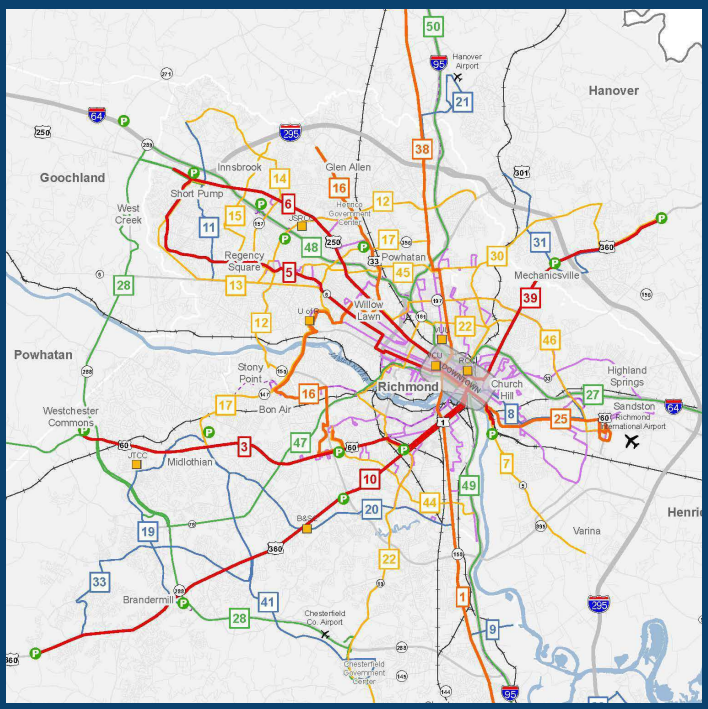
Greater RVA Transit Vision Plan

Virginia Department of Rail and Public Transportation



Greater RVA Transit Vision Plan

INITIAL PUBLIC REVIEW DRAFT – NOT FINAL FORMAT

The Richmond Regional Transportation Planning Organization Serves:

Ashland | Charles City | Chesterfield | Goochland

Hanover | Henrico | New Kent | Powhatan | Richmond

This report was funded by DRPT and prepared by:

Michael Baker International
with:

Rhodeside and Harwell, Inc.

AECOM

Southeastern Institute of Research

Foursquare Integrated Transportation Planning

Greater RVA Transit Vision Plan

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Executive Summary

Why a Vision Plan?

The Greater RVA Region is undergoing transformative trends. The City is experiencing a resurgence of population growth, and the region is becoming known as an attractive place to live on a national scale. From trendy restaurants to outdoor recreation assets, the region's quality of life is attracting young and old alike. Meanwhile, with much anticipation, the Greater RVA Region is embarking on a starter-line of Bus Rapid Transit (BRT) – The Pulse. Yet recent studies have illuminated hurdles to prosperity within the region, particularly with respect to transportation-related issues such as access to jobs. Comparisons to other regions reveal that the overall level of transit investment in the greater Richmond region falls far below that of similarly-sized regions. The questions that arise from these events and insights point to the need for a regional-scale and long-term vision for public transportation.

How will we address the inequities of job access in a growing region, and how can we expand the BRT system most effectively? How can land use and transportation together create greater mobility and opportunity for our residents? The Greater RVA Transit Vision Plan addresses these challenges and offers a long-term plan for transit that can shape regional growth and transit investments for decades to come.

Who Shaped the Plan?

The Vision Plan was developed through a collaborative process. The plan is sponsored by the Virginia Department of Rail and Public Transportation (DRPT) and the Richmond Regional Transportation Planning Organization (RRTPO). The planning process involved all of the jurisdictions in the RRTPO region, both via direct outreach from the study team and through frequent updates to the RRTPO citizen, technical and policy boards. A core group of stakeholders was highly engaged in the plan's development: The Regional Transit Forum was formed to provide guidance and input for this study, and the group is intended to continue in some form as the region moves forward with implementation of the plan. A list of Regional Transit Forum participants is provided below.

The general public also engaged in developing this plan, through three rounds of public meetings, each held in three locations, at key milestones in the planning process. The public engagement process is documented on the project website: www.rvatransitvision.com.

The plan was prepared by a consultant team led by Michael Baker International, with Rhodeside and Harwell,

The Regional Transit Forum included representatives from the RRTPO jurisdictions and the following invited organizations; Amazon, Bay Transit, Capital Region Airport Commission, Chesterfield Chamber of Commerce, Coalition for Smart Transit, Federal Highway Administration, Greater Richmond Chamber of Commerce, Housing Opportunities Made Equal (HOME), John Tyler Community College, Mt. Gilead Church, Chesterfield NAACP, Hanover NAACP, Richmond Branch NAACP , Owl Inc. Transportation, Paralyzed Veterans of America, Partnership for Smarter Growth, Reynolds Community College, Richmond Anti-Poverty Commission, Richmond Association of Realtors, Richmond Hill, Richmond Metropolitan Transportation Authority, RideFinders, Richmond Regional Planning District Commission, RVA Rapid Transit, Senior Connections, the Capital Region Collaborative, Richmond Regional TPO Citizens Transportation Advisory Committee, Richmond Regional TPO Elderly and Disability Advisory Committee, Urban Land Institute, Van Go, VCU, Venture Richmond, Virginia Transit Association, Virginia Union University, Virginians for High Speed Rail

Inc., AECOM, Foursquare Integrated Transportation Planning, and the Southeastern Institute of Research (SIR).

What is the Vision for 2040?

By 2040, transit will connect the Richmond region through an efficient, reliable, seamless and sustainably-funded system that benefits everyone by enabling economic growth, promoting livable and walkable transit-oriented development, expanding access to jobs and services, and strengthening multimodal access within and beyond our region.

What Routes and Services Meet the Vision?

Overview

The Vision Plan includes a full range of bus transit services, from frequent service on dedicated right-of-way in our most transit-supportive corridors to demand-responsive services in rural areas of the region. Most importantly, the plan is a *network* of proposed transit services that are designed to work together to effectively serve areas that have one or more of the following characteristics:

- Existing land use characteristics that support transit (activity density and mixed land uses)
- Existing demographic characteristics pointing to a need for public transit (such as low income and zero-car households)
- Existing population and employment characteristics pointing to a likelihood to use transit (combinations of the above with certain types of jobs that correlate with transit use)
- Adopted land use plans that show transit-supportive characteristics in the future
- Forecasted population and employment densities that indicate transit-supportive land use will occur by 2040
- Opportunities to better link population with jobs despite a lack of the above characteristics

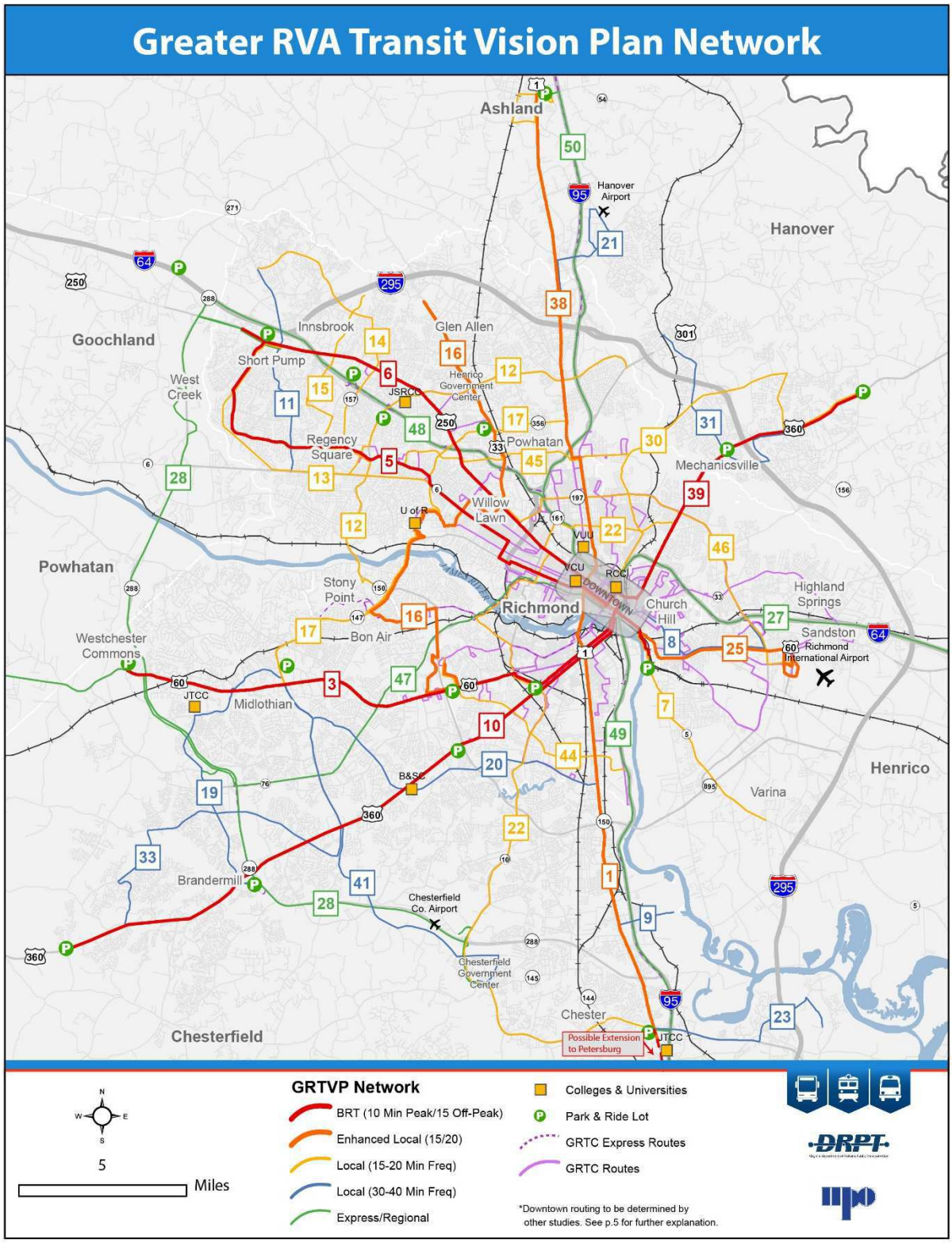
Throughout the development of the plan, stakeholder and public input was key in assessing the technical data and understanding regional dynamics that are important to the Vision Plan. The Plan thus addresses two important types of opportunities for transit service: one is providing services to areas that are expected to have strong ridership once the services are in place based on existing or planned land use and demographics; the other is providing service to areas that have the potential to be shaped into more transit-supportive corridors over time where there are benefits to the region for doing so, such as enhancing access to the region's economic engines. In many corridors, both of these dynamics are in play. In fact, each corridor is unique in its mix of opportunities. A market analysis is included in this study that illustrates the very different dynamics on three different transit corridors that are proposed in the plan. As the regional stakeholders move forward with implementation, it will be important to keep the unique dynamics and opportunities of each corridor in mind as funding and project development strategies take shape.

Two other plans, the **Richmond Transit Network Plan** and the **GRTC Transit Development Plan**, are both anticipated to provide new details for transit service routing in the City of Richmond and downtown in particular, where The Pulse will begin operation in fall of 2017. The studies are all making use of this plan's Vision statement, and engagement of many of the same stakeholders across these studies is helping to provide consistency.

Vision Plan Transit Network

The transit network in the Vision Plan is presented in Figure 1. The network consists of several service types, described in the paragraphs that follow. Route numbers are provided in parentheses, as shown in Figure 1.

Figure 1 Greater RVA Transit Vision Plan – Transit Network



Source: Michael Baker International, 2016

BRT: The Vision Plan includes five BRT corridors, in which frequent (10 or 15 minute) service will be expedited by infrequent stops (every 0.5 to 1.5 miles), stations with off-board fare collection and real-time arrival information, traffic signal enhancements, and some instances of dedicated bus lanes.

- **Broad Street** (6) – from The Pulse BRT at Willow Lawn to Short Pump Mall, this line would be an extension of The Pulse (no transfer between lines)
- **West End South** (5) – from Cary and Main/Patterson/Regency Mall to Short Pump Mall
- **Midlothian** (3) – from The Pulse downtown station(s) to Westchester Commons, via Hull Street/Southside Plaza/Belt Blvd/Midlothian TurnpikeHull Street Road (10) – from The Pulse downtown stations(s) to Southside Plaza (running in parallel with Midlothian BRT, no transfer required) to the Woodlake/Magnolia Green area
- **Hull Street Road** (10) – from The Pulse downtown stations(s) to Southside Plaza (running in parallel with Midlothian BRT, no transfer required) to the Woodlake/Magnolia Green area
- **Mechanicsville Turnpike** (39) – from The Pulse downtown station(s) to Mechanicsville and beyond I-295 (vicinity of Walnut Grove Rd)

Enhanced Local Service: The Vision Plan includes four enhanced local service routes with service every 15 or 20 minutes all day and relatively infrequent stops at main activity centers. These routes provide greater access and reliable service on key regional corridors where the opportunity for enhanced access to employment and activities requires all-day service on local roads, and where transit-oriented development opportunities may ultimately support BRT service later in the future.

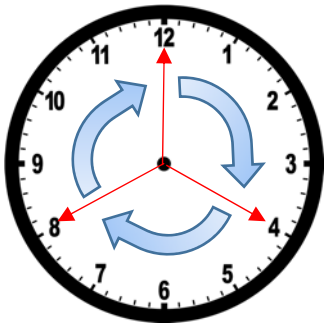
- **Airport Connector** (25) – from The Pulse downtown station(s) to Richmond International Airport along Williamsburg Road/Route 60
- **Staples Mill Road/Regional Connector** (16)– from Willow Lawn/Broad Street to Glen Allen (south of I-295), with a southern extension to University of Richmond and Stony Point, ending at the Midlothian BRT
- **Route 1 North** (38)– from The Pulse BRT downtown to Ashland along US 1
- **Jeff Davis** (1) – from The Pulse BRT (and connecting with Route 1 North service) south to Chester along Jefferson Davis Highway (US 1), with possible express link to Petersburg

Express/Regional Routes: The Vision Plan includes six routes that provide long-distance regional connections via the region's high-speed facilities. These routes support commute trips, with one-way or two-way service during peak commute times. The Vision Plan encourages two-way service to enhance connections between residents and jobs, supported in part by circulator routes at the ends of these routes that are in Henrico, Hanover and Chesterfield to support last-mile access to destinations both downtown and in the suburban activity centers.

- Ashland (50) – Downtown (via I-95)
- Petersburg/Chester (49) – Downtown (via I-95)

- Goochland/Western Henrico (48)– Downtown (via I-64)
- Powhatan-Midlothian (47) – Downtown (via Powhite Parkway) – note that this route also connects Powhatan Route 60 activity center(s) to the Midlothian BRT
- Route 288 (28) – Connecting Short Pump and West Creek to Chesterfield Government Center with connections to activity centers and other transit services along Route 288
- New Kent (27) – Downtown (via I-64)

Local Fixed Route Service: The Vision Plan's recommended local routes focus on extending service into the areas of the region where transit ridership markets are present today or are anticipated in the future. These routes are designed to provide good connections to other routes (existing, or Vision Plan BRT, enhanced local, and express). The plan includes 12 high-frequency (every 15-20 minutes) routes, many of which provide long-distance connections between key activity centers and north-south connections between the primarily east-west-oriented BRT lines. An additional 10 fixed routes in the plan are recommended at 30-40 minute frequencies. These routes are in areas that have lower transit-supportive characteristics today, but either they connect very important activity centers to core transit services in the plan (such as Route 23 which extends to key major employers east of Chester), or they are shown in long-term land use plans to have future potential transit-supportive characteristics. These routes could be started as a different type of service called **Deviated Fixed Route** service, which involves calling ahead of time so that each day's routes will adapt to pick up at requested locations (though not a door-to-door service). This service would provide flexibility to reach more dispersed riders as the ridership base and more transit-supportive land use patterns are established over time.

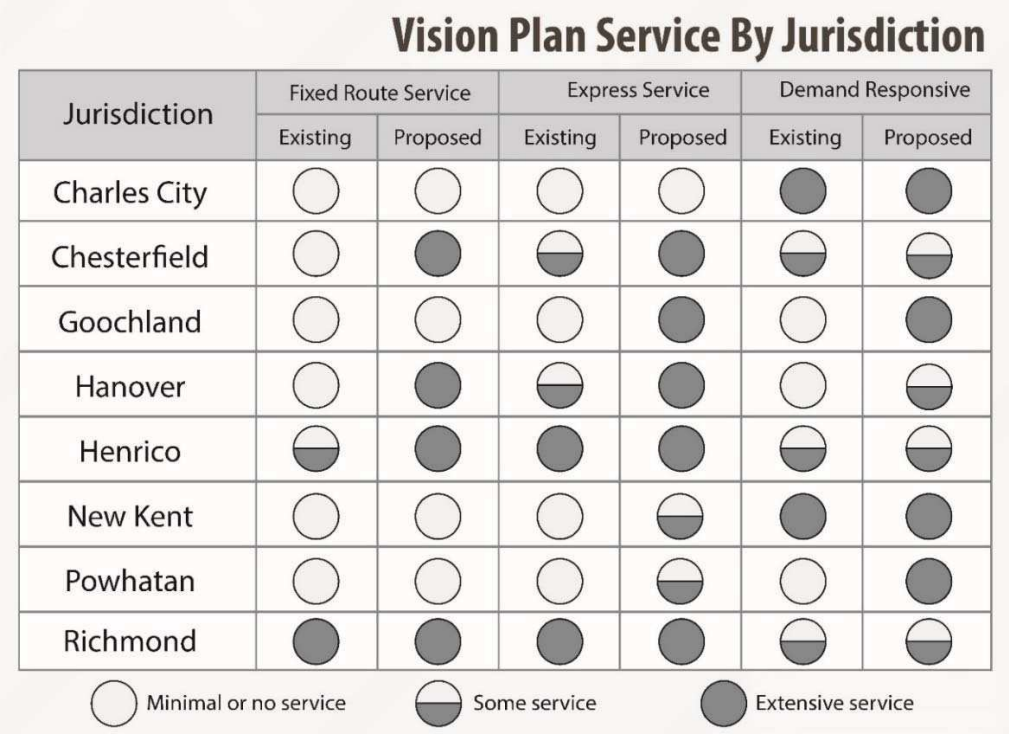


In Figure 1, the downtown area is 'grayed out' and the specific details of the routes are not shown. The reason for this is that two other plans, the **Richmond Transit Network Plan** and the **GRTC Transit Development Plan**, are both anticipated to provide new details for transit service routing in the City of Richmond and downtown in particular, where The Pulse will begin operation in fall of 2017. The engagement of the leaders and many of the same stakeholders across these studies is helping to provide consistency. The Vision asserted in this plan is a key input to the other studies, particularly the high quality service recommendations (BRT and Enhanced Local Service). Thus, the other studies deliberately follow the Vision Plan in sequence. At the same time, some of the principles of the Network study, such as providing a connected network of routes that enable more direct travel via transit, have been incorporated in the Vision Plan network design as well.

The Vision Plan also includes **Park-and-Ride Lots** in strategic locations to provide drive-to access for the higher-speed transit services throughout the region. Many lots also will serve carpoolers.

The network is also enhanced by **Paratransit** services in all of Henrico County and the City of Richmond, per current policy, and within ¾ of a mile on either side of fixed routes in the remaining jurisdictions. Paratransit service is door-to-door or curb-to-curb transit that serves those who are not able to ride fixed route transit, and customers are screened for eligibility. Federal law requires paratransit service be offered to those within ¾ mile on both sides of any fixed route service. The Vision Plan also recommends other **Demand-Responsive** services that offer curb-to-curb rides with no eligibility screening in the rural jurisdictions, ideally modeled on the Bay Transit services available today in New Kent and Charles City Counties. The types of services offered in each jurisdiction are summarized in Figure 2.

Figure 2 Greater RVA Transit Vision Plan – Service Types by Jurisdiction



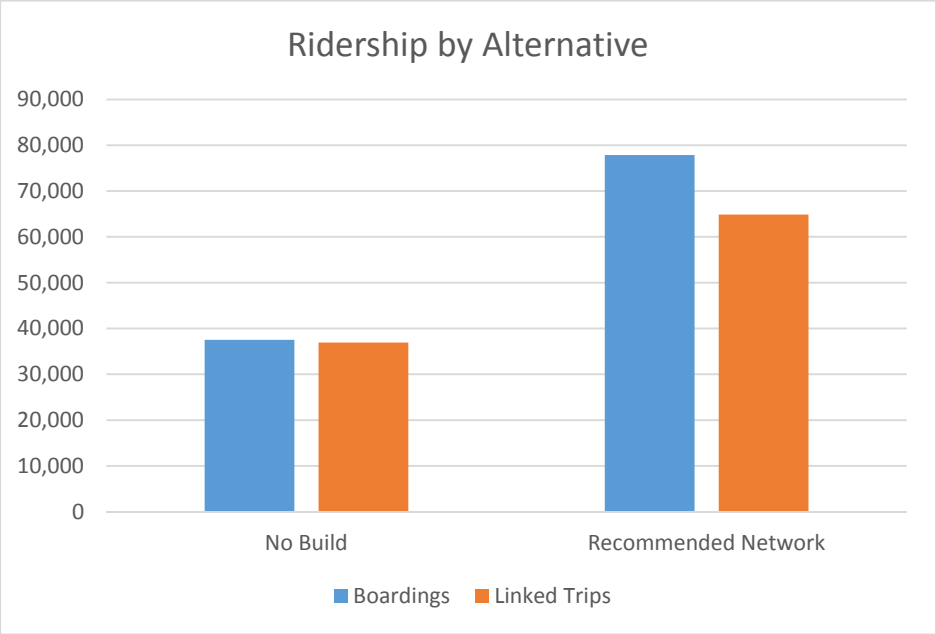
Performance

Several measures are used to assess the performance of transit routes and the full transit network. The travel model used in the study provides a ridership forecast for each route. The performance measures compare the ridership to the investments in the system and each route to understand how effective and cost-effective the routes are as well as the system as a whole. The performance metrics of the 2040 Vision Network are compared to the 2040 No Build Alternative, which represents the forecasted future ridership of the existing transit network plus The Pulse BRT in 2040 (accounting for projected changes in land use that will alter transit usage by 2040).

The performance measures compare the ridership to the investments in the system - and each route - to understand how effective and cost-effective the routes are as well as the system as a whole.

The metrics for ridership are boardings (how many times someone boards a bus, regardless of transfers) and linked trips (the number of trips made by bus, including transfers). The Vision Plan network increases service hours over the No Build Alternative by 93% and increases ridership by 107% to just under 80,000 boardings per day. When transfers are taken into account, the Vision Plan supports 76% more linked trips. Figure 3 provides the ridership results. The higher increase in linked trips also indicates that a higher proportion of trips will include transfers (which is expected in a system offering frequent service, because the reduced wait times make transfers more attractive).

Figure 3 Ridership Results



The Vision Plan network's performance in providing access to transit is impressive. Specifically, the projected 2040 population that will be within ½ mile of transit service will increase substantially. The population near frequent transit will increase from 2% of the population under the No Build to 10% under the Vision Plan, while the population near any transit in total will increase from 19% to 33%. Similarly, for employment, the overall amount of jobs near transit will increase from 31% to 55%, with a dramatic increase of 8% to 23% for employment near frequent transit.

Cost

The system presented in the Vision Plan is estimated to cost **between $123 and $147 million** (in 2016 dollars) for annual operations, which is 150 to 200% more than the No Build Alternative. This estimate includes operation, maintenance, and administrative and marketing costs for high quality, express, fixed route and paratransit services. The No Build includes the current system, plus the planned Pulse system from Willow Lawn to Rockett's Landing. These base costs of $48 million (2016 dollars) are in both the No Build and the Vision Plan cost estimates. Capital costs are estimated separately and include a new maintenance facility, additional buses, and a variety of costs associated with the high quality service lines. At this stage of planning, it is difficult to provide a refined estimate for the capital costs of BRT corridors in particular, since the number of stations, the extent of traffic signal improvements, and the extent of dedicated right-of-way are unknown. The study team estimated a range of costs representing the high and low ends of likely costs, based on average numbers of stations and traffic signals in each corridor based on mileage, and considering the observed range of per-mile costs for existing BRT systems. The estimated Vision Plan costs are summarized in Table 1. Greater detail on the capital and operating costs is provided at the end of Chapter 4. The increase in annual costs is dramatic, but it includes 'catching up' to put the Richmond Region on a par with regions of similar size (as discussed in Chapter 1) as well as expansion to serve anticipated regional growth to 2040.

Table 1 Vision Plan Cost Summary (2016 dollars)

	2040 Vision Plan $ Million
Annual Operating Costs[1]	**$123 - $147**
BRT Capital Costs	**$450 - $870**
Short Pump BRT Extension[2]	$85 - $165
West End South BRT[3]	$110 - $210
Midlothian BRT[4]	$100 - $195
Hull Street BRT[4]	$95 - $190
Mechanicsville BRT[4]	$60 - $110
Enhanced Local Service Capital Costs	**$80 - $145**
Airport Connector	$5 - $10
Staples Mill/Regional Connector	$25 - $45
Route 1 North – Ashland	$30 - $55
Jeff Davis South - Chester	$20 - $35
Other Capital Costs[5]	**$255 to $360**

[1] Includes the costs of the existing transit and paratransit system plus The Pulse

[2] Assumes up to 100% of the corridor has dedicated lanes for BRT

[3] Assumes up to 75% of the corridor has dedicated lanes for BRT

[4] Assumes up to 50% of the corridor has dedicated lanes for BRT

[5]Includes buses and stops for expanded routes, additional paratransit vehicles, park and ride lots and a maintenance facility

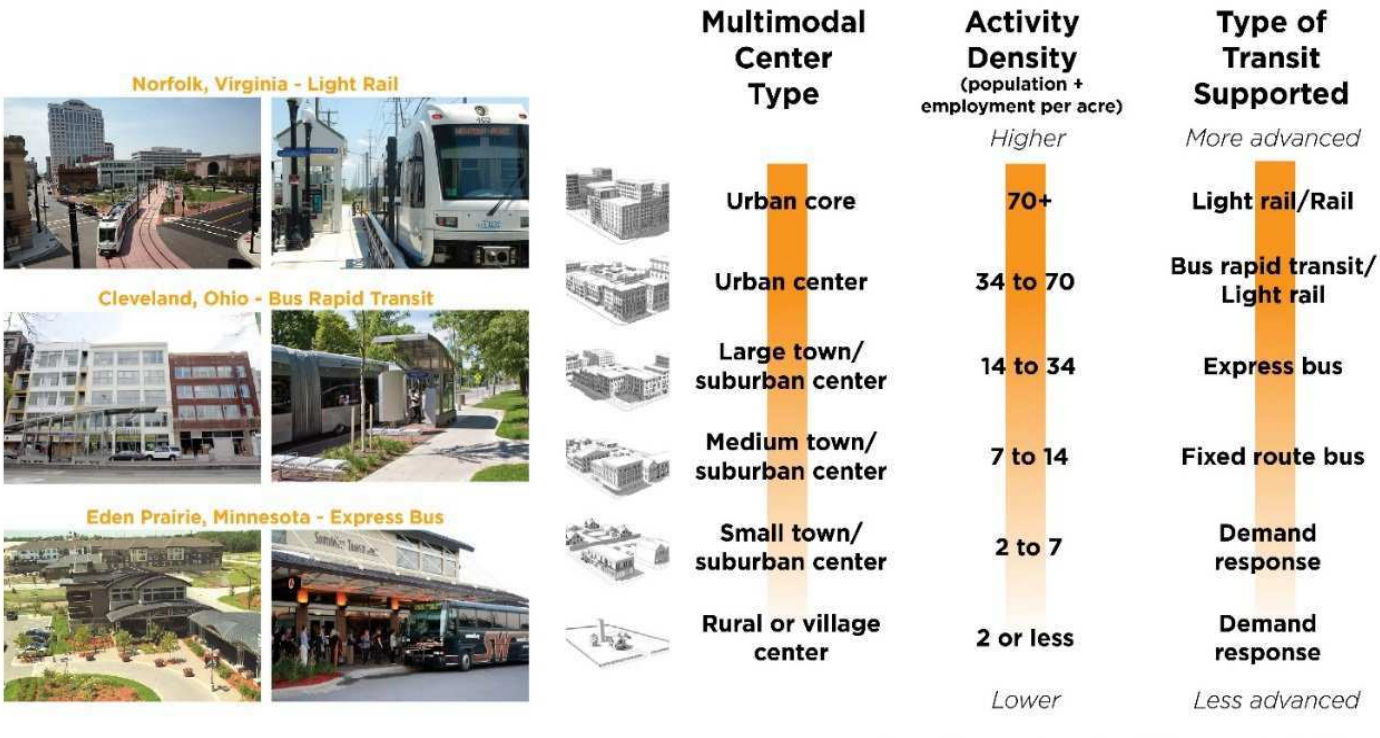
It bears mentioning that the region would not likely leap directly to the investment level of the full Vision Plan Network. A 'catch up' network would cost approximately $100 million per year (including the existing system), to put the Richmond Region on a par with regions of similar size, as discussed in Chapter 1. An initial lower cost alternative could have shorter lines in some BRT corridors, particularly Hull Street, West End South and Mechanicsville BRT, to focus service initially in the areas that have supportive land use today. A lower cost alternative would also have reduced frequencies on some of the longer suburban and orbital routes. An initial alternatives analysis showed that a well-designed smaller scale system expansion would see ridership gains. Chapter 5 addresses more specific suggestions for phasing, but also emphasizes that each component of the Vision Plan will move forward on the basis of local interest and 'championing' the services proposed in the Vision Plan, ideally in tandem with actions to foster transit-supportive land use.

What is the Role of Land Use?

Transit services are most effective when large numbers of people can walk a reasonable distance to and from transit stops and can access a variety of destinations near the stops. Together, transit-oriented land use and transit services create a self-reinforcing pattern of mobility and sustainability by reducing the need for travel lanes and parking to support automobiles, while supporting greater densities of development that increase property values and the local tax base. To understand the viability of transit in an area, we examine the **activity density** – the number of people plus the number of jobs per acre. Different densities of people and land use patterns support different types of transit. Generally, the denser the activity (i.e., the more people living and working) in an area, the more advanced the transit system that can be supported. More advanced transit options

typically have higher quality facilities and more frequent service. The guidelines in Figure 4 relate different levels of activity density to the appropriate types of transit services.

Figure 4 Activity Density and Transit Viability



Source: Rhodeside and Harwell, Adapted from DRPT *Multimodal System Design Guidelines*, 2013

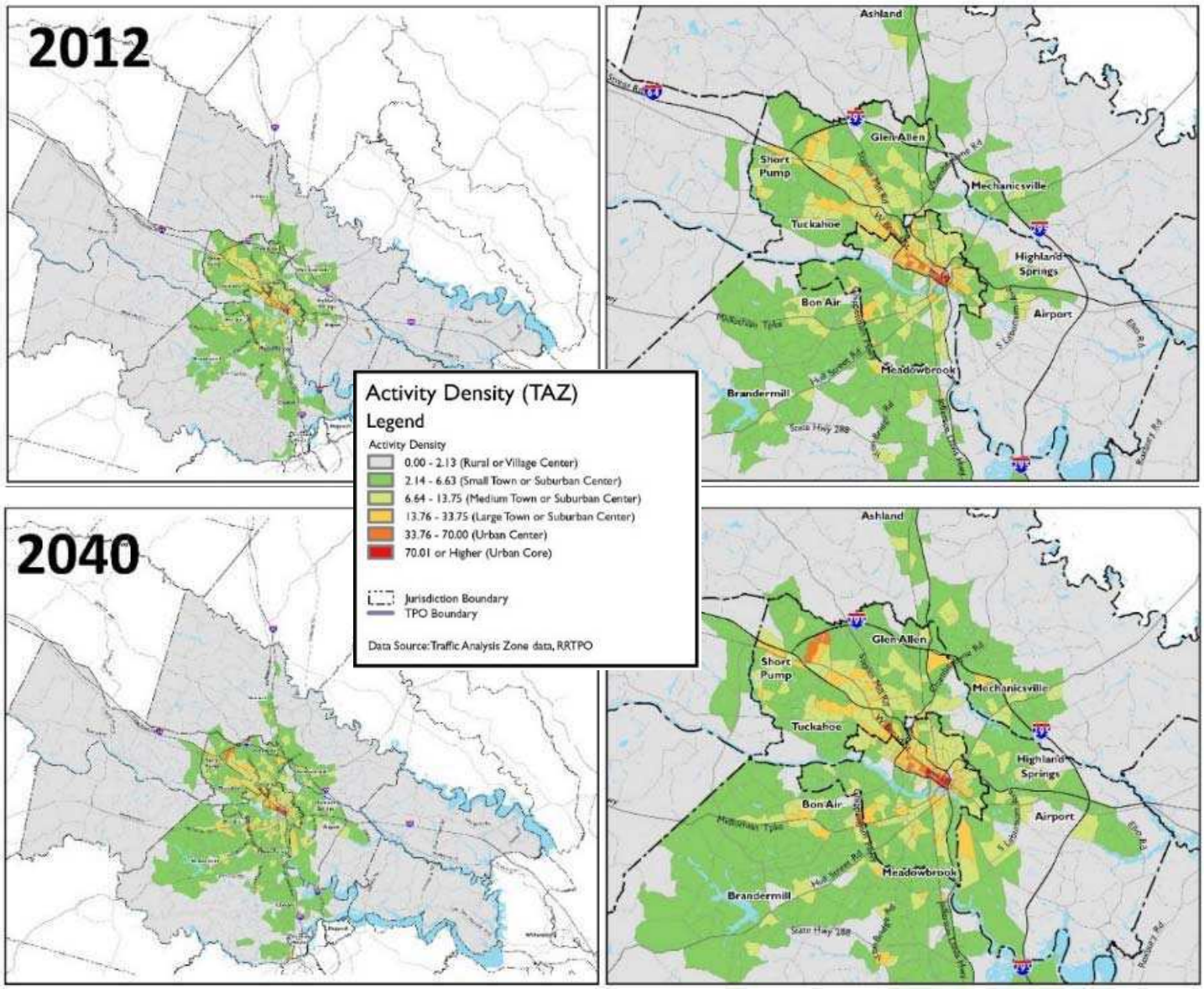
The design of the built environment also influences the viability of transit. In addition to an active transit system and a well-connected street network, transit-oriented development (TOD) has the following characteristics:

- Destinations: Shops, jobs, public spaces, medical facilities, and other activity hubs
- Pedestrian-scale design: Comfortable and spacious sidewalks, with buildings close to the street and parking lots in the back
- People: Enough people for businesses to flourish and for public transit to run frequently.
- Mixed uses: A variety of land uses in the same area (housing, retail, schools, parks, offices, etc.)
- Parks and public spaces: Plenty of public places to meet, gather, and play
- Complete streets: Streets designed to provide safe access for people biking, walking, taking the bus, and driving

Existing Land Use and Future Plans

The Vision Plan includes an examination of both existing and future land use. The existing activity densities reveal several areas of the region that are already 'ripe' for transit and many areas that fall below the threshold for fixed route transit. Future plans and projections indicate that even more of the region will be developed to transit-supportive densities by 2040. Figure 5 shows the activity density for 2012 and 2040, with activity density levels coded to match the Multimodal Center types, as listed in Figure 4. Activity is expected to increase throughout the region from 2012 to 2040; however, much of the growth is

Figure 5 Projected Activity Density, 2012, 2040



Source: Rhodeside & Harwell, from RRTPO data

concentrated in the City of Richmond and the Counties of Chesterfield and Henrico. Most of the study area has activity levels equal to that of a rural or village center, or small town or suburban center, both of which are generally associated with a demand response transit system. As the projections progress from 2012 to 2040, it appears that more areas of the region will have activity levels that can support express bus, BRT, LRT, or rail. Areas projected to have higher densities by 2040 include the area south of Rocketts Landing (between the James River and Route 5), Brandermill, Short Pump, Mechanicsville, and the airport area. Though these are some of the areas expecting the greatest amount of change, they are not necessarily the areas with the highest levels of activity density in the future. In addition, there is potential for growth in other areas, particularly if there are changes in policy to encourage transit-supportive development.

Opportunities in the Vision

Based on analysis of the comprehensive plans and zoning ordinances in the region's jurisdictions, it is evident that transit-supportive development is possible under existing land use and zoning policies. There are opportunities to shape future land use differently in tandem with planned transit services, particularly in the high quality transit service corridors. With the regional vision for transit in mind, land use policies should be enhanced and applied strategically to create a robust and comprehensive long-term implementation plan.

The plan includes Policy recommendations for each of the recommended corridors. These recommendations primarily emphasize the following concepts:

- Collaborate with neighboring jurisdictions to prioritize corridors for TOD investment, and create a shared corridor master plan vision.
- Develop corridor-specific land use plans that direct future development into Multimodal Centers around future transit stations.
- Adopt policies that will require or incentivize development to occur in a pattern that will support efficient transit service.
- Invest in safe and comfortable pedestrian and bicycle facilities for access to all future transit stations.

Wild Card: Autonomous Vehicles

A plan for 2040 needs to acknowledge the likelihood that the ways we get around in general, and particularly in urban areas, will be transformed in many ways by changes in technology that are well underway today. The first fully autonomous vehicles are expected to be on the roads within the next five years and are anticipated by many industry experts to be commercially available within the next 5-10 years. For transit, it's unclear at this time how the changes in travel behavior that result from new technologies will play out. One thing is certain – driverless vehicle technology will fundamentally change the cost and revenue model of public transit. It may be that smaller vehicles in greater numbers will make more customized trips, while essentially driverless BRT operates in the highest-demand corridors. Transit agencies are currently preeminent experts in vehicle fleet management, which may create opportunities for an expanded role if ownership of autonomous vehicles (particularly in urban areas) moves in the direction of fleet ownership in lieu of personal ownership. The marketplace for hailed ride services such as Uber and Lyft, which currently have stated business plans to move towards driverless vehicles (currently being tested by Uber in Pittsburgh, PA), also creates uncertainty in the prediction of how transit agencies will continue to serve the public in 2040. At present, transit agencies are partnering with these Transportation Network Companies (TNCs) for last-mile services and to enhance public transit in low-density areas, but these relationships will continue to evolve as technology, financing and public policy alter the playing field. Many changes will occur to shape how the public, including people of all abilities, incomes and neighborhood densities, alter their transportation demands and habits in the future. Nevertheless, many experts expect that public transit will continue to be an important component of urban mobility.

Olli: http://newatlas.com/olli-electric-driverless-bus/43901/

Where Do We Go from Here?

The Vision Plan provides context and direction for many planning efforts to come. The TPO plans to take the insights from the plan and examine, through scenario planning, how different land use patterns could further enhance the performance of the transportation system including the proposed transit vision network. Each

of the BRT corridors will need to be studied and refined to determine the exact route, station locations, operating plan and design. Many of the recommendations will rely on local government actions to move them forward, such as the fixed route transit services proposed in the Counties. The plan also provides insight into the level of transit investment that the region may aspire to over time. *It's one thing to understand that similarly-sized regions invest a great deal more in transit – this plan provides concrete proposals that illustrate untapped demand for transit in the region and the opportunities to greatly enhance mobility and accessibility through a more robust investment in public transit*.

Critical First Steps

For the TPO and its members, the critical first steps are as follows:

- Encourage local governments to identify the corridors and services they want to champion through further transportation and land use studies. *Initial studies should examine land use and transportation together, identifying goals for the service, determining appropriate alignments, operable segments, design features and station locations, and assessing performance of alternatives.*
- Undertake regional Scenario Planning to further explore the potential synergy between the Vision Plan's transit recommendations and more transit-oriented development patterns. *The land use recommendations for the high quality service corridors described earlier in this chapter can be modeled along with the Vision Plan's transit recommendations to determine the full potential of integrated transit-oriented development to generate transit ridership in the region.*
- Support the continued interaction of the Transit Forum or a similarly-composed group of stakeholders to guide transit planning in the region.
- Study BRT to Short Pump. *This study should lead up to FTA project development for a Small Starts grant – it should identify the purpose and need for the service, develop and evaluate reasonable alternatives, and lead to the selection of a locally-preferred alternative.*
- Examine the feasibility and funding potential for express bus service on Route 288. *This inter-jurisdictional service would require a new model for local funding and should be examined cooperatively to determine if it meets local goals and objectives to an extent that the counties would support it financially.*
- Continue to educate all stakeholders about the relationship between land use density, transit-oriented urban design, and high-quality transit investments so that the appropriate policies can be adopted that will achieve the community's long-term vision and transportation needs.

Chapter One: The Starting Line

The baseline information about the region defines our starting line. The services we have today, the organization and administration of transit services, and the land use and demographic information about the region all provide critical insights into the starting point from which we can craft a regional transit vision.

Where is transit available today?

Within the RRPDC region, four primary types of transit services are available today, and a fifth is on the horizon. Within the City of Richmond and Henrico County, the fixed route services shown in Figure 6 are provided up to 18 or 19 hours per day, seven days a week. In addition to these routes, express routes provide service between park-and-ride lots and downtown during peak commute times. These routes are also shown in Figure 6. Throughout Richmond and Henrico County, paratransit service is offered for those needing door-to-door service based on eligibility criteria such as age and disability. In New Kent and Charles City County, demand-responsive service is available based on advanced reservations, provided by Bay Transit which serves a 12-county region. Human service providers also provide combinations of paratransit and demand-responsive transit in Chesterfield County based on various criteria.

In 2017, Richmond and Henrico County will add a fifth type of transit service known as Bus Rapid Transit or BRT. This type of service is described in greater detail in Chapter Four: The Regional Transit Vision Plan. It will provide bus travel times that are competitive with the automobile through a combination of traffic controls and dedicated lanes, and it will run at high frequencies (every 10 minutes in peak periods and every 15 minutes the remainder of the day), adding greatly to passenger convenience. Figure 7 provides an overview of the corridor to be served by The Pulse BRT.

In addition to GRTC and various human service transit providers, three counties have specialized transit services. Access Chesterfield, Chesterfield County's Coordinated Transportation Program, provides transportation services for any Chesterfield County resident who is disabled, aged 60 or older, or who meets federal income guidelines. Rides outside of Chesterfield are provided for eligible riders to health care and disabled riders to work. New Kent and Charles City County have demand response service provided by Bay Transit which provides 159,000 annual rides across 12 counties. Bay Transit's services include New Freedom for disabled patrons, and additional service that is not eligibility-restricted for $3.00 per ride, which is largely used for work trips including destinations in nearby counties and the City of Richmond.

Figure 6 GRTC Fixed Route Transit Service, 2016

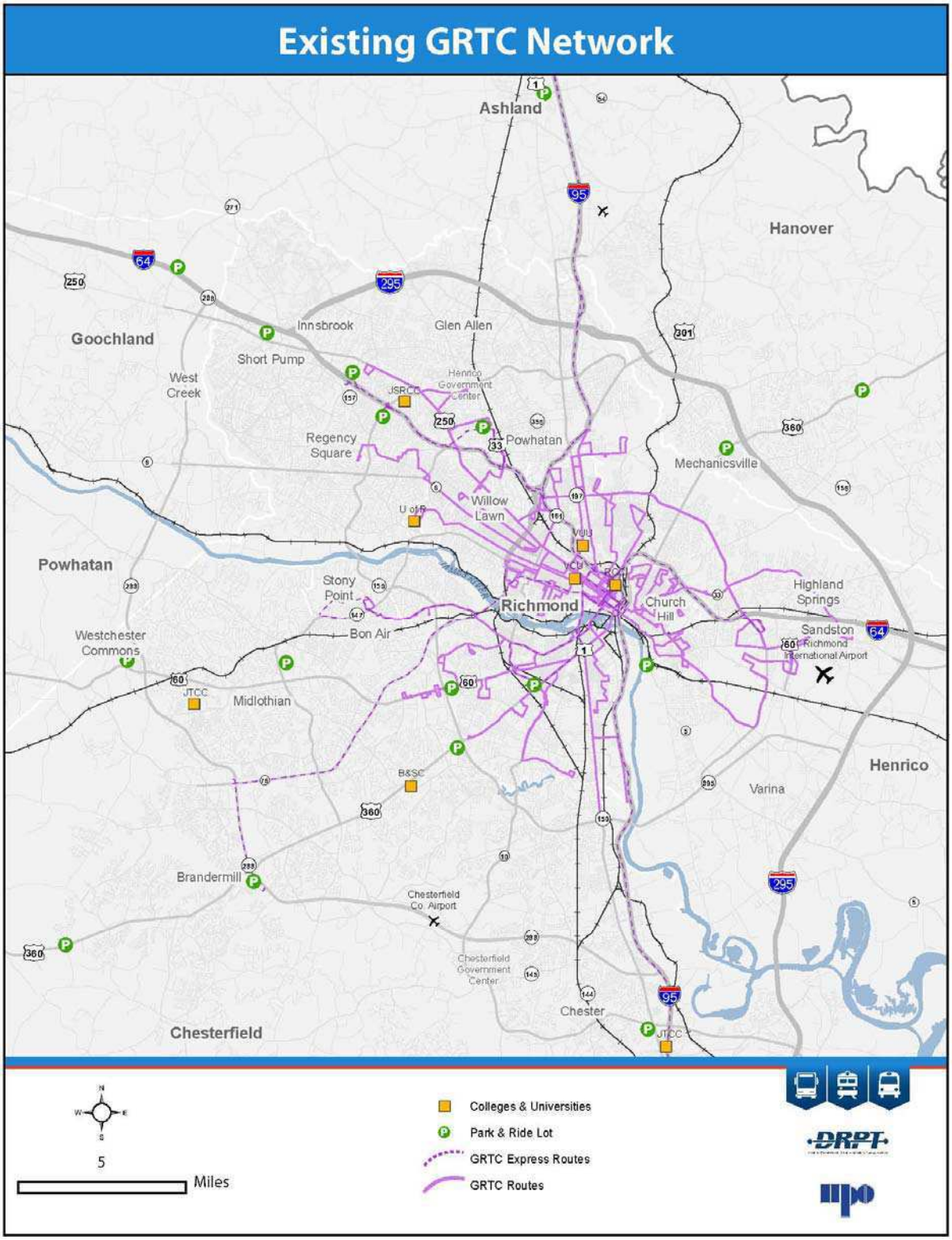
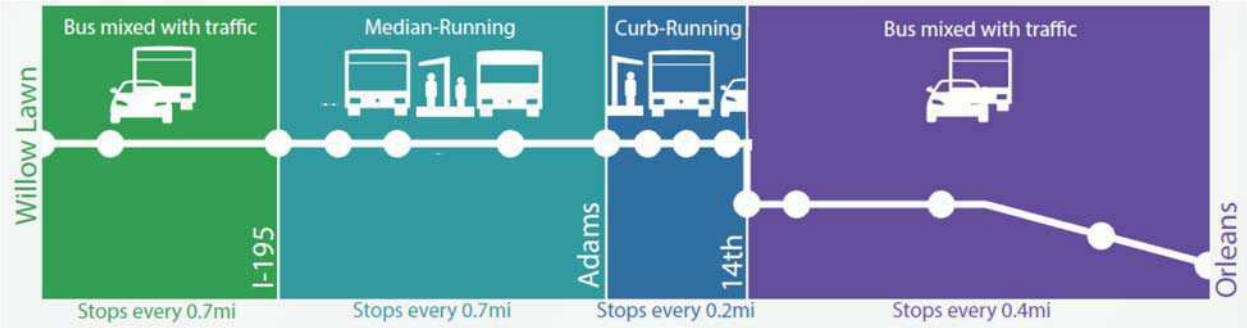


Figure 7 The Pulse BRT Schematic



Source: Michael Baker International

How is transit administered and funded today?

The primary transit provider in the Greater RVA region is GRTC Transit System. GRTC originally served the City of Richmond but became a regional transit agency in 1989 when the current board structure was put in place. Prior to 1989, the City of Richmond was sole owner of GRTC and its predecessors, but in 1989, Chesterfield County purchased one-half interest in the Company. GRTC has six board members, three each from the City of Richmond and Chesterfield County. While Chesterfield County shares control of GRTC, only two express bus services are currently offered in Chesterfield. Henrico County, though not an owner, does contract with GRTC to provide local fixed-route and express services in Henrico. In addition to bus transit services, GRTC includes RideFinders, an arm of the agency that encourages transportation demand management (TDM) through matching riders and drivers for carpools and vanpools, providing web services for trip planning, conducting employer outreach, and providing an emergency ride home service for transit and ridesharing users.

GRTC's system costs were approximately $44 million in 2015, including service, maintenance, marketing and administrative costs. Approximately 40% of these costs were covered by income from fares, advertising and purchased services. The remaining 60% of the funds were provided from federal (10%), state (22%) and local (28%) sources. As referenced throughout the Vision Plan, the 2016 System Costs were $48 million.

How does our region compare in transit mobility?

In 2011, the Brookings Institute conducted analysis of over 350 transit providers in the nation's largest metropolitan areas (*Missed Opportunity: Transit and Jobs in Metropolitan America*, May 2011). As the nation was recovering from the Great Recession, the report emphasized the importance of providing access to regional employment via public transit. The study found that in the Richmond Region (as defined by the full Metropolitan Statistical Area including the RRTPO and Tri-Cities metropolitan regions), only 27% of jobs were reachable via transit in 90 minutes. Also, only 31% of working age residents had access to at least one transit stop within ¾ of a mile of their residences. While the Richmond region ranked 44th in size (population) among the metro areas, it ranked 92nd in transit access. The comparative funding levels in the top 50 regions reinforce this observation: the Top 50 regions average $127 million in annual operating budgets, compared to $48 million for GRTC. Further, if you take the average of the 30 regions that surround Richmond in the rankings (14 above and 16 below Richmond's rank in size), the annual average funding level is $99 million. Just the 16 that rank immediately below average $83 million per year! Thus, many transit networks from similar-sized cities have substantially greater operating budgets than GRTC, such as Milwaukee, WI ranked

39th in size with an operating budget of $149 million, or Tucson, Arizona, ranked 53rd with an annual operating budget of $71 million.

These insights suggest that the Greater RVA region has the potential to improve connections to jobs and other activities through an expanded transit network. This Vision Plan provides a picture of what that expanded network and services should look like to help the region improve accessibility, sustainability, and growth, so that we can move in the direction of similar-sized regions to be a vibrant and successful 21st century metropolis.

Chapter Two: The Vision

Crafting a Vision

The Vision Statement was created through a collaborative process with the Regional Transit Forum and the public. The Transit Forum went through an exercise at its first meeting in which the stakeholders described the value of transit to the region, envisioned future headlines describing the transit system, and shared elements of the regional transit vision. This information was summarized and built upon through public meetings, in which the public added to the draft vision elements. This information was synthesized into a relatively succinct vision statement that captures both the ways in which the region values transit and the vision for the future of our transit system.

Values

The value of transit as described by the Regional Transit Forum includes the following components, which collectively describe the ways in which transit can contribute to the region's sustainability.

Economic Value:

- **Opportunity:** access to jobs for everyone, lower opportunity cost to society
- **Land Use and Property Value Increases:** increase in property values, encourage different types of economic development (different types of land uses)
- **Economic Development:** attract a skilled workforce, and therefore prospective companies
- **Cost Savings:** savings at the regional level (less spending on roads, parking, etc.) and savings for the individual (less spending on car purchases and operations)

Social Value:

- **Access:** to jobs, medical care, education, groceries. This creates opportunities for freedom and aging in place.
- **Personal Quality of Life:** not having to drive, independence, safety (DUI), exercise leading to health improvements
- **Community Building:** interaction in the public realm, reinforcement of walkable development patterns, improvement in land use patterns, connecting people to each other and to places (to arts, restaurants, churches, etc.)
- **Reducing Poverty**

Environmental Value:

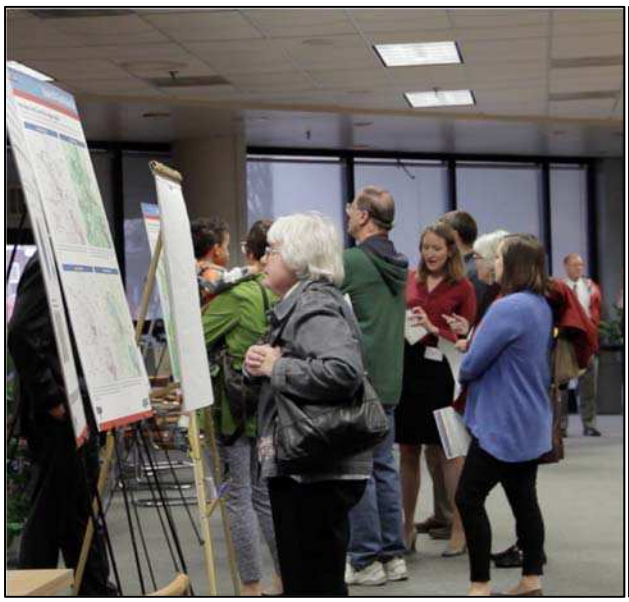
- **Improved Air Quality:** leads to improvements in health
- **Reduction of Carbon Footprint**
- **Reduced Development Impacts**: stormwater management, quality of development
- **Open Space**

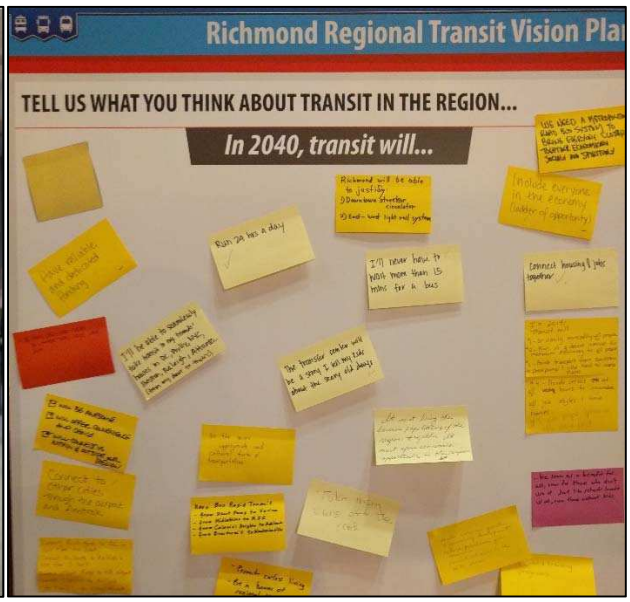
Additional Value:

- Improved Safety
- Increased Regional Cooperation
- Management of Congestion

Public Input

The public was provided the opportunity to respond to a series of prompts regarding the need for transit, the purpose of transit, and the elements of a transit vision. The questions were provided in interactive boards at three public meetings in November, 2015, as well as an online survey that was available through the winter. The greatest responses to the prompt "In 2040, transit will . . ." were "Provide access to jobs and services" and "Connect all areas of the region." (See the summary of November, 2015 public meetings and Survey Results Summary on the project website for more information on the results of the public input and survey.)[1] Additional responses emphasized a vision for transit to be faster and more convenient, to offer new modes of transportation (BRT, light rail, streetcars) and to reduce congestion and reliance on personal vehicles.





Vision Statement

The stakeholder and public input culminated in the following Vision Statement:

> *By 2040, transit will connect the Richmond region through an efficient, reliable, seamless and sustainably-funded system that benefits everyone by enabling economic growth, promoting livable and walkable transit-oriented development, expanding access to jobs and services, and strengthening multimodal access within and beyond our region.*

[1] See www.rvatransitvision.com

Chapter Three: Where Will Transit Succeed?

How does Land Use support transit and vice-versa?

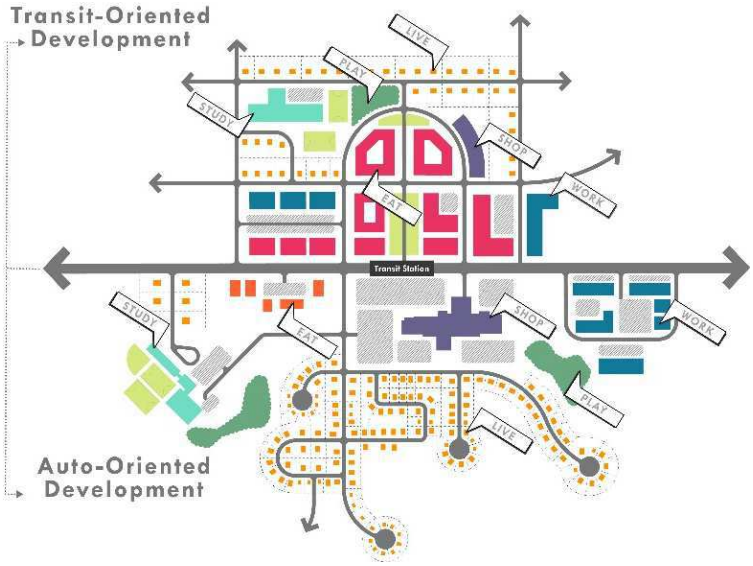
Different densities of people and land use patterns support different types of transit. Generally, the denser the activity (i.e., the more people living and working) in an area, the more advanced the transit system that can be supported. More advanced transit options typically have higher quality facilities and more frequent service.

The design of the built environment also influences the viability of transit. In addition to an active transit system and a well-connected street network, transit-oriented development has the following characteristics:

- Destinations: Shops, jobs, public spaces, medical facilities, and other activity hubs.
- Pedestrian-scale design: Comfortable and spacious sidewalks, with buildings close to the street and parking lots in the back.
- People: Enough people for businesses to flourish and for public transit to run frequently.
- Mixed uses: A variety of land uses in the same area (housing, retail, schools, parks, offices, etc.)
- Parks and public spaces: Plenty of public places to meet, gather, and play.
- Complete streets: Streets designed to provide safe access for people biking, walking, taking the bus, and driving.

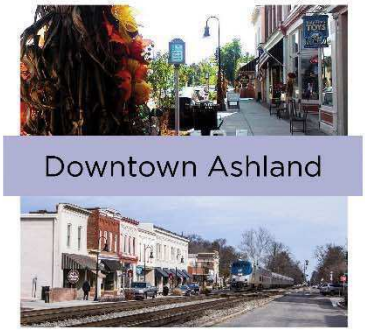
Transit-oriented development is a type of Multimodal Center. The Multimodal Center concept is central to the DRPT *Multimodal System Design Guidelines* (2013), which serve as the centerpiece for this land use analysis methodology. Multimodal Centers are areas that offer easy access for people traveling by train, bus, bike, or foot. They typically include:

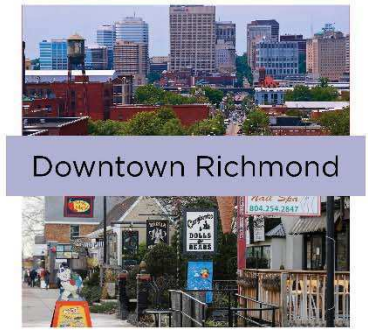
- Localized centers of activity and development density
- Focused activity around transit stations (current or future)
- A walkable, well connected street network with sidewalks
- A mix of uses (live, work, play, shop)



Multimodal Centers can be large or small, in response to their context. For example, within the study area, Ashland, West Broad Village, and Downtown Richmond can all be considered Multimodal Centers.

Multimodal Centers are important because they:





- Create efficient conditions to walk, bike and take transit,
- Boost transit ridership and minimizes the impacts of traffic,
- Provide a mix of housing, jobs, shopping and recreation,
- Create value for the public and private sectors, and
- Promote a sense of community.

Multimodal Corridors move people and goods between and within Multimodal Centers. These roadways accommodate multiple modes in a variety of ways that help to determine whether the corridor is a through corridor or a placemaking corridor. Through corridors generally connect multimodal centers, while placemaking corridors connect areas within multimodal centers. There are several types of corridors (Table 2), as outlined in the DRPT *Multimodal System Design Guidelines* (2013). A corridor is defined as a through corridor or a type of placemaking corridor based on characteristics such as speed, modes accommodated and how, and land uses.

Table 2: Types of Multimodal Corridors

Type of Corridor		Description
Through Corridor	Multimodal Through Corridor	Higher speed corridor that connects multiple activity centers.
Placemaking Corridors	Transit Boulevard	Highest overall capacity and most transit supportive. Dedicated lanes for transit.
	Boulevard	Highest multimodal capacity.
	Major Avenue	Highest density of destinations, intensity of activity, and mix of modes.
	Avenue	Balance between building access and collection of vehicle and pedestrian traffic. Lower speed roadways.
	Local Street	Lowest amount of activity, with slowest speeds and highest access.

Where do regional land use patterns appear to support transit?

To begin the assessment of future land use patterns within the study area, the team looked at projected activity density throughout the region. Activity density is a measure of the concentration of development. It is calculated by adding together population and employment numbers or projections for a certain year, then dividing by acreage of the area being examined. In this case, the areas were individual Traffic Analysis Zones (TAZs). The TAZ data comes from the "Socioeconomic Data Report for the 2012 Base Year and 2040 Forecast Year" (approved April 2, 2015), for which socioeconomic projections (including employment and population estimates) were developed by local governments and the Richmond Regional TPO.[2] The team used the methodology described in the 2013 DRPT Multimodal System Design Guidelines to analyze 2012 ("existing"), 2025, and 2040 projected activity density as a way to understand the region's future expectations for Multimodal Districts and Centers.

Relationship between Activity Density and Supportable Transit Mode

Different levels of development can support different types of transit investments. By differentiating between different types of Multimodal Center types, it is possible to create a relationship between activity density (current and future) and the corresponding level of transit investment that can likely be supported. Generally, higher development densities within these Multimodal Centers can support higher levels of transit investments. Table 2 and Figure 8 present information from the *DRPT Multimodal System Design Guidelines* that relates activity density to specific transit modes, and defines the different types of multimodal centers.

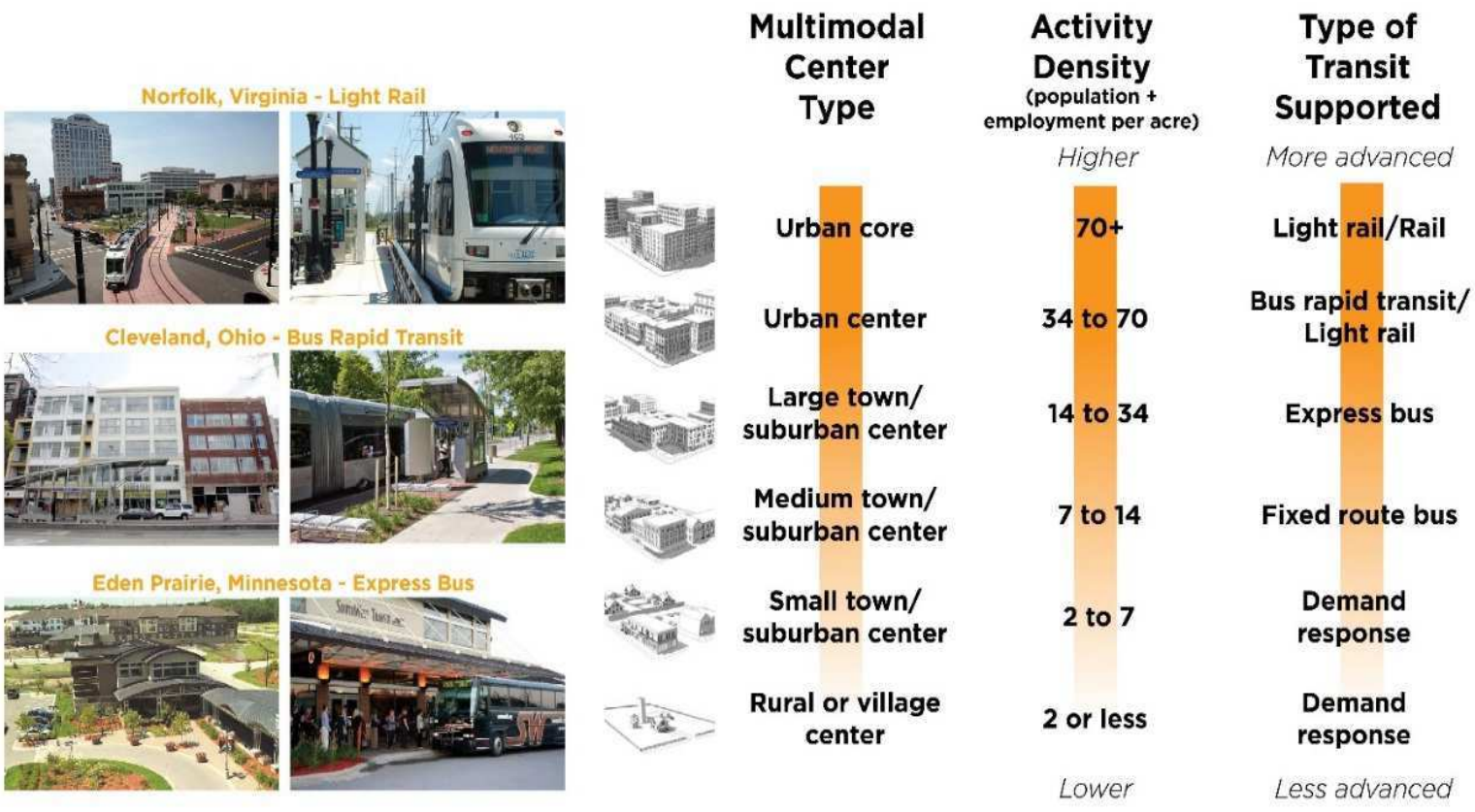
Table 3: Multimodal Center Types and Supportable Transit Investment Based On Activity Density

	Multimodal Center Type	Activity Density (Jobs + People / Acre)	Supported Transit Investment
P-6	Urban Core	70.0 or more	Light Rail Transit (LRT)/Rail
P-5	Urban Center	33.75 to 70.0	Bus Rapid Transit (BRT)/LRT
P-4	Large Town or Suburban Center	13.75 to 33.75	Express Bus
P-3	Medium Town or Suburban Center	6.63 to 13.75	Fixed Route Bus
P-2	Small Town or Suburban Center	2.13 to 6.63	Demand Response
P-1	Rural or Village Center	2.13 or less	Demand Response
SP	Special Purpose Center	Varies	Varies

Source: DRPT Multimodal System Design Guidelines, 2013

[2] More information can be found here: http://www.richmondregional.org/TPO/socioeconomic.htm

Figure 8 Activity Density and Transit Viability



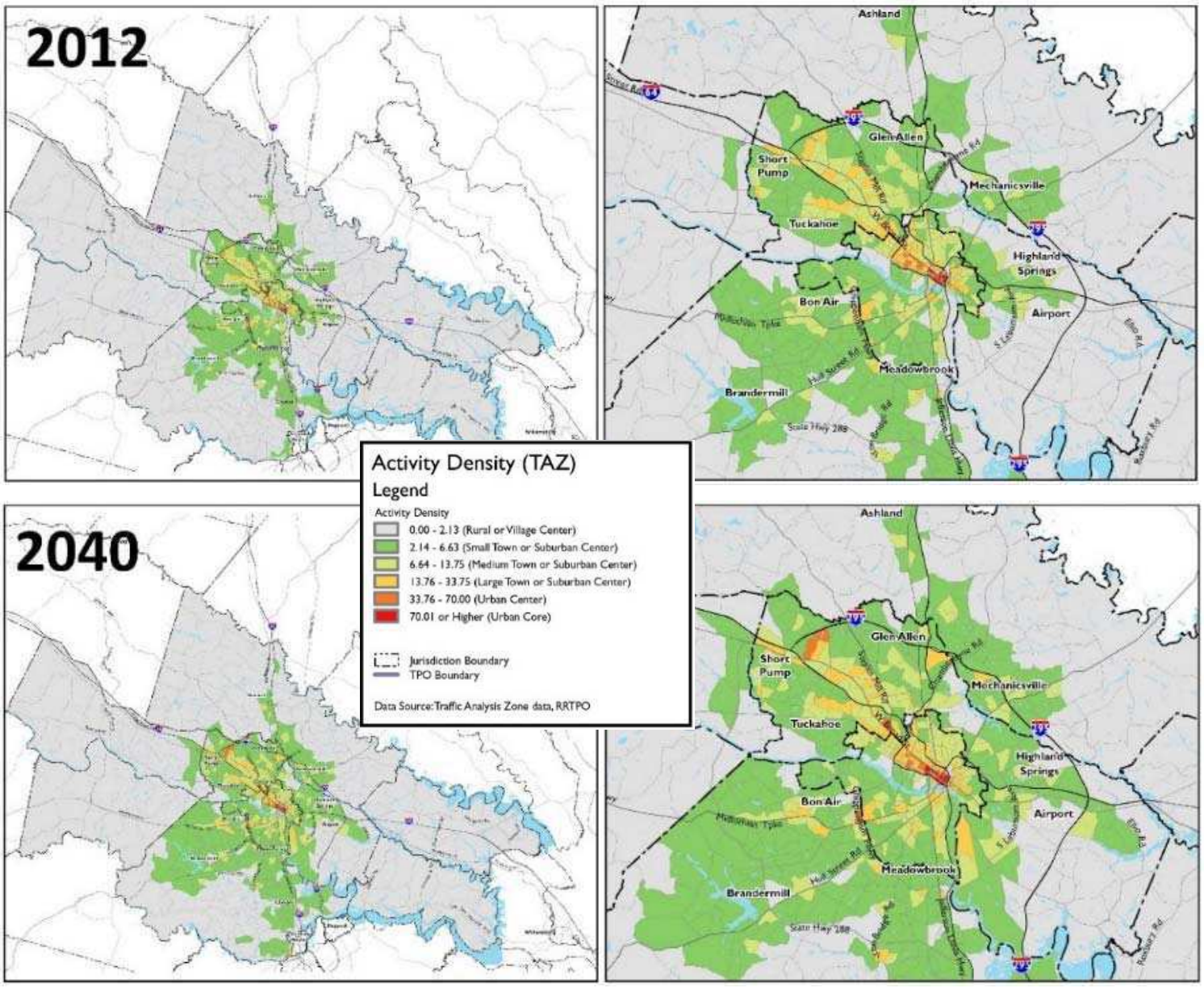
Adapted from: DRPT Multimodal System Design Guidelines, 2013

Activity Density in the Region

Figure 9 shows the activity density for 2012 and 2040, with activity density levels coded to match the Multimodal Center types, as listed in the table above. Activity is expected to increase throughout the region from 2012 to 2040; however, much of the growth is concentrated in the City of Richmond and the Counties of Chesterfield and Henrico. Most of the study area has activity levels equal to that of a rural or village center, or small town or suburban center, both of which are generally associated with a demand response transit system. As the projections progress from 2012 to 2040, it appears that more areas of the region will have activity levels that can support express bus, BRT, LRT, or rail.

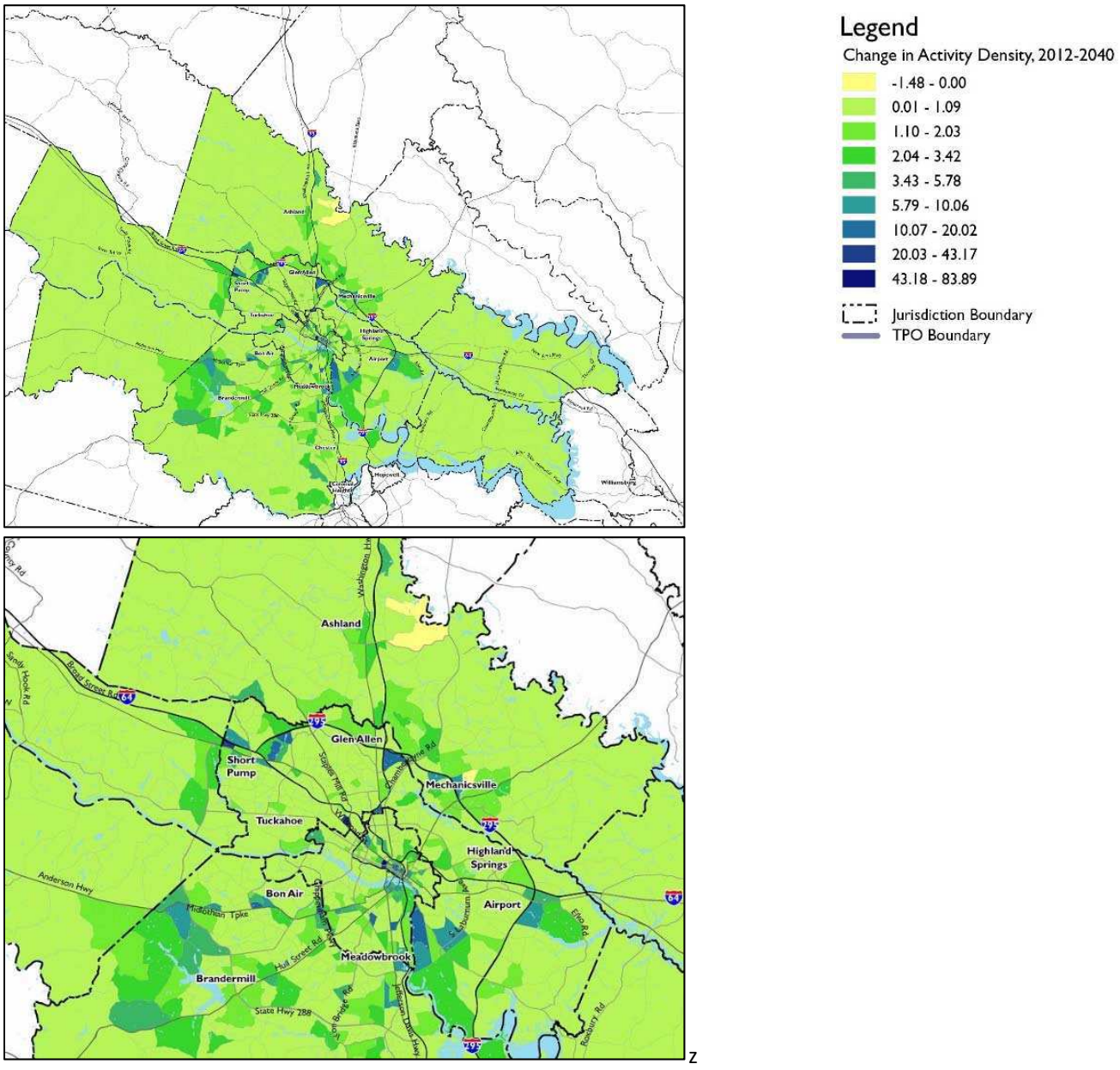
To better understand where the TAZ projections show an increase in activity in the next 20 or more years, the team looked at a map of change in activity density between 2012 and 2040. Figure 10 shows the change in activity density, with darker shades indicating larger changes. These areas include the area south of Rocketts Landing (between the James River and Route 5), Brandermill, Short Pump, Mechanicsville, and the airport area. Though these are some of the areas expecting the greatest amount of change, they are not necessarily the areas with the highest levels of activity density in the future. In addition, there is potential for growth in other areas, particularly if there are changes in policy to encourage development.

Figure 9: Projected Activity Density (2012, 2040)



Source: Rhodeside & Harwell, from RRTPO data

Figure 10: Change in Activity Density (2012 to 2014)



Summary

As documented in Appendix A Land Use Analysis Technical Memorandum, the study team not only examined existing and projected activity density, but also reviewed local land use plans and zoning for transit-oriented development opportunities. Overall, the land use analysis shows that transit-supportive development is possible under existing land use and zoning policies. The areas that appear to support fixed route or higher levels of transit include many areas of the City and portions of western and northern Henrico County along major corridors such as Broad Street, Patterson Avenue, Parham Road, and in both Henrico and Chesterfield in villages such as Bon Air, Midlothian and Highland Springs. Many additional areas of the region are

projected to support fixed route or higher-level transit in 2040, and there is opportunity between now and 2040 to encourage development to occur at higher densities in designated high-quality transit corridors.

Who is likely to use transit and where?

The Vision Plan process employed a detailed transit propensity analysis that identifies locations that are transit deficient as a basis for future transit recommendations. The analysis used the most recently available census and employment data to identify where in the region there currently exists the highest propensity for transit, or in other words, where ridership is likely to be the highest. This approach anticipates the types of trips that would be made by not only transit dependent populations, but those who may have other transportation options as well but would use transit if it was convenient. It includes six base layers that can be combined including:

- Transit-oriented populations
- Commuter populations
- Destinations (retail, medical, educational)
- Workplace (employment)
- Educational populations
- Low-income populations

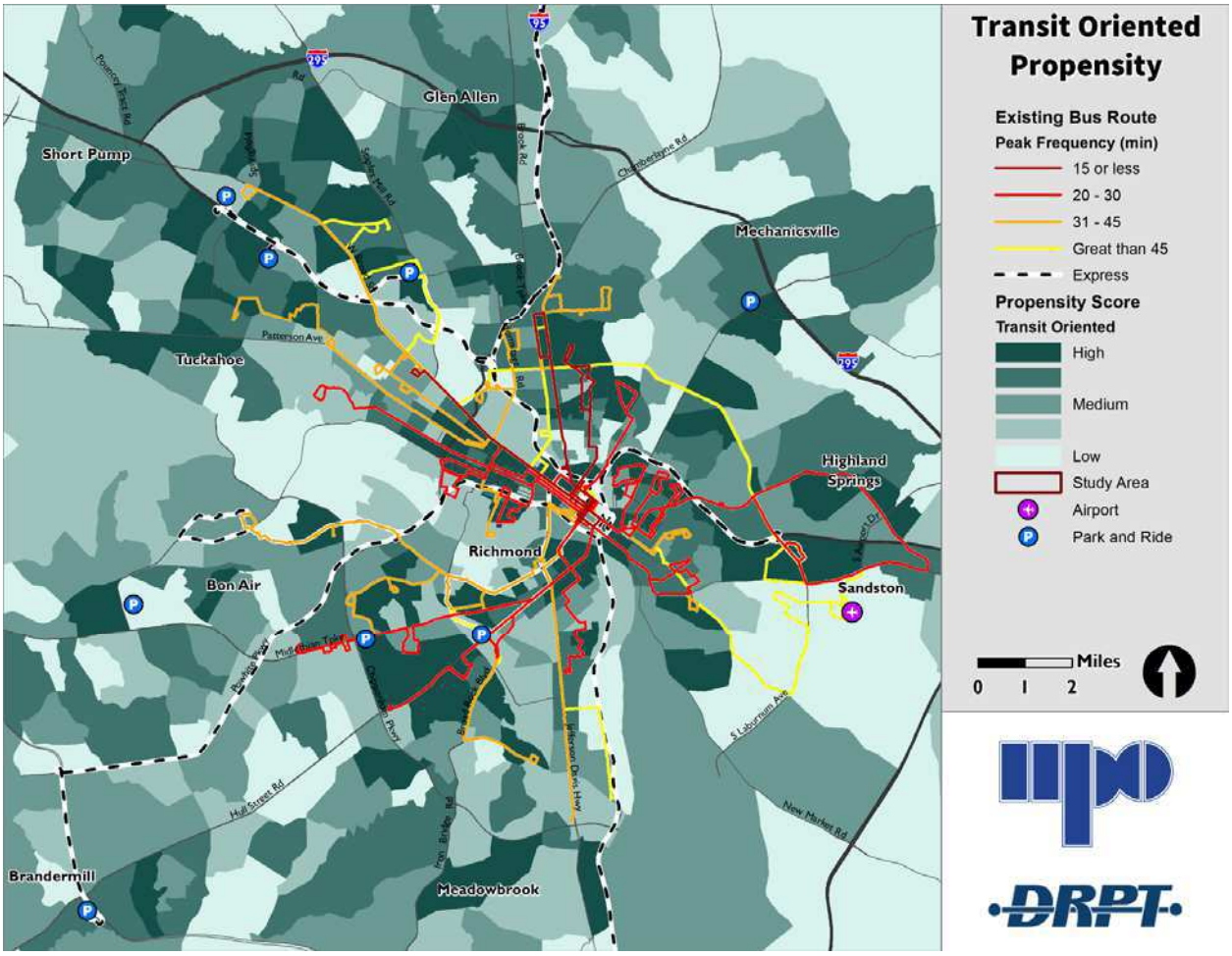
The transit propensity analysis was used to identify areas throughout the Richmond region that have a need and are viable for new or additional transit services. The six propensity base layers that were developed focus on where transit-oriented populations live, where commuters live, where low-income populations live, where students and student aged populations live, locations of where people work and locations where people make trips not related to employment (destinations). The following sections describe this analysis, and the results in more detail, focusing on identifying the areas with high propensity and little or no existing transit service. Appendix B Transit Propensity Technical Memorandum provides additional detail, including full regional-scale versions of the graphics provided in this section.

Transit-Oriented Population Propensity

The Transit-oriented Population propensity is used to identify where high densities of population can be found, as well as focusing on where transit dependent populations live. The population and households census categories highlight where higher densities of population can be found to support transit, while the age, income, vehicle ownership and persons with disabilities census categories identify transit dependent populations that need transit.

In addition to the core of Richmond, the analysis found areas of high Transit-oriented Populations in many of the medium density suburban areas of greater Richmond including Short Pump, Glen Allen, Mechanicsville, Meadowbrook, Chester, Brandermill, and Midlothian (See Figure 11). These areas have very little existing transit service. Within the City of Richmond, the analysis found areas of high Transit-oriented Populations in a wide variety of areas including to the southwest along Midlothian Turnpike and Hull Street, to the south along Jefferson Davis Hwy, to the east towards the airport, and westward between Broad Street and the river. There is also a pocket of high Transit Oriented Propensity north of the city limits along the Staples Mill Rd corridor that has no service. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis.

Figure 11 Transit-oriented Propensity



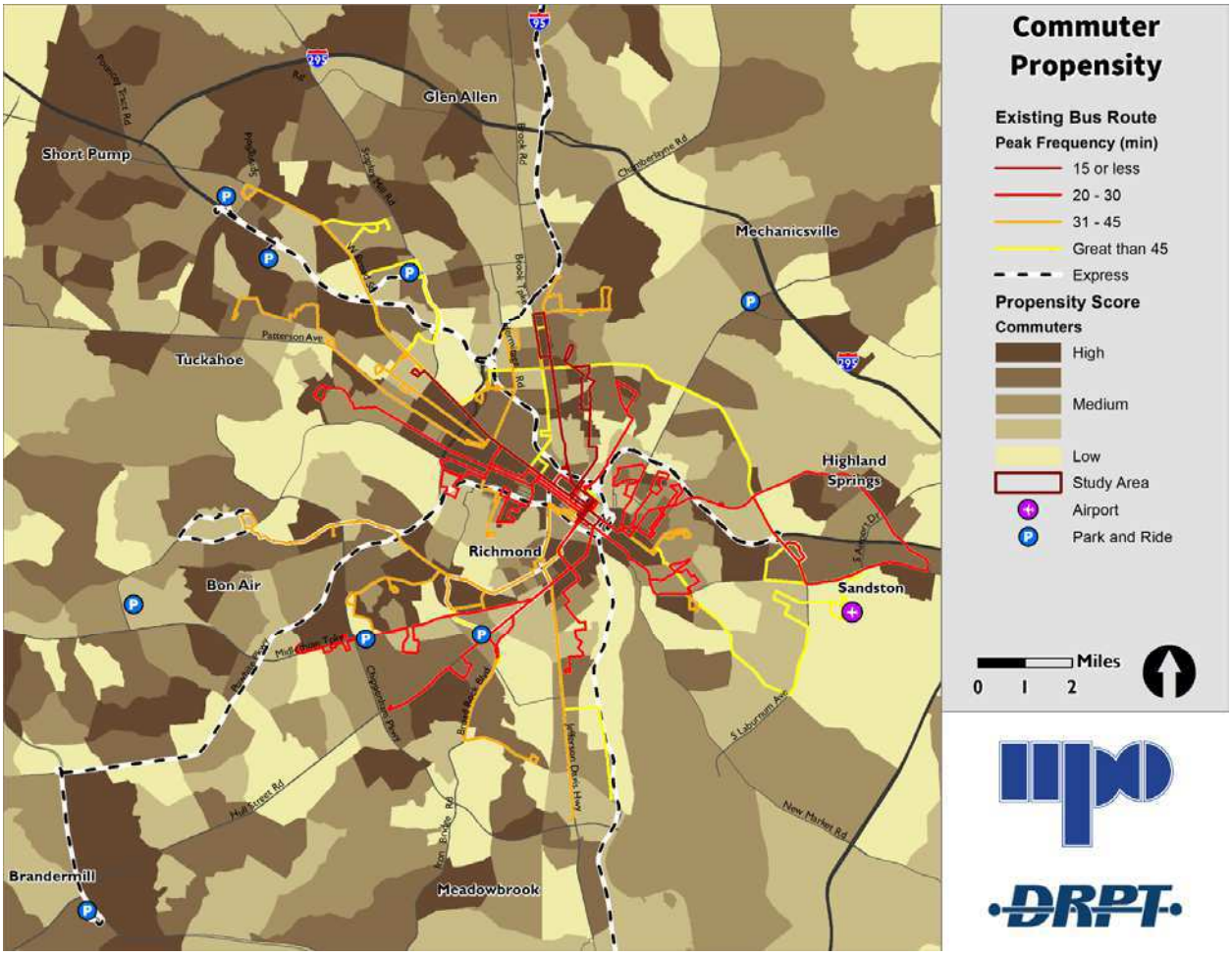
Source: Foursquare Integrated Transportation Planning (FITP), 2016

Commuter Propensity

The Commuter Propensity is used to identify where persons with jobs reside. The employment data identifies where persons eligible for work or those who are currently employed live, and the commute mode category (census) incorporates where commuters reside and also isolates the number of transit specific commuters.

Very similar to the transit-oriented population propensity analysis, the Commuter Propensity found areas of high commuter populations in the suburban areas of greater Richmond with the addition of some suburban areas along Hull Street Road in Chesterfield County and Chamberlayne Avenue in Henrico County (See Figure 12). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found areas of high commuter populations in a wide variety of areas including to the southwest along Midlothian Turnpike and Hull Street, to the east towards the airport, throughout the north side, and westward between Broad Street and the river. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There are also several pockets of high Commuter Propensity that have no existing transit service to the north of downtown (along Staples Mill Rd beyond city limits) and northwest of the downtown (along Chamberlayne Ave.).

Figure 12 Commuter Propensity



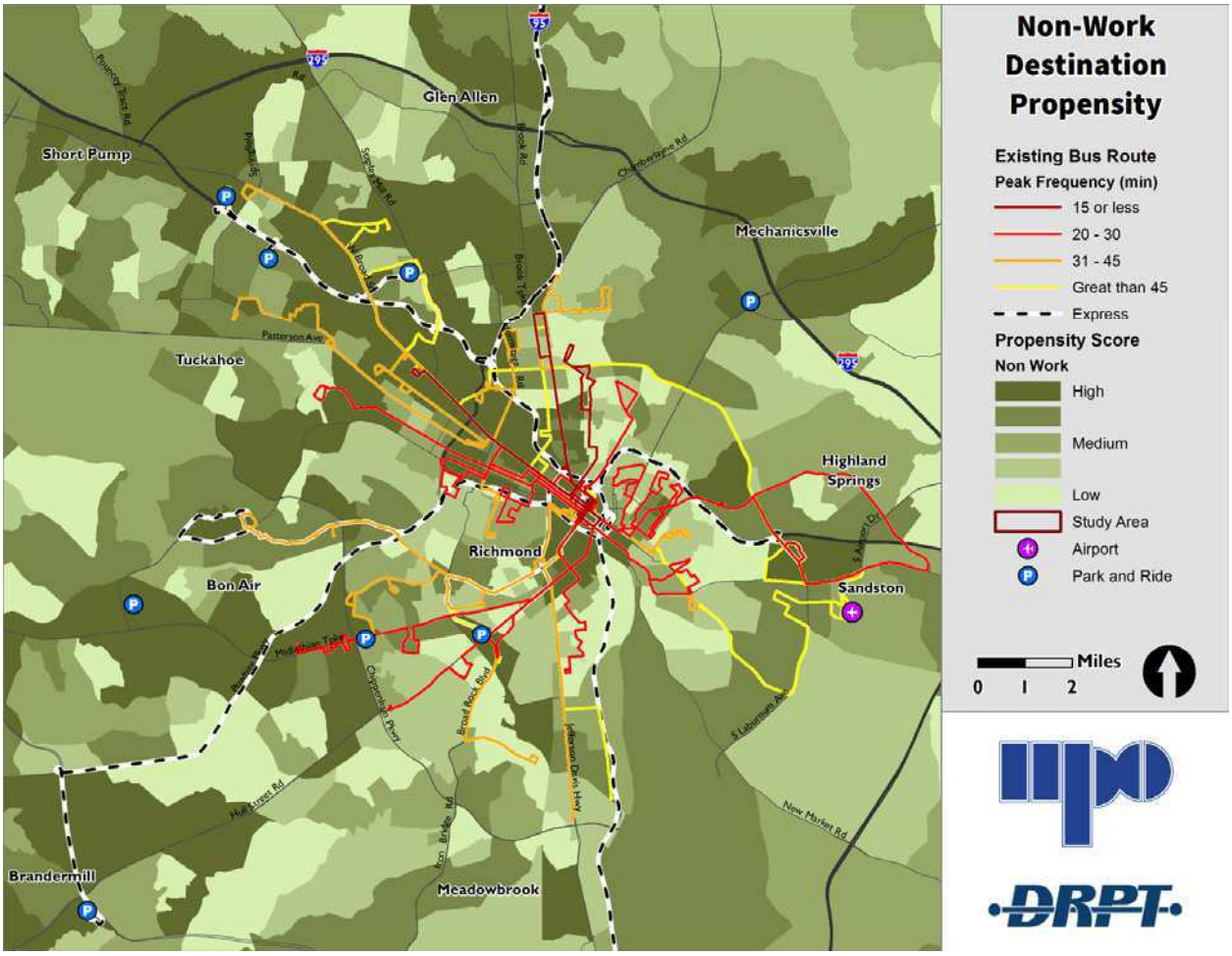
Source: Foursquare Integrated Transportation Planning (FITP), 2016

Destination Propensity

The Destination Propensity is used to identify where typical non-work transit trips are made, which commonly include retail, medical, and school trips. The retail, medical, school, and public administration census categories use the number/density of employees as measurements based on the assumption that more workers correlate to more general utilization at a location.

Although similar to the Transit and Commuter Propensity analysis the Destination Propensity identified additional areas that show high concentrations of destinations in the suburban areas of greater Richmond including Short Pump, Glen Allen to Ashland, Mechanicsville, Meadowbrook along Iron Bridge Rd, along the 288 and 10 in the south, along Hull Street Rd to Brandermill, and in the Midlothian area (See Figure 13). There are also pockets of high Destination Propensity beyond the city limits to the north of downtown along Staples Mill Rd and Brook Rd. These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found areas of high concentrations of destinations but with a definite concentration westward along Broad Street and between Broad Street and the river. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis.

Figure 13 Non-Work Destination Propensity



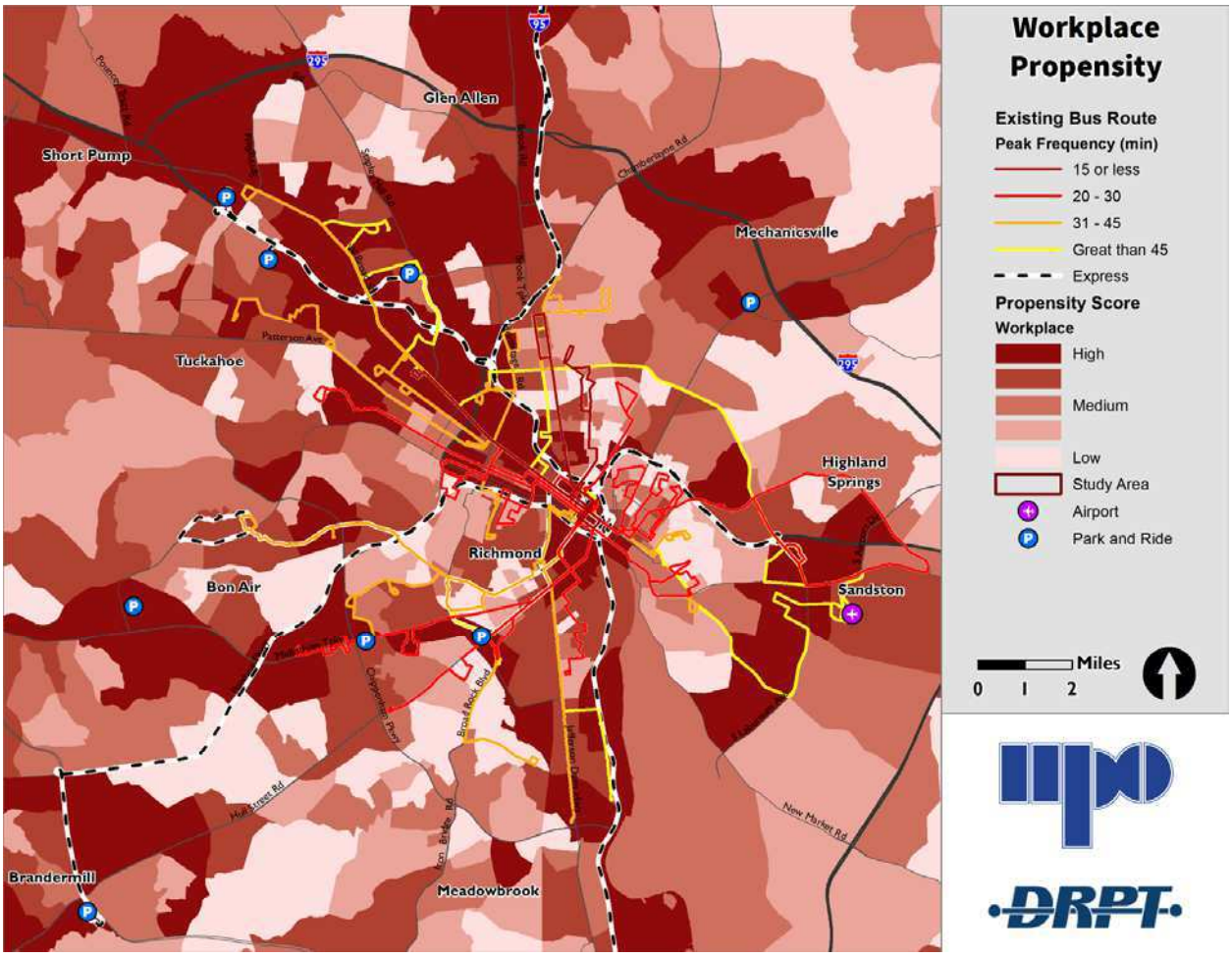
Source: Foursquare Integrated Transportation Planning (FITP), 2016

Work Propensity

The Work Propensity is used to identify areas where employment centers are located. This category factors in the number of employees and density of employees by location.

Very similar to the Destination Propensity, the Work Propensity identified additional high concentrations of destinations in the suburban areas of greater Richmond (See Figure 14). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found a wide range of areas with high Work Propensity but with the highest continuous concentration northwestward along Broad Street and between Broad Street and Patterson Avenue. Other concentrations exist along major arterial corridors and in the area around the airport. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There are also pockets of high Workplace Propensity beyond city limits that have no existing transit service to the north of downtown along Staples Mill Road.

Figure 14 Workplace Propensity



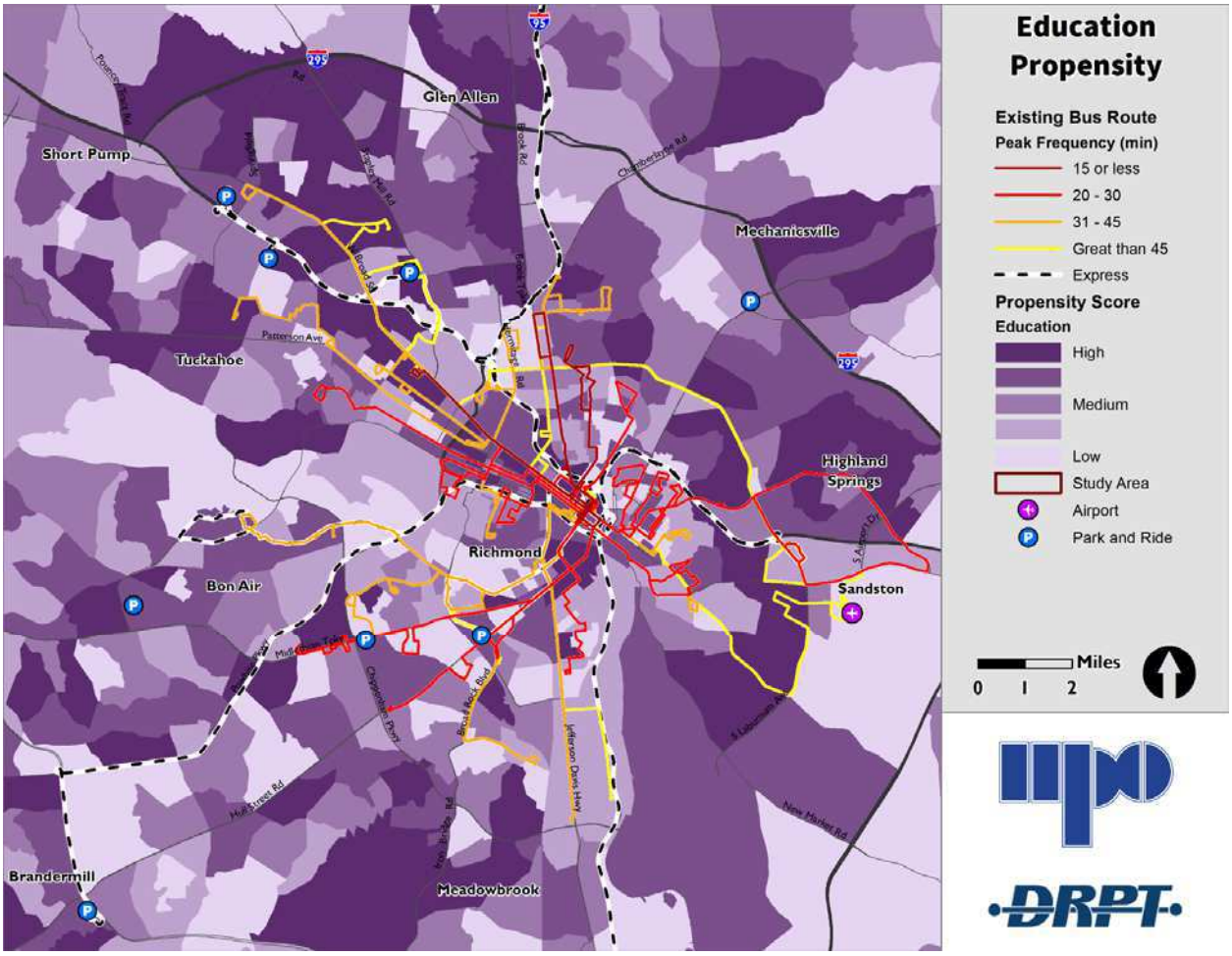
Source: Foursquare Integrated Transportation Planning (FITP), 2016

Education Propensity

The Educational Index is used to identify where college/university students reside. The College/University Attendance census category identifies where persons who are currently enrolled in college live. The College/University Age category incorporates where college-aged persons live to account for those who are eligible to enroll in a program.

The Education Propensity shows high density in most of the same areas mentioned previously, but the overall pattern is more fragmented, and some new concentrations pop up such as the Highland Springs area in Henrico and the area west of Meadowbrook in Chesterfield (See Figure 15). The suburban areas have very little existing transit service. Within the City of Richmond, the analysis found a wide range of areas with high Education Propensity including the Broad Street corridor and southside neighborhoods. Other concentrations exist along major arterial corridors and in the area west of the airport. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There are also pockets of high Education Propensity beyond city limits that have no existing transit service to the north, west, and southeast of the downtown.

Figure 15 Education Propensity

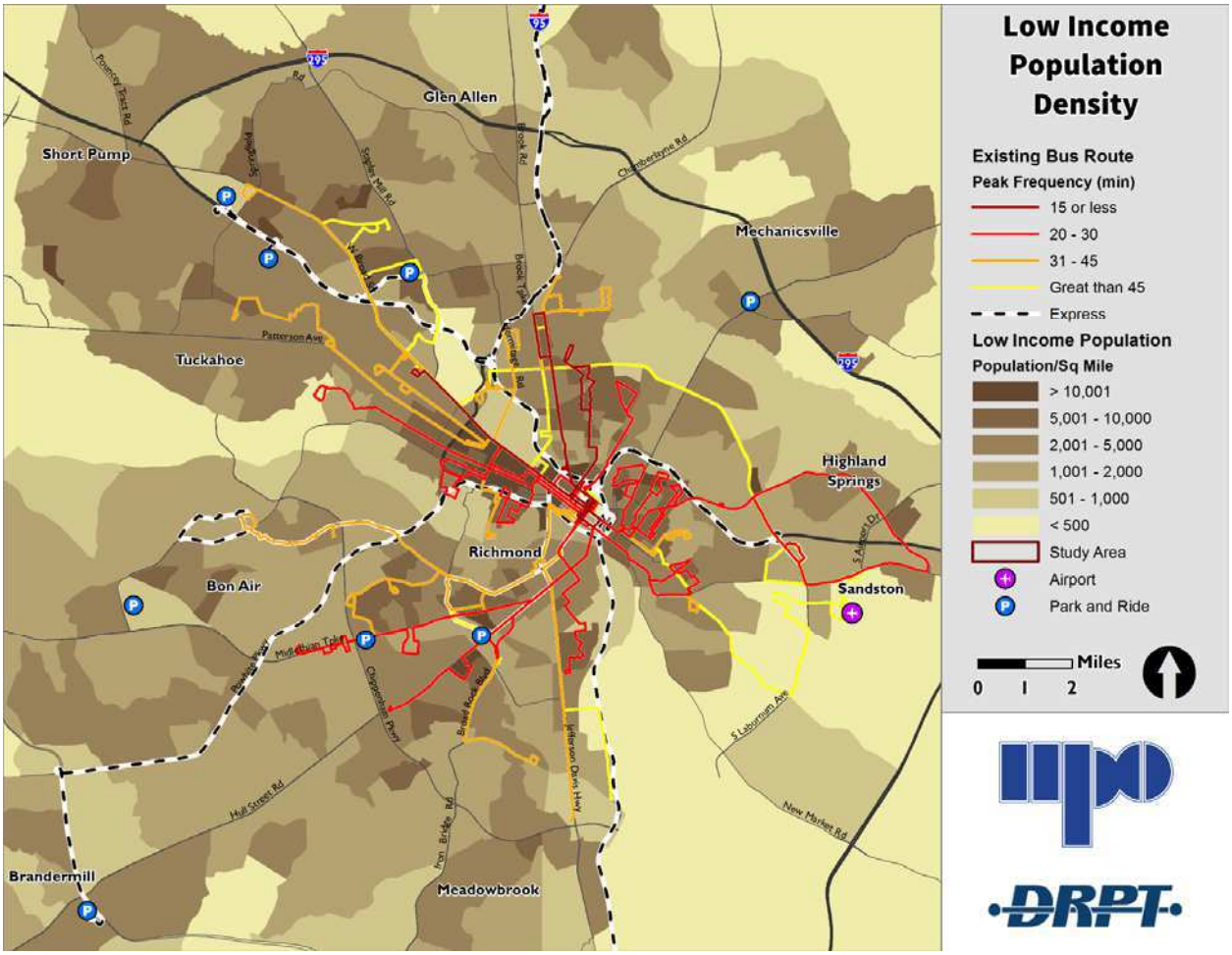


Source: Foursquare Integrated Transportation Planning (FITP), 2016

Low-Income Populations

The Low-Income data is used to identify where concentrations of low-income populations reside. The census category allows us to show the number of low income persons per square mile. This census category is defined as the population for whom poverty status can be determined. The Low-Income census data shows high density in most of the same areas mentioned previously. High concentrations of Low-Income populations exist in along Broad Street and Staples Mill Roads, the far west end of Tuckahoe, and older areas of Chesterfield such as Bon Air and portions of the Jefferson Davis Highway corridor (See Figure 16). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found a wide range of areas with concentrations of low-income populations. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There are pockets of low-income populations that have no existing transit service to the north and west of the downtown.

Figure 16 Low Income Populations



Source: Foursquare Integrated Transportation Planning (FITP), 2016

All-Day Propensity

The All-Day Propensity is a combination of four propensities, grouping the attractor propensities (where people work and make destination trips) and generator propensities (where commuters and transit-oriented populations live) and averaging them to create an All-Day Propensity. This data illustrates the areas most

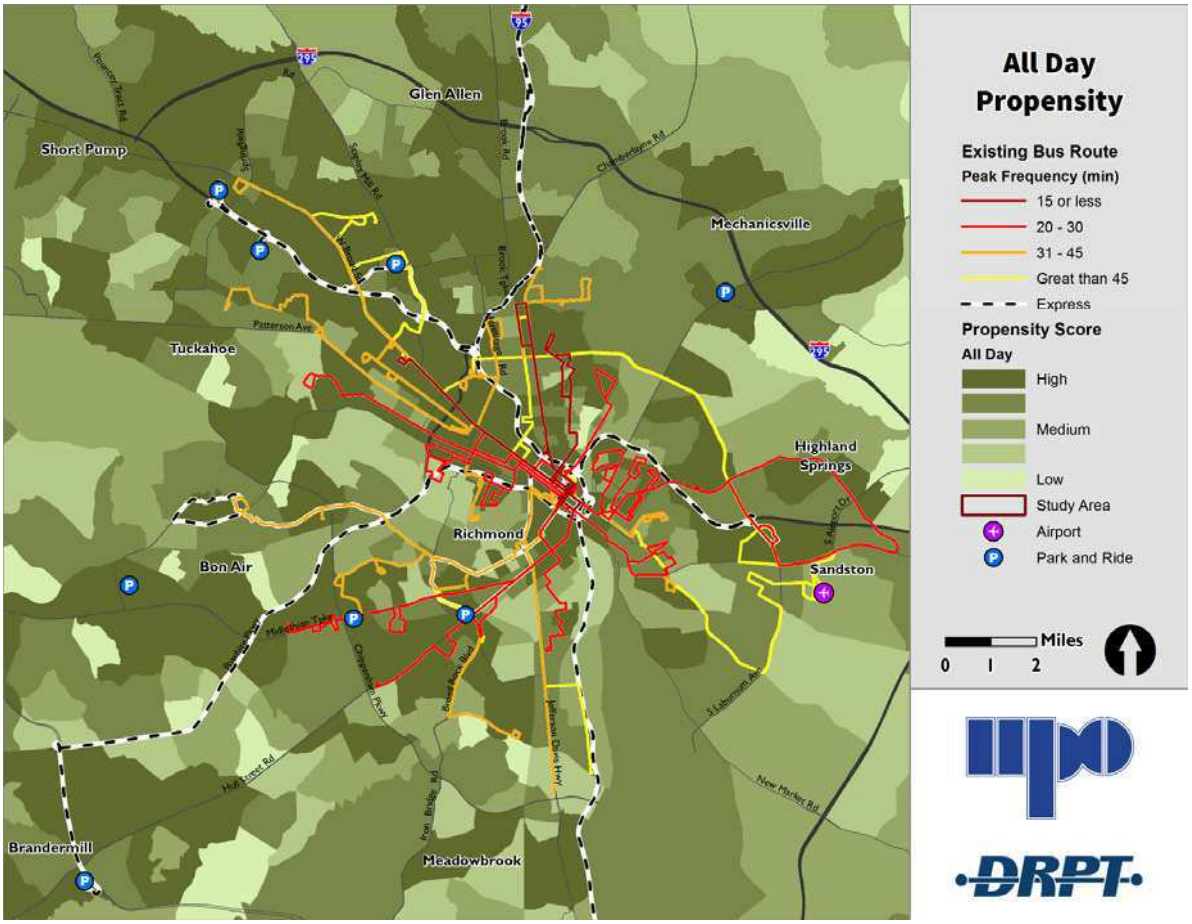
likely to have high trip creation/attraction all day long thus lending themselves to more high capacity/ frequency service.

Not surprisingly the All-Day Propensity shows high density in most of the same areas mentioned previously. High concentrations exist in Short Pump, Glen Allen to Ashland, Mechanicsville, Meadowbrook to Chester, Brandermill, and in the Midlothian area (See Figure 17). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found a wide range of areas with high All-Day Propensity but with the highest concentration northwestward along Broad Street and between Broad Street and the river. Other concentrations exist along major arterial corridors and in the area around the airport. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There is one pocket of high All-Day Propensity just north of downtown and outside of the city limits along the Staples Mill Rd corridor that has no service.

Summary

The propensity analysis provides information on where in the region there currently exists the highest propensity for transit and where these areas exist with no, little, or insufficient transit service. This information was combined with land use analysis and public and stakeholder feedback to develop initial recommendations.

Figure 17 All Day Propensity



Source: Foursquare Integrated Transportation Planning (FITP), 2016

Chapter Four: The Regional Transit Vision Plan

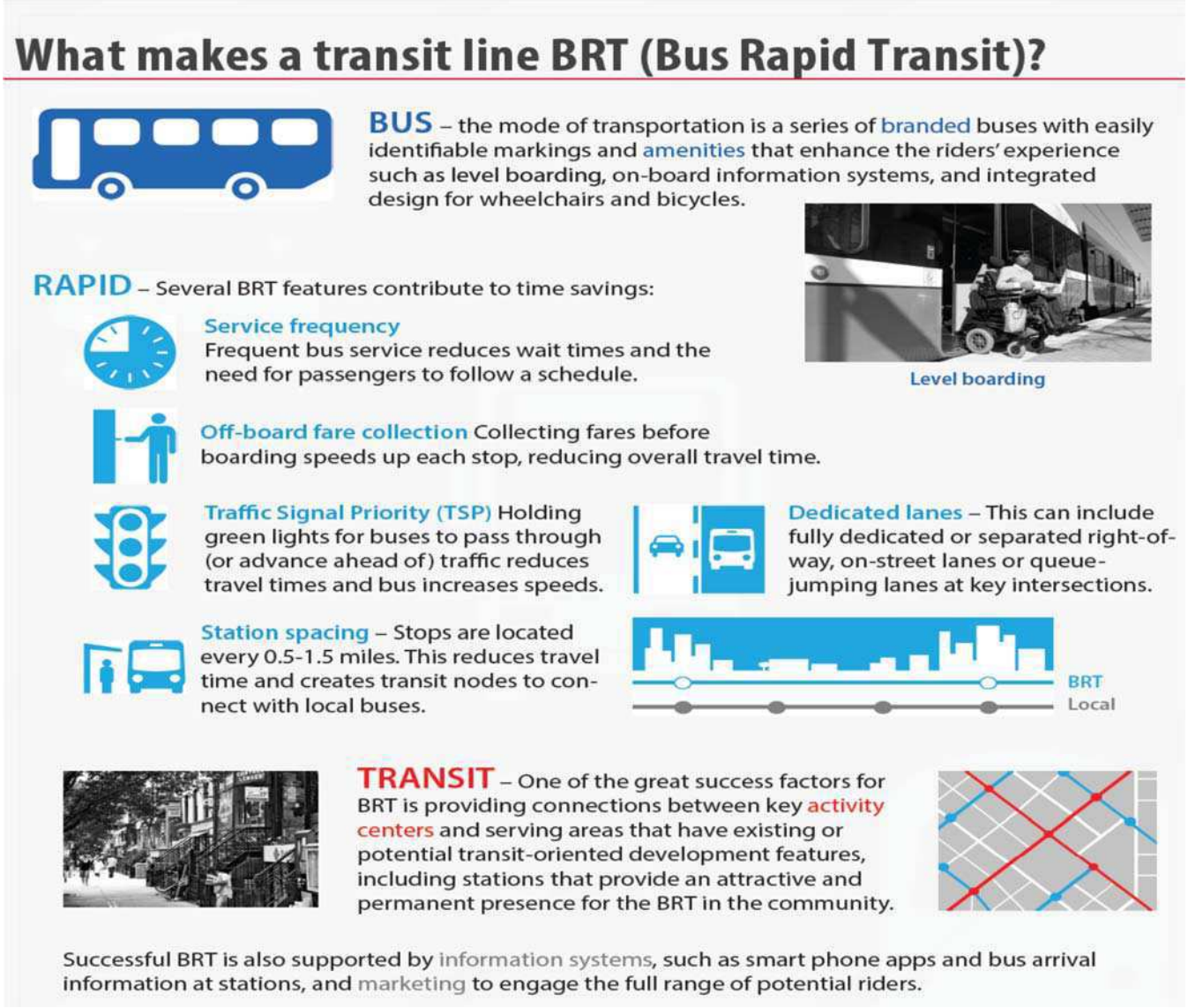
This chapter presents the Vision Plan, including high quality transit corridors, recommended local transit routes, and other specialized transit services such as express routes, park-and-ride lots, and demand-responsive transit services. The Vision Plan also includes recommendations for programs to support transit (transportation demand management). This chapter also reviews the performance and costs of the Vision Plan.

High Quality Transit Services

What is Bus Rapid Transit?

As discussed in Figure 18, Bus Rapid Transit is not a single type of service, but rather a spectrum of service, station, and technology features that combine to make a bus ride fast, convenient, and competitive with the travel times of cars.

Figure 18 Profile of Bus Rapid Transit



The Vision Plan recommends a spectrum of high quality services, including BRT and two types of services that are intended to lead to BRT over time, Limited Stop service, and Enhanced Local service. Table 4 details the components of the three service types for comparison.

Table 4 High Quality Service Comparison

COMPONENT	Transit Service Type		
	Less advanced ⟷ *More advanced*		
	Limited Stop Service	Enhanced Local Service	BRT
Stations	Standard stations	Curbside, bus arrival info, simple shelters	Curbside, bus arrival info, off-board fare collection; simple shelters; level boarding at curb or median; substantial shelter structures
Intersections	No major investments; possible corridor signal coordination if not present	No major investments; possible corridor signal coordination if not present	Bus priority and adaptive signals to improve speed; queue jump lanes where warranted with no dedicated lane
Stop spacing	Infrequent stops at targeted activity nodes	Stops at targeted activity nodes, >1 mile spacing overall	Average ¾ mile apart, closer in major activity centers
Buses	Enhanced Bus Branding	Enhanced Local Branding	Branded buses, standard size or articulated buses
Frequency	20 or 30 minutes all day (responsive to land use)	15 or 20 minutes all day	5 or 10 min in peak; 10 or 15 in off-peak
Dedicated Lanes	None	None	As appropriate in higher-density and high-demand areas

BRT: The Vision Plan includes five BRT corridors, in which frequent (10 or 15 minute) service will be expedited by infrequent stops (every 0.5 to 1.5 miles), stations with off-board fare collection and real-time arrival information, traffic signal enhancements, and some instances of dedicated bus lanes.

- **Broad Street** (6) – from The Pulse BRT at Willow Lawn to Short Pump Mall, this line would be an extension of The Pulse (no transfer between lines)
- **West End South** (5) – from Cary and Main/Patterson/Regency Mall to Short Pump Mall
- **Midlothian** (3) – from The Pulse downtown station(s) to Westchester Commons, via Hull Street/Southside Plaza/Belt Blvd/Midlothian Turnpike
- **Hull Street Road** (10) – from The Pulse downtown stations(s) to Southside Plaza (running in parallel with Midlothian BRT, no transfer required) to the Woodlake/Magnolia Green area

- **Mechanicsville Turnpike** (39) – from The Pulse downtown station(s) to Mechanicsville and beyond I-295 (vicinity of Walnut Grove Rd)

Enhanced Local Service: The Vision Plan includes four enhanced local service routes, generally with service every 15 or 20 minutes all day and relatively infrequent stops at main activity centers. These routes provide greater access and reliable service on key regional corridors where the opportunity for enhanced access to employment and activities requires all-day service on local roads, and where transit-oriented development opportunities may ultimately support BRT service later in the future.

- **Airport Connector** (25) – from The Pulse downtown station(s) to Richmond International Airport along Williamsburg Road/Route 60
- **Staples Mill Road/Regional Connector** (16)– from Willow Lawn/Broad Street to Glen Allen (south of I-295), with a southern extension to University of Richmond and Stony Point, ending at the Midlothian BRT
- **Route 1 North** (38)– from The Pulse BRT downtown to Ashland along US 1
- **Jeff Davis** (1) – from The Pulse BRT (and connecting with Route 1 North service) south to Chester along Jefferson Davis Highway (US 1), with possible express link to Petersburg

As described in Chapter Five, some of the Enhanced Local and BRT corridors are recommended to be started in Phase I with a less intensive service on the spectrum as a means of managing costs and introducing service that can help build ridership. Also, because this is a skip-stop type of service, it would not entirely replace existing local services, particularly in corridors where ridership on the existing local route is high, such as Route 1 North on Chamberlayne Avenue and Brook Road.

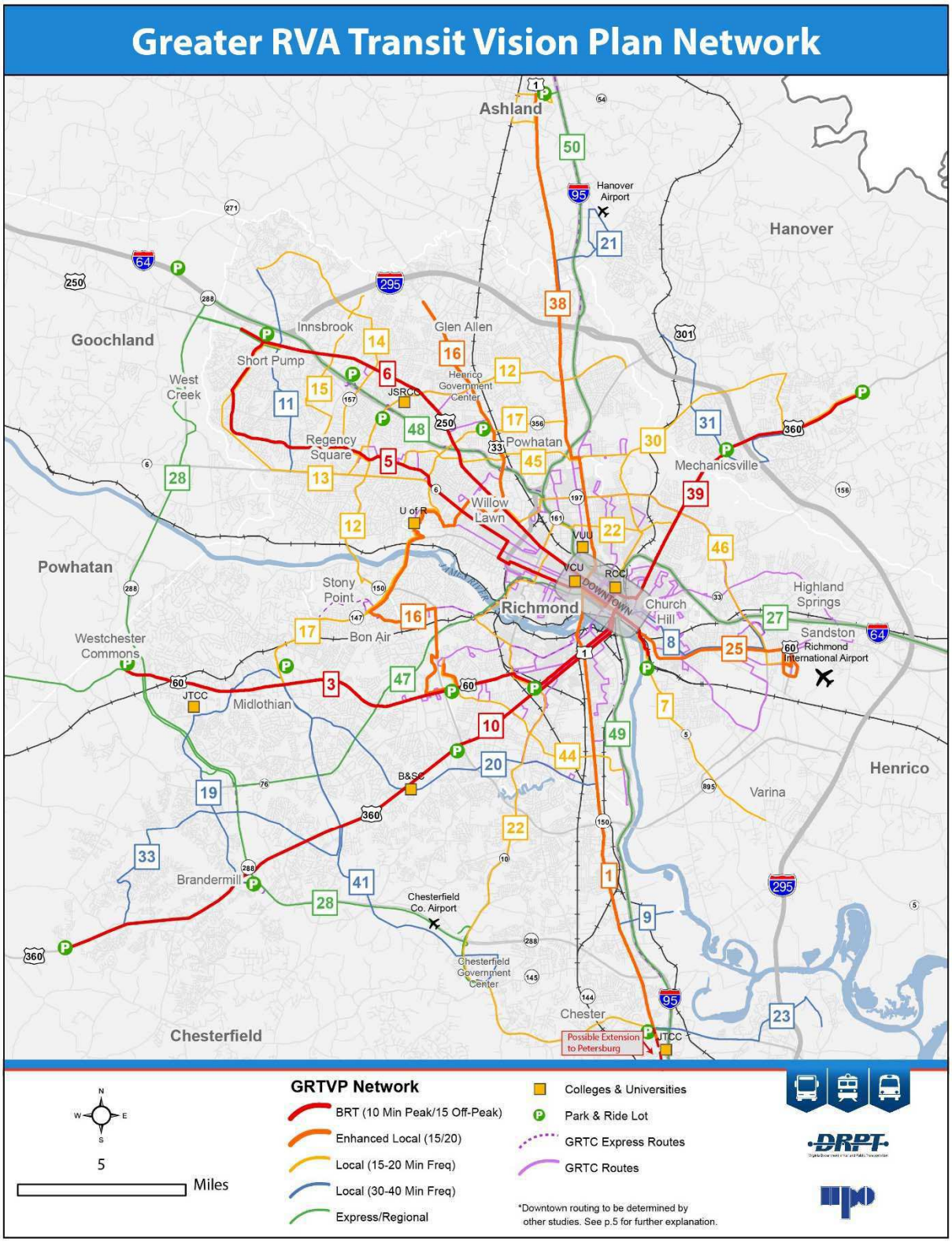
Figure 19 presents the Vision Plan routes.

Local Fixed Route Transit

The Vision Plan's recommended local routes focus on extending service into the areas of the region where transit ridership markets are present today or are anticipated in the future. These routes are designed to provide good connections to other routes (existing, or Vision Plan BRT, enhanced local, and express). Importantly, the routes form a network that works together to maximize mobility – this moves away from a hub-and-spoke system to more of a grid approach, with more connections between the routes that radiate from the City. The new routes presented in the recommendations map are generally intended to operate in addition to those that already serve the City and key corridors in Henrico County, and in many cases, as extensions of existing services into new areas, maintaining connectivity into the City.

The plan includes 12 high-frequency (every 15-20 minutes) routes, many of which provide long-distance connections between key activity centers and north-south connections between the primarily east-west-oriented BRT lines. An additional 10 fixed routes in the plan are recommended at 30-40 minute frequencies. These routes are in areas that have lower transit-supportive characteristics today, but either they connect very important activity centers to core transit services in the plan (such as Route 23 which extends to key major employers east of Chester), or they are shown in long-term land use plans to have future potential transit-supportive characteristics. These routes could be started as a different type of service called **Deviated Fixed Route** service, which involves calling ahead of time so that each day's routes will adapt to pick up at requested locations (though not a door-to-door service). This service would provide flexibility to reach more

Figure 19 Greater RVA Transit Vision Plan – Transit Network



Source: Michael Baker International, 2016

dispersed riders as the ridership base and more transit-supportive land use patterns are established over time.

In Figure 19, the downtown area is 'grayed out' and the specific details of the routes are not shown. The reason for this is that two other plans, the Richmond Transit Network Plan and the GRTC Transit Development Plan, are both anticipated to provide new details for transit service routing in the City of Richmond and downtown in particular, where The Pulse will begin operation in fall of 2017. The engagement of the leaders and many of the same stakeholders across these studies is helping to provide consistency. The Vision asserted in this plan is a key input to the other studies, particularly the high quality service recommendations, and the other studies deliberately follow the Vision Plan in sequence. At the same time, some of the principles of the Network study, such as providing a connected network of routes that enable more direct travel via transit, have been incorporated in the Vision Plan network design as well.

Other Transit Services

Express/Regional Routes

The Vision Plan includes six routes that provide long-distance regional connections via the region's high-speed facilities. These routes support commute trips, with one-way or two-way service during peak commute times. The Vision Plan encourages two-way service to enhance connections between residents and jobs, supported in part by circulator routes at the ends of these routes that are in Henrico, Hanover and Chesterfield to support last-mile access to destinations both downtown and in the suburban activity centers.

- **Ashland** (50) – Downtown (via I-95)
- **Petersburg/Chester** (49) – Downtown (via I-95)
- **Goochland/Western Henrico** (48)– Downtown (via I-64)
- **Powhatan-Midlothian** (47) – Downtown (via Powhite Parkway) – note that this route also connects Powhatan Route 60 activity center(s) to the Midlothian BRT
- **Route 288** (28) – Connecting Short Pump and West Creek to Chesterfield Government Center with connections to activity centers and other transit services along Route 288
- **New Kent** (27) – Downtown (via I-64)

Park and Ride Lots

The Vision Plan also includes Park-and-Ride Lots in strategic locations to provide drive-to access for the higher-speed transit services throughout the region. Many lots also will serve carpoolers. A total of 600-900 new spaces are assumed in the cost estimates, totaling $8.5 to $12.8 million. The new park and ride locations provide access to the ends of the high quality transit lines in Short Pump, Westchester Commons, Hull Street, Jeff Davis, Mechanicsville, and Ashland. Several would serve both Express and either BRT or Enhanced Local Service from the same location.

The Vision Plan adds:

Over **1000** Revenue-Miles of Service

150 revenue-miles of BRT

125 revenue-miles of Enhanced Local

575 revenue-miles of local service

200 revenue-miles of express service

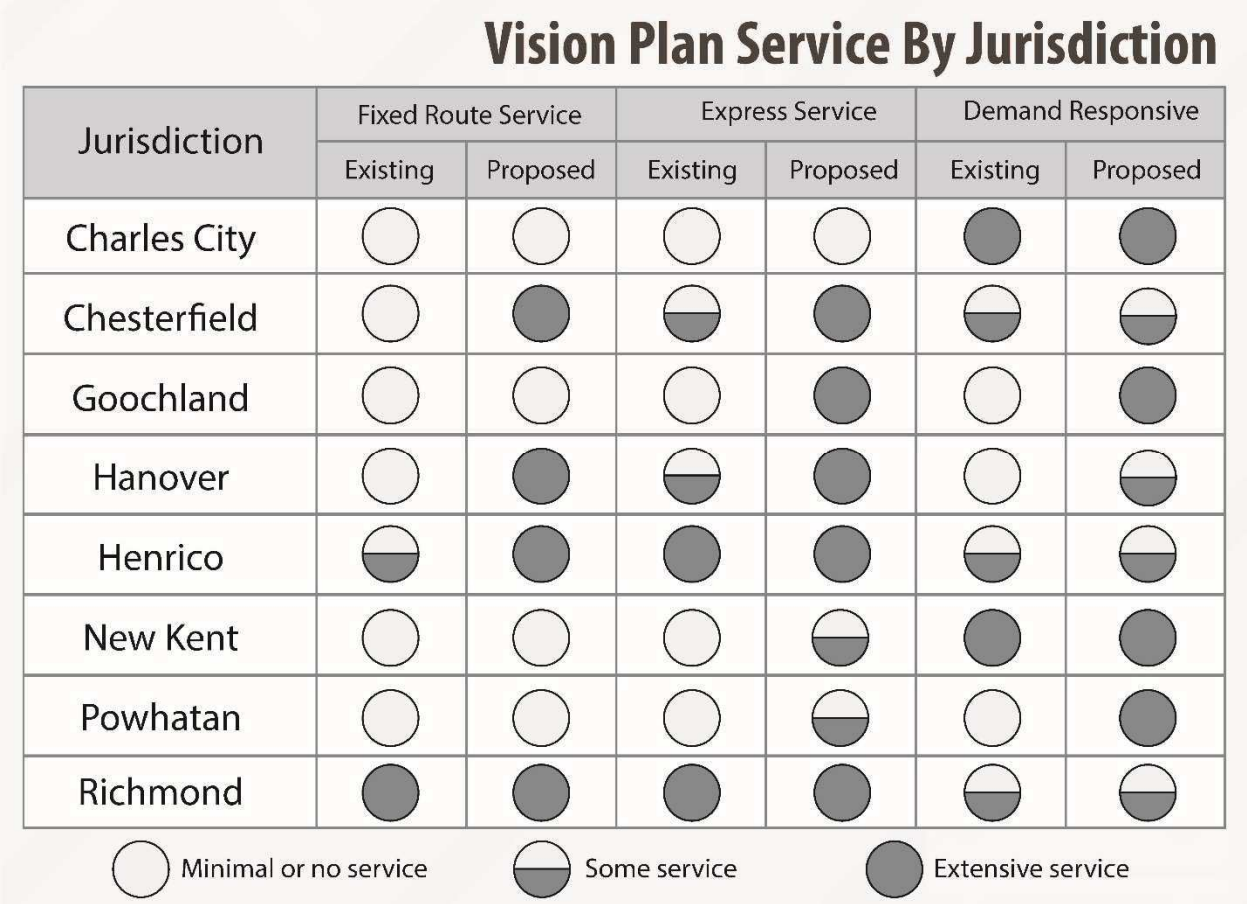
600 – 900 new Park-and-Ride spaces

Demand-Responsive Transit Services

The Vison Plan network is also enhanced by **Paratransit** services in all of Henrico County and the City of Richmond, per current policy, and within ¾ of a mile on either side of fixed routes in the remaining jurisdictions. Paratransit service is door-to-door or curb-to-curb transit that serves those who are not able to ride fixed route transit, and customers are screened for eligibility.

Federal law requires paratransit service be offered to those within ¾ mile on both sides of any fixed route service. Based on the recommended locations of new fixed routes services in areas that are not already eligible for paratransit service, the estimated cost of expanded paratransit for the Vision Plan is $12.7 - $15.3 million, including the baseline paratransit costs of nearly $8 million per year (all figures in 2016 dollars). The Vision Plan also recommends other **Demand-Responsive** services that offer curb-to-curb rides with no eligibility screening in the rural jurisdictions, ideally modeled on the Bay Transit services available today in New Kent and Charles City Counties. The types of services recommended by the Vision Plan in each jurisdiction are summarized in Figure 20. The cost estimates do not account for the additional cost of Demand-Responsive services as these recommendations are less specific than the fixed route transit services and related paratransit obligation. Note, however, that the paratransit services in Chesterfield may replace some existing human service transportation costs, and would not entirely be a net increase in costs to the region.

Figure 20 Greater RVA Transit Vision Plan – Service Types by Jurisdiction



Transportation Demand Management

What is Transportation Demand Management?

Transportation Demand Management (TDM) is a set of public planning processes, strategies and policies designed to relieve congestion, influence travel demand, improve efficiencies of the transportation network, and redistribute demand in space or time. The benefits of TDM include cost effective alternatives to

increasing highway capacity and coordinated efforts delivering better environmental outcomes, improved public health benefits, and higher quality of life.

Traditionally, TDM measures are coordinated through a local jurisdiction in conjunction with regional employers and other interested groups such as business improvement districts, transportation management associations, or concerned citizens. Although programs are often quite simple and cost effective, TDM has the power to significantly reduce vehicle miles traveled and gas costs, cut down on harmful air and water pollution, spread awareness of all travel alternatives, make commuting more enjoyable, and even increase social interaction.

Common TDM strategies include:

- **Ridematching.** An organized, usually database-driven effort to match employees with similar commute patterns with regular carpool partners;
- **Vanpool assistance and incentives.** Programs through which interested commuters match with workers with similar commute patterns and temporarily lease a van to drive to workplaces. As an added bonus, some employers and TDM agencies offer financial incentives to start vanpools or even preferential parking at worksites;
- **Park-and-rides** allow commuters to park their vehicles in a lot and subsequently board a transit service. Park-and-ride lots are particularly useful for long-distance commuters;
- **Marketing and promotion** of non-single occupancy vehicle (SOV) travel options through websites, informational brochures, and targeted mailings;
- **Financial incentives** to ride transit, bike, walk, or carpool;
- **Employee shuttle** coordination;
- **Bicycle-friendly programs.** Bicycle racks, lockers, shower, and other bike-friendly infrastructure at worksites;
- **Direct assistance to employers** through targeted outreach, transportation fairs, and regular communication;
- **Direct assistance to and education for residential property managers** and residents themselves;
- Promotion of **"guaranteed/emergency ride home"** programs, which allow commuters who regularly utilize non-SOV modes to travel to work a free ride home in the event of an unanticipated emergency; and
- **Commuter stores.** A local TDM agency, generally at a transit station or a mobile kiosk, sells fare media and provides print and verbal information on travel options in an area.

In Greater Richmond, the Richmond Regional Transportation Planning Organization (RRTPO) is the federal and state-designated regional transportation planning organization. The RRTPO is responsible for developing TDM processes, strategies, and policies for the region as well as administering the competitive annual allocation of CMAQ and RTSP funding to grantees. The organization currently evaluates funding support for RideFinders, a TDM program serving Central Virginia. RideFinders originally began as a pilot in 1980 and was folded into the GRTC Transit System in 1998 from the RRTPO with a focus on ridematching as well as carpool and vanpool support.

Seeking to move as many people as possible in fewer vehicles, RideFinders works directly with local governments, chambers of commerce, transit advocates, regional partners and working groups, and employers to address specific transportation challenges. Current services include:

- Ridematching;
- Vanpool assistance;
- Residential outreach;

- Employer outreach;
- Marketing and promotion;
- An Emergency Ride Home program;
- A Commuter Store in Richmond's financial business district;
- Bicycle and pedestrian promotion; and
- A Clean Air Campaign.

The Vision for TDM

As part of the Greater RVA Transit Vision Plan public outreach process, at public workshops in June 2016**,** attendees were invited to provide feedback on TDM programs. Workshop participants were given the following prompt and asked to place colored dots next to potential programs in order to 'vote' for initiatives they supported:

> *In addition to the existing [TDM] programs, which of the following strategies do you think will further encourage people to stop driving alone and choose more sustainable, healthy, and affordable options?*

The results of the public workshop voting exercise show a strong preference for four strategies:

- Commuter Choice Benefits (25 percent of votes)
- Bike and Walk Program (22 percent of votes)
- Employer Outreach (18 percent of votes)
- Long-Distance Commuters (13 percent of votes)

These preferences indicate a desire from the public for additional commuter benefits, additional information for employers, and programs that promote first and last mile connections for bicyclist and pedestrians, and long-distance commuters as well. The complete results of the public meeting exercise are detailed in the Appendix C. The following section describes how each potential TDM strategy supports the vision, goals, and objectives of the Greater RVA Transit Vision Plan.

School Pool Ridematching promotes non-SOV travel for an essential trip that parents, students, and faculty must make at least twice daily. The facilitation of ridematching would make the process of finding carpool partners easier and ultimately lead to traffic congestion mitigation around schools.

As various income, ethnic, or age groups often have different needs, **Targeted Marketing** is essential to any TDM effort. Targeted marketing allows TDM programs to reach a greater constituency, more effectively disseminating information and catering to the specific transportation challenges of interest groups, including populations who might otherwise avoid transit, ridesharing, or biking.

Growing regional **Carpool and Vanpool** programs would spread awareness of services available, continue incentives to utilize non-SOV modes (especially via the VanStart and Van Save programs), improve regional air quality through reduced automobile traffic, and reduce the commute-related stress of countless workers across the Greater Richmond region. Currently, the Virginia Department of Rail and Public Transportation (DRPT) is leading a statewide vanpool initiative to expand vanpool subsidies, develop a statewide vanpool brand, and improve ridematching procedures.

Enhancements to regional **Bike and Walk programs** that focus on first and last mile transit connections could effectively increase transit ridership in the region while supporting active, healthy, and fun modes to connect

to and from transit. In essence, while encouraging alternatives to driving alone, such a program could act as a double-edged sword, promoting biking and walking as well as public transit simultaneously. The RRTPO is currently involved in planning with regional jurisdictions to advance pedestrian and bicycling connections to and from places where residents, live, work, and play, and as a means of accessing transit. The RRTPO also selects regional bike and pedestrian projects for federal funding.

A proposed increase of the **Commuter Choice Benefits** subsidy did not receive the most votes among public workshop participants by accident. For commuters, this program presents a highly attractive incentive to vanpool or ride transit to work and thereby mitigates roadway travel demand. For employers, the benefits, which include tax savings, a competitive edge, and corporate stewardship, are equally appealing.

Because the potential to change employee commute decisions begins at the workplace, strong **Employer Outreach** is a hallmark of any TDM program. An expansion of regional Employer Outreach programs would allow programs to interact with a greater number of businesses. This increased reach would promote additional, lasting commute assistance partnerships that could elicit more transportation fairs and special events. Put simply, if regional programs can reach more employers, they can influence a greater number of commuter travel choices.

http://www.ridegrtc.com

Finally, in a region such as Richmond, the prevalence of **Long-Distance Commuters** presents a unique transportation challenge. A program designed to specifically reach these commuters would involve a targeted effort to reach travelers who might not otherwise try transit. This can be accomplished in part through Employer Outreach and targeted marketing and can assist these commuters transition to non-SOV alternatives. The reduction of these long-distance trips has greater benefits when compared to local trips because you are potentially reducing the number of vehicles across more facilities coupled with greater health benefits as well (greater greenhouse gas reductions, greater health benefits for the drivers).

All of these strategies should be pursued through cooperation with regional agencies to support the vision, goals, and objectives of the Greater RVA Transit Vision Plan.

Alternatives

While developing the Vision Plan Network, the study team evaluated several different alternatives. The initial set of alternatives was a first-draft network with essentially all the routes that seemed to be justified by land use and demographics, or that were requested by stakeholders. A reduced network was also tested initially. From that point forward, the network was refined via assessment of performance as well as stakeholder and public input. A second round of alternative testing included a refined “lower cost” alternative with most of the full network and some areas of reduced service such as lower frequencies, and a “higher cost” alternative with the full network and more service. The “higher cost” alternative was also tested with baseline (2012) land use to provide insight into which routes support strong ridership in the short term versus the long term. The results of these alternatives were shared with the Transit Forum and refined one last time to shape the final Vision Plan Network.

Performance Measures

Several measures are used to assess the performance of transit routes and the full transit network. The travel model used in the study provides a ridership forecast for each route. The performance measures compare the ridership to the investments in the system and each route to understand how effective and cost-effective the routes are as well as the system as a whole. The performance metrics of the 2040 Vision Network are compared to the 2040 No Build Alternative, which represents the forecasted future ridership of the existing transit network in 2040 (accounting for projected changes in land use that will alter transit usage by 2040).

The metrics for ridership are boardings (how many times someone boards a bus, regardless of transfers) and linked trips (the number of trips made by bus, including transfers). Comparing the boardings to the service hours creates a measure called productivity – boardings per hour. This is a key measure of cost-effectiveness, as the service hours are the main driver of cost. Productivity is a good measure to look at by route; while a good system-wide measure of cost-effectiveness is the overall operating cost per rider.

An additional, significant performance measure looks at the number of residents and jobs that are near transit. This measure provides a direct indication of whether the region is improving the access for people, and specifically to jobs, via public transit.

Initial Alternatives

As noted above, the alternatives analysis process included a Lower Cost Alternative and a Higher Cost Alternative, leading to the Vision Plan. The Lower- and Higher- Cost Alternatives provided initial key insights with respect to existing and future transit demand in the region, so those alternatives' performance results are briefly summarized here. For example, the Higher Cost Alternative increased service hours by more than 180% over the No Build Alternative, from about 1,400 daily service hours to nearly 3,900. The Higher Cost Alternative increased boardings by 100% and transit trips by 74% (accounting for transfers). The Higher Cost alternative increased the operating cost per rider by 52%, based on boardings from $4.11 in the No Build to $6.26, with a greater difference (79%) in the cost per linked trip between the No Build and Higher Cost Alternative[3]. These metrics indicated that significant expansion of the region's transit investment has the potential to grow transit ridership throughout the region. Extending services into less densely-developed areas would be expected to cost more and the cost per boarding does increase over the No Build, but the tradeoff is greatly enhanced access to jobs, as discussed in the next section.

The Lesser Cost Alternative increased the service hours by 119%, to nearly 3,000 daily hours. This alternative saw an increase of 75% in boardings and 55% in linked trips, compared to the No Build, with the overall cost per passenger systemwide rising 45% based on boardings and 57% based on linked trips. Thus, while the alternative with lower levels of service does have an efficiency advantage over the Higher Cost Alternative, particularly on the per-

Key findings from the analysis of **initial alternatives** included:

- There appears to be ***strong demand*** for an expanded transit network today and in the future
- While extending service into the less-densely developed areas of the region increases the cost per rider, the tradeoff is ***greatly enhanced access to jobs*** throughout the expanded network.

[3] Note that corrections and updates were made to the cost estimation methodology concurrent with the final Vision Plan network analysis; the costs and metrics of initial alternatives presented here have been updated to be comparable to the final Vision Plan costs.

linked trip metric, the fact that the cost per boarding is not dramatically higher in the High Cost Alternative while the boardings and linked trips increase significantly between the two alternatives indicates that there is a strong increase in ridership that goes along with the greater investment in service. These findings are a strong indication that there is demand for a greatly expanded transit network today and in the future.

Looking at differences over time, the productivity results per route for the Higher Cost Alternative with 2012 and 2040 land use provided insights into the short-term and long-term demand within specific areas of the region. This analysis showed that there is the potential for highly productive BRT routes in western Henrico County today, particularly along Broad Street, and many of the western and northern Henrico local fixed routes also performed well in the short-term. Most other routes had much stronger productivity results in 2040 than in the baseline, and some did not perform very well even by 2040. The lower-productivity routes included the northern and southern Route 1 high quality transit lines and the outer portions of the Mechanicsville and Hull Street Road high quality transit lines. The airport connector line also had weak productivity results. These results helped shape modifications to the routes and the types of high quality transit modeled in the Vision Plan and also informed the phasing recommendations.

Vision Plan Performance

The Vision Plan is a refinement of the 2040 Higher Cost Alternative, where lower frequencies were offered on lesser-performing routes and some routes were slightly reconfigured to better respond to both higher and lower ridership areas of the region. Stakeholder comments were also considered, leading to some key changes such as elevating service on Staples Mill Road to high quality service and carrying that route south across the two east-west BRT lines (with transfer opportunities) to the University of Richmond area and across the River to Stony Point. Some express services were also expanded based on stakeholder input. These express service expansions did not fare as well on ridership, possibly due to the improved results in the high quality transit services in those corridors; however, the express routes remain in the Vision Plan results.

> The Vision Plan is a refinement of the 2040 Higher Cost Alternative including stakeholder input that shaped key final changes

> Some of the same principles of the Richmond Transit Network study, such as providing a connected network of routes that enable more direct travel via transit, have been incorporated in the Vision Plan network design.

The Vision Plan network increases service hours over the No Build Alternative by 172% and increases ridership by 107% to just under 80,000 riders per day. When transfers are taken into account, the Vision Plan supports 76% more linked trips. Figure 21 provides the total ridership results for the Vision Plan's recommended network. Figure 22 shows the differences in service hours and operating costs for the No Build and Vision Plan Alternatives. The increase in operating costs for fixed route, express and high quality transit is estimated at 190%, from approximately $40 million to about $116 million. This is a high-end estimate in that the tallied operating costs of all the new services are added to the existing GRTC operating costs to form the cost estimate of the Vision Alternative, even though there are some small overlaps in services that, if taken into account, would reduce the net increase.

Figure 21 Ridership Results

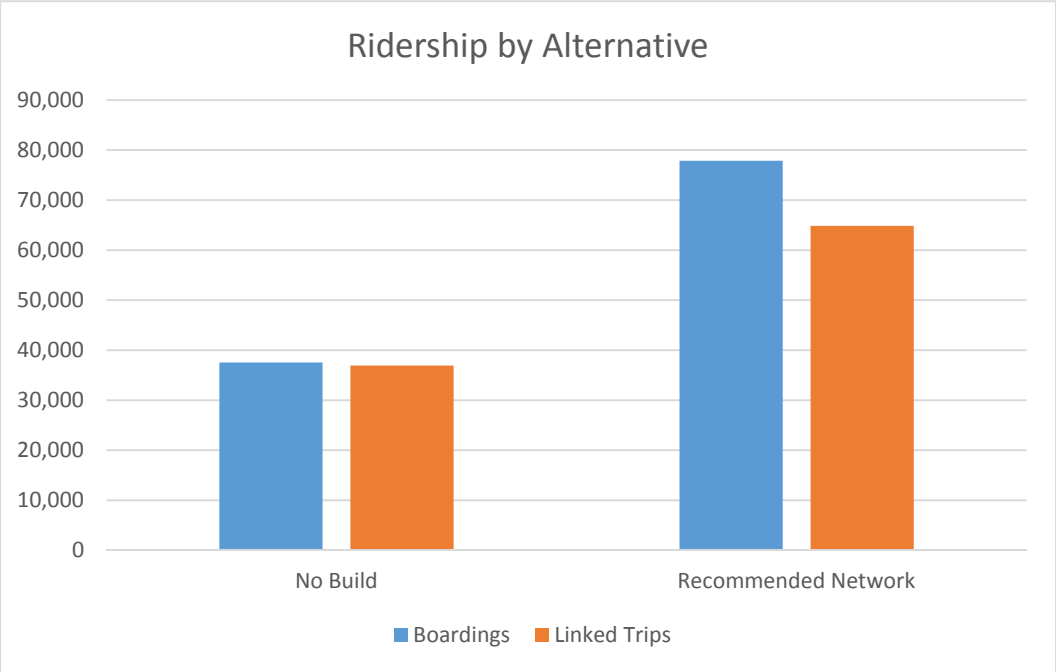
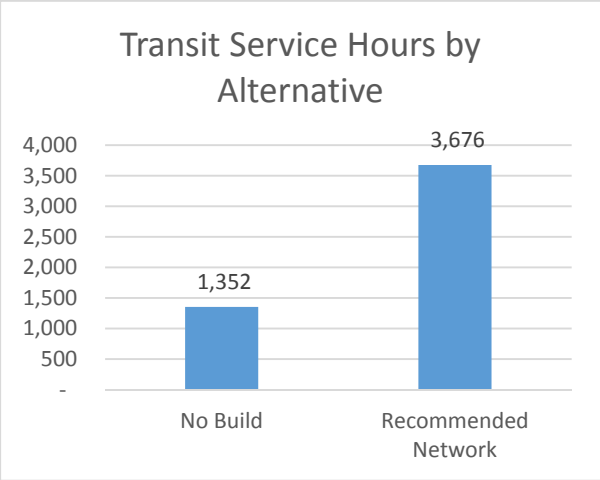
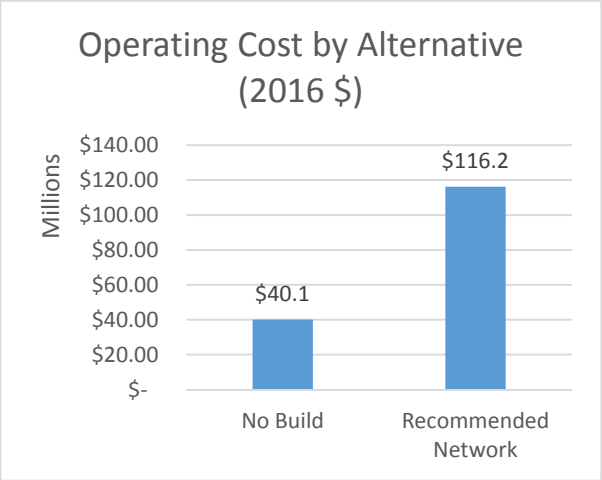


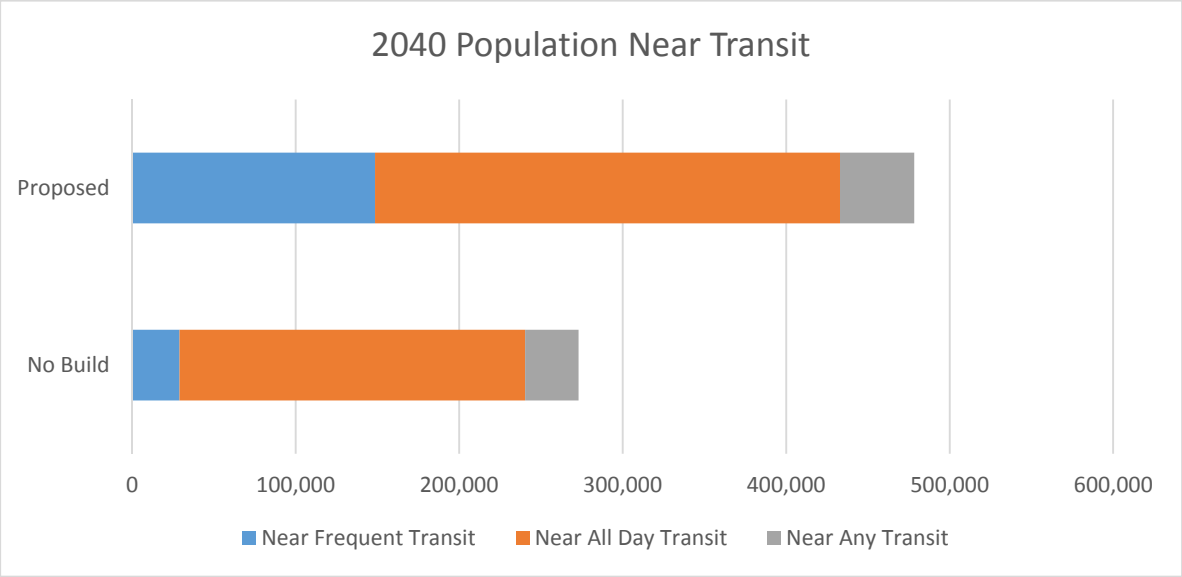
Figure 22 Service Hours and Operating Cost Comparisons





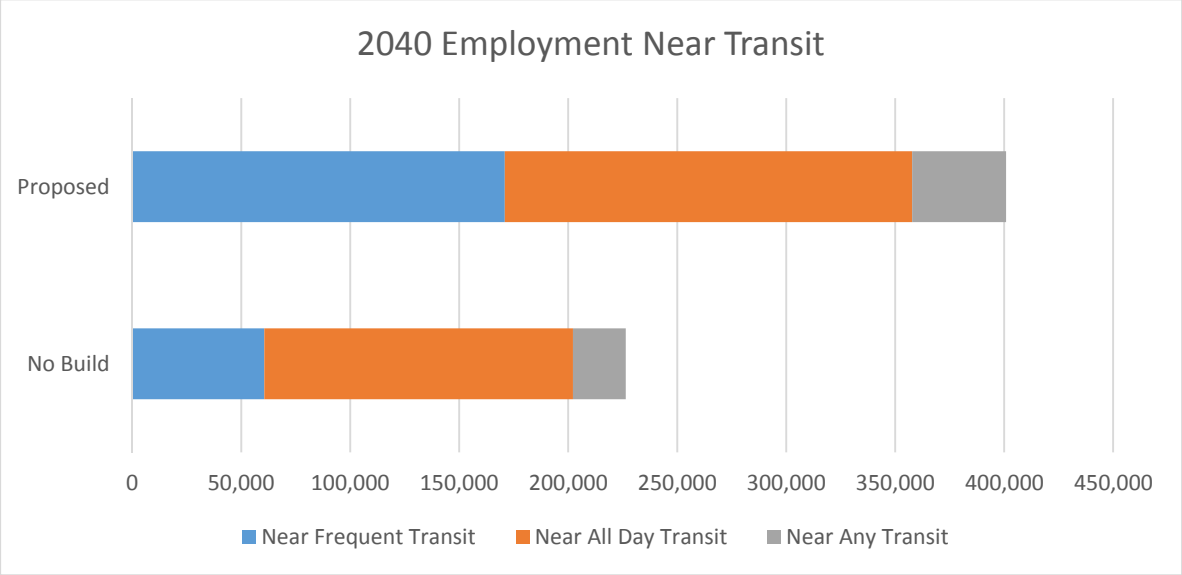
The Vision Plan network's performance in providing access to transit is impressive. As shown in Figure 23, the projected 2040 population that will be within ½ mile of transit service will increase substantially. The population near frequent transit will increase from 2% of the population under the No Build to 10% under the Vision Plan, while the population near any transit in total will increase from 19% to 33%. Similarly, for employment, the overall amount of jobs near transit will increase from 31% to 55%, with a dramatic increase of 8% to 23% for employment near frequent transit. Figure 24 shows the employment results.

Figure 23 2040 Population Near Transit



Source: Michael Baker International

Figure 24 2040 Employment Near Transit



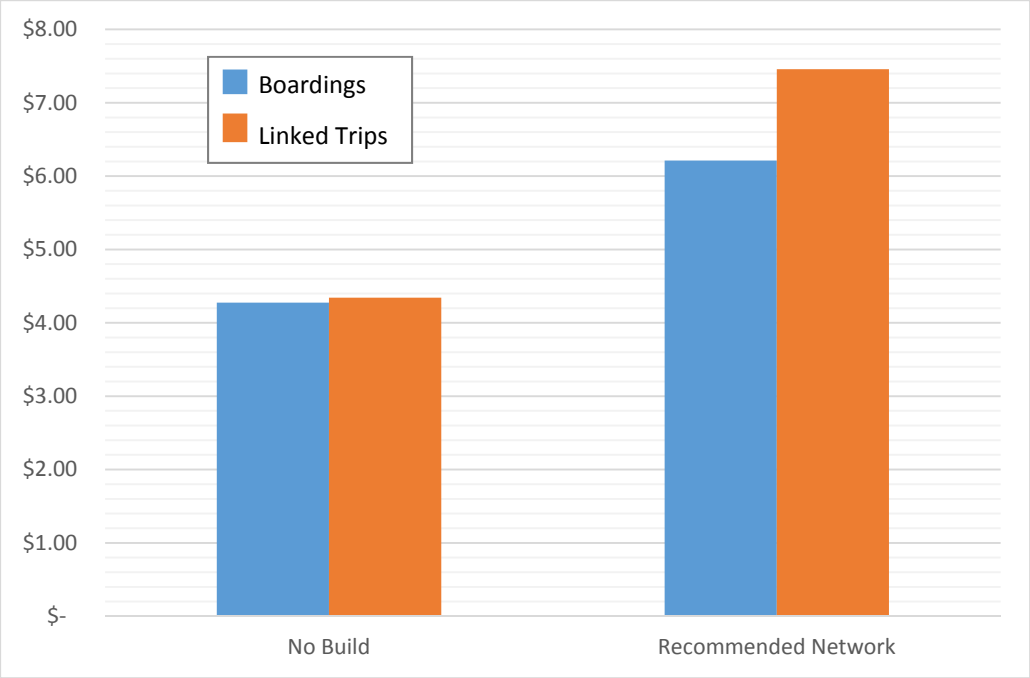
Source: Michael Baker International

The route productivity results in the Vision Plan are varied, but they indicate strong potential for the high quality service corridors. With the refinements in the Vision Plan BRT and Enhanced Local Service Routes, the productivity results range from the mid-teens for the Enhanced Local Service Routes to high teens for the Airport Connector, over 20 for the West End South BRT, close to 30 passengers per hour for the Midlothian and Mechanicsville BRT routes, and over 50 passengers per hour for the Short Pump BRT Extension. Keep in mind that 30 passengers per hour is the equivalent of one passenger every two minutes, and given that these services will not stop as often as every two minutes, the results indicate that *on average for the entire service period*, multiple passengers would board every time the bus stops.

Among the local routes, most perform as well as the existing system's typical routes today and 8-10 routes have very strong productivity, particularly those in the west end of Henrico, radiating out from Regency Square Mall (which would serve as a hub) and the north side of the City including Henrico and Mechanicsville. A route connecting the east end of The Pulse to Varina also shows strong productivity results. The weakest productivity results occur on long routes with limited service such as express services to Ashland, New Kent and Midlothian and West Creek. Private shuttles to Tranlin and Amazon that were modeled do not show strong productivity, but it is likely these services would be implemented as employer-provided shuttles that could be highly tailored to shift times (which is not captured in the regional travel model).

The less-productive routes result in some increases in cost per passenger between the No Build and Vision Plan Recommended Network Alternatives. Figure 25 shows that the cost per passenger increases from $4.27 to $5.97, or a 40% increase, while the cost per linked trip increases from just over $4.34 to over $7.17, a 65% increase. The final design and implementation of the Vision Plan network can include strategies to tighten up the systemwide cost per passenger, such as reducing redundancies between the existing and proposed services and between express, high quality and/or local services in the same corridor. Many factors will determine the future route productivities and system costs and efficiencies, including the final service plans determined for each of the high quality transit corridors, the frequencies of local routes, the service hours of express routes, and any refinements to the hours per day that each service is offered. The land use and phasing of service in the corridors also will have a significant impact on actual performance. The performance metrics provided here provide an overview of the potential results for the Vision Plan network, and they demonstrate that substantial demand exists today and is anticipated in the future for expanded transit services.

Figure 25 Vision Plan Costs Per Passenger



Costs

The full Vision Plan annual operating costs are estimated at $123 to $147 million (see Table 5 for details), compared to current operating costs for fixed route, express services, and paratransit which total nearly $48 Million for GRTC in 2016 dollars. This large of a system expansion would also necessitate constructing an additional maintenance facility, which is addressed in the capital cost estimates below. As discussed in Chapter 1, much of the increase in annual costs is 'catch-up' to put the Richmond Region on a par with regions of similar size.

In addition to the operating costs, the Vision Plan entails significant capital costs. These costs include a new maintenance facility, additional buses, and a variety of costs associated with the high quality service lines.

The Vision Plan would increase the region's annual transit investment by 150- 200%, with a five-fold increase in the residents with access to frequent transit and a tripling of jobs with access to frequent transit.

Specifically, the components of the high quality transit service lines include stations, intersection operational improvements, branded buses and conversion of existing lanes to dedicated bus lanes. At this stage of planning, it is difficult to provide a refined estimate for the capital costs of BRT corridors in particular, since the number of stations, the extent of traffic signal improvements, and the extent of dedicated right-of-way are unknown. The study team estimated a range of costs representing the high and low ends of likely costs, based on average numbers of stations and traffic signals in each corridor, based on mileage, and considering the observed range of per-mile costs for existing BRT systems. Table 5 provides the summary costs for the Vision Plan. The High Quality Transit Line costs include $450-$870 million for the BRT lines and $80 to $145 million for the enhanced local services. These costs are broadly buffered to account for the uncertainty regarding the ultimate design of the corridors. As such, the estimated cost per mile for BRT ranges from $5.7 to $11 million, while the cost per mile for Enhanced Local Service is $1.5 to $2.7 million. The corridor-level capital and operating costs for high quality transit are shown in Table 5. Note that the mileage of each service is a driver of both capital and operating costs, but the amount of fixed guideway (which varies by corridor) is also a significant driver of capital cost for the BRT lines. The operating cost estimates for Enhanced Local Service assumed 20-minute headways.

A lower cost alternative similar to the earlier phase of analysis was not tested with the final Vision Plan Network, but it bears mentioning that the region would not likely leap directly to the investment level of the full Vision Plan Network. A 'catch up' network would cost approximately $100 million per year (including the existing system), to put the Richmond Region on a par with regions of similar size, as discussed in Chapter 1. An initial lower cost alternative could have shorter lines in some of the BRT corridors, particularly Hull Street, West End South and Mechanicsville BRT, to focus service initially in the areas that have supportive land use today. A lower cost alternative would also have reduced frequencies on some of the longer suburban and orbital routes. The initial alternatives analysis showed that a well-designed smaller scale system expansion would see ridership gains. Chapter 5 addresses more specific suggestions for phasing, but also emphasizes that each component of the Vision Plan will move forward on the basis of local interest and 'championing' the services proposed in the Vision Plan, ideally in tandem with actions to foster transit-supportive land use.

Table 5 Vision Plan Cost Breakdown

Costs in Millions	Corridor Length (Miles)	Annual Operating Costs (in 2016 $)[1] Low – High Estimates	Capital (in 2016$) Low – High Estimates
BRT Corridors		**$19 - $23**	**$450 - $870**
Short Pump BRT Extension[2]	9.3	$2.3 - $2.8	$85 - $165
West End South BRT[3]	18.3	$4.7 - $5.5	$110 - $210
Midlothian BRT[4]	17.2	$4.4 - $5.2	$100 - $195
Hull Street BRT[4]	20.5	$5.2 - $6.1	$95 - $190
Mechanicsville BRT[4]	10.8	$2.7 - $2.9	$60 - $110
Enhanced Local Service Corridors		**$12 - $15**	**$80 - $145**
Airport Connector	8.9	$1.7 - $2.1	$5 - $10
Staples Mill/Regional Connector	21.2	$4.2 - $4.9	$25 - $45
Route 1 North – Ashland	16.6	$3.3 - $3.8	$30 - $55
Jeff Davis South - Chester	15.3	$3.0 - $3.6	$20 - $35
Local and Express Routes[5]	N/A	**$78 - $95**	**$244 - $347**
Paratransit	N/A	**$13 - $15**	**$11 - $13**

[1] Includes the costs of the existing transit and paratransit system plus The Pulse

[2] Assumes up to 100% of the corridor has dedicated lanes for BRT

[3] Assumes up to 75% of the corridor has dedicated lanes for BRT

[4] Assumes up to 50% of the corridor has dedicated lanes for BRT. Potential overlap of Midlothian and Hull Street BRT corridors is not factored into the cost estimates.

[5]Includes buses and stops for expanded routes, park and ride lots and a maintenance facility

Chapter Five: Pursuing the Vision

Now that the region has a Vision for transit services, the most challenging part may be determining next steps. This chapter describes the suggestions for phasing the plan that were developed through both technical analysis and stakeholder input. We also discuss the many opportunities that arise from the Vision – from fostering a more transit-supportive land use pattern to tackling the financial and institutional challenges that are necessary if the region is to fully realize the Vision.

Where Do We Start?

Some parts of the Vision will take years to implement and are suited to conditions that will occur as the region continues to grow. However, some parts of the Vision plan appear to be feasible right now, and others are needed in the near-term to put the region on the path towards the Vision. The phasing recommendations include:

- Short-term concepts associated with existing transit-supportive land use and demographics
- Short-term actions necessary to fostering high quality transit services as envisioned by the plan
- Early-phase services that may transition to higher-level services over time

BRT and Enhanced Local Transit Services

Each high quality service corridor will need to be championed by the region, local government, and the transit service provider in order to advance. Each corridor will need to be studied to determine the best route, service frequency, station locations, and specific features of high quality service that will be included. If federal funds are to be sought for capital improvements (buses and any construction costs), then the project owner will need to follow a planning process under Federal Transit Administration (FTA) guidelines. This process can take several years and should be started as soon as the region can foresee providing the support to choose a Locally Preferred Alternative for each corridor and the local funding matches necessary to construct and operate the planned service. The TPO's long range planning and Transportation Improvement Plan processes provide the opportunity to discuss the timing, funding, and ownership of the planning processes to be pursued for each corridor. The region appears ready to start one or more of these studies very soon. The Phasing recommendations for all of the BRT and Enhanced Local Service corridors are summarized in Table 6.

Corridor studies for High Quality Transit will need to address the logical segments and alignments of the service, design configuration such as location of dedicated lanes, station locations, anticipated ridership, connections to local transit, traffic impacts, and sensitive environmental and community issues.

One of the BRT corridors in the Vision Plan appears ready to launch based on existing transit-supportive characteristics and strong ridership projections: **Broad Street to Short Pump**. This service is a logical extension of the first phase of The Pulse which will be completed in late 2017. There is no early phase recommendation for this corridor; it should proceed to study and implementation as BRT.

The **West End South** corridor also has existing transit-supportive characteristics and strong ridership projections, but it will have some challenges to advance towards BRT in the eastern portions of the corridor where traffic congestion and high-volume, one-way streets create a challenging environment to implement BRT. The study for this corridor should consider a broad range of service options and potential routes. Also, the western portion of the corridor is unlikely to warrant BRT service without supporting connections from local routes and the Short Pump BRT line and thus should be phased in accord with those services. One way

to address this circumstance could be to focus the initial BRT service east of Regency Mall or the City line (where Three Chopt and Patterson cross), and offer Enhanced Local Service west of that transition point initially.

The remaining BRT corridors (**Midlothian Turnpike**, **Hull Street** and **Mechanicsville Turnpike**) will need to undergo careful study as well and may benefit from starting out as Enhanced Local service or even Limited Stop service (described later in this section). The benefits of beginning with a transitional form of service include:

- Minimal study and permitting required prior to launching service
- Flexibility in service levels, reducing the cost of introducing the route (BRT requires at least 15 minute frequencies)
- Addressing the chicken-or-egg dilemma of transit-oriented development and transit service by providing a cost-effective service while land use evolves to a more transit-supportive state, while demonstrating to developers that there is a transit service commitment in the corridor (see the examples provided in the final public meeting boards, page 3)

Stakeholders also expressed concern that the introduction of new services that may begin in less transit-supportive circumstances and that have lower initial ridership potential should be carefully managed so that the success and perception of full, branded BRT in the region are not undermined.

For the **Airport Corridor**, a study could be launched soon to determine the right location, frequency and branding of service to provide maximum benefit to the airport, regional tourism, and potential redevelopment opportunities. Another option is to implement a limited stop service quickly to harness the potential of this corridor, and the service could evolve from there. Both options – introductory service and a comprehensive study – could be implemented in the short-term, but there are benefits to conducting a study first. While this corridor does not show the high productivity based on current land use that some other corridors show, it comes up again and again as a high priority in regional opinion polls and outreach, and the business community also seems to favor this service. The distance from downtown to the airport is not far – about 7 miles – and therefore the cost of venturing some service into this corridor is more feasible than many others in the Vision Plan. These factors support moving forward on implementing Airport Corridor service sooner rather than later.

The **Staples Mill/Regional Connector** and the **Jeff Davis** corridors are recommended to start as Enhanced Local service, perhaps with 30 minute service that would increase in response to ridership and changing land use patterns. The Route 1 North corridor to Ashland covers a very long corridor and could be started with a simplified version of Enhanced Local Service, referred to as Limited Stop service. Limited Stop service resembles Express Service in that it may have very few stops, but like Enhanced Local Service, it would run all day in both directions, accessing the stops on local roads. This is a lower-cost service that provides an entry into these key corridors, but is designed to foster growth in ridership by providing relatively fast, reliable and all-day access between activity centers.

Express Services and Local Circulators

The express services play different roles in the plan. The ones that ultimately will be parallel to BRT services (particularly along I-64 and Powhite Parkway) do not show strong ridership with the BRT services in place, but prior to implementation of BRT, those express services may have a role in the early transition and build-up of ridership in those corridors. The routes that show strong ridership even with current land use are the I-95 south and 288 corridor services. Those services should be considered for early implementation. Anywhere that new express services are offered, there are two important considerations in phasing. First, the

Table 6 Phasing Recommendations for BRT and Enhanced Local Service Corridors

Corridor	Phase I	2040
Broad Street	BRT, partially dedicated lanes	BRT, increased frequency and dedicated lanes
West End South	Enhanced Local in Henrico; to be determined by study in City	BRT (Dedicated lane downtown to at least Harrison)
Midlothian	Enhanced Local	BRT (dedicated lane to Providence Rd)
Hull Street	Enhanced Local/ Limited Stop Chesterfield	BRT (no dedicated lanes in Chesterfield)
Mechanicsville Tpk	Enhanced Local City/Henrico; Limited Stop Hanover	BRT (no dedicated lanes in Hanover)
Airport via Route 60	Enhanced Local	Enhanced Local (or BRT)
Staples Mill Corridor	Enhanced Local	Enhanced Local
Route 1 to Ashland	Limited Stop	Enhanced Local
Jeff Davis to Chester	Enhanced Local	Enhanced Local

placement of park-and-ride lots is key at the suburban end(s) of the service to allow the service to draw riders from a broad area. At the same time, the Vision Plan encourages two-way service for these routes so that residents at both ends of the service have the opportunity to reach employment centers accessed by the routes. Thus, in addition to park-and-ride lots, these services also will depend on local circulator services at the suburban end(s) of the services to enable commuters to those areas to reach their final destinations. Many of these routes are planned to serve as all-day local fixed routes in the Vision Plan, but as express routes are developed earlier in the time frame, these circulators should also be put in place in the form of deviated fixed route service (to reach more customized destinations) and/or focused at the times of day used by commuters, with lesser or no frequency in off-peak periods. The local route services can be expanded over time as land use and transit ridership evolve.

Fixed Route Services

The two most important factors in implementation of the Local Fixed Route services in the Vision Plan are land use and transit network connectivity. Each route depends on the immediate corridor land use characteristics for ridership, but it also relies on riders that may connect to and from other routes for the complete ridership potential. Phasing of the Local Fixed Route services similarly depend on the transit-readiness of land use and the existence of other routes to form a complete network.

Each local route depends on the immediate corridor land use characteristics for ridership, but it also relies on riders that may connect to and from other routes for the complete ridership potential.

Based on these factors, the portion of the Vision Plan that is most suitable for Phase I implementation is largely the high frequency routes in Henrico County, particularly western and northern Henrico. From a network perspective, the highest-productivity routes that form a broad grid should be given first

priority in all three Counties where fixed route services are proposed. Generally, these are the routes on the major thoroughfares connecting the largest regional activity centers, and they appear as 15-minute routes in the Vision Plan. Where radial high-quality services are considered for early implementation, a basic network of last-mile services should be in place, though potentially starting at lower frequencies and/or as deviated fixed-route service to allow flexibility while ridership grows. Similarly, where the Vision Plan recommends lower-frequency service in 2040, deviated fixed-route service should be considered for Phase I. The land use conditions should be reviewed frequently to determine where new development patterns can support transit services and may even depend on them.

Wild Card: Autonomous Vehicles

A plan for 2040 needs to acknowledge the likelihood that the ways we get around in general, and particularly in urban areas, will be transformed in many ways by changes in technology that are well underway today. The first fully autonomous vehicles are expected to be on the roads within the next five years and are anticipated by many industry experts to be commercially available within the next 5-10 years. For transit, it's unclear at this time how the changes in travel behavior that result from new technologies will play out. One thing is certain – driverless vehicle technology will fundamentally change the cost and revenue model of public transit. It may be that smaller vehicles in greater numbers will make more customized trips, while essentially driverless BRT operates in the highest-demand corridors. Transit agencies are currently preeminent experts in vehicle fleet management, which may create opportunities for an expanded role if ownership of autonomous vehicles (particularly in urban areas) moves in the direction of fleet ownership in lieu of personal ownership. The marketplace for hailed ride services such as Uber and Lyft, which currently have stated business plans to move towards driverless vehicles (currently being tested by Uber in Pittsburgh, PA), also creates uncertainty in the prediction of how transit agencies will continue to serve the public in 2040. At present, transit agencies are partnering with these Transportation Network Companies (TNCs) for last-mile services and to enhance public transit in low-density areas, but these relationships will continue to evolve as technology, financing and public policy alter the playing field. Many changes will occur to shape how the public, including people of all abilities, incomes and neighborhood densities, alter their transportation demands and habits in the future. Nevertheless, many experts expect that public transit will continue to be an important component of urban mobility.

It may be that smaller transit vehicles in greater numbers will make more customized trips, while a form of driverless BRT operates in the highest-demand corridors.

How can we realize the Vision?

Visualize Transit-Oriented Development

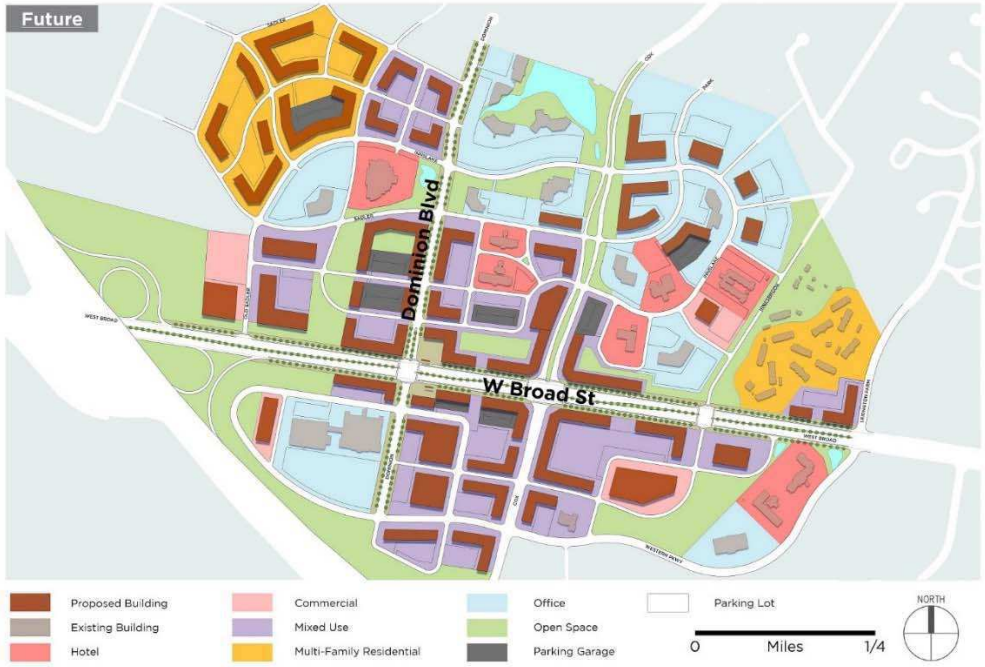
A simple step towards realizing the Vision is to work with planners to visualize future transit-oriented development in key locations that fit the Vision Plan network. The study team undertook this exercise for two intersections to further the land use analysis and visualize the type of transit-oriented development that could occur, based on existing land use and zoning policies. Small area plans and visualizations help communities understand the potential for future development to support a transit investment. The results are conceptual and further studies will be required before stations are defined and specific plans are approved.

Each of the two small area plans shows an area within approximately a 1/2 mile radius of an intersection, as one-quarter to one-half mile is typically an acceptable walking distance for an individual to access a transit station, assuming that the walking environment is comfortable and inviting. The plans demonstrate how a transit-oriented environment could develop within these areas.

A Multimodal Center at West Broad St. and Dominion Blvd.

The small area plan (Figure 26) and visualization (Figure 27) for the West Broad and Dominion intersection shows how the area could develop to create pedestrian-friendly access to a future transit station while maintaining current automobile capacity. The vision is consistent with current Henrico County development codes for this area in terms of the types of uses and built environment shown. The plan contains of mix of uses in a walkable environment, with buildings pulled up to generous, shaded sidewalks.

Figure 26: West Broad St. and Dominion Blvd. – Existing Conditions and Small Area Plan



Source: Rhodeside & Harwell

Figure 27: West Broad St. and Dominion Blvd. looking southeast – Visualization

Source: Rhodeside & Harwell

A Multimodal Center at Hull Street and Cowardin Ave. (Route 1)

The small area plan (Figure 28) and visualization (Figure 29) for the Hull and Cowardin intersection show how the area could develop to create pedestrian-friendly access to a future transit station. The plan and visualization emphasize preservation of the area's historic resources and are consistent with City of Richmond development codes. While they show a mix of uses on Hull and Cowardin south of Hull, the vision preserves the single family residences and shows how new infill development could step down in scale as it approaches these areas.

Figure 28: Hull Street and Cowardin Ave. – Existing Conditions and Small Area Plan

Source: Rhodeside & Harwell

Figure 29: Hull Street and Cowardin Ave.looking northwest – Visualization

Source: Rhodeside & Harwell

Understand and Promote Unique Development Opportunities

The Vision Plan study included a market analysis of three high quality transit corridors, which serves to illustrate that each of the Vision Plan high-quality transit corridors has unique circumstances and opportunities for development. As each corridor moves into project development, and as each jurisdiction plans for the synergies of transit-oriented development, the unique opportunities in each corridor should be explored to provide a sustainable plan for land use, transportation, and also funding.

The complete market analysis is included in Appendix D. In brief, the analysis examined potential property value and development effects of the proposed high quality transit services, to offer an early snapshot of the possible land use responses across the three corridors, and to provide indicators of the corridors' respective attractiveness as places to live and work. The three corridors were selected to explore different types of markets – they are the airport corridor, Broad Street west to Short Pump, and the Midlothian corridor. For each, conceptual-level planning and analysis considered effects within ½ mile of representative stations. The analysis considers square footage, property value, and tax revenue of anticipated new development. Transit-induced premium's effects on property value and tax revenue of existing properties were also calculated.

Corridor 1: Broad Street – Densification Strategy

As discussed in Chapter 4, the Broad Street corridor offers the greatest immediate potential for high-quality transit because it is already highly developed and has mixed use and other transit-supportive land use characteristics in several areas along the corridor. This corridor's main development potential is to maximize build-out through focused growth and improving jobs-housing balance. The current landscape in the station areas selected for the corridor is comprised of two-story shopping centers surrounded by large parking lots and suburban areas. Limited pedestrian and bicycle paths are available. The corridor station areas have robust commercial/retail properties but an office market that is projected to decline and minimal housing in the immediate station areas. The three selected station areas are shown in Figure 30. The quantitative results of the analysis are provided in the Appendix. In summary, the analysis shows that the Broad Street corridor has the highest potential for increased property premium benefits, due to the combination of infill development and increased value of existing development. During project development, Henrico County may want to consider whether the potential for increased property tax revenue warrants consideration for value-capture funding of the transit line for capital and/or operating costs.

Figure 30 Broad Street Corridor Market Analysis – Representative Station Areas

Short Pump Town Center | Innsbrook Dominion Blvd | Westland Shopping Center

Source: AECOM

Corridor 2: Midlothian Turnpike – Development Strategy

The station areas along the Midlothian corridor vary in density, but all have the potential for greenfield investments. The development of high-quality transit in the corridor offers the opportunity for a greater focus on transitioning land use from a pattern of sparse development and underutilized parcels to one that has a greater focus on residential, retail and office, offering around-the-clock activity. Figure 31 shows the three representative station areas, Westchester Commons, Chesterfield Towne Center, and Southside Plaza (which is envisioned to be served by both the Midlothian and Hull Street BRT services). The market analysis shows that this corridor has tremendous potential for new development, which in turn would enhance the local tax base. Closer to downtown, a new rapid transit station at the Southside Plaza between Midlothian Turnpike and Hull Street Road would have an important economic impact to the region since it would support the development of a robust retail and commercial area where currently there are underutilized parcels that are opportunity sites (large horizontal parking lots, vacant properties, lots with no buildings). Also, the area around the other selected transit stations, Chesterfield Towne Center, and Westchester Commons, have plenty of space to convert land use from big parking lots and vacant lots by building new housing and commercial developments which will also increase the value of existing properties.

Figure 31 Midlothian Turnpike Corridor Market Analysis – Representative Station Areas

Source: AECOM

Corridor 3: Airport Connector/Williamsburg Road – Commercial Connectivity Strategy

Connecting the Richmond International Airport and downtown with BRT would support Richmond as a preferable conference destination due to the closeness and ease of access to the main means of transportation. Visitors would access the convention center downtown faster without difficulty. In addition, implementation of a BRT system would encourage local airport users and employees not to drive to the airport, allowing planners to reconfigure some current parking facility lots to add more retail stores, offices, hotels, structured parking, distribution centers, and meeting areas (see Figure 32). From the economic point of view, such a change would increase the property value and the tax revenue around the airport in addition to promoting new development. The selected potential station along Williamsburg Road is at Richmond International Airport. (Redevelopment potential along Williamsburg Road appears constrained by existing residential development which is adjacent to, or one shallow parcel back from the road.) A new BRT system would change the land use of the area near the airport to be more commercial oriented instead of promoting more suburban housing development.

Figure 32 Airport Connector – Representative Station Area

Richmond International Airport

Source: AECOM

Summary

BRT will lead to greater development activity and property tax revenue from both new and existing development. Each corridor has a unique profile of opportunities, which should be carefully examined in future planning activities. Appendix D Market Analysis Technical Memorandum details the quantitative results of the market analysis. When looking at the results for the Broad Street Corridor, the Vision Alternative yielded over 250 percent more undiscounted tax revenue from 2020 to 2040 than under the No Build Alternative. For the Williamsburg Road Corridor, the Vision Alternative yielded nearly 35 percent more undiscounted tax revenue from 2020 to 2040, and the Midlothian Turnpike Corridor yielded over 90 percent more undiscounted tax revenue from 2020 to 2040 under the Vision Alternative compared to No Build. However, the analysis does not capture numerous other benefits that can be realized from BRT implementation such as environmental, land conservation, and workforce access benefits to name a few.

Strategically Promote Transit-Oriented Development Policies

While the land use analysis shows that transit-supportive development is possible under existing land use and zoning policies, these policies should be enhanced and applied strategically to create a robust and comprehensive long-term implementation plan for the region.

Detailed policy recommendations for each of the recommended corridors are provided in Appendix A Land Use Analysis Technical Memorandum. In general, these recommendations primarily emphasize the following concepts:

- Collaborate with neighboring jurisdictions on priority corridors for TOD investment, and create a seamless corridor master plan vision.
- Develop corridor-specific land use plans that direct future development into Multimodal Centers around future transit stations.
- Adopt policies that will require or incentivize development to occur in a pattern that will support efficient transit service.
- Invest in safe and comfortable pedestrian and bicycle facilities for access to all future transit stations.

As discussed in Chapter Three, Multimodal Centers have varying levels of density, depending on the frequency and quality of transit service to be provided on the corridor. In general, higher densities of development are required for higher quality, more frequent service. However, all Multimodal Centers have similar design characteristics:

- Localized centers of activity and development density
- Focused activity around transit stations (current or future)
- A walkable, well connected street network with sidewalks
- A mix of uses (live, work, play, shop)

The following section highlights land use recommendations for each of the high quality transit corridors in the Vision Plan, by jurisdiction. Fully detailed findings and recommendations are provided in Appendix A Land Use Analysis Technical Memorandum. Land use recommendations are organized according to the High Quality Transit Corridor recommendations. Each corridor recommendation includes a multimodal corridor designation, using the DRPT Multimodal System Design Guidelines (2013), and specific direction for appropriate next steps in order to create a land use pattern that will support the short and long term transit vision. Please note that all phasing suggestions are subject to further studies.

Henrico County Recommendations

The Vision Plan's high quality transit corridors in Henrico County are Broad Street, West End South, Staples Mill, Route 1 North, Mechanicsville Turnpike and Airport Connector.

Broad Street		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	BRT, partially dedicated lanes	Transit Boulevard
2040	BRT, partially dedicated lanes	Transit Boulevard

Land Use Recommendations**:** 2040 activity densities will likely support BRT, but current land use plans and zoning do not encourage or envision transit-supportive urban design patterns along most of the corridor. Recommendations:

- Develop a comprehensive vision plan for transit-oriented development on the Broad Street corridor, linking the Willow Lawn and Short Pump areas. Build on the vision already established for the Innsbrook area.
- Begin with a focus on the low-density strip commercial shopping centers lining Broad Street, which offer tremendous opportunity for future mixed-use, pedestrian oriented development to support a transit investment.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

West End South (Cary/Main/Patterson)		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Boulevard/Major Avenue
2040	BRT, no dedicated lanes	Boulevard/Major Avenue

Land Use Recommendations: 2040 activity density projections show transit supportive levels of development east of Regency Square; however, comprehensive plans and zoning do not generally support a transit-oriented design vision (other than one small area near Regency Square). Recommendations:

- Develop a comprehensive vision plan for transit-oriented development on the Cary/Main/Patterson corridor.

- Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential. This includes shopping center parcels at Quioccasin/N. Parham, and the large single-owner office parks and apartment complexes along Three Chopt Road.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Route 1 to Ashland		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Limited Stop	Multimodal Through Corridor
2040	Enhanced Local (20 min)	Boulevard

Land Use Recommendations: 2040 activity density projections show low densities from I-95 to Virginia Center Commons, with the exception of the Brook Road/I-95 intersection. This small area shows a node of future growth supported by both Urban Mixed Use (UMU) and Traditional Neighborhood Design (TND) plans. Recommendations:

- In coordination with the City of Richmond and Hanover County, determine the vision and priority for transforming station areas on the corridor into a transit-supportive land use pattern.
- Limited Stop and Enhanced Local service requires less density than a full BRT investment; however, it also benefits significantly from pedestrian and bicycle facility investments that allow riders to easily and safely access stations. At a minimum, develop a pedestrian and bicycle plan to efficiently link corridor developments to future transit stations.

Mechanicsville Turnpike		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Multimodal Through Corridor
2040	BRT, dedicated lanes	Transit Boulevard

Land Use Recommendations: 2040 activity density projections show very low densities, and comprehensive plans and zoning ordinances do not support a future transit-supportive land use vision. Land uses lining the Turnpike between I-64 and the Chickahominy River are primarily very low density strip commercial development and auto-related industries. Recommendations:

- In coordination with the City of Richmond and Hanover County, determine the vision and priority for transforming the corridor into a transit supportive land use pattern.
- Enhanced Local Service requires less density than a full BRT investment; however, it also benefits significantly from pedestrian and bicycle facility investments that allow riders to easily and safely access stations. At a minimum, develop a pedestrian and bicycle plan to efficiently link corridor developments to future transit stations in the short-term. Over the longer-term, promote higher concentrations of development around the station areas.
- Consider redevelopment opportunities along the corridor to enhance productivity, beginning with large single-ownership parcels that can more easily redevelop into transit-supportive land use patterns.

Airport via Route 60		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Avenue
2040	Enhanced Local (or BRT) (20 min)	Avenue/Transit Boulevard

Land Use Recommendations: 2040 activity density projections show low to very low densities along the Route 60 corridor to the airport. Future land use plans and zoning codes do not support a transit-oriented land use future. Recommendations:

- Work with other jurisdictions to further evaluate the purpose of the transit connection to the airport, and shape the service for that end (service for employees and/or service for travelers).
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.
- Consider redevelopment opportunities along the corridor to enhance productivity, beginning with large single-ownership parcels that can more easily redevelop into transit-supportive land use patterns. Redevelopment recommendations should be tailored to avoid impacting single-family residential development in the corridor.

Chesterfield County Recommendations

Midlothian		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Boulevard/Major Avenue
2040	BRT, dedicated lanes to Providence Rd	Major Avenue/Transit Boulevard

Land Use Recommendations: 2040 activity density projections show medium to low densities, and the comprehensive plans show limited support for transit-oriented development on this corridor. Zoning codes, on the other hand, show tremendous opportunity on this corridor, with the community business, neighborhood business, general business, corporate office, and several residential zoning categories represented throughout. Recommendations:

- Develop a comprehensive vision plan for transit-oriented development at key focus areas on the corridor, for example at the Spring Rock Green Shopping Center, Chesterfield Towne Center, and Midlothian Village.
- Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Hull Street		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Limited Stop	Boulevard/Major Avenue
2040	BRT, no dedicated lanes	Boulevard/Major Avenue

Land Use Recommendations: 2040 activity density projections show very low densities on this corridor. The comprehensive plan, however, shows significant support for transit-supportive development along the corridor. The zoning code shows some support. Recommendations:

- Establish a vision for transit-supportive development nodes on the corridor. The 2013 Hull Street Corridor Revitalization Plan recommends several key locations and provides suggested small area redevelopment plans. Adopt these concepts into the Comprehensive Plan. Investigate additional sites not included in the 2013 Hull Street plan that hold potential for redevelopment to enhance productivity.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Jefferson Davis Highway to Chester		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Multimodal Through Corridor
2040	Enhanced Local (20 min)	Boulevard

Land Use Recommendations: 2040 activity density projections show very low densities along the corridor. Future land use plans currently show very little support for transit-supportive development, however, the zoning conditions generally would allow mixed-use development nodes. Recommendations:

- Continue progress on the current small area/corridor planning for Jefferson Davis Highway, and include recommendations to support transit-supportive development nodes along the corridor.
- Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

City of Richmond Recommendations

Broad Street		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	BRT, partially dedicated lanes	Transit Boulevard
2040	BRT, increase in frequency and dedicated lanes	Transit Boulevard

Land Use Recommendations: Continue to progress the current BRT land use and transit planning vision, which supports transit-oriented development.

West End South (Cary/Main/Patterson)		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Boulevard
2040	BRT, dedicated lanes downtown to Harrison	Transit Boulevard

Land Use Recommendations: 2040 projections show very high activity densities planned for the downtown area, as well as comprehensive plans for transit-supportive development east of I-195. West of I-195, density projections are somewhat lower, and comprehensive plans are no longer supportive of mixed-use redevelopment; however, these areas are largely established residential neighborhoods and are unlikely to significantly redevelop. Recommendations:

- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Hull Street		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Boulevard
2040	BRT, dedicated lanes	Transit Boulevard

Land Use Recommendations: 2040 projections show medium activity density along the corridor. The 2013 Hull Street Corridor Revitalization Plan is an adopted plan that shows nodes of transit-supportive development throughout the corridor; however, there is very little zoning support. Recommendations:

- Proceed with the Hull Street Corridor Revitalization Plans. Locate transit stations that correspond with these mixed-use node locations.
- Consistent with the Revitalization plan, ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor.

Route 1 to Ashland		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Limited Stop	Multimodal Through Corridor
2040	Enhanced Local (20 min)	Boulevard

Land Use Recommendations: 2040 projections show medium activity density along this corridor. The comprehensive plan largely does not support future transit-oriented development, and the zoning code offers little support. Recommendations:

- Develop a comprehensive vision plan for transit-oriented development at key focus areas on the corridor, for example in the many older industrial lots or large, aging shopping center plazas that line the corridor.
- Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Jefferson Davis Highway to Chester		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Multimodal Through Corridor
2040	Enhanced Local (20 min)	Boulevard

Land Use Recommendations: 2040 projections show medium to low activity density along the corridor. Comprehensive plans and zoning show limited support. Recommendations:

- In collaboration with Chesterfield County, develop a comprehensive vision plan for transit-oriented development at key focus areas on the corridor, for example in the many older industrial lots or large, aging shopping center plazas that line the corridor.
- To enhance productivity, begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Mechanicsville Turnpike		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Enhanced Local	Avenue
2040	BRT, dedicated lanes	Transit Boulevard

Land Use Recommendations: 2040 projections show medium activity density along the corridor. This, however, is a short segment of the overall corridor that primarily extends into Henrico and Hanover Counties. Most of the Richmond portion is single family homes that are unlikely to redevelop.

Hanover Recommendations

Route 1 to Ashland		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Limited Stop	Multimodal Through Corridor
2040	Enhanced Local (20 min)	Boulevard

Land Use Recommendations: 2040 projections show extremely low density of development between Virginia Center Commons and Ashland. Service on this section of the corridor will likely have few, if any, stops between Henrico and Ashland. Current land uses are primarily very low density service and repair shops. The focus should be on a future transit node and station in Ashland (see later description).

Mechanicsville Turnpike		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Limited Stop	Multimodal Through Corridor
2040	BRT, no dedicated lane	Boulevard

Land Use Recommendations: 2040 projections show low density development along this corridor, with slightly higher densities in the historic village of Mechanicsville, and the area just east of I-295. Numerous

opportunities exist for redevelopment of shopping centers on this corridor into a transit-supportive development node, though the zoning is not currently supportive. Recommendations:

- Plan for at least one future transit-oriented development node (lower-density) along this section of the corridor, to include a mix of uses, as well as a park-and-ride.
- Ensure safe and comfortable pedestrian and bicycle access to the future station locations, including wide, buffered sidewalks, and well-marked, signalized street crossings.

Ashland Recommendations

Route 1 to Ashland		
Phase	Transit Recommendation	Multimodal Corridor Designation
Phase I	Limited Stop	Multimodal Through Corridor
2040	Enhanced Local (20 min)	Boulevard

Land Use Recommendations: The Town of Ashland is preparing a plan for future redevelopment along England Street, in the vicinity of this transit corridor. Although 2040 projections show low levels of development density, the town should direct that future development to occur in a transit-supportive urban design pattern. For example, buildings can be pulled up to the streets, parking can be located in the rear, and streets can be designed for safe pedestrian and bicycle access. The plan for England Street should focus this type of transit-supportive development around the future transit station. Safe and comfortable pedestrian and bicycle access should be provided to this station area.

Rural Jurisdiction Recommendations

Residents of the rural counties will be able to access end stations on many of the corridors identified in this report for park and ride service. Dispersed land use patterns make demand responsive, paratransit, and some express service most efficient and appropriate for these communities. This conclusion can be re-evaluated over time as land use patterns change and nodes of concentrated transit-supportive development emerge.

Improve Local Accessibility to Enhance Ridership

Planners often pose the question of how to grow transit ridership and transit-oriented development as a chicken-or-egg dilemma. However, just as a critical element – the nest – is missing from the analogy, a critical element to support both transit ridership and TOD is local accessibility, and particularly walkability. The ridership projections developed in the Vision Plan assume that transit stops are accessible and therefore represent an ideal situation in which the development that occurs around stations is designed to maximize access between the stations and riders' origins or destinations. An absence of this accessibility can reduce ridership, particularly if transit station locations do not offer dedicated pedestrian facilities from activity centers or otherwise are unsafe for walkers and bicyclers. The direct investments in transit discussed in Chapter 4 do not include the additional planning and implementation of pedestrian and bicycle accessibility improvements. As discussed in Chapter 3, accessibility is a key feature of transit-oriented development and would therefore ideally be implemented through coordination with developers as private development and redevelopment occur in station areas over time. However, where transit service is provided ahead of development or redevelopment, the region's planners should consider planning for improved pedestrian and bicycle accessibility. Henrico County has already begun this process in the Short Pump area through

Congestion Mitigation and Air Quality (CMAC) funding, and the state's Transportation Alternatives Program (TAP) and Smart Scale programs also offer the opportunity to design and build improved access to transit stations as stand-alone transportation projects. The cost of these projects varies widely, depending on the type of facility and the scale of the improvements.

Scenario Planning

The Vision Plan examined existing and projected land use, and ridership estimates were prepared based on the TPO's existing land use projections. Scenario Planning is a more robust way to examine the potential interactions between land use and transportation, by varying the land use projections according to alternative development patterns that reflect anticipated synergies with transit or other investments. With respect to the Vision Plan, an important next step that the TPO plans to undertake is to closely examine the land use projections in the proposed transit corridors and fixed route service areas, and to adjust the projections to reflect more transit-supportive land use patterns. The TPO would then use the altered projections with the regional travel demand model to produce refined transit ridership and traffic projections. This exercise will illustrate a fully-developed Vision Plan with respect to both transit and land use, and its results will reveal not only more optimal transit ridership estimates, but also the Vision Plan's impacts to traffic congestion, air quality, and other regional transportation performance measures. In addition to the proposed transit network, the land use and market analysis components of the Vision Plan provide good information upon which to develop a Transit Vision Plan scenario and will support the TPO's next steps in regional planning.

Funding

Funding presents another chicken-or-egg dilemma. The evidence, as found in Chapter 1, is clear that the Greater RVA region falls far below regions of similar size in the scale of transit funding, and one result of this under-investment is an extremely poor rating for access to regional jobs via transit. However, it's clear from the examples of other regions across the U.S. that it's very difficult to raise new revenues for transit without clearly showing the public what the investment would 'buy' in terms of new services and regional benefits. The Vision Plan is an important step in the process of addressing this dilemma – it provides specific concepts for long-term investments and it also illustrates where unmet transit demand exists today.

The next steps for increasing funding for transit, as a means of pursuing the Vision Plan, are not necessarily obvious. The process is by definition political in nature, and it will face many obstacles. However, according to research conducted by the Southeastern Institute of Research (SIR) for GRTC in 2015, a key gap in the regional dialogue about transit is the extent of support for transit investments that exists today. Specifically, the business community rates transit higher than other types of transportation investments when asked how they would allocate dollars among alternative investments such as highways, transit and the airport. John Martin of SIR explains this phenomenon in a video prepared for the first Vision Plan public meeting here[4]. This is a change since past surveys, and an important next step is to explore the reasons for this shift in priorities and to begin a dialogue across interested parties regarding the benefits of and need for transit. RVA Rapid Transit has already begun the hard work of grass roots advocacy for transit in the region. It will be critical to bring the business community to the table, to work together to develop a clear case for increasing the region's investment in transit. With a strong coalition across regional interests, the region can move towards a future in which . . . *transit will connect the Richmond region through an efficient, reliable, seamless and sustainably-funded system that benefits everyone by enabling economic growth, promoting livable and*

[4] See www.rvatransitvision.com

walkable transit-oriented development, expanding access to jobs and services, and strengthening multimodal access within and beyond our region.

Critical First Steps

For the TPO and its members, the critical first steps are as follows:

- Encourage local governments to identify the corridors and services they want to champion through further transportation and land use studies. *Initial studies should examine land use and transportation together, identifying goals for the service, determining appropriate alignments, operable segments, design features and station locations, and assessing performance of alternatives.*
- Undertake regional Scenario Planning to further explore the potential synergy between the Vision Plan's transit recommendations and more transit-oriented development patterns. *The land use recommendations for the high quality service corridors described earlier in this chapter can be modeled along with the Vision Plan's transit recommendations to determine the full potential of integrated transit-oriented development to generate transit ridership in the region.*
- Support the continued interaction of the Transit Forum or a similarly-composed group of stakeholders to guide transit planning in the region.
- Study BRT to Short Pump. *This study should lead up to FTA project development for a Small Starts grant – it should identify the purpose and need for the service, develop and evaluate reasonable alternatives, and lead to the selection of a locally-preferred alternative.*
- Examine the feasibility and funding potential for express bus service on Route 288. *This inter-jurisdictional service would require a new model for local funding and should be examined cooperatively to determine if it meets local goals and objectives to an extent that the counties would support it financially.*
- Continue to educate all stakeholders about the relationship between land use density, transit-oriented urban design, and high-quality transit investments so that the appropriate policies can be adopted that will achieve the community's long-term vision and transportation needs.