

RICHMOND REGIONAL



SOCIOECONOMIC DATA ANALYSIS

2012 - 2040



October 2015

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1 METHODOLOGY

Background

The *2012-2040 Socioeconomic Data Report* was approved on April 2, 2015 by the Richmond Regional Transportation Planning Organization (RRTPO). The following methodology describes in detail how the 2012 base year and 2040 forecast data was developed and distributed throughout the Richmond Region which consists of the Town of Ashland, Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan, and the City of Richmond. All analysis on base year and forecast year data was developed through this methodology.

The Socioeconomic Data the Richmond Region has been collected and reported in aggregate by jurisdiction and by smaller geographies called traffic analysis zones (TAZs) on a four to five year basis. The primary purpose for regularly updating socioeconomic data is to provide input into the RRTPO's regional travel demand model for developing future traffic forecasts for input into the Metropolitan Transportation Plan (MTP), previously called the Long Range Transportation Plan (LRTP). The Socioeconomic Data provides a useful tool in combination with other regional planning data layers such as existing land use and green infrastructure, also updated on a regional basis.

The *2012-2040 Socioeconomic Analysis Report* interprets this approved data through a regional perspective. This analysis report was developed to show where the Richmond Region has historically been, where we are now, and where we are going. This is intended to be a regional macro level analysis, independent of any one jurisdiction.

2012 Base Year Methodology

POPULATION AND HOUSING

The 2012 base year methodology for development of the housing and population data used a bottom up approach for tracking local residential development. Previously, Henrico, Chesterfield, and Hanover tracked their annual growth through their Continuing, Cooperative and Comprehensive data process, also known as 3-C data. Richmond Regional Planning District Commission (RRPDC) and local staff decided to use this approach for all jurisdictions in developing the population and housing data as part of the 2012-2040 Socioeconomic update.

The RRPDC hosted a 3-C workshop led by Henrico, Chesterfield, and Hanover on how they track their housing and population data. RRPDC staff used Henrico's model to develop a standard model template for the rest of the jurisdictions as follows:

- Certificate of occupancies (COs) and demolitions were recorded by address/location and through the use of GIS, spatially joining each CO and demolition point to the transportation analysis zone (TAZ).
- Since the 2010 Census Summary File 1 (SF1) data was completed on April 1, 2010 each jurisdiction was instructed to track their COs and demolitions from April 1 – Dec 31, 2010, and then for each subsequent calendar year 2011 and 2012.
- Using the 2010 Census SF1 data as the starting point, all the Census blocks with total population, group quarters population, total housing units, vacant housing units, and occupied housing units where nested into each TAZ.
- COs and demolitions dating from April 1 – Dec 31, 2010 were then inputted into 3-C model for year 2010.
- The data development process used for Hanover, Chesterfield,



and Henrico included the following:

- All three of these jurisdictions had already been tracking their 3-C data using the same methodology as described for the rural jurisdictions below with a few exceptions:
 - ♦ Having tracked 3-C data prior to 2010 all three jurisdictions had a breakdown between single family vs multi-family.
 - ♦ Henrico used surveys to identify group quarters population and the multi-family vacancy rates
 - ♦ All three jurisdictions use specific countywide average household size based on the 2010 Census SF1 and then use American Community Survey (ACS) in subsequent years.
 - ♦ Chesterfield and Hanover used individual vacancy rate by TAZ based on the 2010 Census SF1. For subsequent years vacancy rate estimates are used for multi-family.
- The rural jurisdictions (Charles City, New Kent, Powhatan, and Goochland) process was developed as follows:
 - A countywide vacancy rate, specific to each jurisdiction and based on the 2010 Census SF1, was applied to all the rural jurisdictions for both single family and multi-family.
 - An estimate of the number of multi-family housing units known to be on the ground as of 2010 (2010 Census SF1 does not report housing units by single family vs multi-family) was developed if the jurisdiction had any multi-family housing.
 - Once the COs and demolitions were inputted into the 2010 3-C model the number of single family and multi-family housing units were populated by TAZ. A countywide average household size was then applied based on the 2010 Census SF1 to calculate the single family and multi-family population. This gave each jurisdiction the total population, household population, group quarters population, housing units, and households through the end of 2010.
 - This data was then copied into the 2011 3-C model and the COs and demolitions for 2011 were inputted which calculated

the new 2011 population and housing data.

- The same step above was repeated for 2012 which calculated the population and housing data through the end of 2012.
- Vacancy rates and average household sizes were applied from the 2010 Census SF1 for years 2010 - 2012 as a more accurate estimate than ACS.
- City of Richmond data development process:
 - The same process for the rural jurisdictions was followed for Richmond with two exceptions:
 - ♦ Only total housing units were tracked since the housing stock in the City is so much more diverse and City staff had not tracked their 3-C data in order to determine the exact breakdown as of April 1, 2010 of single family vs multi-family.
 - To account for the diverse housing stock the City was divided into five districts having similar housing characteristics (downtown, northeast, southside, uptown, and the westend) and each district assigned an appropriate vacancy rate and average household size. For example, the westend had a vacancy rate of 6.85% and an average household size of 2.11 vs downtown with 13.08% and 1.64 respectively.

EMPLOYMENT

Staff used the 2nd quarter 2012 VEC data as the primary source. The 2012 VEC data was provided with latitude and longitude coordinate systems for most of the employer addresses allowing staff to plot most of the points rather than geocoding over 27,000 employer addresses. Over 99% of the 2012 VEC employment was either plotted or successfully geocoded. Employer addresses without latitude and longitude coordinates were geocoded after their addresses were verified.

With a point layer for the 2012 employment a thorough spot checking process, staff compared it against the 2008 employment using the new TAZ geography. Any major differences were reality-checked. Some differences reflected employers relocating or going out of business. Other addresses were geocoded on the wrong side of the street or employment needed to be disaggregated into several locations. Generally speaking staff researched any TAZ where employment had a difference of +/-100 and/or represented a large proportional difference. Several



rounds of this spot checking were done along with notes as to reasons for major differences.

The 2008 base year employment made use of the VEC data and verified through contact with employers of 50 or more and disaggregated employment where it was necessary. The extensive verification of the 2008 base year employment data to verify the 2012 VEC data using the 2008 point file. It is recognized that even though different economic conditions existed between 2008 - 2012, a base year comparison was helpful at the TAZ level.

AUTOS

The following methodology was used to determine auto distribution by TAZ in the Region:

- The source for auto data is the Census Transportation Planning Products (CTPP) 2006-2010 5-year estimates based on ACS 2006-2010 released on October 31 2013. The CTPP releases data in many geographic levels, TAZ (henceforth called CTPP TAZ) being one.
- The TAZ framework use for socioeconomic data report (henceforth called Model TAZs) nest to form CTPP TAZs.
- There are 639 CTPP TAZs and 875 Model TAZs in the Richmond Region.
- 453 of CTPP TAZ retain the same geographic footprint as the model TAZs. These TAZs are referred to “Non- Split Model TAZs”.
- The remaining 186 CTPP TAZs have been split into 422 Model TAZs. These TAZs are “Split Model TAZs”.

The methodology for automobile calculation for Split and Non-Split Model TAZs differ and are described below:

For Non-Split Model TAZs

- Two tables were used from CTPP 2006-2010, Table B111103 (Aggregate Number of Vehicles Available in Households) and Table A112100 (Total households).
- Since the Non-Split Model TAZs retain same geographic structure as CTPP TAZs the data from the above two tables, Total Autos and Total Households were used directly.

- Autos per Household ratio for each Non -Split Model TAZ was then derived.
- For 2012 Total Automobile per TAZ, the ratio from the previous step was multiplied by the 2012 household numbers provided by jurisdictional 3-C data.

For Split TAZs

- Total Household for each- Split Model TAZ for Decennial Census 2010 was calculated using the Census block data.
- The total household was then aggregated to CTPP TAZ.
- A ratio of total households for the CTPP TAZ and the total households of nested Split Model TAZ was calculated to arrive at the distribution of households in each Split Model TAZ.
- Two tables from CTPP 2006-2010, Table B111103 (Aggregate Number of Vehicles Available in Households) and Table A112100 (Total households) downloaded previously were then multiplied by the ratio determined in the previous step to calculate total autos and total households for split Model TAZs.
- The total autos were then divided by total household to get the autos per household ratio.
- To arrive at 2012 automobiles per TAZ the ratio from the previous step was multiplied by the 2012 households provided by jurisdictional 3-C data.

SCHOOL ENROLLMENT

K-12 school enrollment was compiled using the fall of 2012-2013 academic enrollment numbers provided by Virginia’s Department of Education (DOE). In some cases, axillary locations and alternative schools were called to verify.

K-12 private school enrollment was compiled using a combination of the Virginia Economic Development Partnership’s (VEDP) database (using the 2011-2012 academic year) and Henrico County’s database (using the 2012-2013 academic year). In both cases the fall enrollment was used. For any other private schools where staff had no record of enrollment numbers, staff contacted individual schools.

University and college enrollment was compiled through phone calls





to each institution, using the fall enrollment of the 2012-2013 academic year. These enrollment numbers include both full-time and part-time students. These institutions include 4-year universities, 2-year colleges, post-graduate programs, certificate programs, technical schools, and proprietary colleges and universities – also known as for-profit institutions of higher learning.

2040 Forecast Year Methodology

CHARLES CITY COUNTY

Total Population: A population control total of 9,796 was established by Charles City County staff using the VEC projections for 2040 plus 10 % variance established by VDOT. To reach this population the County established a new population of 2,404 over its 2012 base year population.

Housing Units and Households: Charles City County staff provided the expected and potential new residential development (housing units) in seven Neighborhood Service Areas (NSAs) for the 2040 forecast year which added up to 880 housing units. A vacancy rate of 9.75% was applied to these new housing units (vacancy rate kept constant from 2012 base year) to calculate the new households. These new housing units and households were added to the 2012 base year housing units and households number to arrive at the total 2040 housing units and households.

Group Quarters: There are no Group Quarters population in Charles City for the 2012 base year. Group quarters population for the future year 2040 was kept constant from the 2012 base year.

Population in Households: First, the average household size (2.48 - kept constant from the base year 2012) was multiplied by the new households. This resulted in an additional household population of 1,970. The remaining population 434 (needed to reach the control total) was distributed evenly to all TAZs accounting for natural growth. This overall population in households was added to the base year population in households to arrive at the total 2040 population in households.

Automobiles: Automobile per household was kept constant from the 2012 base year for each TAZ. This ratio was multiplied to 2040 households to arrive at the 2040 automobile count by TAZ.

K-12 School Enrollment: First, the total school age children (age ranges 5-9, 10-14 and 15-19) for Charles City County was calculated using the cohort component model. Drop-out rates and home schooling rates (data from the 2012 DOE) were applied assuming they remain constant in 2040. Children living in Charles City and going to private school in other jurisdiction were also considered, reflecting in an adjusting factor of 1.31 for Charles City County. Applying the adjusting factor yielded the total public school enrollment for Charles City County for 2040. Then, the same proportion of 2012 public school enrollment were applied to 2040 public school enrollment to arrive at the K-12 School enrolment by TAZ.

College enrollment: There is no college enrollment attributable based on location in Charles City County for the 2012 base year. College Enrollment for the 2040 forecast year was kept constant to the 2012 base year.

Employment: An employment control total of 1,643 was projected by Chmura Economics and Analytics and accepted by Charles City County staff. To reach this employment the County would increase by an additional 224 jobs from its 2012 base year employment. County staff provided expected employment at the Neighborhood Service Areas (NSAs), resulting in an additional employment of 214 being allocated to twelve TAZs. The remaining employment of 10 (needed to reach the control total) was distributed proportionally to all remaining 3 TAZs not previously allocated to account for natural employment growth based on the 2012 employment distribution.

**CHESTERFIELD COUNTY**

Total Population: A population control total of 508,307 was established by the RRPDC staff using the cohort component model as agreed upon by Chesterfield County staff. To reach this population the County established a new population of 186,589 over its 2012 base year population.

Housing Units and Households: Chesterfield County staff provided the new residential development (housing units) by TAZ by year ranges (2010-2014, 2015-2020, 2020-2025, and 2025-2040) totaling 68,005 new housing units. A vacancy rate of 6.10% was applied to this new housing units (vacancy rate kept constant from the 2012 base year) to calculate the new households. This new housing units and households were added to the 2012 base year housing units and households to arrive at the total 2040 housing units and households.

Group Quarters: Group quarters population was kept constant from the 2012 base year.

Population in Households: First, the average household size (2.71 - kept constant from the base year 2012) was multiplied to the new households. This resulted in an additional household population of 173,050. The remaining population 13,539 (needed to reach the control total) was distributed evenly to all TAZs accounting for natural growth. This new population in households was added to the 2012 base year population in households to arrive at the total 2040 population in households.

Automobiles: Automobile per household was kept constant from 2012 for each TAZ. This ratio was multiplied by the 2040 households to arrive at the automobile count by TAZ.

K-12 School Enrollment: Private school enrollment in the future year 2040 was kept constant to the 2012 base year. Only growth is accounted for in public school enrollment. First, the total school age children (age ranges 5-9, 10-14 and 15-19) for Chesterfield County was calculated using the cohort component model. Private school enrollment (from 2012 base year), drop-out rates and home schooling rates (data from the 2012 DOE) was applied assuming they remain constant in 2040. Children living in other jurisdiction and going to private school in Chesterfield County and vice versa also were also considered reflected in an adjusting factor of 1.14 for Chesterfield County. Applying the adjusting

factor yielded the total public school enrollment for Chesterfield County for 2040. Then, the same proportion of 2012 public school enrollment were applied to 2040 public school enrolment. The private school enrollment were then added to arrive at the total K-12 enrollment by TAZ.

College enrollment: John Tyler Community College (JTCC), Virginia State University (VSU), and several proprietary colleges are located in Chesterfield County. JTCC's total enrollment (both campuses in Chesterfield) was extrapolated to 2040 based on historical enrollment numbers. Once the total enrollment was projected enrollment based on campus location was allocated based on the 2012 enrollment distribution. VSU enrollment was also extrapolated to 2040 based on historical enrollment numbers. The proprietary colleges were assumed to remain constant.

Employment: An employment control total of 181,391 was established by Chmura Economics and Analytics and accepted by Chesterfield County staff. To reach this employment the County would increase by an additional 64,957 jobs from its 2012 base year employment. The County provided new retail, office, and industrial development (square footage) by TAZ by year ranges (2010-2014, 2015-2020, 2020-2025, and 2025-2040). Revisions by RRPDC staff added employment in James River Industrial Park and Meadowville Technology Park based on recent announcements and additional capacity. This resulted in an additional employment of 53,809 being allocated to 55 TAZs. The remaining employment of 11,148 (needed to reach the control total) was distributed proportionally to all remaining 187 TAZs not previously allocated to account for natural employment growth based on the 2012 employment distribution.



GOOCHLAND COUNTY

Total Population: A population control total of 30,256 was established by Goochland County staff using the VEC projections for 2040 plus 10% variance established by VDOT. To reach this population the County established a new population of 8,314 over its 2012 base year population.

Housing Units and Households: Goochland County's utility master plan provided the expected and potential new residential development (housing units) by phases (1, 2, 3 and 4) and stated whether the development is planned or conceptual. Only planned residential development from phases 1 to 3 (year ranges 2010-2020, 2020- 2025 and 2025- 2035) were taken into consideration as it was enough to reach the control total established. This added up to 3,181 housing units. A vacancy rate of 7.84% was applied to this new housing units (vacancy rate kept constant from the 2012 base year) to calculate the new households. This new housing units and households were added to the 2012 base year housing units and households to arrive at the total 2040 housing units and households.

Group Quarters: Group quarters population was kept constant from the 2012 base year.

Population in Households: First, the average household size (2.54 - kept constant from the 2012 base year) was multiplied to the new households. This resulted in an additional household population of 7,450. The remaining population 864 (needed to reach the control total) was distributed evenly to all TAZs accounting for natural growth. This overall population in households was added to the 2012 base year population in households to arrive at the total 2040 population in households.

Automobiles: Automobile per household was kept constant from the 2012 base year for each TAZ. This ratio was multiplied to 2040 households to arrive at the automobile count by TAZ.

K-12 School Enrollment: Private school enrollment in the future year 2040 is kept constant to the 2012 base year. Only growth is accounted for in public school enrollment. First, the total school age children (age ranges 5-9, 10-14 and 15-19) for Goochland County was calculated using the cohort component model. Private school enrollment (from 2012 base year), drop-out rates and home schooling rates (data from the 2012

DOE) were applied assuming they remain constant in 2040. Children living in other jurisdiction and going to private school in Goochland County and vice versa also were also considered reflected in an adjusting factor of 1.33 for Goochland County. Applying the adjusting factor yielded the total public school enrollment for Goochland County for 2040. Then, the same proportion of 2012 public school enrollment were applied to 2040 public school enrolment. The private school enrollment to arrive at the total K-12 enrollment by TAZ.

College enrollment: The only college located in Goochland County is J Sargeant Reynolds Community College (JRCC) Goochland Campus. JSRCC total enrollment (all campuses in the Region) was extrapolated to 2040 based on historical enrollment numbers. The total enrollment was then projected based on campus location and allocated based on the 2012 enrollment distribution.

Employment: An employment control total of 26,450 was established by Chmura Economics and Analytics and accepted by Goochland County staff. To reach this employment the County added an additional 13,941 jobs from its 2012 base year employment. The County's utility master plan provided the expected and potential new employment development (square footage) by phases (1, 2, 3 and 4). Only employment development from phases 1 to 3 (year ranges 2010-2020, 2020- 2025 and 2025- 2035) were taken into consideration since this was enough to reach the established control total. This resulted in an additional employment of 12,817 being allocated to nine TAZs. The remaining employment of 1,124 (needed to reach the control total) was distributed proportionally to all remaining 21 TAZs not previously allocated to account for natural employment growth based on the 2012 employment distribution.

**HANOVER COUNTY AND THE TOWN OF ASHLAND**

Local staff from the Town of Ashland and Hanover County, with the exception of K-12 school enrollment and autos, distributed the forecast data themselves over several joint working sessions using their own methodology and in accordance with Hanover County's Comprehensive Plan. Housing, population, and employment were distributed more heavily in the "suburban service area", where more intense development is planned, allowing the Town and the County to leverage its infrastructure, particularly the expansion of roads and utilities, and maintain its rural character.

Total Population: The Town of Ashland and Hanover County staff used a bottom up approach based off housing units to establish their population control total of 156,515, an increase of 54,849 from its 2012 base year population.

Housing Units and Households: The Town of Ashland and Hanover County staff distributed housing units based off a 1.5% annual targeted growth rate and calculated households on known vacancy rates by TAZ. This was based on Hanover County's "suburban service area", where more intense development is planned.

Group Quarters: The Town of Ashland and Hanover County staff either increased group quarters population or kept it constant depending on local knowledge.

Population in Households: The Town of Ashland and Hanover County staff applied known average household sizes to the households to calculate the population in households.

Automobiles: Automobile per household was kept constant from the 2012 base year for each TAZ. This ratio was multiplied by the 2040 households to arrive at the automobile count by TAZ.

K-12 School Enrollment: Private school enrollment in the 2040 forecast year was kept constant to the 2012 base year. Only growth is accounted for public school enrollment. First, the total school age children (age ranges 5-9, 10-14 and 15-19) for Hanover County was calculated using the cohort component model. Private school enrollment (from the 2012 base year), drop-out rates and home schooling rates (data from the 2012

DOE) were applied assuming they remain constant in 2040. Children living in other jurisdiction and going to private school in Hanover County and vice versa also were also considered reflected in an adjusting factor of 1.15 for Hanover County. Applying the adjusting factor yielded the total public school enrollment for Hanover County for 2040. Then, the same proportion of 2012 public school enrollment were applied to 2040 public school enrolment. The private school enrollment were then added to arrive at the total K-12 enrollment by TAZ.

College Enrollment: The Town of Ashland and Henrico County staff only had one college located within its jurisdiction, Randolph-Macon College. The projected increase was based off local knowledge.

Employment: An employment control total of 26,450 was established by Chmura Economics and Analytics and accepted by Hanover County and the Town of Ashland staff. To reach this employment the County and Town added an additional 34,413 jobs from its 2012 base year employment. The Town of Ashland and Hanover County staff distributed employment based off a 1.5% targeted annual growth rate. This was based on Hanover County's "suburban service area", where more intense development is planned, and known economic development projects in the pipeline.



HENRICO COUNTY

Total Population: A population control total of 450,630 was established by the Henrico County staff using the VEC projections for 2040. To reach this population Henrico County established 132,467 over its 2012 base year population.

Housing Units and Households: Henrico County staff provided the residential projects in the 20 year pipeline adding 11,422 housing units in 11 TAZs. Similarly, based on the 2026 Henrico County Comprehensive Plan and future land use map RRPDC staff allocated 40,947 additional housing units in 55 TAZs. A vacancy rate of 2.99% was applied to these new housing units (vacancy rate kept constant to 2012 base year) to calculate the new households. This new housing units and households were added to the 2012 base year housing units and households to arrive at the total 2040 housing units and households.

Group Quarters: Group quarters population was kept constant to the 2012 base year.

Population in Households: First, the average household size (2.44 - kept constant from the 2012 base year) was multiplied to the new households. This resulted in an additional household population of 123,960. The remaining population 8,507 (needed to reach the control total) was distributed proportionally to 160 TAZs which did not get any new housing units from pipeline residential projects or from comprehensive plan allocation, accounting for natural growth. This overall population in households was added to the base year population in households to arrive at the total 2040 population in households.

Automobiles: Automobile per household was kept constant from 2012 for each TAZ. This ratio was multiplied by the 2040 households to arrive at the automobile count by TAZ. For TAZs which did not have any population in 2012, but are forecasted to have some population in 2040, the countywide automobile per household ratio was used.

K-12 School Enrollment: Private school enrollment in the future year 2040 was kept constant to the 2012 base year. Growth is only accounted for public school enrollment. First, the total school age children (age ranges 5-9, 10-14 and 15-19) for Henrico County was calculated using the cohort component model. Private school enrollment (from the 2012

base year), drop-out rates and home schooling rates (data from the 2012 DOE) were applied assuming they remain constant in 2040. Children living in other jurisdiction and going to private school in Henrico County and vice versa also were also considered reflected in an adjusting factor of 1.13 for Henrico County. Applying the adjusting factor yielded the total public school enrollment for Henrico County for 2040. Then, the same proportion of 2012 public school enrollment were applied to 2040 public school enrolment. The private school enrollment was then added to arrive at the total K-12 enrollment by TAZ.

College enrollment: J Sargeant Reynolds Community College (JSRCC), Bon Secours School of Nursing, UVA and Virginia Tech satellite campuses, and several proprietary colleges are located in Henrico County. JRCC's total enrollment was extrapolated to 2040 based on historical enrollment numbers. The total enrollment was then projected based on campus location and allocated based on the 2012 enrollment distribution. The other college/universities and proprietary colleges were assumed to remain constant.

Employment: An employment control total of 255,226 was established by Chmura Economics and Analytics and accepted by Henrico County staff. To reach this employment the County added an additional 76,561 jobs from its 2012 base year employment. The County provided 20 year pipeline activity for known retail, office, and industrial development (square footage) by TAZ. This resulted in an additional employment of 29,379 being allocated to 14 TAZs. Additionally, 45,199 jobs were allocated to 73 TAZs throughout the County using a future land use (FLU) built-out analysis. This FLU built-out analysis looked at land uses as they related to retail, office, industrial, and mixed-uses assuming any undeveloped land would be developed to 35% of its capacity. The remaining employment of 1,983 (needed to reach the control total) was distributed proportionally to all remaining 128 TAZs not previously allocated by pipeline activity or by the FLU built-out analysis to account for natural employment growth based on the 2012 employment distribution.

**NEW KENT COUNTY**

Total Population: A population control total of 27,539 was established by New Kent County staff using the VEC projections for 2040 plus 10 % variation established by VDOT. To reach this population the County established a new population of 8,262 over its 2012 base year population.

Housing Units and Households: New Kent County staff provided the residential projects in the pipeline, adding 260 housing units in 5 TAZs. Similarly, based on the 2012 New Kent County Comprehensive Plan and Richmond Area MPO's 2035 projections for New Kent County, RRPDC staff allocated 2,952 additional housing units in 12 TAZs. A vacancy rate of 6.87% was applied to this new housing units (vacancy rate kept constant to the 2012 base year) to calculate the new households. This new housing units and households were added to the 2012 base year housing units and households to arrive at the total 2040 housing units and households.

Group Quarters: Group quarters population was kept constant to the 2012 base year.

Population in Households: First, the average household size (2.62 - kept constant from the 2012 base year) was multiplied to the new households. This resulted in an additional household population of 7,834. The remaining population of 428 (needed to reach the control total) was distributed evenly to 8 TAZs (TAZs in which the growth based on comprehensive plan was not distributed), accounting for natural growth. This new population in households was added to the base year population in households to arrive at the total 2040 population in households.

Automobiles: Automobile per household was kept constant to the 2012 base year for each TAZ. This ratio was multiplied to 2040 households to arrive at the automobile count by TAZ.

K-12 School Enrollment: Private school enrollment in the future year 2040 was kept constant to the 2012 base year. Growth is only accounted for public school enrollment. First, the total school age children (age ranges 5-9, 10-14 and 15-19) for New Kent County was calculated using the cohort component model. Private school enrollment (from the 2012 base year), drop-out rates and home schooling rates (data from the 2012 DOE) were applied assuming they remain constant in 2040. Children liv-

ing in other jurisdiction and going to private school in New Kent County and vice versa also were also considered reflected in an adjusting factor of 1.14 for New Kent County. Applying the adjusting factor yielded the total public school enrollment for New Kent County for 2040. Then, the same proportion of 2012 public school enrollment was applied to 2040 public school enrolment. The private school enrollment was then added to arrive at the total K-12 enrollment by TAZ.

College Enrollment: There was no college enrollment in New Kent County for the 2012 base year. College Enrollment for the 2040 forecast year was kept constant from the 2012 base year.

Employment: An employment control total of 6,289 was established by Chmura Economics and Analytics and accepted by New Kent County staff. To reach this employment the County added an additional 2,636 jobs from its 2012 base year employment. County staff provided employment of known commercial development in the pipeline. This resulted in an additional employment of 44 being allocated to two TAZs. The remaining employment of 2,592 (needed to reach the control total) was distributed proportionally to all 20 TAZs to account for natural employment growth based on the 2012 employment distribution.



POWHATAN COUNTY

Total Population: A population control total of 43,277 was established by Powhatan County staff using the VEC projections for 2040 plus 10 % variation established by VDOT. To reach this population the County established a new population of 14,867 over its 2012 base year population.

Housing Units and Households: Powhatan County staff provided the County's utility master plan which specified the number of residential lots to be served by 2035. RRPDC staff extrapolated this to the year 2040. The total number of lots added up to 3,805 (this development would occur only in 4 TAZs out of the 20 Powhatan TAZs). Assuming these lots as single-family, RRPDC staff calculated an addition 3,805 housing units. A vacancy rate of 5.76% was applied to the new housing units (vacancy rate kept constant to the 2012 base year) to calculate the new households. This new housing units and households were added to the 2012 base year housing units and households to arrive at the total 2040 housing units and households.

Group Quarters: Group quarters population was kept constant to the 2012 base year.

Population in Households: First, the average household size (2.70 - kept constant from the 2012 base year) was multiplied by the new households. This resulted in an additional household population of 9,682. This population was distributed in 4 TAZs. The remaining population of 5,185 (needed to reach the control total) was distributed evenly to the other 16 TAZs accounting for natural growth. This new population in households was added to the base year population in households to arrive at the total 2040 population in households.

Automobiles: Automobile per household was kept constant to the 2012 base year for each TAZ. This ratio was multiplied by 2040 households to arrive at the automobile count by TAZ.

K-12 School Enrollment: Private school enrollment in the 2040 forecast year was kept constant to the 2012 base year. Growth is only accounted for public school enrollment. First, the total school age children (age ranges 5-9, 10-14 and 15-19) for Powhatan County was calculated using the cohort component model. Private school enrollment (from the 2012 base year), drop-out rates and home schooling rates (data from the 2012

DOE) were applied assuming they remain constant in 2040. Children living in other jurisdiction and going to private school in Powhatan County and vice versa also were also considered reflected in an adjusting factor of 1.16 for Powhatan County. Applying the adjusting factor yielded the total public school enrollment for Powhatan County in 2040. Then, the same proportion of 2012 public school enrollment were applied to 2040 public school enrolment. The private school enrollment were then added to arrive at the total K-12 enrollment by TAZ.

College Enrollment: There was no college enrollment in Powhatan County for the base year 2012. College Enrollment for the 2040 forecast year was kept constant to the 2012 base year.

Employment: An employment control total of 15,307 was established by Chmura Economics and Analytics and accepted by Powhatan County staff. To reach this employment the County added an additional 9,901 jobs from its 2012 base year employment. The County's utility master plan provided new retail, office, and industrial development (square footage) served by 2035. This employment was allocated to two TAZs along the eastern portion of Route 60 (TAZs 699 and 703). RRPDC staff assumed a floor area ratio (FAR) of 1/3 of land area for future employment designated by this utility master plan, resulting in an additional employment of 7,326 being allocated to these two TAZs. The remaining employment of 2,575 (needed to reach the control total) was distributed proportionally to all remaining 18 TAZs not previously allocated to account for natural employment growth based on the 2012 employment distribution.

**CITY OF RICHMOND**

Total Population: A population control total of 231,404 was established by the City of Richmond staff using the VEC projections for 2040 plus 10% variation established by VDOT. To reach this population the City added a new population of 21,508 over its 2012 base year population.

Housing Units and Households: City of Richmond staff provided a list of residential projects in the pipeline. RRPDC staff compiled this data and calculated 2,622 new housing units in 15 TAZs. Similarly, RRPDC staff looked at the vacant parcels zoned for residential use (as of June 2014), adding another 7,578 housing units for potential infill development in 155 TAZs. A vacancy rate of 10.65% was applied to these new housing units (vacancy rate kept constant to the 2012 base year) to calculate the new households. This new housing units and households were added to the 2012 base year housing units and households number to arrive at the total 2040 housing units and households.

Group Quarters: Group quarters population was kept constant to the 2012 base year.

Population in Households: First, the average household size (2.18 - kept constant from the 2012 base year) was multiplied by the new households. This resulted in an additional household population of 19,905. The remaining population 1,603 (needed to reach the control total) was distributed proportionally to 56 TAZs (TAZs which did not get any new housing units for infill development) accounting for natural growth. This new population in households was added to the base year population in households to arrive at the total 2040 population in households.

Automobiles: Automobile per household was kept constant to 2012 base year for each TAZ. This ratio was multiplied by the 2040 households to arrive at the automobile count by TAZ. TAZs which did not have any population in 2012, but are forecasted to have some population in 2040, the citywide automobile per household ratio was used instead.

K-12 School Enrollment: Private school enrollment in the future year 2040 was kept constant to the 2012 base year. Growth is only accounted for public school enrollment. First, the total school age children (age ranges 5-9, 10-14 and 15-19) for the City of Richmond was calculated

using the cohort component model. Private school enrollment (from the 2012 base year), drop-out rates and home schooling rates (data from the 2012 DOE) were applied assuming they remain constant in 2040. Children living in other jurisdiction and going to private school in the City and vice versa also were also considered reflected in an adjusting factor of 1.16 for the City. Applying the adjusting factor yielded the total public school enrollment for the City of Richmond in 2040. Then the same proportion of 2012 public school enrollment was applied to 2040 public school enrollment. Then, private school enrollment was added to arrive at the total K-12 enrollment by TAZ.

College enrollment: J. Sargeant Reynolds Community College (JSRCC), Virginia Union University (VUU), University of Richmond (UR), Virginia Commonwealth University (VCU) and Union Presbyterian Seminary (UPS) are located in the City of Richmond. JSRCC total enrollment (all campuses in the Region) was extrapolated to 2040 based on historical enrollment numbers. Once the total enrollment was projected enrollment by campus location was allocated based on the 2012 enrollment distribution. UR and VUU's enrollment was also extrapolated to 2040 based on historical enrollment numbers. In accordance to VCU's master plan their enrollment was kept constant. UPS enrollment was also assumed to remain constant.

Employment: An employment control total of 172,290 was established by Chmura Economics and Analytics and accepted by the City of Richmond staff. To reach this employment the City added an additional 26,022 jobs from its 2012 base year employment. RRPDC staff first allocated employment based on what major commercial development projects were already in the pipeline (i.e. Whole Foods, Stone Brewery, and Gateway Plaza). This resulted in allocating 1,328 jobs into three TAZs. RRPDC staff then used real estate assessment parcel based data joined with zoning from June 2014 to determine infill potential for vacant or undeveloped land. Additionally, City staff provided the building points determined to be vacant and used the real estate assessment parcel based data and zoning to determine redevelopment potential. Designated vacant land and buildings were assumed for infill development potential if they met the zoning ordinance requirements (i.e. minimum floor areas, maximum height

restrictions, permitted uses).

Vacant land was assumed to have a certain percentage of usable land and a floor area ratio (FAR) depending on the zoning and where the parcel was located. To convert this data into jobs the square footage of the parcel was applied to the percent of usable land and the FAR, and divided by the square footage per employee based on industry standards. If the vacant building met the zoning ordinance then the building was converted into jobs by dividing the building square footage by the number of employees per square feet, again based on industry standards. This resulted (in addition to the employment already in the pipeline) an additional 22,104 jobs (1,382 jobs in the pipeline + 20,777 jobs for infill potential) being allocated to 100 TAZs. The remaining employment of 3,918 (needed to reach the control total) was distributed proportionally to all remaining 119 TAZs not previously allocated to account for natural employment growth, based on the 2012 employment distribution.

2 REGIONAL TRENDS

Population

The Richmond Region’s population has grown significantly in the past 42 years. Charles City County and the City of Richmond are the only jurisdictions to have a population loss, though both have enjoyed growth since 1990 and 2000 respectively. Regional population has increased by about 16% each decade between 1970 and 2010, indicating a steady and stable pattern of growth.

Since 1970, the Richmond Region has nearly doubled in size; having a population increase of 88%. Chesterfield County, followed by Henrico County have experienced the most growth by number of residents. The City of Richmond has lost the greatest number of inhabitants, but is now increasing annually. The City of Richmond has seen an increase of 5,682 residents between 2010 and 2012, coming behind Henrico County’s

9,228, and just above Chesterfield County’s 5,482. Increases in these three jurisdictions are indicative of a strengthening urban core and its supporting suburban ring.

Between 2000 and 2010, the region’s population increased by 138,755 people. The largest percent increases in this decade were in New Kent (37%), Goochland (29%), and Powhatan (25%), showing a continued and increasing trend of movement to the rural jurisdictions.

Apart from Charles City County, all rural jurisdictions have seen significant growth since 1970, with Powhatan County, New Kent County and Goochland County growing 269%, 264%, and 118% respectively. New Kent County has recently seen the most growth of rural jurisdictions, having increased the most percentage-wise of any jurisdiction in the region between 2010 and 2012.

Exhibit 1. Population Trends

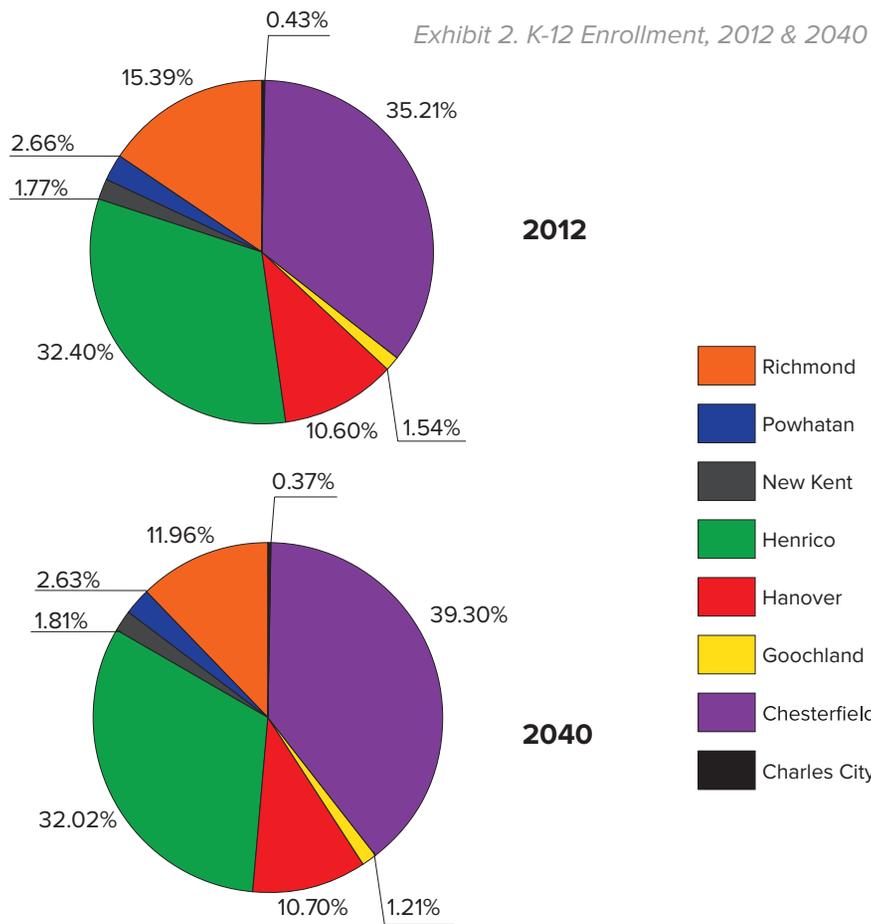
Jurisdiction	1970	1970-1980 % change	1980	1980 - 1990 % change	1990	1990 - 2000 % change	2000	2000 - 2010 % change	2010	2012	2012-2040 % change	2040
Ashland	2,934	58%	4,640	26%	5,864	13%	6,619	9%	7,225	7,439	41%	10,526
Charles City	6,158	9%	6,692	-6%	6,282	10%	6,926	5%	7,256	7,392	33%	9,796
Chesterfield	77,045	83%	141,372	48%	209,274	24%	259,903	22%	316,236	321,718	58%	508,307
Goochland	10,069	17%	11,761	20%	14,163	19%	16,863	29%	21,717	21,942	38%	30,256
Hanover*	37,479	34%	50,398	26%	63,306	36%	86,320	16%	99,863	101,666	54%	156,515
Henrico	154,463	17%	180,735	21%	217,881	20%	262,300	18%	308,935	318,163	42%	450,630
New Kent	5,300	66%	8,781	19%	10,445	29%	13,462	37%	18,429	19,277	43%	27,539
Powhatan	7,696	70%	13,062	17%	15,328	46%	22,377	25%	28,046	28,410	52%	43,277
Richmond	249,332	-12%	219,214	-7%	203,056	-3%	197,790	3%	204,214	209,896	10%	231,404
Region	547,542	15%	632,015	17%	739,735	17%	865,941	16%	1,004,696	1,028,464	42%	1,457,724

Source: Decennial Census, 1970 -2010. 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April 2015.

*Includes the Town of Ashland.

Private and Public K-12 Enrollment

This chart shows the distribution of public and private school enrollment across the jurisdictions in the Richmond Region by location of school. Not surprisingly, the succession of enrollment portions is relative to population, with Chesterfield, Henrico, and Richmond having the highest school enrollments. It is important to note that the City of Richmond and Henrico County have more private schools than other jurisdictions, adding to their school enrollment percentages. The 2040 projects show Chesterfield increasing and Richmond decreasing student population shares, with the other jurisdictions' shares remaining virtually the same.



Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

College Enrollment

University enrollment will remain fairly constant overall, with a decrease and increases across a few Universities. Based on a historical trend of annual decreasing enrollment, University of Richmond is expected to have about 200 less students by 2040. With an increasing historical enrollment trend, Virginia Union University and Randolph Macon are expected to increase their student body by 2040. Other Universities in the region have no plans of growing and therefore are expected to maintain their current student populations by 2040.

Exhibit 3. College Enrollment

Universities	2012	2040
Virginia Commonwealth University (Monroe Park)	27,432	27,432
University of Richmond	4,348	4,179
Virginia Commonwealth University (MCV)	4,320	4,320
Virginia Union University	1,678	1,901
Randolph Macon College	1,257	1,500
UVA Richmond Center	200	200
VA Tech Richmond Center	172	172
Virginia State University	6,208	8,294

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.



Community Colleges are expected to grow with population, resulting in significant enrollment increases by 2040. Professional and Vocational institutions are expected to remain constant in accordance with their own growth plans.

Exhibit 4. Professional/Community/Vocational School Enrollment

Professional/Community/Vocational	2012	2040
Bon Secours Memorial School of Nursing	322	322
Reynolds Community College (Henrico)	7,047	15,752
Reynolds Community College (Richmond)	3,985	8,908
Reynolds Community College (Goochland)	1,169	2,613
John Tyler Community College (Midlothian)	5,051	12,854
John Tyler Community College (Chester)	5,094	12,963
The School of Medical Imaging	36	36
Union Theological Seminary & Presbyterian School	118	118

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

Proprietary schools, or for-profit institutions are also expected to remain constant to 2040. As proprietary schools, many are not willing to divulge how much if any they will be expanding and obtaining accurate historical data is not available in most cases, so extrapolating the data was not possible. Because of the confidentiality nature of these institutions it was assumed future enrollment will remain constant.

Exhibit 5. Proprietary Colleges by Location

Proprietary College Location	2012	2040
Chesterfield	3,189	3,189
Henrico	3,521	3,521

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

Housing

The Richmond Region’s population boom has caused a substantial increase in housing units: a 139% increase since 1970, as shown in Exhibit 6. Exhibit 7 shows the greatest decade of production occurred between 1980 and 1990. The following decade experienced a decline in construction, only to return to near 1980s levels in the 2000s. In recent years, from 2008 - 2012, housing has increased by 3%. The rural jurisdictions, however, experienced their greatest period of growth in the 1990s, continuing through the 2000s. Between 2010 and 2012, the Region has added over 5,000 units, primarily in Chesterfield and Richmond. The region is projected to continue to grow up to 2040, with Chesterfield, Henrico, and Hanover having the largest number of additional housing units built.

Exhibit 6 shows an increase in housing units of 139% in the Region since 1970. In comparison to population growth in this same period, an increase of 88%, housing construction has overtaken population. This trend reflects the decreasing average household size, which has seen

Exhibit 6. Changes in Housing Units

Jurisdiction	1970	2012	1970 - 2012 % Change	2040
Ashland	n/a	2,943	n/a	4,399
Charles City	1,576	3,301	109%	4,376
Chesterfield	22,554	124,584	452%	197,910
Goochland	2,873	8,768	205%	12,318
Hanover*	10,948	39,033	257%	59,069
Henrico	49,528	131,660	166%	187,624
New Kent	1,641	7,676	368%	11,063
Powhatan	1,968	10,224	420%	16,066
Richmond	87,026	101,028	16%	112,049
Region	178,114	426,274	139%	600,475

Source: Decennial Census, 1970. 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

*Includes the Town of Ashland



Exhibit 7. Housing Unit Trends

Jurisdiction	1970	1970-1980 % change	1980	1980 - 1990 % change	1990	1990 - 2000 % change	2000	2000 - 2010 % change	2010	2012	2012-2040 % change	2040
Charles City	1,576	38%	2,172	7%	2,314	25%	2,895	12%	3,229	3,301	33%	4,376
Chesterfield	22,554	117%	48,883	58%	77,329	26%	97,707	25%	122,555	124,584	59%	197,910
Goochland	2,873	40%	4,031	29%	5,203	26%	6,555	31%	8,618	8,768	40%	12,318
Hanover*	10,948	58%	17,278	37%	23,727	36%	32,196	19%	38,360	39,033	63%	63,468
Henrico	49,528	42%	70,428	34%	94,539	19%	112,570	18%	132,778	131,660	43%	187,624
New Kent	1,641	98%	3,256	22%	3,968	31%	5,203	40%	7,295	7,676	44%	11,063
Powhatan	1,968	95%	3,838	28%	4,910	53%	7,509	34%	10,043	10,224	57%	16,066
Richmond	87,026	5%	91,527	3%	94,141	-2%	92,282	7%	98,349	101,028	11%	112,049
Region	178,114	36%	241,413	27%	306,131	17%	356,917	18%	421,227	426,274	42%	604,874

Source: Decennial Census, 1970 -2010. 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April 2015.

*Includes the Town of Ashland.

a decrease of at least 21% in each jurisdiction since 1970, as illustrated in Exhibit 8. As a region, the average household size in 2012 was 2.49 compared to Virginia and the nation at 2.61 and 2.64, respectively, according to the Census 2012 1-year American Community Survey. This

reflects a national trend of people getting married later in life as well as the decrease in number of children per household.

Exhibit 8. Household Size

Year	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond
1970	4.19	3.42	3.64	3.45	3.18	3.51	3.61	2.89
1980	3.22	2.85	2.87	2.86	2.54	2.79	2.96	2.43
1990	2.91	2.82	2.7	2.73	2.41	2.77	2.84	2.25
2000	2.59	2.73	2.51	2.71	2.39	2.65	2.75	2.21
2010	2.46	2.69	2.54	2.68	2.44	2.62	2.70	2.20
2012	2.48	2.71	2.54	2.67	2.44	2.62	2.70	2.18
% Change 1970 - 2012	-41%	-23%	-30%	-25%	-23%	-25%	-25%	-26%

Source: Decennial Census, 1970 -2010. 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April 2015.

*Includes the Town of Ashland.



Automobiles

The region as a whole is expected to increase the total number of automobiles by 49% from 2012 to 2040, or an increase of over 370,000, as depicted in Exhibit 9. In relative and absolute terms, Chesterfield is projected to experience the largest increase, while Richmond and Charles City are expected to increase the least. These trends are in line with population and household growth where Chesterfield is expected to experience substantial gains and Richmond and Charles City are forecast for minimal gains. Automobiles per household will increase at a slight rate as well, from 1.91 in 2012 to 2.01 in 2040, or 5.18%. Henrico is expected to experience the largest increase in autos per household at 6.3%.

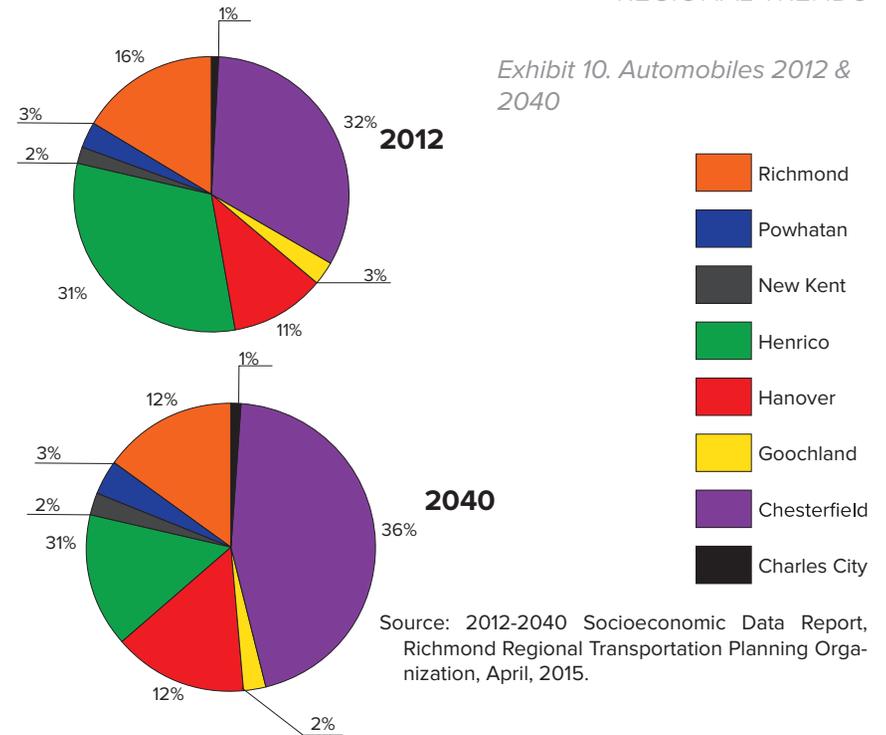
Richmond and Goochland are projected to decrease their shares of the overall number of automobiles while Hanover and Chesterfield are projected to increase from 2012 to 2040 (Exhibit 10). All other jurisdictions will remain proportionally the same while automobiles increase throughout. Chesterfield and Henrico will remain the jurisdictions with the highest number of automobiles, both proportionally and in absolute terms.

Exhibit 9. Autos & Autos Per Household

Jurisdiction	Autos			Autos Per Household		
	2012	2040	% Change	2012	2040	% Change
Ashland	4,967	7,604	53%	1.77	1.81	2.36%
Charles City	6,670	8,873	32%	2.24	2.22	-0.67%
Chesterfield	248,418	406,872	64%	2.12	2.19	3.10%
Goochland	19,614	27,863	42%	2.43	2.45	1.12%
Hanover	87,146	132,844	52%	2.34	2.36	0.72%
Henrico	236,826	358,763	51%	1.85	1.97	6.30%
New Kent	17,815	25,602	44%	2.49	2.48	-0.28%
Powhatan	23,567	36,947	57%	2.45	2.44	-0.24%
Richmond	124,865	138,726	11%	1.38	1.39	0.17%
Region	764,921	1,136,400	49%	1.91	2.01	5.18%

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

Exhibit 10. Automobiles 2012 & 2040



Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

Employment

Suburban and rural employment growth is projected to continue to grow at a higher rate than urban growth. Westward development into rural jurisdictions is evident in Powhatan and Goochland’s significant projected employment increases with 183% and 111%, respectively. Hanover and Chesterfield are expected to increase 57% and 56%, respectively, with Henrico increasing by 43%. Henrico is projected to remain the largest employer in the region with a total of 255,226 jobs by 2040 (Exhibit 11).

Exhibit 12 shows industries as defined by North American Industry Classification System (NAICS). The top three industries are Retail, Accommodation & Food Services, Other Services (except Public Admin), Health Care and Social Assistance, and Educational Services. The largest health care providers are VCU Health System, Bon Secours Richmond Health System, and HCA of Virginia. The largest employers in education are Virginia Commonwealth University, and the school boards of Henrico,



Chesterfield, Richmond, and Hanover. Finance and Insurance, the fifth largest industry in the region, is also worth noting as Anthem, SunTrust and Capital One are top 20 employers, with Capital One being the larg-

est employer in the region (Exhibit 13). The top ten industries comprise 87% of the region's economy. Such a diverse regional economy avoids over exposure during economic downturns, such as a major company leaving the region should occur. This was most evident when, during the peak of the recession in 2008 and 2009, where a number of large employers relocated or ceased to exist.

Exhibit 11. Employment by Jurisdiction

Jurisdiction	2012	2040	% Change
Ashland	8,214	12,140	48%
Charles City	1,419	1,643	16%
Chesterfield	116,434	181,391	56%
Goochland	12,509	26,450	111%
Hanover	45,888	72,087	57%
Henrico	178,665	255,226	43%
New Kent	3,653	6,289	72%
Powhatan	5,406	15,307	183%
Richmond	146,268	172,290	18%
Region	510,242	730,683	43%

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

Exhibit 12. Employment by Industry

Industry	Employment	%
Retail, Accommodation & Food Services	111,774	22%
Health Care and Social Assistance	70,899	14%
Educational Services	49,530	10%
Finance and Insurance	35,633	7%
Professional, Scientific, and Technical Services	34,378	7%
Administrative and support and waste management and remediation services	34,285	7%
Public Administration	33,477	7%
Construction	29,171	6%
Manufacturing	24,499	5%
Management of Companies and Enterprises	21,343	4%

Source: Virginia Employment Commission (VEC), 2nd Quarter 2012, verified by RRPDC staff.

Exhibit 13. 2012 Top Employers in the Richmond Region

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

Source: Virginia Employment Commission (VEC), 2nd Quarter 2012, verified by RRPDC staff.

3 GROWTH AREAS

Population Density

Exhibit 14 shows the 2012 population density, illustrating the greatest amount of density currently exists within the I-295/Route 288 beltway. From a broader perspective the density within this beltway is generally above 1,000 persons per square mile. However, higher levels of population density also exist beyond the beltway, stretching southwest along Route 360, south of Route 288 along Route 1 and I-95, near Mechanicsville along Route 360, near Atlee along Route 301, the Town of Ashland, and near Wyndham in western Henrico.

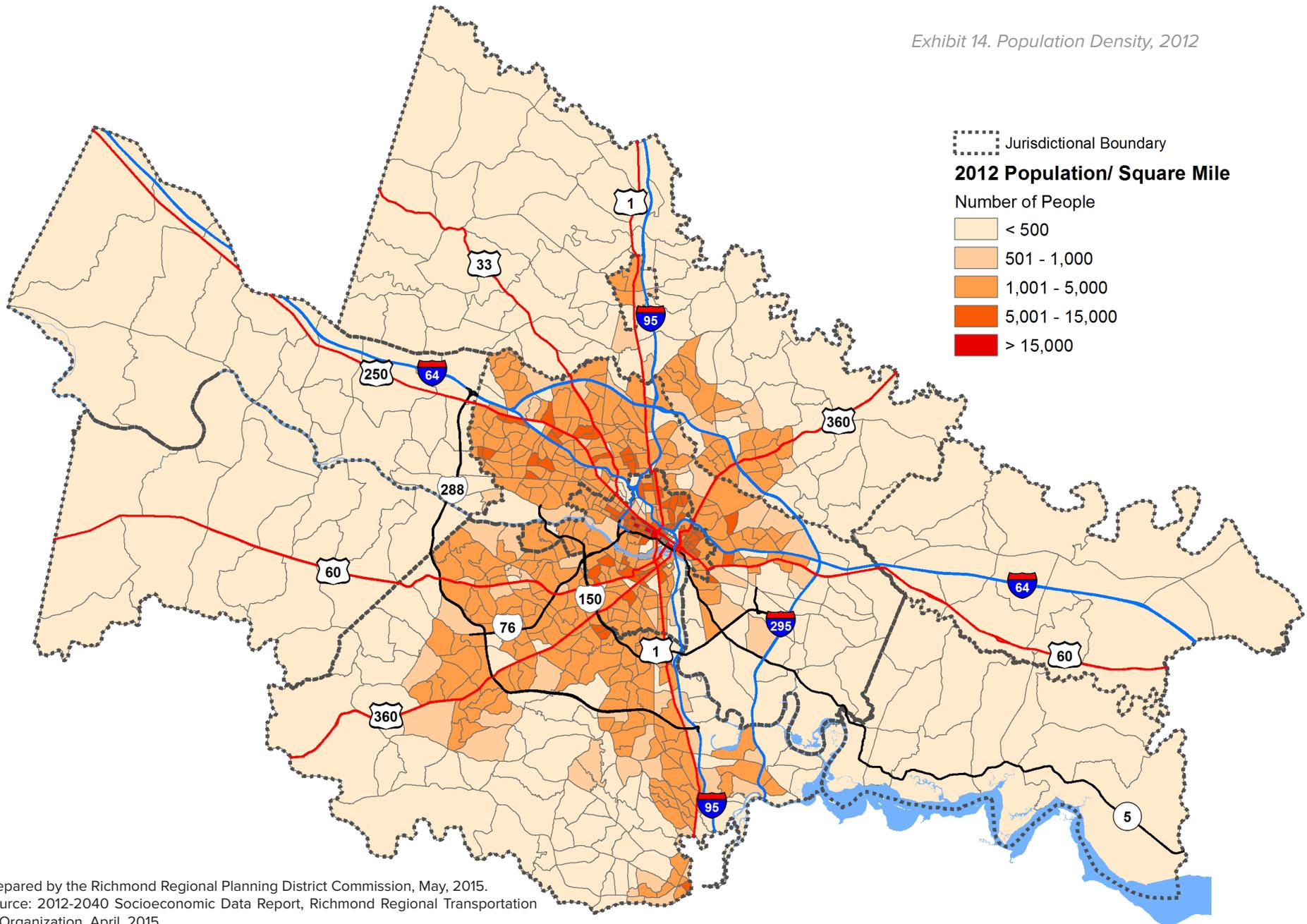
Both Exhibits 14 & 15 show population density distribution by transportation analysis zone (TAZ). As described in more detail in the methodology section, 2040 population distribution was developed by working closely

with each jurisdiction in developing buildout scenarios using a combination of local residential development pipeline activity, existing and future land use, and incorporating local comprehensive land use plans for various horizon years.

Exhibit 15 illustrates the 2040 forecasted population density, highlighting where density is expected to occur. As depicted in the map the regional population is projected to grow within and beyond the I-295/Route 288 beltway in the southwest and southeast portions of Chesterfield. Also, growth into eastern Henrico, southern parts of Hanover, and eastern Goochland is projected over the next 28 years based on past trends and knowledge of local plans in the development pipeline.

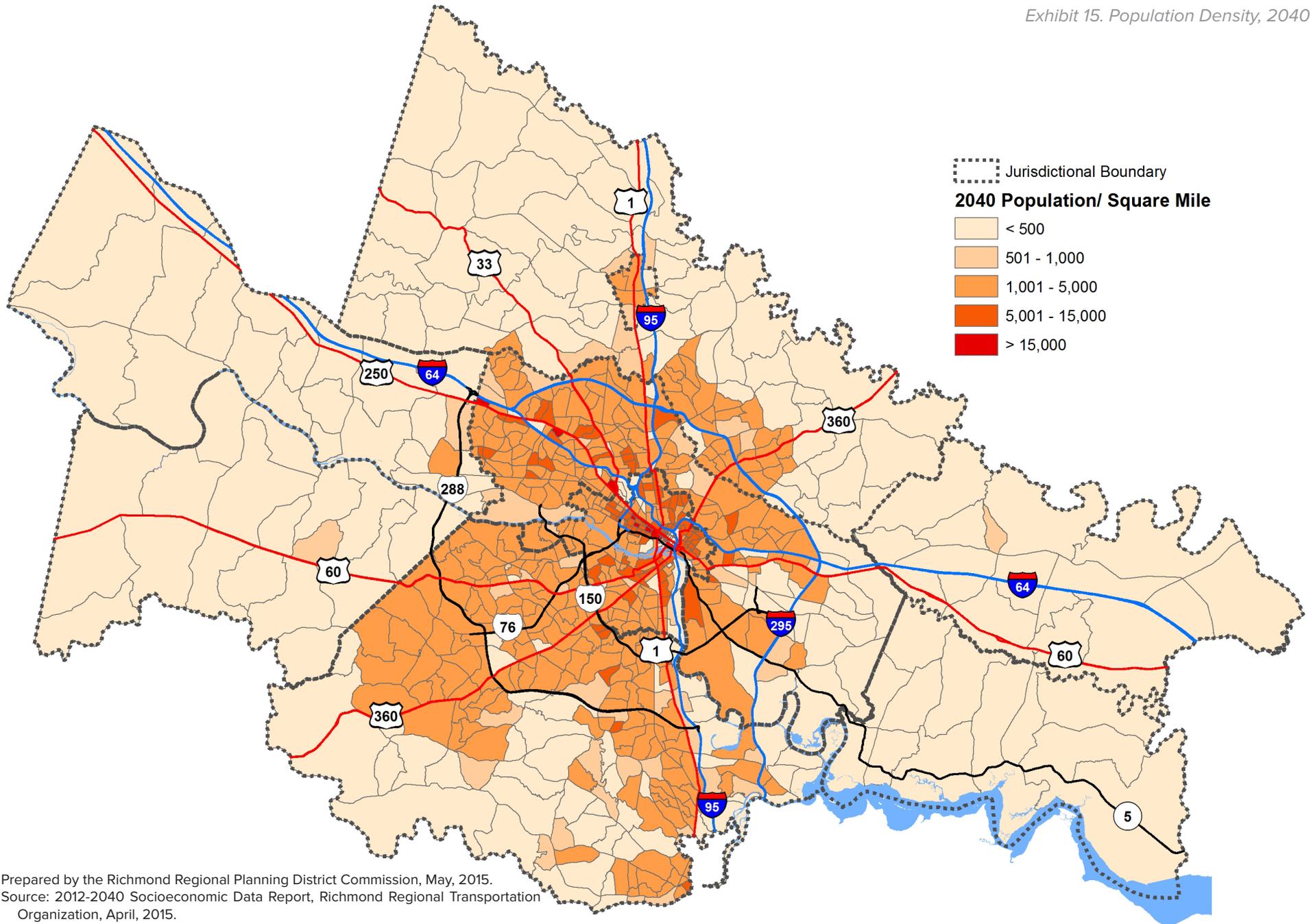


Exhibit 14. Population Density, 2012



Prepared by the Richmond Regional Planning District Commission, May, 2015.
 Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Organization, April, 2015.

Exhibit 15. Population Density, 2040



Prepared by the Richmond Regional Planning District Commission, May, 2015.
Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Organization, April, 2015.

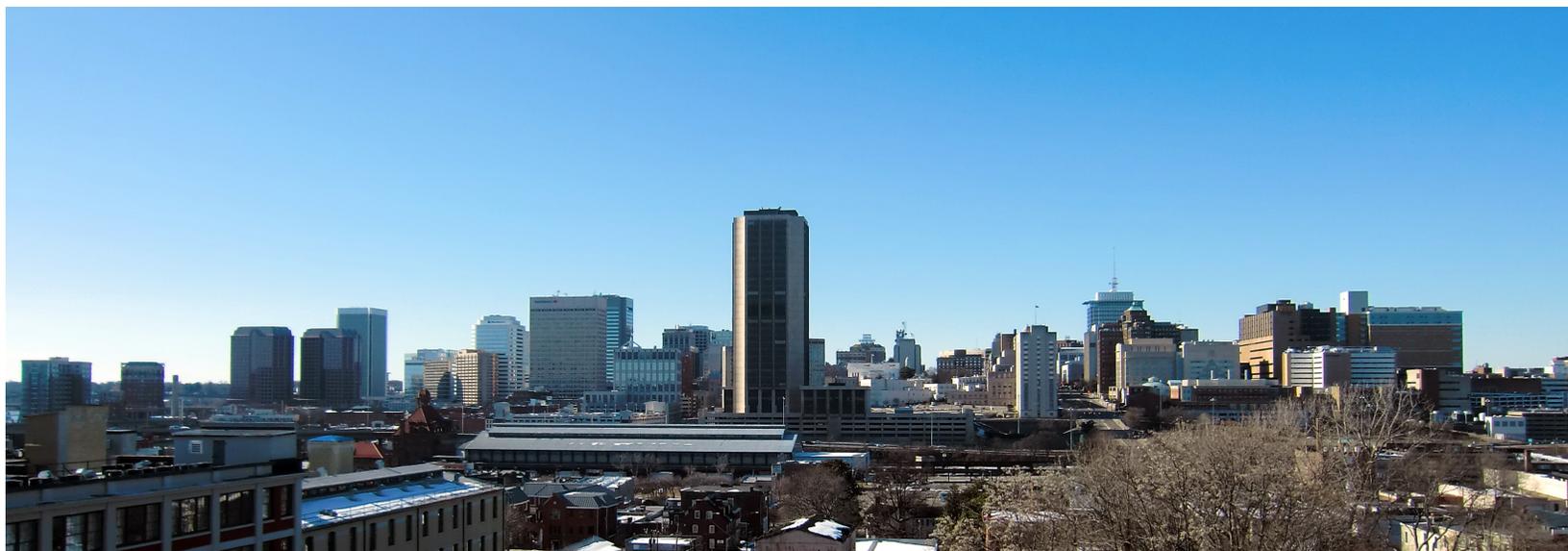


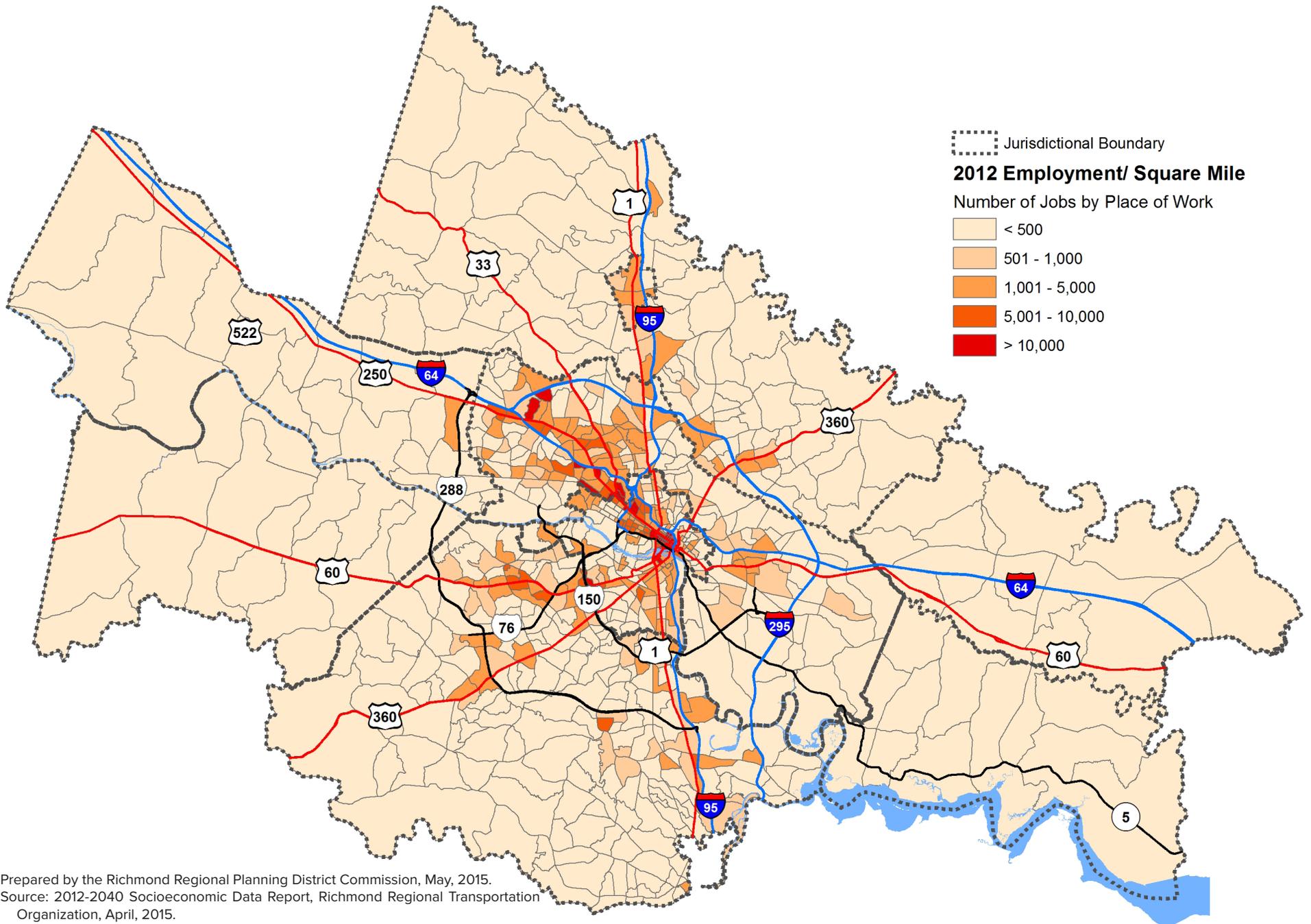
Employment Density

Employment density based on location of jobs per square mile are currently concentrated in downtown and along the major corridors within the Region, as illustrated in Exhibit 16. Similar to existing population density most of the employment concentration is within the I-295/Route 288 beltway, with exceptions in Ashland and southern Hanover, and near Mechanicsville, Chester, Swift Creek, West Creek, and Wyndham.

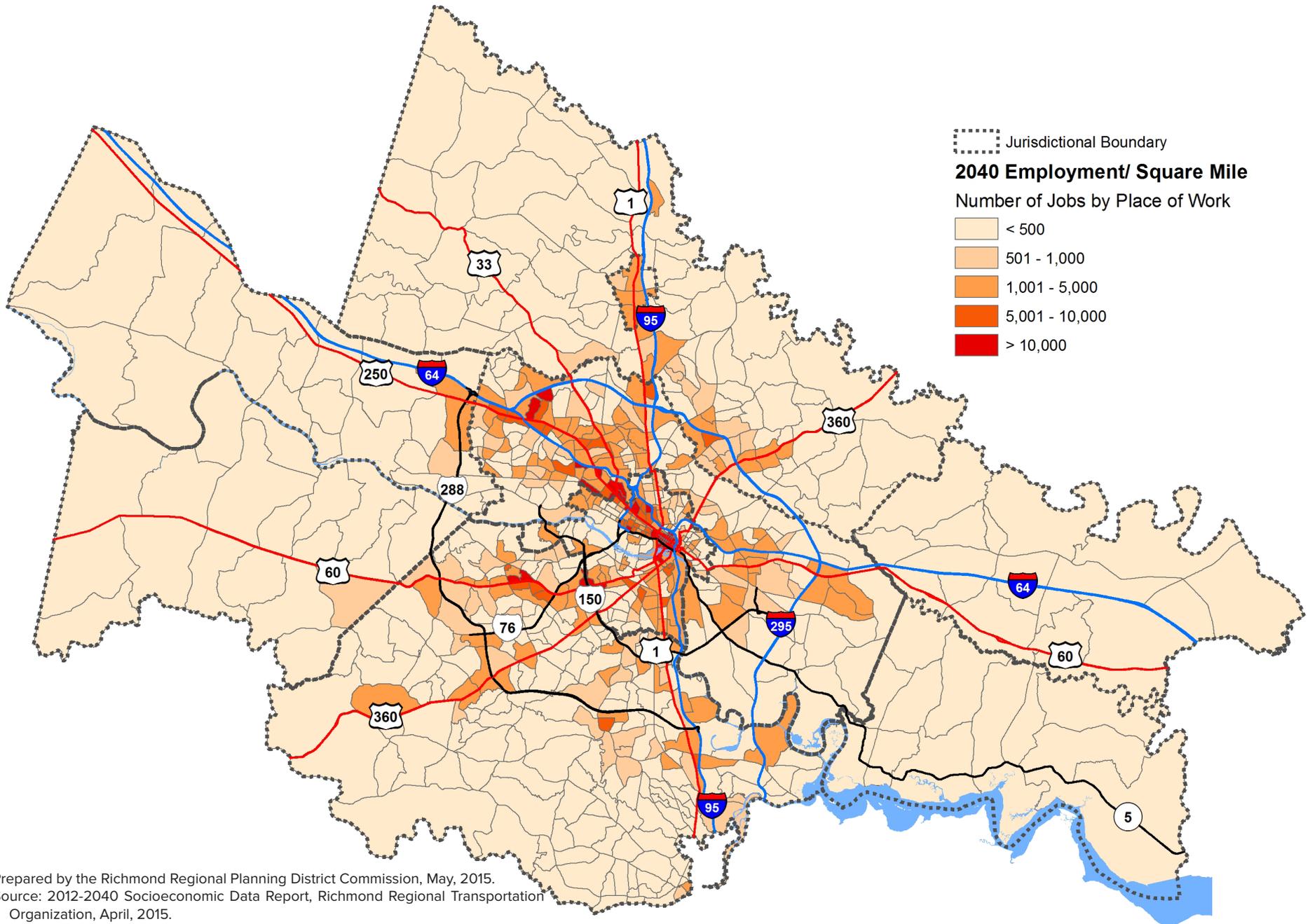
Exhibit 17 indicates the significant concentration of employment is expanding to areas beyond the beltway along these same major corridors in 2040. Based on current development activity employment is expected to expand into areas southwest of Magnolia Green along Route 360, Meadowville Technology Park along the James River, White Oak Technology Park adjacent to Route 60, and West Creek Business Park in eastern Goochland.

Jurisdictional employment thresholds were determined under contract by Chmura Economics and Analytics to develop a detailed jurisdictional analysis, looking at historical trends and future labor force statistics by industry sector. Similar to population distribution by TAZ, employment was allocated using a similar method. Local jurisdictions were involved in determining where future employment would most likely occur. When available, local commercial activity was used along with existing and future land use, and knowledge of local plans. A more detailed explanation of the methodology can be found in the methodology section of this document.





Prepared by the Richmond Regional Planning District Commission, May, 2015.
Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Organization, April, 2015.



Prepared by the Richmond Regional Planning District Commission, May, 2015.
Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Organization, April, 2015.



Classification of Density Areas

The classification of growth areas were identified through TAZ geographies using 2012 population density. The density map in Exhibit 18 was developed for conceptual purposes, showing a regional perspective of the highest population density. Generally, areas were defined according to varying levels of density as follows.

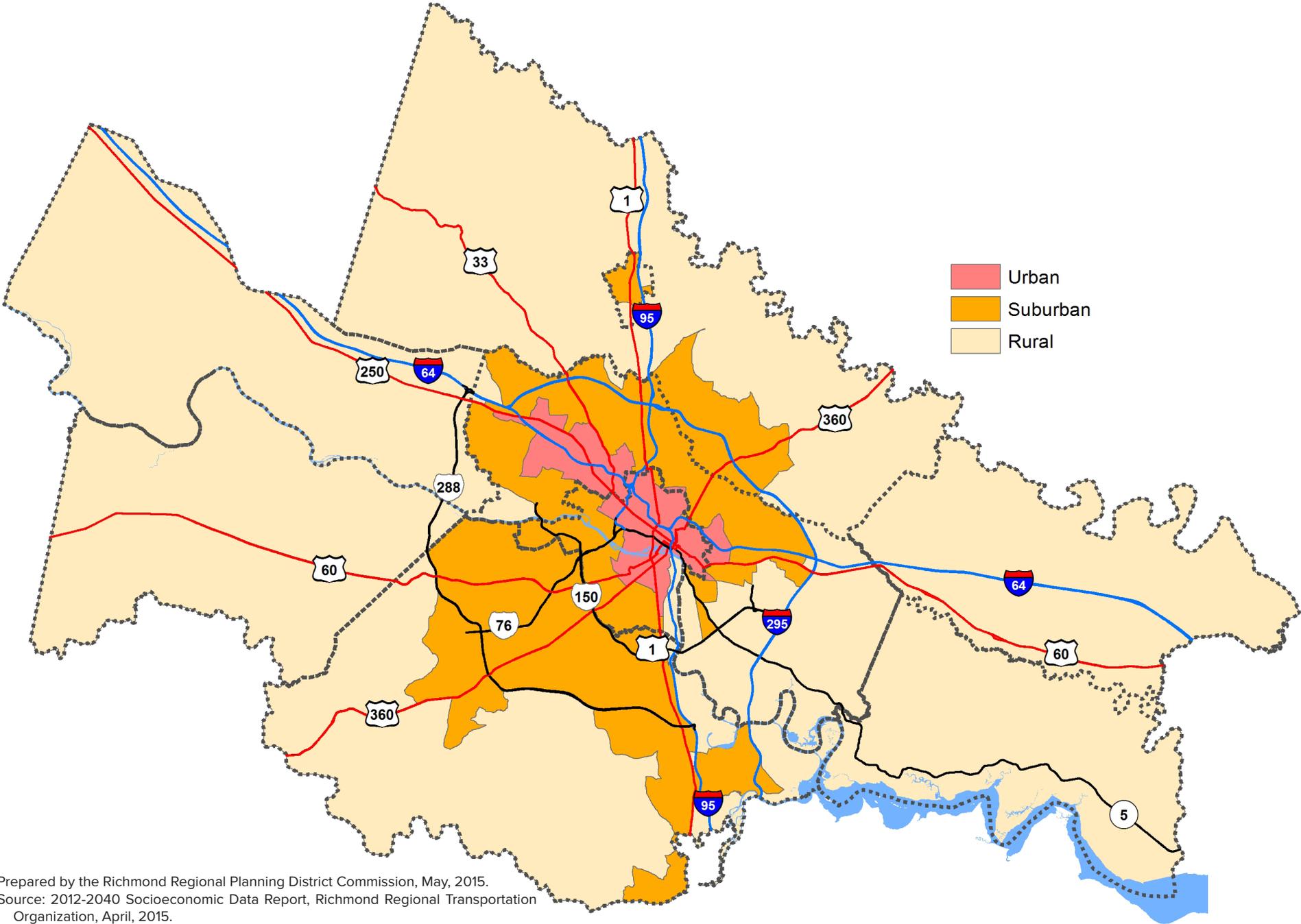
- Urban areas are defined as areas with a population per square mile of greater than 3,500 (2% of the region's total land area).
- Suburbanized areas are defined as areas with a population per square mile between 1,000 and 3,500 (15% of the region's total land area).
- Rural areas are defined as areas with a population per square mile of less than 1,000 (82% of the region's total land area).

Using this methodology, exceptions emerged for some TAZs that fit different density descriptions.

Exhibit 18 was derived from the data shown in Exhibit 14 which depicts the varying population density. In both maps the greatest density is reflected within the I-295/Route 288 beltway. The urban area is located in the City core and expands westward toward Henrico, whereas the least density occurs in the rural jurisdictions of Charles City, New Kent, and Powhatan, and Goochland.



Exhibit 18. Density Areas



Prepared by the Richmond Regional Planning District Commission, May, 2015.
Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Organization, April, 2015.



Urban Core

As illustrated in the Exhibit 20 , the urban core is located in the centroid of the City of Richmond and westward, towards Short Pump and Henrico’s west end, and consists of approximately 55 square miles, or 2% or the Region’s total land area. The urban core extends slightly south of the James into the Manchester area, and into the near East End of Henrico County, just outside of the City’s boundary. Within the urban core, Richmond comprises 52% of the total land area while Henrico makes up the remaining 48%.

In 2012 the total population of the urban core area was 239,230 with a density of approximately 4,378 persons per square mile, as reference in

Exhibit 19. Percentage of Land in Urban Area

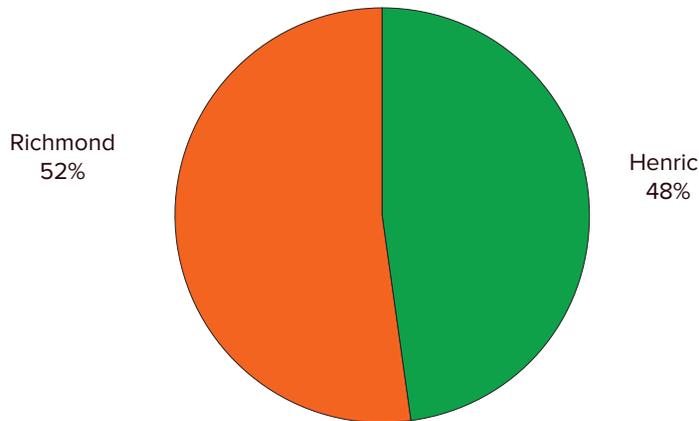


Exhibit 20. Urban Area

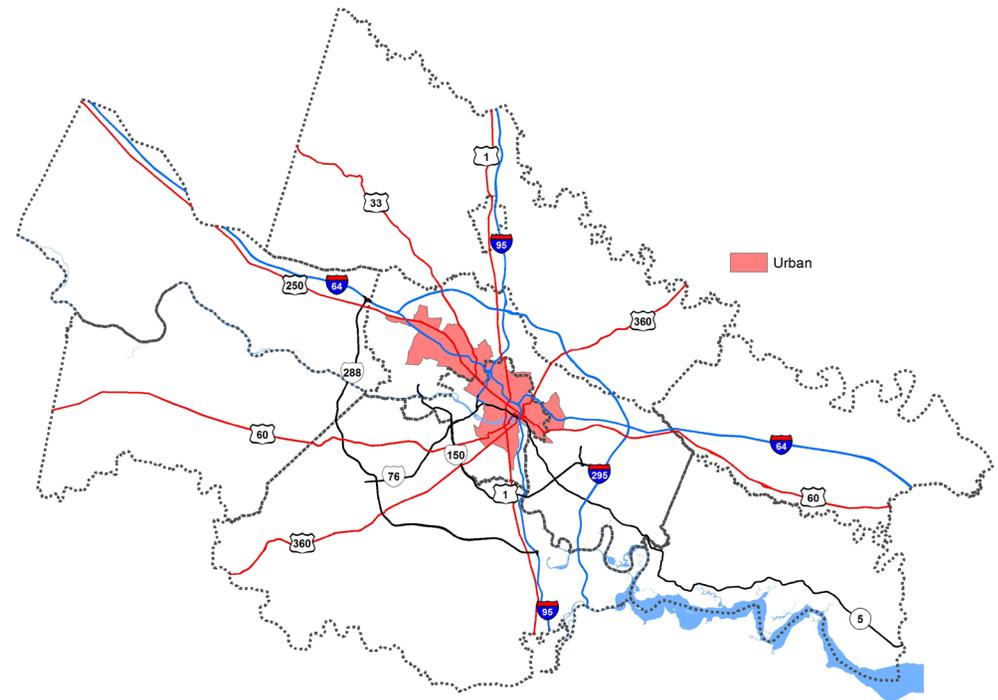


Exhibit 21. The total population is expected to grow by 11% to 264,384 persons in 2040, or 4,838 persons per square mile. The 3.14 dwelling units per acre and 2.37 persons per household in 2012 is expected to increase to 3.48 and slightly decreasing to 2.36 respectively in 2040. In 2012 194,045 jobs were located in the densest part of the Region, with 33,224 or 17.1% in retail employment and the remainder in non-retail employment. By 2040, total employment in the urban core is expected to increase to 215,155, an 11% increase. Retail employment will increase to a total of 35,420, representing 16.5% of the total urban core employment in 2040. In 2012 the urban core comprised of 1.41 autos per household, slightly decreasing to 1.40 in 2040.

Exhibit 21. Urban Area Demographics

	Jurisdiction	Total Population	Population Density	Total Employment	Employment Density	Employment/Population	Population/HH	Autos/HH
2012	Henrico	99,207	3,778	81,048	3,086	0.82	2.52	1.62
	Richmond	140,023	4,934	112,997	3,981	0.81	2.28	1.27
	Urban	239,230	4,378	194,045	3,551	0.81	2.37	1.41
2040	Henrico	110,333	4,202	88,249	3,361	0.80	2.51	1.61
	Richmond	154,051	5,428	126,906	4,472	0.82	2.27	1.27
	Urban	264,384	4,839	215,155	3,938	0.81	2.36	1.40

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

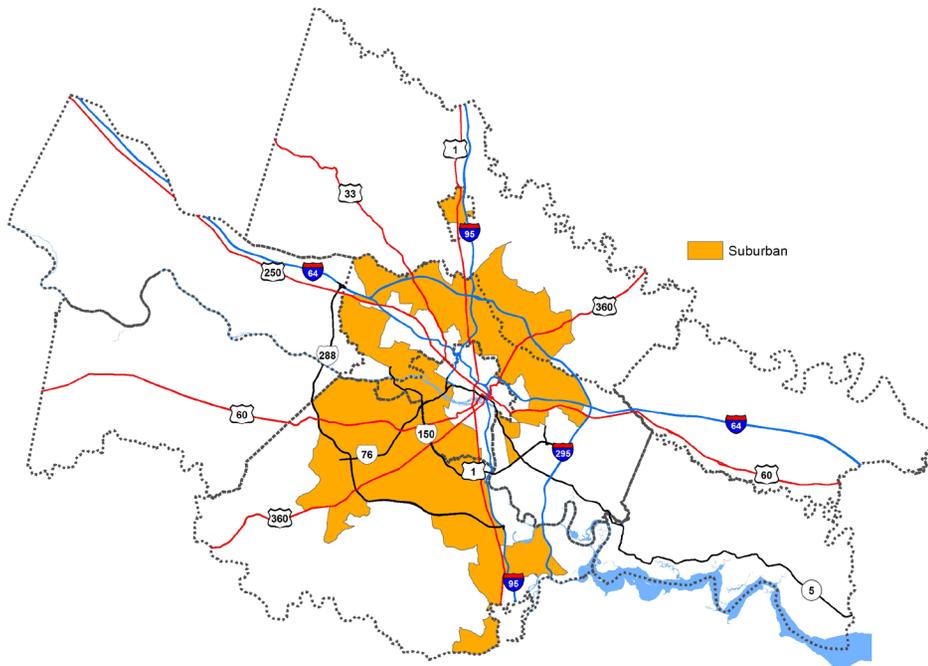




Suburbanized Area

The suburban area in the Richmond Region surrounds the urban core, with a land area of approximately 338 square miles, or 15% of the Region's total land area (Exhibit 22). As seen in the Exhibit 24, Chesterfield contains the majority of the Region's suburban area at just over 49%, with Henrico following at almost 30%. In 2012, the total population of the suburban areas was 605,339 and is forecasted to increase to 754,803 in 2040, representing approximately a 25% increase in the suburban population (Exhibit 23). The population density for the suburban area was 1,789 persons per square mile in 2012, and is projected to grow to 2,231 persons per square mile in 2040.

Exhibit 22. Suburban Area



In 2012 there was a total of 231,690 households, projected to grow to 288,354 in 2040, a 25% increase. The overall housing density in 2012 was 1.13 dwelling units per acre, increasing to 1.41 in 2040. The total number of automobiles in the suburban area is expected to increase from 457,482 in 2012 to 577,131 in 2040, an increase of 119,649 or 26%. Total suburban employment in 2012 was 234,224, with 67,018 or 29% comprised of retail and the remainder comprised of non-retail employment. Employment is forecasted to increase to 322,501 in 2040, representing a 38% increase in the suburban area. Of the 2040 total suburban employment, 96,472 or 30% is expected to be retail.

From a density perspective many of the jurisdictions located in the suburban area are forecast to undergo significant increases in the next 28 years. Pertaining to population density within the suburbanized area, the City has the highest density while Hanover (excluding Ashland) has the lowest density in 2012 as depicted in Exhibit 23. Ashland is expected to increase its population density the most, increasing from 1,466 to 2,247 from 2012 to 2040, or a 53% change; while the City is expected to have the least amount of density increase at 11%. The City's marginal gains in density can be attributed to an already built out residential land use in its suburbanized area. The most significant increase in housing density is projected to occur in Hanover (excluding Ashland), increasing from 0.84 to 1.22, an increase of 0.38 dwelling units per acre; while the City is expected to increase the least amount with an increase of 0.20 dwelling units per acre from 2012 to 2040.

Suburban employment density is expected to increase at a more dramatic rate compared to population density from 2012 to 2040, at a 38% rate compared to population at a 25% rate. Within the suburban area, Hanover (excluding Ashland) is expected to experience the greatest surge in employment density, increasing by 66%, while the City's suburbanized area is forecasted to experience the smallest gain at 23%. This suggests the land areas currently defined as traditionally suburban will be attracting more residential and commercial development over the next 28 years and may eventually transition to more urban characteristics in density.

Exhibit 23. Suburban Area Demographics

2012

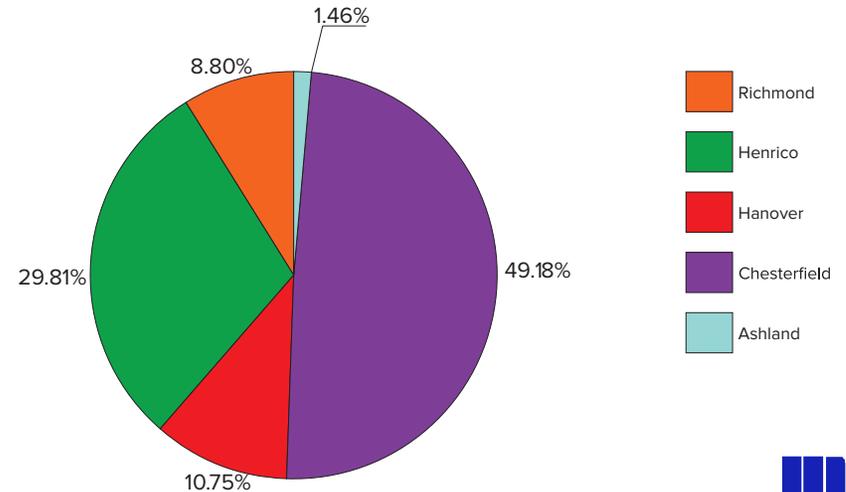
Jurisdiction	Total Population	Population Density	Total Employment	Employment Density	Employment/Population	Population/HH	Autos/HH
Ashland	7,240	1,466	5,781	1,170	0.80	2.67	1.78
Chesterfield	277,913	1,670	92,980	559	0.33	2.73	2.08
Hanover	52,118	1,433	18,264	502	0.35	2.79	2.24
Henrico	198,779	1,971	88,080	873	0.44	2.48	1.91
Richmond	69,289	2,327	28,759	966	0.42	2.43	1.61
Suburban	605,339	1,789	233,864	691	0.39	2.61	1.97

2040

Jurisdiction	Total Population	Population Density	Total Employment	Employment Density	Employment/Population	Population/HH	Autos/HH
Ashland	11,099	2,246.76	8,730	1,767	0.79	2.92	1.81
Chesterfield	355,702	2,137.38	129,465	778	0.36	2.73	2.08
Hanover	75,855	2,085.65	30,311	833	0.40	2.80	2.26
Henrico	235,380	2,333.96	118,606	1,176	0.50	2.48	1.95
Richmond	76,767	2,577.80	35,389	1,188	0.46	2.40	1.63
Suburban	754,803	2,230.77	322,501	953	0.43	2.62	2.00

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

Exhibit 24. Percentage of Land in Suburban Area





Rural Areas

The rural area of the Richmond Region is made up of land area from each of the jurisdictions, totaling a land area of 1,803 square miles, or 82% of the Region's total land area. Most of the rural area consist of the entire jurisdictions of Powhatan, Goochland, New Kent, and Charles City, and parts of the remaining others. The total population of the rural areas in 2012 was 183,895, increasing to 438,487 in 2040, representing a 138% increase in population. The population density for the rural area in 2012 was 102 persons per square mile. In 2040, the average population density is forecasted to increase to 243 persons per square mile. In 2012 67,413 households were in the rural area, increasing to 164,864 in 2040, a 144% increase. The housing density in the rural areas was low in 2012, as expected, at 0.06 dwelling units per acre. In 2040, the housing density is forecasted to increase to 0.15 dwelling units per acre, echoing the trend that the rural area is expected to intensify in density. The total number of automobiles in 2012 was 165,347, growing by 143% to 402,373 automobiles in 2040.

Exhibit 25. Rural Area

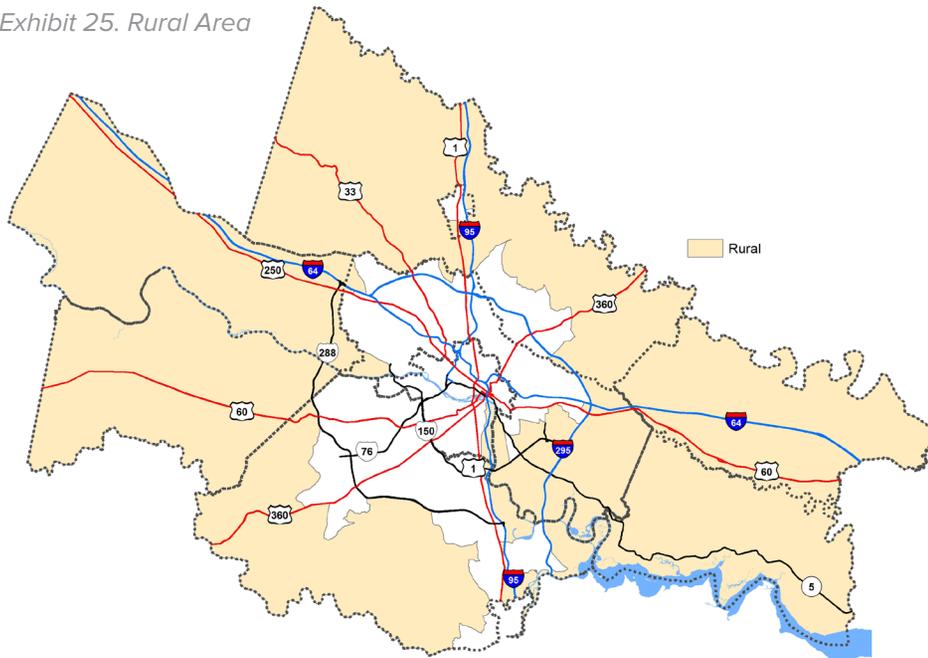
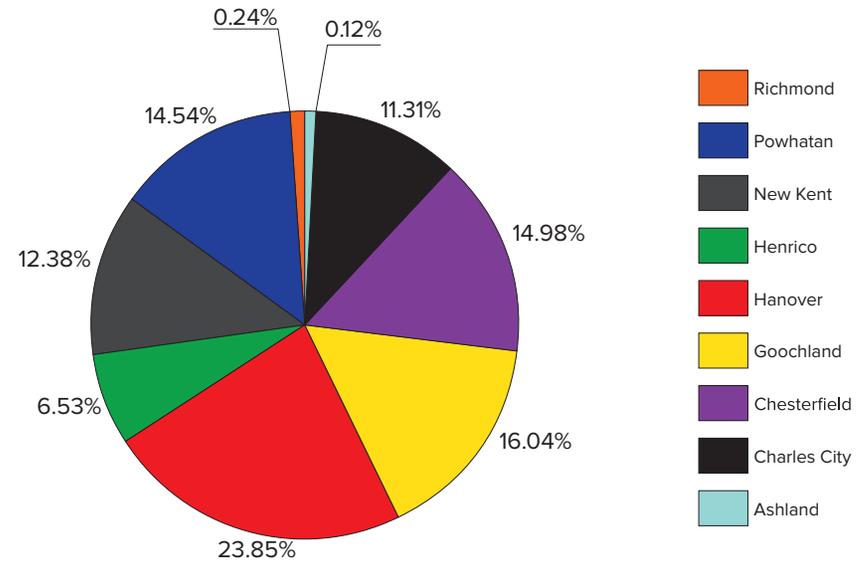


Exhibit 26. Percentage of Land in Rural Area



2012 employment in the rural area was 81,973, with 11,532 retail jobs representing 14% of total rural employment. In 2040, rural employment is projected to grow to 193,027, with 45,161 or 23% being retail employment. Similar to the increase in population, the increase in total employment also represents a 138% increase. Rural employment density is projected to increase from 46 to 107 jobs per square mile.

Among the four rural jurisdictions Charles City is the least dense in terms of population, employment and housing. Despite this, it is still expected to experience a 33% growth in population, accompanied by a 16% increase in employment from 2012 to 2040. Due to these increases, the population density is projected to increase from 36 to 48 persons per square mile and employment density is forecasted to increase from 7 to 8 jobs per square mile. The ratio of employment to population is expected to decrease from 0.19 jobs per person to 0.17 jobs per person, indicating population is expected to increase at a larger rate than employment.

Goochland is projected to experience a 38% growth in population by



2040, coupled with a 111% increase in total employment. Employment density is expected to grow from 43 jobs per square mile to 91 jobs per square mile. The number of jobs available per person is expected to increase from 0.57 in 2012 to 0.87 in 2040. A great deal of this growth is forecasted to occur in the eastern portion of the County with development from West Creek and Short Pump spurring much of this growth.

New Kent is forecasted to increase its population by 43%, while total employment is expected to grow by 72%, by 2040. Density of employment is projected to increase from 16 to 28 jobs per person in 2040. The number of jobs per person is projected to increase from 0.19 to 0.23 in 2040.

The population in Powhatan is expected to increase by 52% in 2040, along with an increase of 183% in total employment numbers. Employment density is projected to increase from 21 to 58 jobs per square mile, and the number of jobs available per person is projected to change from 0.19 jobs per person to 0.35 jobs per person in during this same period.

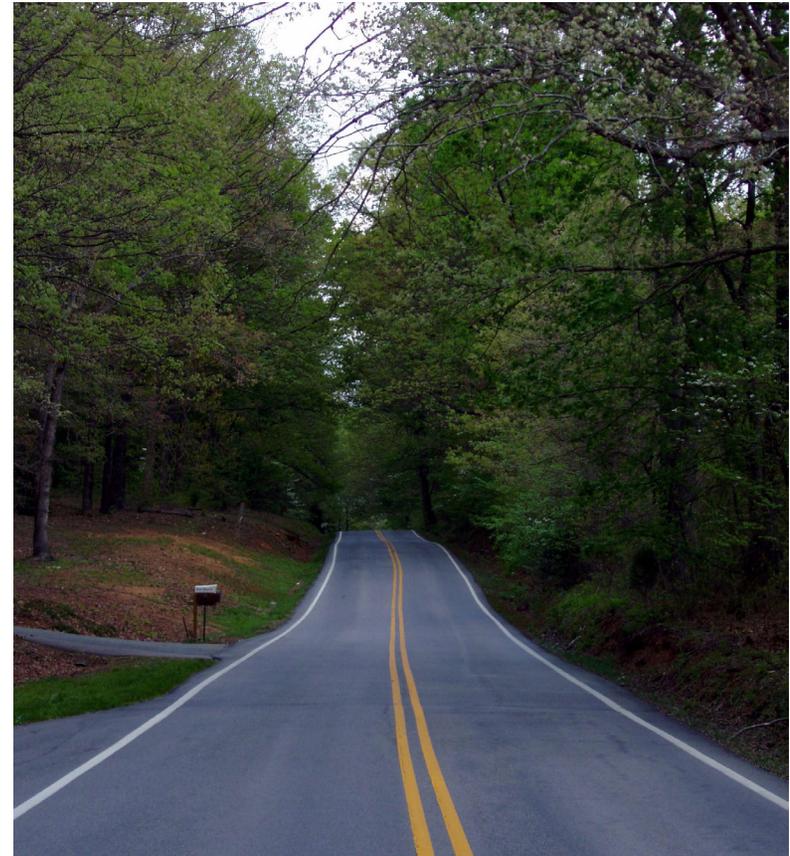




Exhibit 27. Rural Area Demographics

2012

Jurisdiction	Total Population	Population Density	Total Employment	Employment Density	Employment/Population	Population/HH	Autos/HH
Ashland	199	90	1,494	673	7.51	2.12	1.57
Charles City	7,392	36	1,419	7	0.19	2.48	2.24
Chesterfield	43,805	162	23,454	87	0.54	2.87	2.41
Goochland	21,942	76	12,509	43	0.57	2.72	2.43
Hanover	42,109	98	19,050	44	0.45	2.67	2.57
Henrico	20,177	171	9,537	81	0.47	2.45	2.42
New Kent	19,277	86	3,653	16	0.19	2.70	2.49
Powhatan	28,410	108	5,406	21	0.19	2.95	2.45
Richmond	584	136	4,512	1,052	7.73	2.42	1.86
Rural	183,895	102	81,034	45	0.44	2.73	2.45

2040

Jurisdiction	Total Population	Population Density	Total Employment	Employment Density	Employment/Population	Population/HH	Autos/HH
Ashland	1,060	477	3,410	1,536	3.22	2.67	1.80
Charles City	9,796	48	1,643	8	.017	2.48	2.22
Chesterfield	152,605	564	51,926	192	0.34	2.76	2.44
Goochland	30,256	105	26,450	91	0.87	2.67	2.45
Hanover	68,501	159	29,636	69	0.43	2.73	2.54
Henrico	104,917	891	48,371	411	0.46	2.44	2.40
New Kent	27,539	123	6,289	28	0.23	2.67	2.48
Powhatan	43,227	165	15,307	58	0.35	2.85	2.44
Richmond	586	137	9,995	2,330	0.35	2.42	1.86
Rural	438,487	243	193,027	107	0.44	2.66	2.44

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.



4 REGIONAL ACTIVITY CENTERS

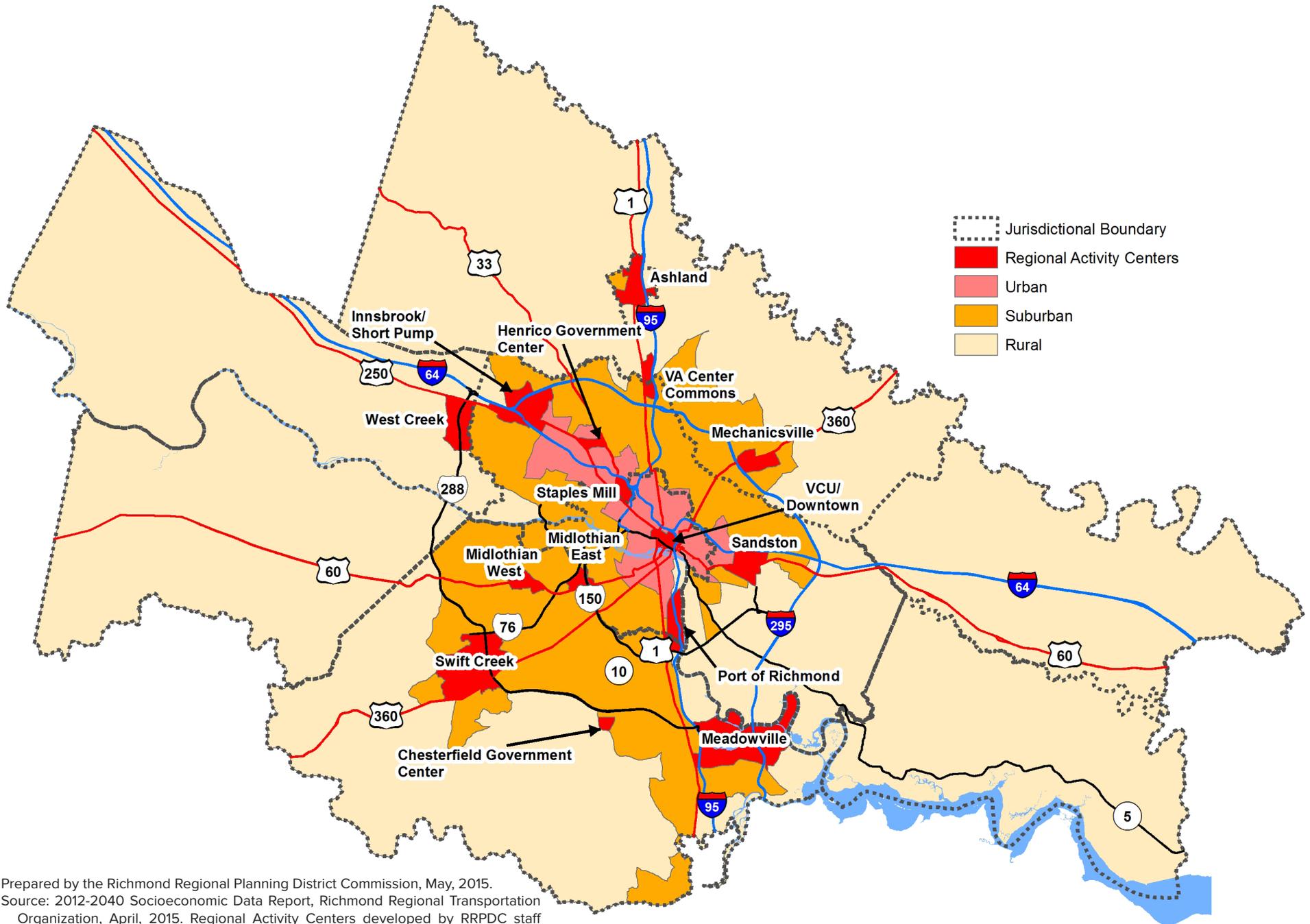
Regional activity centers are proposed to describe existing growth concentrations in a conceptual way. They were defined by looking at both the concentrations of population and employment density, with more emphasis placed on higher employment density and strategic importance of geographic location. The regional activity centers are mostly located in the urban core area and inner suburbanized areas, with few spreading into the exurb areas of the Richmond Region, as shown in Exhibit 28. The activity centers generally occur along major the major corridors such as Route 1, Route 250, Route 33, Route 60, and Route 288. They are also generally located close to interstates and highways in the region, allowing easy access for commuters.



Activity centers such as Swift Creek, Innsbrook/Short Pump, and the Downtown area exhibit the large impacts from employment and population of the areas in which they are located, as depicted in Exhibits 29 & 30. The employment of Swift Creek in 2012 was 11,565, and is projected to grow by 36% to 15,746 in 2040. Innsbrook/Short Pump had 33,714 jobs in 2012, and is expected to grow by 44% to 48,379 in 2040. While the growth is not as large in the VCU/Downtown area, the employment is still forecasted to grow by 7% from 62,898 in 2012 to 67,289 in 2040. West Creek is a key example of how an activity center can affect employment, and thus, population. In 2012, the population of West Creek was 176. It is projected to grow to 2,644 in 2040, a growth of over 140%, while employment is forecasted to increase from 4,849 to 7,933, or a 64% increase. This growth changes the number of jobs per person from 28 to 3 jobs per person living in West Creek. Essentially, West Creek is expected to have a large impact on the population of the area by first providing jobs and subsequently transitioning to more of a mixed-use community.

As mentioned above, employment was one of the main drivers in the development of these activity centers. From an employment density (jobs per square mile) perspective, some of the more concentrated areas include VCU/Downtown, Staples Mill, East and West Midlothian, Innsbrook/Short Pump, and both the Chesterfield and Henrico Government Centers, as depicted in Exhibit 29. In terms of jobs per person (also known as employment/population), Staples Mill, West Creek, and the Port Area all have at least double digit ratios.

Across all of the identified activity centers, overall housing density (dwelling units per acre) is generally increasing, leading to areas that are densifying over time whether they be located in urban, suburban, or rural areas. The number of automobiles is also increasing across the activity centers, a direct relationship with increases in housing and population.



Prepared by the Richmond Regional Planning District Commission, May, 2015.
 Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Organization, April, 2015. Regional Activity Centers developed by RRPDC staff based on approved data.

Exhibit 29. Regional Activity Centers & Demographics, 2012

2012	Activity Center	Total Population	Population Density	Total Employment	Employment Density	Employment/Population	Population/HH	Autos/HH
	Ashland	5,925	1,486.80	5,274	1,323	0.89	2.71	1.71
Chesterfield Government Center	1,022	1,538.63	4,586	6,904	4.49	4.39	1.69	
East Midlothian	3,246	2,440.29	9,622	7,234	2.96	2.44	1.27	
Henrico Government Center	2,299	2,728.02	5,406	6,415	2.35	3.4	1.42	
Innsbrook/Short Pump	13,463	2,097.55	33,714	5,253	2.5	2.44	1.73	
Meadowville	4,964	342.37	8,423	581	1.7	2.66	2.07	
Mechanicsville	3,765	1,522.17	4,420	1,787	1.17	2.48	2.05	
Port Area	580	161.01	6,379	1,771	11	2.42	1.87	
Sandston	4,108	1,214.88	9,524	2,817	2.32	2.44	1.54	
Staples Mill	196	173.66	10,042	8,897	51.23	2.45	2.5	
Swift Creek	20,578	1,485.52	11,565	835	0.56	2.55	2.04	
VCU Downtown	11,368	7,357.80	62,898	40,710	5.53	2.75	0.94	
Virginia Center Commons	542	340.64	5,191	3,262	9.58	2.06	1.15	
West Creek	176	38.36	4,849	1,057	27.55	2.55	2.23	
West Midlothian	1,862	1,076.88	10,825	6,261	5.81	2.49	1.9	

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.



Exhibit 30. Regional Activity Centers & Demographics, 2040

Activity Center	Total Population	Population Density	Total Employment	Employment Density	Employment/Population	Population/HH	Autos/HH
Ashland	8,995	2,257	8,030	2,015	0.89	3.01	1.74
Chesterfield Government Center	1,037	1,561	5,108	7,690	4.93	4.34	1.69
East Midlothian	3,367	2,531	14,844	11,159	4.41	2.45	1.27
Henrico Government Center	2,358	2,798	5,561	6,599	2.36	3.36	1.42
Innsbrook/Short Pump	20,899	3,256	48,379	7,538	2.31	2.44	1.92
Meadowville	7,466	515	16,452	1,135	2.2	2.67	2.05
Mechanicsville	5,456	2,206	5,150	2,082	0.94	2.57	2.06
Port Area	582	162	10,134	2,813	17.41	2.41	1.87
Sandston	4,447	1,315	10,034	2,967	2.26	2.44	1.56
Staples Mill	202	179	10,131	8,976	50.15	2.43	2.51
Swift Creek	24,638	1,779	15,746	1,137	0.64	2.57	2.04
VCU Downtown	12,706	8,224	67,289	43,552	5.3	2.68	0.95
Virginia Center Commons	1,199	754	6,229	3,915	5.2	2.41	1.12
West Creek	2,644	576	7,933	1,729	3	2.54	2.32
West Midlothian	1,942	1,123	16,713	9,666	8.61	2.5	1.9

Source: 2012-2040 Socioeconomic Data Report, Richmond Regional Transportation Planning Organization, April, 2015.

5 CONCLUSION

Historical trends show the Richmond Region has experienced an 88% population growth since 1970. According to the *2012-2040 Socioeconomic Data Report* the Region is expected to see continued strong growth in population, increasing by 42% in the next 28 years. Individually, Chesterfield followed by Powhatan and New Kent have historically experienced the greatest growth in population since 1970 in relative terms with growth rates at 318%, 239%, and 264%, respectively. Forecasting population growth to 2040 also shows the Chesterfield expected to have the greatest growth at 58%, followed by Hanover and Powhatan at 54% and 52%, respectively.

Housing has seen a tremendous growth since 1970 with housing units having increased by 139% through 2012. Conversely, the average household size has significantly decreased during the same period. Since 1970 the average household size has decreased at least 23% within every jurisdiction in the Region. People waiting longer to get married and choosing to have less children has contributed to smaller household sizes over the last few decades.

Employment is on a similar trajectory as population growth, forecasted to grow by 43% over the next 28 years. In relative terms Powhatan is forecasted to experience the greatest growth in jobs at 183% followed by Goochland and New Kent at 111% and 72%, respectively. In absolute terms Henrico and Chesterfield are expected to gain the most employment with an additional 76,561 and 64,957 jobs, respectively. Currently the largest industry sectors in the Region consist of retail at 22%, health care at 14%, and educational services at 10%. The top employers in the Region include Capital One, Virginia Commonwealth University, Henrico School Board, Chesterfield School Board, and VCU Health System.

As expected, existing population density is concentrated within the I-295/Route 288 beltway. 2040 population density is expected to expand to

areas in southern Chesterfield, eastern Goochland, southern Hanover, and eastern Henrico. Current population density is concentrated along major corridors within the beltway, and throughout Downtown Richmond and western Henrico. 2040 Employment density is expected to increase along these major corridors, expanding past the beltway, specifically near Meadowville Technology Park, Swift Creek, West Creek, and the Richmond International Airport.

The existing growth areas consist of the urbanized, suburbanized, and rural areas. The urbanized area is comprised of 2% of the Region's total area, located in the City and parts of western Henrico. The suburbanized area makes up 15% of the Region's total land area, consisting of parts of the City, Henrico, Chesterfield, Hanover, and Ashland. The largest growth area is the rural areas which is comprised of 82% of the Region's land area. This is considered the exurbs of Henrico and Chesterfield as well as the very rural areas of Hanover, Charles City, New Kent, Powhatan, and Goochland.

Based on employment density and to some degree population density, 15 regional activity centers have been identified. These are areas where a high concentration of jobs currently exists and in many cases also contain or are adjacent to high concentrations of population. These activity areas are where people work, live, or shop, or in some cases a combination of these three elements.