

GROW CAPITAL JOBS ECONOMIC GROWTH AND DIVERSIFICATION PLAN

AUGUST 21, 2017

DecideSmart



CHMURA
Economics & Analytics

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
PROLOGUE	9
PART ONE: BACKGROUND & DATA	13
BASELINE ECONOMIC CONDITIONS	13
INDUSTRY CLUSTERS IN REGION 4.....	32
WORKFORCE SKILLS AND JOB GAPS	44
APPENDIX	59
PART TWO: STAKEHOLDER ENGAGEMENT	67
WORKFORCE, WORKFORCE, WORKFORCE	67
CLUSTERS: STAKEHOLDER PERSPECTIVES	77
INNOVATION	91
SITES AND BUILDINGS	98
FRAMEWORK FOR MOVING FORWARD	103
POSTSCRIPT.....	107

EXECUTIVE SUMMARY

ECONOMIC GROWTH AND DIVERSIFICATION PLAN REGION 4

Approach

1. The report was developed in alignment with the instructions of the statewide GO Virginia board. It begins with a baseline analysis of economic conditions in the region. It includes an examination of the major industry clusters in terms of employment, wages and opportunities and the identified skill gaps between available and forecasted jobs and the current supply in the workforce. The report supplements the data analysis with surveys, focus groups, and interviews that were part of an extensive stakeholder engagement process. Stakeholders express their views on what they believed are the key drivers of growth in higher paying jobs and the clusters and innovation activities the region should prioritize going forward. The report does not recommend specific projects that the Regional Council should pursue, but includes recommended directions about workplace development and talent attraction, industry cluster enhancement, innovation, and site development that could provide a framework for eliciting and evaluating project ideas.
2. While the PLAN is extensive and comprehensive, a set of common themes emerged that are threaded throughout the report. A) The region's primary focus should be on the economy of tomorrow (and beyond). B) The talent and skills of the workforce will be an essential key to the creation of higher paying jobs in the emerging economy. C) Significant cultural and institutional changes are necessary for the region to become a leader in developing the workforce of the future. D) Communicating and branding the region's appeal will be essential to enhancing our competitive position.

Baseline Economic Analysis

3. GO Virginia Region 4 performs well relative to the state and nation on many economic and labor force measures. Population has been growing more rapidly in the region, overall labor force participation is high, and employment growth is supported by a diverse mix of industries. However, the region has a larger share of the population with only a high-school degree, and high rates of poverty in both urban and rural areas. The growth in sole proprietors and share of new jobs created by young firms—drivers of innovation and productivity growth—have been increasing in the region in the past five years, although still lagging state and national averages.
4. Significant intraregional differences exist. Population has declined in each of the five localities with the smallest populations (Emporia, Surry, Sussex, Greensville, and Charles City), and the decline is projected to continue through at least 2030. Labor force participation is lower than the regional average in the Crater district and declined more rapidly in these localities between 2006 and 2016 than in the state or nation. Per capita income ranges from a low of \$28,943 in Sussex up to \$84,253 in Goochland, and though the poverty rate has declined overall in Region 4, poverty rates increased in 7 localities from 2011 through 2015.
5. In the recession period, several closings and reductions in jobs in high paying clusters negatively affected wages in the region. Richmond was particularly hard hit during the recession due to its cluster of finance, real estate, insurance firms and corporate headquarters. The overall regional economy has rebounded relatively well from the recession, but wages have been slow to recover (especially in the Crater district), growing below average rates in the state and nation.

Industry Clusters in Region 4

6. The creative services, financial services, defense and security, and bioscience/ life sciences clusters pay above-average wages and performed well locally compared to growth in those industries nationally over the last 10 years. The logistics, warehousing and distribution cluster and arts and entertainment cluster grew competitively within

the region over this period, but have below-average wages. Clusters with the largest contributions to Gross Domestic Product in Region 4 include professional services, energy, financial services, manufacturing, and defense and security.

7. Eight of the identified clusters are forecasted to grow at least as quickly as the regional average, led by bioscience/ life sciences, creative services, and information technology and communications. Manufacturing categories- advanced materials, glass and ceramics, chemicals, and food and beverage- are significant historical drivers but are forecasted to grow below the regional average annual rate (0.7%) or decline.
8. The industry mix of localities within the region vary substantially, and clusters that may not be dominant at the regional level are no less important locally. Instances where localities share a high specialization in a cluster that pays above-average wages suggest opportunities for interregional collaboration to reverse potential negative growth forecasts.

Workforce Skills and Job Gaps

9. Online job postings data suggest current needs for occupations requiring less than a college degree: retail salespersons; first-line supervisors of retail sales workers; and sales representatives. Jobs with a large number of online postings and requiring higher levels of training include registered nurses; computer user specialists; and software developers.
10. Over the next ten years, the most rapid growth forecasts are for occupations that require a postgraduate degree, or a two-year degree or certificate. This is consistent with previous studies that have shown a need for advanced new economy skills and identified a large “middle skills” gap in jobs that require more than high school and less than a four-year degree.
11. The report details 32 occupations that typically require an associate’s degree or less that have a potential annual training gap and 35 occupations that require a bachelor’s degree that have an annual shortfall. Approximately 2/3 of these occupations are

substantially related to strong regional clusters. These estimated gaps could potentially inhibit growth within clusters in Region 4.

Stakeholder Insights

12. Region 4 stakeholders in surveys and focus groups identify workforce development and talent attraction/retention as the key driver of growth in higher paying jobs. This perspective is evident across the entire geographic region and transcends the intraregional differences that are evident on other issues.
13. There is an impressive range of creative effort and investment underway to address workforce development issues throughout the region and in the Commonwealth. Stakeholders believe that the most successful efforts will involve partnerships in which business involvement is proactive and sustained. They also believe that substantial cultural and institutional changes are necessary for a long-term solution to the middle skills gap.
14. Stakeholders identify information technology as the “cluster of clusters.” Not only is information technology an important cluster in its own right, but it is driving higher paying jobs in other clusters and is the essential foundation for the region’s entrepreneurial creativity and innovation ecosystem.
15. Logistics is an important industry cluster due to the region’s natural locational advantages. Potential collaborations on port issues with Hampton Roads on developing an inland port around the Richmond Marine Terminal are perceived to be genuine opportunities. If the cluster is to support higher paying jobs, however, it will be important to link logistics to other clusters such as manufacturing and/or to enhance the research based applications of advanced logistics to contemporary business processes.
16. Although employment in manufacturing has declined over time, advanced manufacturing is seen to be critically important to driving higher paying jobs by stakeholders involved in the industry and by leaders throughout in the rural parts of Region 4. The state and the region have already made significant investments in

revitalizing advanced manufacturing that have paid notable dividends. Addressing workforce development concerns and infrastructure issues that inhibit site development are necessary prerequisites for success.

17. Stakeholders, especially in metro RVA, believe that the region can develop a reputation for economic innovation that matches the extraordinary accolades that it has received in recent years for its restaurants, arts scene, outdoor recreation, downtown housing, and overall quality of life. RVA has established the basics of a successful “innovation ecosystem” with increased access to capital, effective linkages with VCU researchers, and the creation of a vibrant entrepreneurial network. Stakeholders suggest that linking traditional strengths such as financial services and medical research with new economy companies and developing more effective ways of branding RVA as an innovation center will enable the region to capitalize on its emerging potential.

Framework for Moving Forward

18. The purpose of the Plan is not to recommend specific projects. It is intended to engage the Council in a dialogue about how to address the region’s key challenges and to provide a framework for considering the project proposals that will be brought to it.
19. In workforce development- The Plan recommends that the Council consider how resources and investments can be leveraged to ensure that initiatives address important skill gaps and demonstrate how business can be a more effective partner in achieving measurable outcomes. It also recommends long-term changes that enable young people to make informed choices about careers and the pathways to achieving their goals.
20. On attracting and retaining new economy professionals and millennials to RVA- The Plan recommends that the Council consider more effective ways of attracting and retaining graduates from the I-64 educational corridor that extends from Staunton to Virginia Beach and that includes more than half of the public university college students, the state’s major historically black colleges and universities (HBCUs), significant private universities, and the majority of medical students.

21. On industry clusters- The Plan notes that the health, life sciences, bioscience cluster is perceived by stakeholders to have the region's highest potential for growth. Commercializing research innovations at Virginia Commonwealth University will be crucial to tapping this potential. The Council should promote health, life science and wellness innovations that develop products, processes, firms and institutions with "tradeable" competitive advantages.
22. On industry clusters-The Plan recommends that the Council consider how advanced manufacturing initiatives can make significant progress in addressing the challenges of workforce preparation and infrastructure for site development.
23. On industry clusters- The Plan recommends that the Council consider how average wages in the region's logistics cluster could be enhanced by linking initiatives to clusters such as manufacturing that pay higher wages and by focusing on the research based applications of advanced logistics that can improve bottom line business processes.
24. On innovation- The Plan recommends that the Council consider how the region can enhance its growing reputation as a place for innovators with initiatives that recruit/retain new economy skills and talent, establish greater "innovative density" in downtown Richmond, and develop spaces that serve the interests of innovators and distinctively brand the region's efforts.
25. On sites- The Plan recommends that the Council consider supporting an initiative for increasing the supply of modernized shell buildings. The Council should also consider how the Collaborative Jobs Act can provide an incentive for multiple localities to participate in joint site development.

PROLOGUE

The GO Virginia initiative arose in response to Virginia’s unusually slow recovery from the recession of 2008-2010. For much of the past half century, the Commonwealth had been accustomed to falling into national recessions late and coming out early. But continuing cutbacks in federal defense spending impacted Virginia far more than most other states. Since the recession ended, the unemployment rate in Virginia has been reduced. Yet wage growth has been relatively anemic due to a phenomenon in which high paying jobs, often in defense and government contracting, have been replaced by lower paying jobs. Business leaders and elected officials came to believe that the Commonwealth had become overly dependent on public sector and government-related employment and it was critical to develop a new Virginia economy less reliant on the federal government.

The purpose of GO Virginia is to restore the Commonwealth’s “position of economic leadership by growing and diversifying the state economy,” focused especially on private sector growth that can result in higher paying jobs. The GO Virginia legislation, passed by the Virginia General Assembly, encourages business, government, and education in each region of the Commonwealth to collaborate in new and creative ways to diversify the economy, to promote private sector employment and to seek growth in high wage industry clusters. The role of state government in GO Virginia is not to pick winners and losers but to incentivize collaborative efforts within regions that can lead to improved economic outcomes.

The GO Virginia Initiative calls for each of the nine regions to form their own regional councils and to develop an Economic Growth and Diversification Plan (the PLAN) specific to their region, outlining the major areas of opportunity and the key challenges. The PLAN is required to provide a basic economic overview of the region, an assessment of the major industry clusters where opportunities for higher paying jobs could be successfully pursued, and an examination of workforce issues, particularly focused on the alignment/mismatch between available and forecasted higher paying jobs and the identified skill levels and availability of workers.

Complementing the data analysis, each region's PLAN is to include a stakeholder engagement process in which representatives from business, government and education offer their ideas about regional economic priorities and the factors they believe are driving higher paying jobs in the future. The statewide GO Virginia guidelines also require each regional council to have a serious dialogue about the information presented in the PLAN prior to the time that it considers projects that it will submit to the statewide board for funding.

The approach taken by the Grow Capital Jobs Council in developing its PLAN is consistent with the guidelines outlined by the statewide GO Virginia board. The approach contains three main elements.

1. **Data Analysis**—The consultant team developed an economic overview of the region, an examination of the major industry clusters where the region is currently strong and where it has potential opportunities, and an assessment of major workforce issues, addressing the alignment/mismatch between skills and jobs requirement.
2. **Stakeholder Engagement**—An extensive array of stakeholder engagement activities was conducted including surveys of business leaders, focus groups throughout the region with businesspeople and government and education officials, and one-on-one interviews with key regional leaders.
3. **Regional Council Working Groups**—After the Interim Report was submitted and discussed at the regional council's July meeting, six working groups were established to focus on major themes in the report and to work with the consultant team in identifying opportunities/challenges and framing key issues that eventual project proposals should address. The conclusions of the working groups are included in the PLAN.

While the PLAN is extensive and comprehensive, a set of common themes emerged that are threaded throughout the report.

1. *The region's primary focus should be on the economy of tomorrow (and beyond).*

The region's economy, like the state's and the nation's, is in transition in which almost every industry is being transformed by the application of technology in a globally competitive environment. Companies, large and small, need to be continually focused on innovation and reinvention to remain competitive and have enduring success. Old economy manufacturing is rapidly being replaced by advanced manufacturing that requires technical training, critical thinking and the capacity to work well in teams. Industry clusters that were once considered distinct such as information technology, manufacturing, logistics, health care, and agriculture, are increasingly converging. (Interviewees and working groups continually told us that the official NAICS codes that define industry clusters make little sense to them.) Basic scientific research, at the root of modern technological change, has been completely transformed as the era of the lone researcher has been replaced by interdisciplinary teams focusing on solving common problems. Fortunately, there are many indications that metro RVA and the Tri-Cities areas of the Crater District are on the positive side of this transition. Our stakeholders believe that GO Virginia's success will be dependent on projects that respond to where the economy is moving, not simply meeting the challenges it faces today.

2. The talent and skills of the workforce will be an essential key to the creation of higher paying jobs in the emerging economy.

While there are significant differences between the metropolitan and rural areas of the region, the focus on the talents and skills of the workforce transcends all differences. Our research noted that jobs in tomorrow's economy will favor individuals who will need technical certifications beyond high school and those with post-baccalaureate degrees. Talent education, attraction and retention will be the currency of economic competitiveness in the emerging economy. Our stakeholders believe that increasing the number of individuals with advanced certifications is a challenge that will have to be met primarily by institutions and organizations serving the current population within the region. Attracting individuals with undergraduate and graduate degrees should focus on

the “Education Corridor” from Staunton to Virginia Beach that contains half of Virginia’s public university enrollment, several high quality private universities and the state’s HBCUs.

- 3. Significant cultural and institutional changes will be necessary for the region to be a leader in developing the workforce of the future.*

Stakeholders in the region believe that long-term workforce issues cannot be solved without significant cultural and educational reforms. This is especially true for jobs that may not require a college degree, but do require technical skills beyond a high school education. Our stakeholders believe that a long term deemphasis on skilled trades, a pervasive misunderstanding of the contemporary opportunities and working conditions in industries such as manufacturing, and a stigma that is often attached to not pursuing college or university education have contributed to the workforce gaps that are evident today.

- 4. Communicating and branding the region’s appeal will be crucial to enhancing our competitive position.*

In the contemporary global environment, the creation of a regional brand has become ever more important to economic success. Branding is not a mere marketing device unrelated to the substance of underlying economic activities, but an instrument for drawing attention to and enhancing interest in how the region has substantially reinvented itself over the past 15 years. The region’s stakeholders believe that we have an important story to tell about the development of an innovation ecosystem, the attraction of a global manufacturing firm such as Rolls Royce, the array of quality universities anchored by major research activity at VCU, and an overall quality of life that is perfectly attuned to the features that millennials and families desire.

PART ONE: BACKGROUND & DATA

BASELINE ECONOMIC CONDITIONS

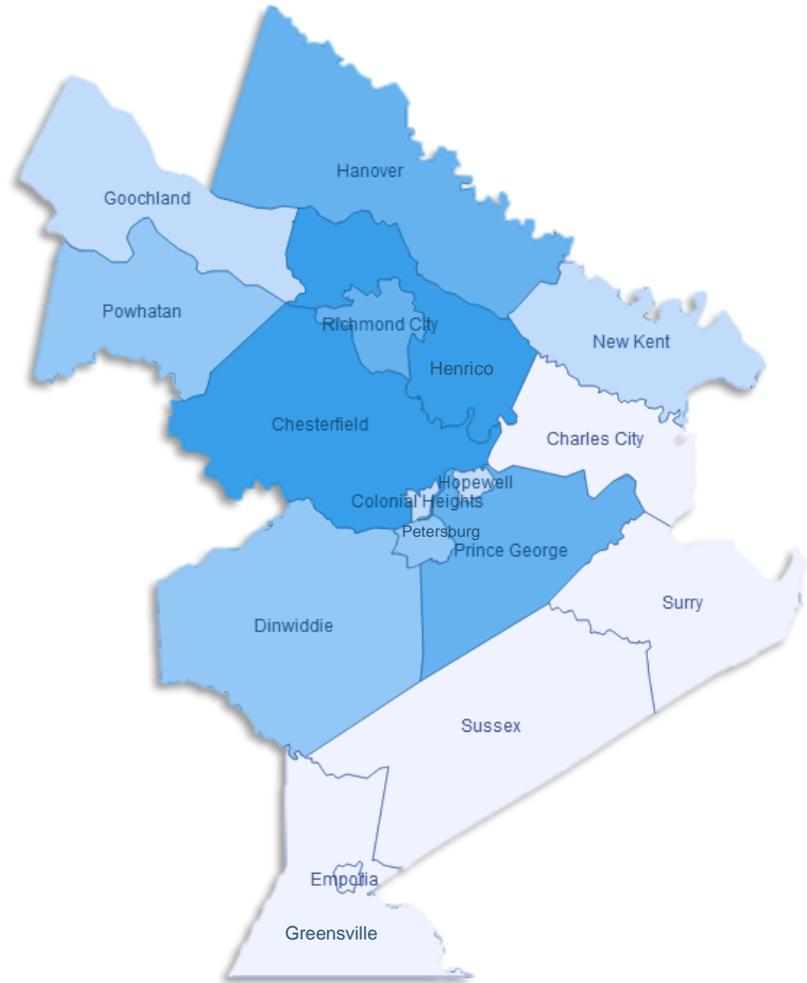
Region 4 performs well on many economic and labor force measures, including solid population growth, a high labor force participation rate, inflow of commuting workers, and a diverse mix of industries. Though Richmond was hit particularly hard during the recession with closures of large employers such as Qimonda, Circuit City, and LandAmerica, the region recovered fairly well from the recession relative to Virginia, surpassing the previous peak level of employment a quarter before the state. However, relative to the state and the nation, wage growth has been slower in Region 4, and small, young firms and sole proprietors have contributed smaller percentages to new job creation.

This section defines the region and reviews the historic and current state of the region's economy and workforce.

Figure 1: GO Virginia Region 4

Region definition

GO Virginia Region 4 is defined as the counties of Charles City, Chesterfield, Dinwiddie, Goochland, Greenville, Hanover, Henrico, New Kent, Powhatan, Prince George, Surry, and Sussex and the independent cities of Colonial Heights, Emporia, Hopewell, Petersburg, and Richmond. A map of the region is shown in Figure 1.



The region definition also serves as a fitting definition for the regional labor shed based on commuting patterns. The region is a net importer of commuters, drawing 121,883 workers into the area who live outside the region, while 81,166 live in the region and commute out of the region to their primary jobs. However, the regional labor shed is largely self-contained—541,769 workers both live and work in the region as summarized in Table 1.

Table 1: Region 4 Inflow/ Outflow Job Counts

	Count
Employed in Region 4 but Living Outside	121,883
Living in Region 4 but Employed Outside	81,166
Employed and Living in Region 4	541,769

Source: JobsEQ®

Population and Wage Trends

Population in the region has been growing faster than the state, and much faster than the United States. From 2000 through 2010, population grew at an average annual rate of 1.3% in Region 4, compared to 1.2% in Virginia; population growth slowed to 0.9% and 0.8%,

respectively, from 2010 through 2016. In a comparison with nine peer regions performed by Richmond’s Future¹, the Richmond metropolitan statistical area (MSA)² ranks 4th out of ten in terms of population growth from 2000 to 2010. The areas within Region 4 with the fastest growth over the last 6 years are New Kent (2.2%), Chesterfield (1.1%), Henrico (1.0%), and Prince George (1.0%). Population has declined over the past six years in each of the five localities with the smallest populations: Emporia City (-1.8%), Surry (-1.3%), Sussex (-0.7%), Greenville (-0.7%), and Charles City (-0.5%). Population projections in JobsEQ[®] through 2030 estimate the population in each of these localities will continue to decline, up to an average annual rate of -1.0% in Surry over this period.

Table 2: Population and Population Growth in Region 4

	1995	2000	2010	2016	Annual Growth (95-00)	Annual Growth (00-10)	Annual Growth (10-16)
United States	265,471,847	281,424,600	308,745,538	323,127,513	1.2%	0.9%	0.8%
Virginia	6,696,100	7,105,817	8,025,773	8,411,808	1.2%	1.2%	0.8%
Region 4	973,900	1,036,200	1,178,106	1,245,838	1.2%	1.3%	0.9%
Charles City	6,600	6,930	7,271	7,071	1.0%	0.5%	-0.5%
Chesterfield	242,200	261,047	317,342	339,009	1.5%	2.0%	1.1%
Dinwiddie	22,800	24,674	28,021	28,144	1.6%	1.3%	0.1%
Goochland	15,900	16,935	21,741	22,668	1.3%	2.5%	0.7%
Greenville	11,200	11,566	12,215	11,706	0.6%	0.5%	-0.7%
Hanover	75,000	86,972	99,939	104,392	3.0%	1.4%	0.7%
Henrico	241,200	264,385	307,633	326,501	1.9%	1.5%	1.0%
New Kent	12,000	13,537	18,558	21,147	2.4%	3.2%	2.2%

¹ *Richmond’s Future: Final Report*, Published in the *Richmond Times-Dispatch*, February 21, 2016, available at http://richmondfuture.org/wp-content/uploads/2016/02/Richmonds_Future_Final_Report_RTDP.pdf.

² The Richmond MSA overlaps significantly with Region 4, and consists of the counties of Amelia, Caroline, Charles City, Chesterfield, Dinwiddie, Goochland, Hanover, Henrico, King William, New Kent, Powhatan, Prince George, Sussex, and the cities of Colonial Heights, Hopewell, Petersburg, and Richmond.

Table 2: Population and Population Growth in Region 4

	1995	2000	2010	2016	Annual Growth (95-00)	Annual Growth (00-10)	Annual Growth (10-16)
Powhatan	19,100	22,585	28,118	28,443	3.4%	2.2%	0.2%
Prince George	30,100	33,100	35,633	37,845	1.9%	0.7%	1.0%
Surry	6,600	6,833	7,060	6,544	0.7%	0.3%	-1.3%
Sussex	10,100	12,456	12,000	11,504	4.3%	-0.4%	-0.7%
Colonial Heights City	16,600	16,905	17,359	17,772	0.4%	0.3%	0.4%
Emporia City	5,600	5,655	5,933	5,305	0.2%	0.5%	-1.8%
Hopewell City	23,000	22,277	22,646	22,735	-0.6%	0.2%	0.1%
Petersburg City	36,300	33,561	32,522	31,882	-1.6%	-0.3%	-0.3%
Richmond City	199,600	196,782	204,115	223,170	-0.3%	0.4%	1.5%

Source: US Census Bureau, Population Estimates Programs

Per capita income in Region 4 has been approaching the statewide average—between 2010 and 2015, per capita income growth in the region (1.4%) outpaced growth statewide (0.9%), but trailed national growth (1.5%). The Richmond MSA ranks 2nd in per capita personal income out of the ten regions examined by Richmond’s Future. However, the Richmond MSA was 9th out of ten between 1990 and 2000, and tied for 5th between 2000 and 2010. In 2015, regional per capita income was \$50,623, pulled up by higher incomes in the counties of Goochland (\$84,253), Henrico (\$58,452), New Kent (\$54,876), and Hanover (\$53,971). The lowest estimates of per capita income were in Sussex (\$28,943), which is the only area with negative income growth between 2010 and 2015, followed by Greenville and Emporia (\$30,101), and Prince George and Hopewell (\$37,178).

Table 3: Per Capita Income in Region 4

	2015	Annual Growth (96-00)	Annual Growth (00-10)	Annual Growth (10-15)
United States	\$48,112	1.2%	0.4%	1.5%
Virginia	\$52,052	1.4%	0.9%	0.9%
Region 4	\$50,623	1.1%	0.5%	1.4%
Charles City	\$42,002	1.7%	0.9%	1.7%
Chesterfield	\$48,513	1.3%	0.0%	0.8%

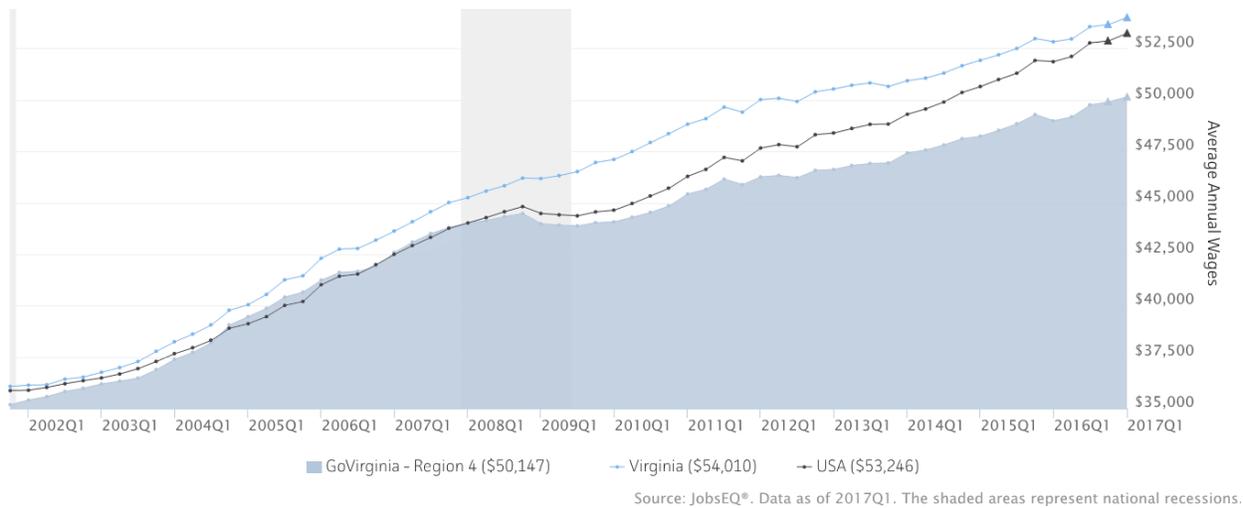
Table 3: Per Capita Income in Region 4

	2015	Annual Growth (96-00)	Annual Growth (00-10)	Annual Growth (10-15)
Dinwiddie, Colonial Heights + Petersburg, VA*	\$38,010	0.7%	0.4%	0.3%
Goochland	\$84,253	2.0%	2.3%	2.0%
Greensville + Emporia, VA*	\$30,101	0.6%	1.2%	0.9%
Hanover	\$53,971	1.2%	0.9%	1.8%
Henrico	\$58,452	1.4%	0.2%	2.4%
New Kent	\$54,876	1.3%	1.8%	2.8%
Powhatan	\$49,105	1.4%	1.0%	2.3%
Prince George + Hopewell, VA*	\$37,178	0.4%	0.7%	0.9%
Surry	\$39,631	0.2%	2.0%	1.1%
Sussex	\$28,943	-1.5%	0.8%	-0.1%
Richmond city	\$48,652	0.8%	0.5%	0.6%

Source: US Census Bureau, Population Estimates Programs

Average wages have increased at a slower pace than in the state or the nation following the Great Recession. As shown in the graph below, between 2002 and 2008 average annual wages in Region 4 were on par with average wages in the nation and below that of the state. However, regional wages dropped as high paying firms went bankrupt, closed, and relocated due to the recession. Richmond was particularly hard hit during the recession due to its cluster of finance and insurance firms and firms with corporate headquarters that had been struggling with slowing demand even before the recession. Regional wages have been slow to recover from the recession—average annual wages in Region 4 grew at an annual rate of 1.9% between 2008 and 2016, compared with 2.5% growth in Virginia and 2.8% growth in the U.S.

Figure 2: Average Annual Wages for Region 4



The poverty rate in Region 4 is well below the national rate, but above the average in Virginia. The percent of people in poverty in Region 4 has grown 1.5 percentage points since 1998 to 12.0% in 2015. In comparison, the poverty rate was 14.7% in the U.S. and 11.2% in Virginia. In the recovery from the recession from 2011 through 2015, the poverty rate in Region 4 declined 0.7 percentage points, greater than the 0.4 percentage point decline in Virginia over this period. Among peer regions compared by Richmond’s Future, the Richmond MSA ranked 3rd in population in poverty. The poverty rate increased in seven localities from 2011 through 2015, led by a 4.1 percentage point increase in Petersburg City from 24.3% to 28.4%. Poverty also increased in Greenville (+3.2 percentage points); Hopewell City (+2.2); Sussex (+1.4); Colonial Heights City (+1.0); Surry (+0.3); and Hanover (+0.1).

Table 4: Region 4 Poverty Trends

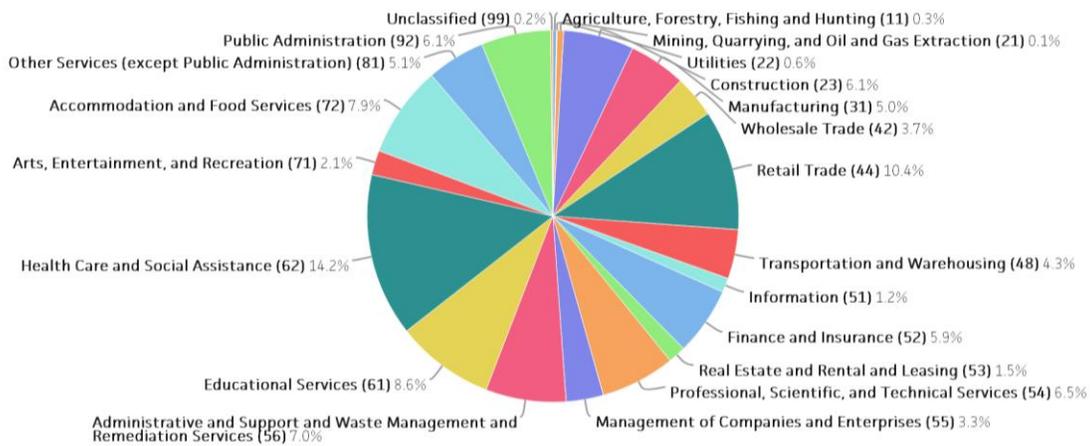
	1998 Poverty Rate	2006 Poverty Rate	2011 Poverty Rate	2015 Poverty Rate
United States	12.7%	13.3%	15.9%	14.7%
Virginia	10.2%	9.6%	11.6%	11.2%
Region 4	10.5%	9.8%	12.7%	12.0%
Charles City	10.5%	10.5%	11.7%	11.6%
Chesterfield	5.8%	5.5%	7.2%	6.9%
Dinwiddie	10.8%	11.1%	13.3%	12.4%
Goochland	7.3%	6.3%	8.1%	7.4%
Greensville	19.1%	18.8%	24.7%	27.9%
Hanover	4.4%	4.1%	6.1%	6.2%
Henrico	7.4%	7.9%	10.8%	9.3%
New Kent	5.6%	5.5%	6.9%	6.7%
Powhatan	5.6%	5.8%	7.4%	6.4%
Prince George	7.9%	8.6%	10.7%	9.9%
Surry	14.3%	10.7%	12.8%	13.0%
Sussex	20.1%	23.5%	20.7%	22.1%
Colonial Heights City	16.8%	7.3%	9.7%	10.6%
Emporia City	19.9%	18.7%	22.8%	22.5%
Hopewell City	16.4%	16.6%	18.3%	20.6%
Petersburg City	22.5%	19.3%	24.3%	28.4%
Richmond City	21.4%	20.7%	26.4%	24.4%

Source: US Census Bureau, Small Area Income and Poverty Estimates

Industry

The largest major sector in Region 4 is health care and social assistance, employing 94,168 workers. The next-largest sectors in the region are retail trade (69,341 workers) and educational services (56,818). High location quotients (LQs) represent sectors in which a region has high concentrations of employment compared to the national average. An LQ above 1.25 suggests a competitive advantage—given the concentration of industries in the region, it is easier to attract additional firms. The sectors with the largest LQs in the region are management of companies and enterprises (LQ = 2.22), finance and insurance (1.49), and public administration (1.27).

Figure 3: Region 4 Employment by Industry



Source: JobsFOIA Data as of 2017Q1

Employment data are derived from the Quarterly Census of Employment and Wages, provided by the Bureau of Labor Statistics and imputed where necessary. Data are updated through 2016Q3 with preliminary estimates updated to 2017Q1.

Sectors in Region 4 with the highest average wages per worker are management of companies and enterprises (\$110,977), utilities (\$107,653), and finance and insurance (\$79,061). Average wages in the management of companies and enterprises sector includes those of chief executives and various managers in corporate headquarters, which accounts for the high average wages. Regional sectors which added the most jobs over the last 10 years are health care and social assistance (+22,476 jobs), accommodation and food services (+9,397), and administrative and support and waste management and remediation services (+8,460).

Table 5: Region 4 Industries

NAICS	Industry	Four Quarters Ending with 2017q1			Total Change over the Last 10 Years	Average Annual % Change in Employment 2007q1-2017q1		
		Empl	Avg. Annual Wages	Location Quotient	Empl	Region 4	Virginia	USA
62	Health Care and Social Assistance	94,168	\$50,529	1.00	22,476	2.80%	2.20%	2.20%
44	Retail Trade	69,341	\$28,751	0.96	39	0.00%	-0.20%	0.20%
61	Educational Services	56,818	\$43,933	1.03	512	0.10%	0.60%	0.60%
72	Accommodation and Food Services	52,688	\$17,676	0.89	9,397	2.00%	1.40%	1.80%
56	Administrative and Support and Waste Management and Remediation Services	46,311	\$35,892	1.08	8,460	2.00%	0.90%	0.70%

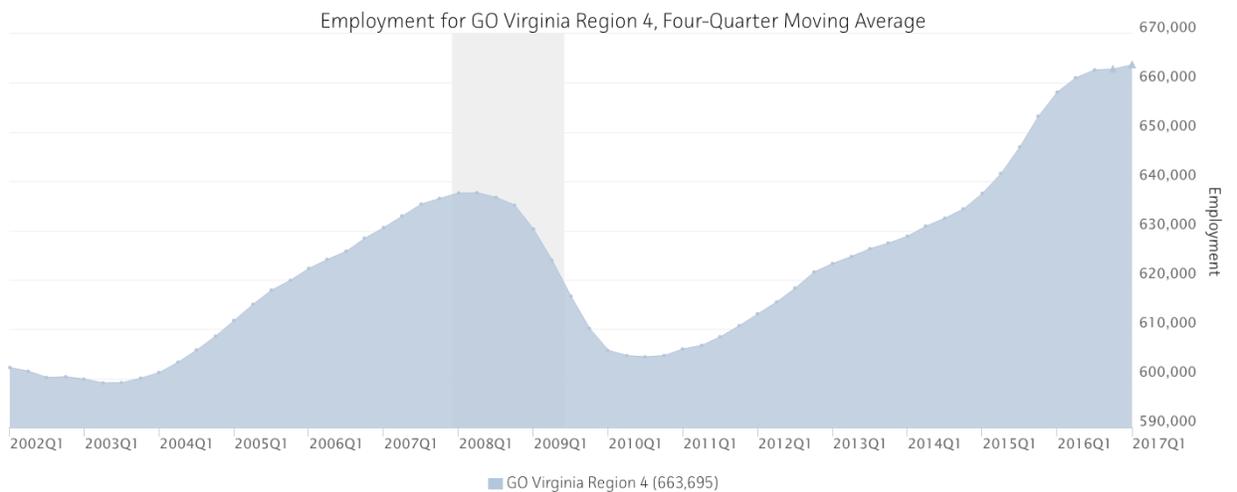
		Four Quarters Ending with 2017q1			Total Change over the Last 10 Years	Average Annual % Change in Employment 2007q1-2017q1		
NAICS	Industry	Empl	Avg. Annual Wages	Location Quotient	Empl	Region 4	Virginia	USA
54	Professional, Scientific, and Technical Services	42,948	\$78,314	0.98	6,037	1.50%	1.50%	1.50%
23	Construction	40,693	\$51,794	1.12	-8,595	-1.90%	-2.70%	-1.50%
92	Public Administration	40,170	\$59,253	1.27	1,716	0.40%	1.20%	0.10%
52	Finance and Insurance	39,299	\$79,061	1.49	866	0.20%	0.00%	-0.40%
81	Other Services (except Public Administration)	33,732	\$31,025	1.15	1,492	0.50%	0.60%	0.00%
31	Manufacturing	33,074	\$63,161	0.61	-10,101	-2.60%	-1.90%	-1.30%
48	Transportation and Warehousing	28,456	\$42,612	1.03	5,783	2.30%	0.60%	0.60%
42	Wholesale Trade	24,305	\$66,742	0.94	-936	-0.40%	-0.90%	-0.10%
55	Management of Companies and Enterprises	21,610	\$110,977	2.22	-2,630	-1.10%	-0.30%	2.30%
71	Arts, Entertainment, and Recreation	14,134	\$19,789	1.08	2,020	1.60%	1.10%	1.20%
53	Real Estate and Rental and Leasing	10,219	\$53,190	0.91	-278	-0.30%	-1.70%	-0.90%
51	Information	8,259	\$59,751	0.62	-4,497	-4.30%	-2.80%	-0.80%
22	Utilities	3,786	\$107,653	1.07	441	1.20%	0.20%	0.10%
11	Agriculture, Forestry, Fishing and Hunting	2,042	\$29,461	0.21	-234	-1.10%	-0.50%	0.10%
21	Mining, Quarrying, and Oil and Gas Extraction	379	\$59,921	0.14	-172	-3.70%	-4.90%	-0.60%
99	Unclassified	1,263	\$46,376	0.94	1,261	84.80%	12.60%	2.60%
	Total - All Industries	663,695	\$50,147	1	33,057	0.50%	0.30%	0.50%

Source: JobsEQ®

Labor Force

Region 4 began to experience employment declines associated with the Great Recession in the third quarter of 2008. The Great Recession, driven by a financial crisis and subprime mortgage crisis, hit Richmond particularly hard due to the strong finance presence regionally. Wachovia was perhaps the region's first big casualty to the financial crisis when it was bought by Wells Fargo in October 2008 after suffering losses related to toxic subprime mortgages. The closings of Circuit City, Qimonda, Reynolds, and LandAmerica soon followed. The employment declines advanced through the first quarter of 2010 and reached its trough in the third quarter of 2010 at a low of 604,634. Employment has grown at a steady pace through the first quarter of 2017, surpassing previous levels (second quarter of 2008) of peak employment in the second quarter of 2015 while the state surpassed its previous peak a quarter later in 2015Q3. Total employment in Region 4 has grown for 26 consecutive quarters, to 663,695 in the first quarter of 2017.

Figure 4: Region 4 Employment

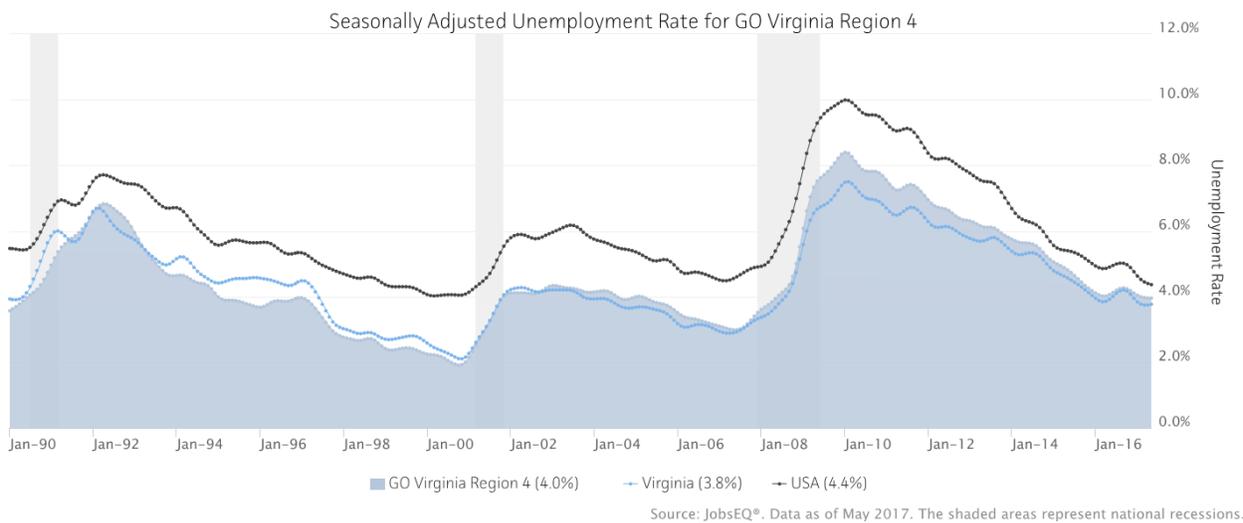


Source: JobsEQ®. Data as of 2017Q1. The shaded areas represent national recessions.

Leading up to the recession, the unemployment rate in the region was reliably around 0.1 percentage point above that of the state; however, the gap widened considerably in the recession. The recession's impact on finance, insurance, and real estate in the Richmond metro hit the region hard—in October 2009 Virginia's seasonally adjusted unemployment rate

reached 7.1%, while unemployment in Region 4 stood a full percentage point higher at 8.1%. The unemployment rate in Region 4 has declined considerably since the end of the Great Recession, remaining well below the national unemployment rate and just above the state unemployment rate. Unemployment peaked in the region at a seasonally adjusted rate of 8.4% in January 2010, and has fallen by more than half to 4.0% as of May 2017. In comparison, seasonally adjusted unemployment was 3.8% in Virginia and 4.4% in the nation in May 2017.

Figure 5: Region 4 Unemployment, Seasonally Adjusted



Labor force participation has been declining nationally for nearly two decades, due to an aging baby boomer generation and lower participation rates among other factors, but the labor force participation rate in Region 4 remains above the participation rates in the nation and on par with Virginia. The five-year average from 2011 through 2015 for the labor force participation rate in Region 4 is 66.2%, compared with 66.3% in Virginia and 63.7% in the nation.

Unsurprisingly, given greater access to jobs and younger populations relative to rural areas, localities with the highest labor force participation rates are centered around the metro area: Henrico (70.2%), Chesterfield (69.3%), Hanover (68.2%), New Kent (67.0%), and Richmond City (65.5%). The areas with the lowest labor force participation rates are Sussex (26.9%), Greenville (35.8%), Emporia City (56.9%), and Petersburg City (57.8%). Notably, labor force

participation rates increased between the 2010 estimates and 2015 estimates in Goochland, Powhatan, Hopewell City, and Richmond City.

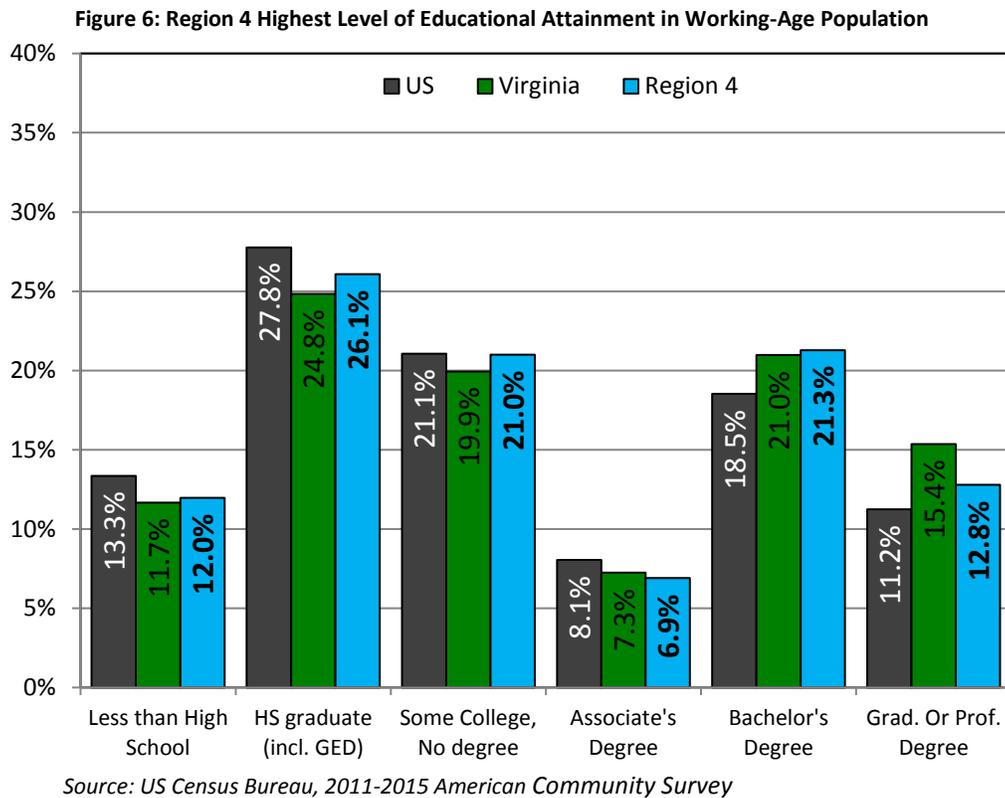
Table 6: Region 4 Labor Force Participation Rate

	LF Participation (06-10)	LF Participation (11-15)
United States	65.0%	63.7%
Virginia	67.4%	66.3%
Region 4	66.9%	66.2%
Charles City	62.8%	59.8%
Chesterfield	70.5%	69.3%
Dinwiddie	61.9%	61.6%
Goochland	45.3%	60.4%
Greensville	46.5%	35.8%
Hanover	70.0%	68.2%
Henrico	71.1%	70.2%
New Kent	67.2%	67.0%
Powhatan	47.8%	59.6%
Prince George	61.8%	57.9%
Surry	64.5%	63.0%
Sussex	57.6%	26.9%
Colonial Heights City	62.3%	61.1%
Emporia City	57.4%	56.9%
Hopewell City	60.3%	60.6%
Petersburg City	59.3%	57.8%
Richmond City	65.2%	65.5%

Source: US Census Bureau, 2006-2010 and 2011-2015 American Community Surveys

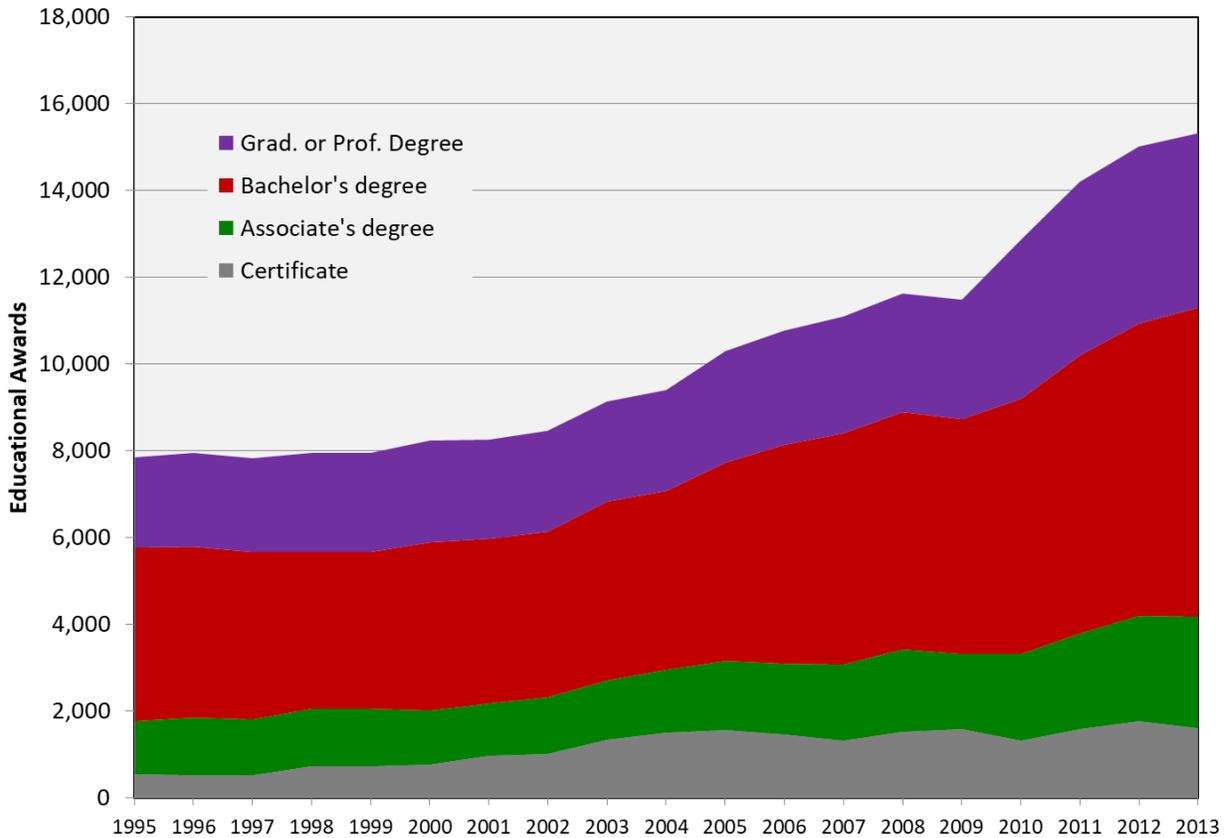
Overall, the Region 4 workforce is highly educated— a higher percentage of the working-age population within the region has a bachelor’s degree (21.3%) when compared with Virginia (21.0%) or the United States (18.5%). However, educational attainment for Region 4 is also above the Virginia rate in less than high school education (12.0%); high school (26.1%); and some college, no degree (21.0%). Educational attainment in the region is lagging the state in associate’s degrees (6.9%) and graduate or professional degrees (12.8%). In a comparison with peer regions by Richmond’s Future, the Richmond MSA ranks 3rd out of ten in population over

25 with at least a bachelor’s degree, but ranked 8th out of ten in terms of population with at least a high school degree.



Twenty-five institutions in Region 4 conferred a total of 15,668 awards in the 2014-2015 academic year, double the 7,845 awards conferred in 1995. The number of certificates has ballooned 214% over this period, from 552 in 1995 to 1,731 in 2015. Associate’s degrees have grown 103% from 1,221 in 1995 to 2,483 in 2015; while 11,454 bachelor’s degrees or higher were awarded in 2015. Despite this growth in awards, numerous regional, state, and national studies point to a “middle skills” gap of unfilled jobs that require more than a high school diploma but less than a 4-year degree.

Figure 7: Region 4 Degrees/ Awards Conferred by Institutions, 2014-2015



Source: US Dept. of Education, National Center for Education Statistics' (NCES) Integrated Postsecondary Education Data System (IPEDS)

Entrepreneurship Trends

Small business start-ups are an important source of job creation in a regional economy, spurring innovation and competition and driving productivity growth. Research from the National Bureau of Economic Research³ indicates that the age of a business matters more than the size for job creation—young firms are more volatile, showing higher rates of both job creation due to rapid growth as well as higher rates of job destruction due to failures and exit.

Jobs created by young companies (5 years old or less) contributed 24.0% of total job creation in Region 4 in 2015. Though this is a decrease from the 25.1% in 2010, the percent contribution of young firms to total jobs created has increased each year since 2011. In comparison, the

³ Who Creates Jobs? Small vs. Large vs. Young, <http://www.nber.org/papers/w16300.pdf>

percent contribution of job creation for young firms in Virginia increased from 22.6% in 2010 to 26.2% in 2015. The areas with the highest percentage contributions to job creation from young companies tend to have lower job creation totals: Charles City (45.4%), Emporia (33.5%), New Kent (33.2%), Sussex (32.4%), and Powhatan (29.4%). The areas with the lowest contributions from young companies are Dinwiddie (10.4%), Goochland (15.4%), Surry (17.8%), and Petersburg (20.1%).

Table 7: Region 4 Average Quarterly Young firm (5 yr. Young or less) job creation

	2000 Average	2010 Average	2015 Average	2000 as a % of Total	2010 as a % of Total	2015 as a % of Total
US	2,390,076	1,577,942	1,638,228	30.2%	26.4%	26.1%
Virginia	58,935	42,890	39,288	27.9%	22.6%	26.2%
Region 4	8,398	7,135	6,358	25.7%	25.1%	24.0%
Charles City	28	25	33	28.0%	25.4%	45.4%
Chesterfield	1,835	1,679	1,568	28.2%	27.3%	23.6%
Dinwiddie	123	64	51	35.8%	27.0%	10.4%
Goochland	99	128	83	23.7%	21.6%	15.4%
Greensville	27	16	20	23.5%	10.1%	22.4%
Hanover	788	670	596	27.4%	23.0%	23.9%
Henrico	2,276	2,058	2,041	21.2%	23.2%	24.1%
New Kent	93	92	69	39.9%	27.9%	33.2%
Powhatan	165	132	99	39.2%	40.1%	29.4%
Prince George	180	118	83	39.9%	31.4%	21.0%
Surry	24	11	25	25.7%	9.7%	17.8%
Sussex	62	37	40	22.7%	33.3%	32.4%
Colonial Heights City	153	141	99	29.1%	24.9%	24.9%
Emporia City	69	14	48	26.3%	2.9%	33.5%
Hopewell City	82	73	38	20.2%	21.6%	13.5%
Petersburg City	228	114	102	28.6%	18.4%	20.1%
Richmond City	2,166	1,765	1,364	26.8%	28.7%	26.5%

Source: US Census Bureau, LEHD, QWI

In all regions except Charles City, firms greater than 10 years old accounted for a majority of the job creation in 2015. On average, older firms accounted for 64.9% of jobs created in Region 4,

higher than the 62.3% contribution in both Virginia and the nation. As in the rest of job creation data, the average number of jobs created has been declining in Region 4 from 2000 to 2015.

Table 8: Region 4 Average quarterly older firm (greater than 10 yrs. old) job creation

	2000 Average	2010 Average	2015 Average	2000 as a % of Total	2010 as a % of Total	2015 as a % of Total
US	4,591,068	3,706,006	3,911,120	58.0%	62.0%	62.3%
Virginia	126,758	128,052	93,513	60.0%	67.3%	62.3%
Region 4	19,951	18,572	17,186	61.2%	65.3%	64.9%
Charles City	67	67	31	66.1%	66.8%	41.9%
Chesterfield	3,911	3,888	4,442	60.0%	63.2%	66.8%
Dinwiddie	196	155	422	56.8%	65.1%	86.2%
Goochland	273	396	418	65.4%	66.6%	77.6%
Greensville	77	137	58	67.3%	85.2%	63.7%
Hanover	1,744	1,992	1,575	60.7%	68.3%	63.1%
Henrico	6,625	5,920	5,432	61.8%	66.6%	64.1%
New Kent	79	212	109	33.9%	64.7%	52.5%
Powhatan	202	144	179	48.0%	43.6%	53.1%
Prince George	227	217	248	50.2%	57.8%	63.3%
Surry	50	93	106	53.5%	86.3%	76.6%
Sussex	183	65	74	67.7%	59.6%	60.1%
Colonial Heights city	332	369	272	63.1%	65.4%	68.4%
Emporia city	159	411	86	60.6%	85.8%	59.7%
Hopewell city	291	241	220	71.5%	71.8%	79.2%
Petersburg city	503	469	352	62.9%	75.6%	69.2%
Richmond city	5,034	3,798	3,164	62.4%	61.8%	61.5%

Source: US Census Bureau, LEHD, QWI

Jobs created by small companies contributed to 30.9% of job creation in Region 4 in 2015, below their average contributions in Virginia (36.4%), and in the United States (36.2%). However, the 2015 percentage contribution is an increase from 29.4% in both 2000 and 2010. Localities with the highest contributions from small companies are Charles City (75.9%), Powhatan (61.2%), New Kent (58.0%), Sussex (40.1%), and Emporia (39.4%). Localities with the lowest contributions from small companies include Dinwiddie (19.7%), Prince George (24.4%), Surry (26.6%), Henrico (27.5%), and Chesterfield (28.7%).

Table 9: Region 4 Average quarterly small firm (0-19 Emp.) job creation

	2000 Average	2010 Average	2015 Average	2000 as a % of Total	2010 as a % of Total	2015 as a % of Total
US	2,736,015	2,152,248	2,260,292	34.5%	36.0%	36.0%
Virginia	65,095	56,625	54,683	30.8%	29.8%	36.4%
Region 4	9,582	8,375	8,177	29.4%	29.4%	30.9%
Charles City	57	47	55	56.4%	47.2%	75.9%
Chesterfield	2,242	1,957	1,911	34.4%	31.8%	28.7%
Dinwiddie	138	122	96	40.1%	51.2%	19.7%
Goochland	171	213	156	40.8%	35.9%	28.9%
Greensville	43	32	26	38.0%	19.7%	29.1%
Hanover	1,034	954	878	36.0%	32.7%	35.2%
Henrico	2,310	2,220	2,331	21.6%	25.0%	27.5%
New Kent	119	144	121	51.1%	44.0%	58.0%
Powhatan	260	214	206	61.8%	65.0%	61.2%
Prince George	204	112	96	45.2%	29.9%	24.4%
Surry	35	24	37	37.4%	22.0%	26.6%
Sussex	68	53	50	25.0%	48.6%	40.1%
Colonial Heights city	168	163	144	31.9%	29.0%	36.0%
Emporia city	73	48	57	27.8%	9.9%	39.4%
Hopewell city	167	116	89	40.9%	34.6%	31.9%
Petersburg city	260	186	197	32.5%	29.9%	38.8%
Richmond city	2,236	1,772	1,730	27.7%	28.8%	33.6%

Source: US Census Bureau, LEHD, QWI

The number of workers that generate income from self-employment provides a broad measure of entrepreneurs, as well as people who are self-employed to earn money on the side, and those who start a business but have no desire to expand beyond one or two employees. A higher share of sole proprietors within total regional employment can indicate a population's greater willingness to take on risks of self-employment, fewer barriers to starting a business, the need for additional sources of income for workers with lower wage jobs, and/or an innovative environment.

Sole proprietorships accounted for 18.0% of total employment in Region 4, below the 19.9% in Virginia and 22.4% in the nation. However, growth in the number of proprietors in Region 4 has outpaced the state and the U.S. in all three comparison time periods (1996-2000, 2000-2010, 2010-2015). The localities with the highest percentage contributions from proprietors to total employment are New Kent (40.4%), Powhatan (31.2%), Charles City (25.5%), Chesterfield (21.9%), and Hanover (20.7%). Localities with the lowest contributions include Prince George + Hopewell (10.1%), Richmond City (13.4%), Greensville + Emporia (13.8%), and Henrico (17.8%).

Table 10: Proprietors as a percent of total employment: Region 4

	2015 Proprietors	Annual Growth (96-00)	Annual Growth (00-10)	Annual Growth (10-15)	Proprietors as a % of total employment
United States	42,561,400	1.8%	3.1%	2.1%	22.4%
Virginia	1,008,978	2.3%	3.3%	2.1%	19.9%
Region 4	147,080	3.1%	4.4%	2.3%	18.0%
Charles City	593	4.3%	-1.7%	1.9%	25.5%
Chesterfield	39,580	8.2%	4.9%	1.9%	21.9%
Dinwiddie, Colonial Heights + Petersburg, VA*	7,865	1.4%	2.9%	1.9%	18.6%
Goochland	3,657	23.3%	-4.5%	0.7%	18.7%
Greensville + Emporia, VA*	1,305	0.6%	2.2%	3.8%	13.8%
Hanover	14,071	3.1%	5.2%	1.6%	20.7%
Henrico	43,401	0.3%	8.1%	2.2%	17.8%
New Kent	3,036	-1.1%	8.4%	2.8%	40.4%
Powhatan	3,467	0.7%	-3.2%	0.9%	31.2%
Prince George + Hopewell, VA*	3,684	2.8%	1.9%	1.8%	10.1%
Richmond city	24,933	-1.5%	2.7%	4.4%	13.4%
Surry	599	3.5%	1.2%	-0.5%	18.3%
Sussex	889	-0.1%	1.8%	1.7%	17.9%

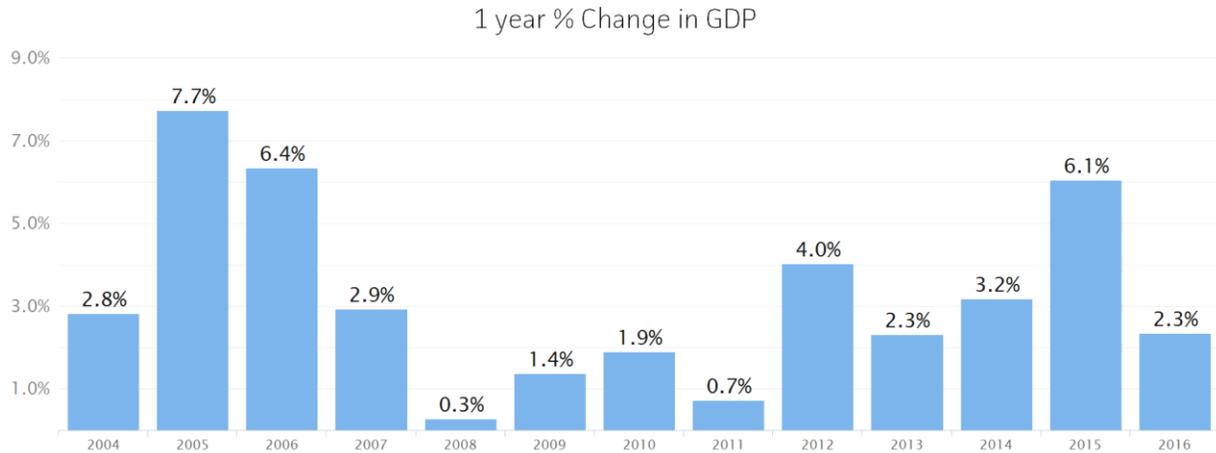
Source: US Bureau of Economic Analysis

GDP

Gross Domestic Product (GDP) is the total value of goods and services produced by a region, the broadest measure of economic performance. In 2016, nominal GDP in Region 4 expanded 2.3%. This follows growth of 6.1% in 2015. In Richmond's Future's comparison with peer regions, the

Richmond MSA was 4th out of ten in overall real GDP growth, and 9th out of ten between 2000 and 2010. As of 2016, total GDP in Region 4 was \$76.9 billion.

Figure 8: Change in GDP in Region 4



Gross Domestic Product data are provided by the Bureau of Economic Analysis, imputed by Chmura where necessary, updated through 2016.

Of the major sectors in Region 4, real estate and rental and leasing contributed the largest portion of GDP in 2016, \$10.6 billion. The next-largest contributions came from manufacturing (\$8.2 billion); health care and social assistance (\$7.3 billion); and finance and insurance (\$6.7 billion).

Figure 9: GDP in Region 4

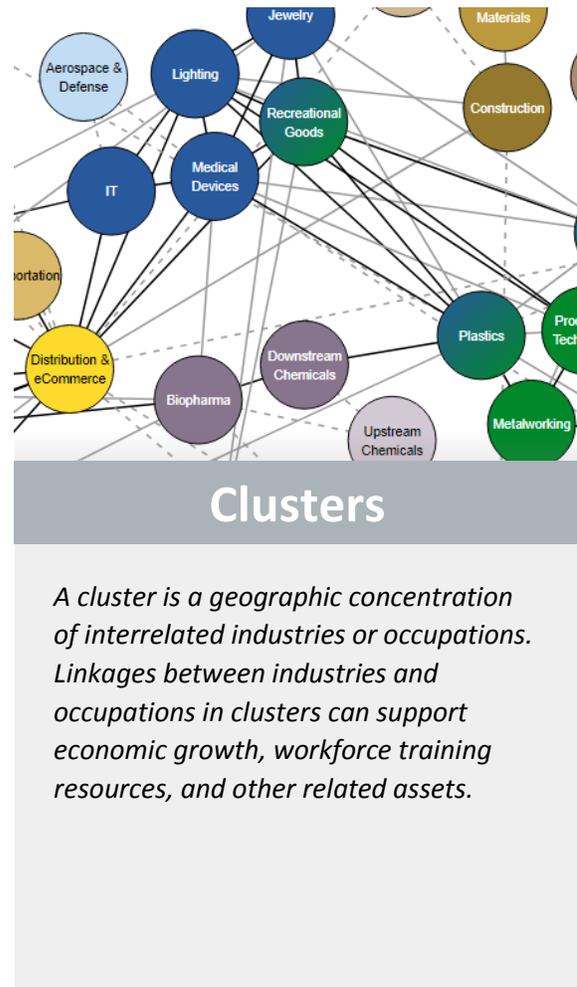


Gross Domestic Product data are provided by the Bureau of Economic Analysis, imputed by Chmura where necessary, updated through 2016.

INDUSTRY CLUSTERS IN REGION 4

Cluster Analysis

There have been many reports produced examining the major industry clusters in the region. A cluster is a geographic concentration of interrelated industries or occupations. Analysis and reports for the Greater Richmond Partnership, Richmond's Future, the Crater Workforce Development Area, the Capital Workforce Development Area, and the Virginia Economic Development Partnership have identified approximately 40 clusters. However, there is significant overlap in the definitions of the various clusters. The list of clusters to be examined in this plan was narrowed to remove overlapping industries where possible to get the most specific definitions and identify regional drivers. However, some overlap in definitions remains as industries could potentially serve multiple clusters. This process resulted in the following clusters (definitions by NAICS codes are included in the appendix):



- Logistics, Warehousing, and Distribution
- Construction
- Professional Services
- Financial Services
- Creative Services
- Information Technology and Communications
- BioScience/ Life Sciences
- Energy
- Management of Companies and Enterprises
- Chemicals
- Arts and Entertainment
- Printing and Publishing
- Education and Knowledge
- Glass and Ceramics
- Mining
- Advanced Materials
- Food and Beverage
- Defense and Security

The bioscience/ life sciences cluster is the largest cluster by employment at the regional level, with an estimated 70,573 workers in 2016. The next largest clusters are energy (51,556 workers); defense and security (50,759); and Information Technology and Communications (42,953). High location quotients (LQs) represent sectors in which a region has high concentrations of employment compared to the national average. An LQ above 1.25 suggests a competitive advantage—given the concentration of industries in the region, it is easier to attract additional firms. The highest location quotients for clusters across Region 4 are in management of companies and enterprises (LQ=2.23) and financial services (LQ=1.48).

Table 11: Region 4 Clusters

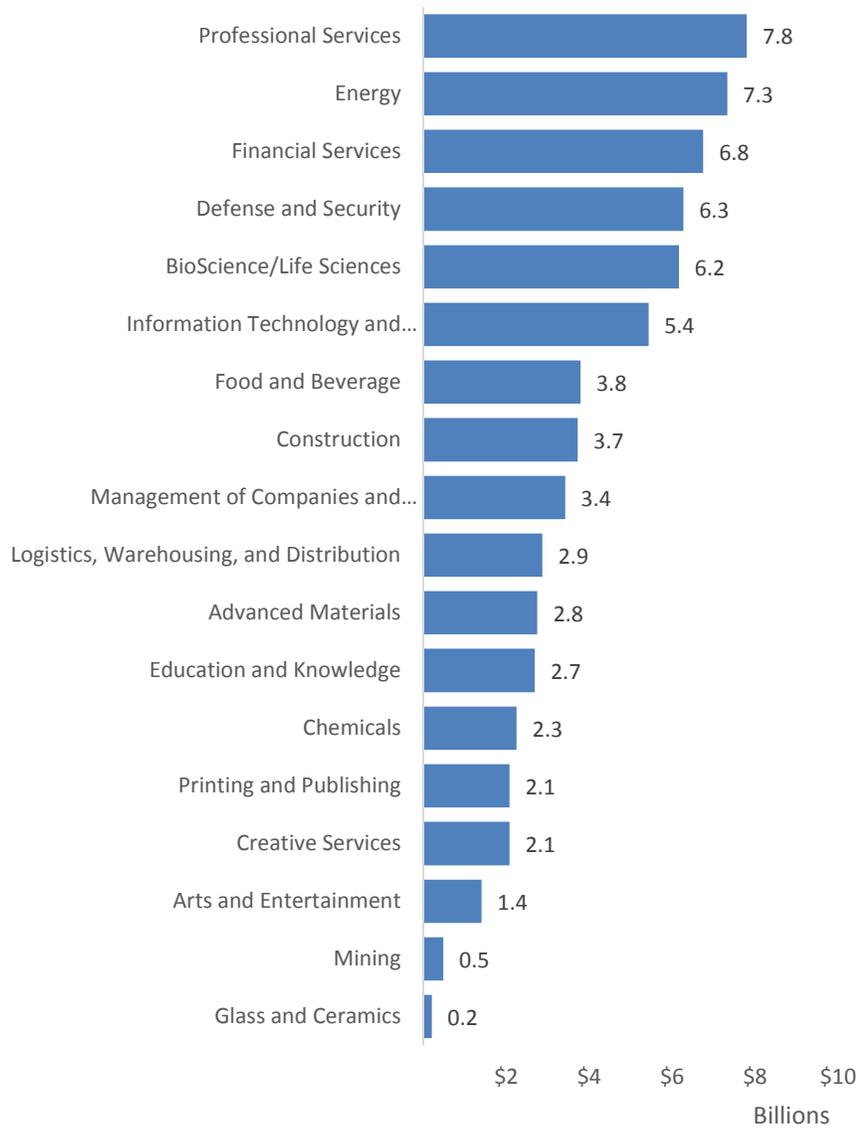
Cluster	Four Quarters Ending with 2016q4			Total Change over the Last 10 Years	Average Annual % Change in Employment 2006q4-2016q4
	Empl	Avg. Annual Wages	Location Quotient	Employment	Region 4
BioScience/ Life Sciences	70,573	\$51,788	0.93	12,550	2.0%
Energy	51,556	\$68,207	0.95	1,772	0.4%
Defense and Security	50,759	\$64,121	1.13	4,916	1.0%
Information Technology and Communications	42,953	\$71,638	0.88	-1,796	-0.4%
Construction	40,541	\$50,911	1.12	-8,591	-1.9%
Financial Services	39,273	\$80,932	1.48	602	0.2%
Logistics, Warehousing, and Distribution	32,866	\$46,399	1.04	7,773	2.7%
Professional Services	32,855	\$72,894	0.91	-1,604	-0.5%
Arts and Entertainment	24,683	\$25,758	0.84	1,861	0.8%
Education and Knowledge	23,732	\$48,547	1.00	-522	-0.2%
Management of Companies and Enterprises	21,547	\$113,422	2.23	-2,467	-1.1%
Advanced Materials	20,238	\$74,594	0.54	-3,697	-1.7%
Printing and Publishing	19,671	\$59,700	0.85	-86	0.0%
Creative Services	18,820	\$80,636	0.99	3,781	2.3%
Chemicals	8,128	\$77,315	0.87	-3,357	-3.4%
Food and Beverage	6,802	\$53,962	0.92	-936	-1.3%
Mining	1,705	\$70,337	0.52	61	0.4%
Glass and Ceramics	1,328	\$61,625	0.53	-347	-2.3%
Total - All Industries	662,818	\$49,912	1.00	34,324	0.5%

Source: JobsEQ®

GDP Contribution

As of 2016, total Gross Domestic Product (GDP) in Region 4 was \$76.9 billion. Measuring the total value of goods and services produced by clusters in Region 4 provides a broad measure of contribution to economic performance. Of the clusters identified in Region 4, professional services contributed the largest portion of GDP in 2016, \$7.8 billion. The next-largest contributions came from energy (\$7.3 billion); financial services (\$6.8 billion); defense and security (\$6.3 billion); and bioscience/ life sciences (\$6.2 billion).

Figure 10: Region 4 GDP Contribution by Cluster, 2016



Historical Drivers

A shift-share analysis is conducted for each cluster to identify drivers of regional employment change. Shift-share analysis sheds light on factors underlying regional employment growth by breaking total employment change for a given period into three components:

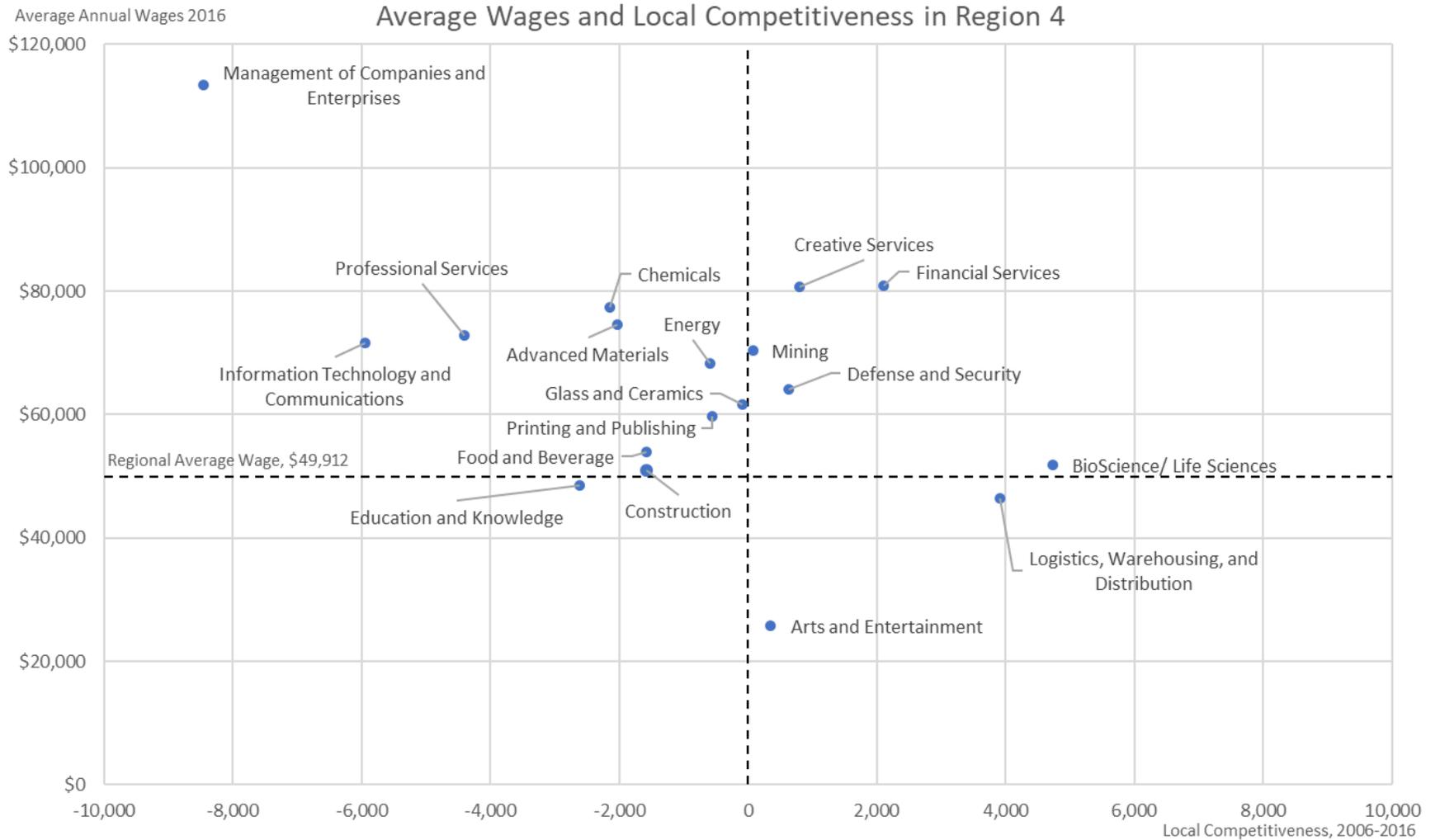
- *National Growth* is due to the overall growth or contraction in the national economy
- *Industry Mix Share* is attributable to the specific industries or clusters being examined based on national industry growth and the industry mix of the region
- *Local Competitiveness* is the remaining growth or contraction that is attributable to regional factors. A positive number here indicates a productive advantage in this industry that may be due to superior technology, management, labor pool, etc.

Shift-share analysis is dependent on the job growth over time, and thus can change depending on the time period selected. The time period for this analysis is the last ten years (2006-2016). This allows for analysis of long term trends and incorporates time before, during and after the Great Recession (2007-2009).

The results of this analysis are summarized in Figure 11 below. The average annual wages in 2016 for each cluster are shown on the vertical axis and the local competitiveness component (number of jobs gained or lost attributable to regional factors) for the reference period is shown on the horizontal axis. The chart is divided into four quadrants by lines marking the regional average annual wage per worker in 2016 (\$49,912) and local competitiveness of zero.

Clusters that appear in the upper right quadrant (high wage, high local competitiveness) represent industries that pay a high average annual wage and have grown faster than the national industrial average over the last ten years. These industries represent a demonstrated regional competitive advantage. Creative Services benefitted from national growth in computer systems design and related services, but was primarily driven by advertising and public relations services as well as architectural, engineering, and related services.

Figure 11



Source: JobsEQ

Competitive growth in financial services was driven by non-depository credit intermediation, which includes employers such as Capital One and SunTrust, and by agencies, brokerages, and other insurance related activities, which includes employers such as Genworth and Allianz. Fort Lee in Prince George County and the Defense Supply Center Richmond in Chesterfield County, with missions centered around defense logistics and supply chain management, account for much of the growth in the defense and security cluster.

The upper left quadrant (high wages, negative local competitiveness) contains the largest number of clusters, and closings and reductions in these clusters during the recession offers an explanation for the slowdown in regional wage growth. These high-paying industries are not growing as quickly regionally as they are on average in the nation, or in fact may be declining faster regionally than nationally. Low local competitiveness could be due to several factors (technology, labor pool, etc.), but there may be reason for some concern for the region if employers in these clusters could be more competitive elsewhere and choose to relocate.

In the recession period, several closings and reductions in jobs in the high paying clusters negatively affected wages in the region. In the management of companies and enterprises cluster, Wachovia Securities cut 2,000 jobs in 2007, and more than 2,000 more jobs were lost due to the closings of Circuit City Stores' headquarters and LandAmerica Financial Group's headquarters. In the professional service cluster, wired telecommunications carriers, with average annual wages of \$83,753 in 2016, led employment declines overall and accounting for local competitiveness over the past 10 years. Semiconductor manufacturer Qimonda's closing in 2009 accounts for much of the decline in the advanced materials cluster. The cluster was also negatively impacted by the closings of Rehrig International and Berry Plastics in plastics product manufacturing, and Reynolds Wrap in aluminum manufacturing.

Though the information technology and communications cluster grew in Virginia and the nation, employment declined in Region 4, driving the local competitiveness factor negative. The largest losses were in wired telecommunications carriers; building equipment contractors; and data processing, hosting, and related services.

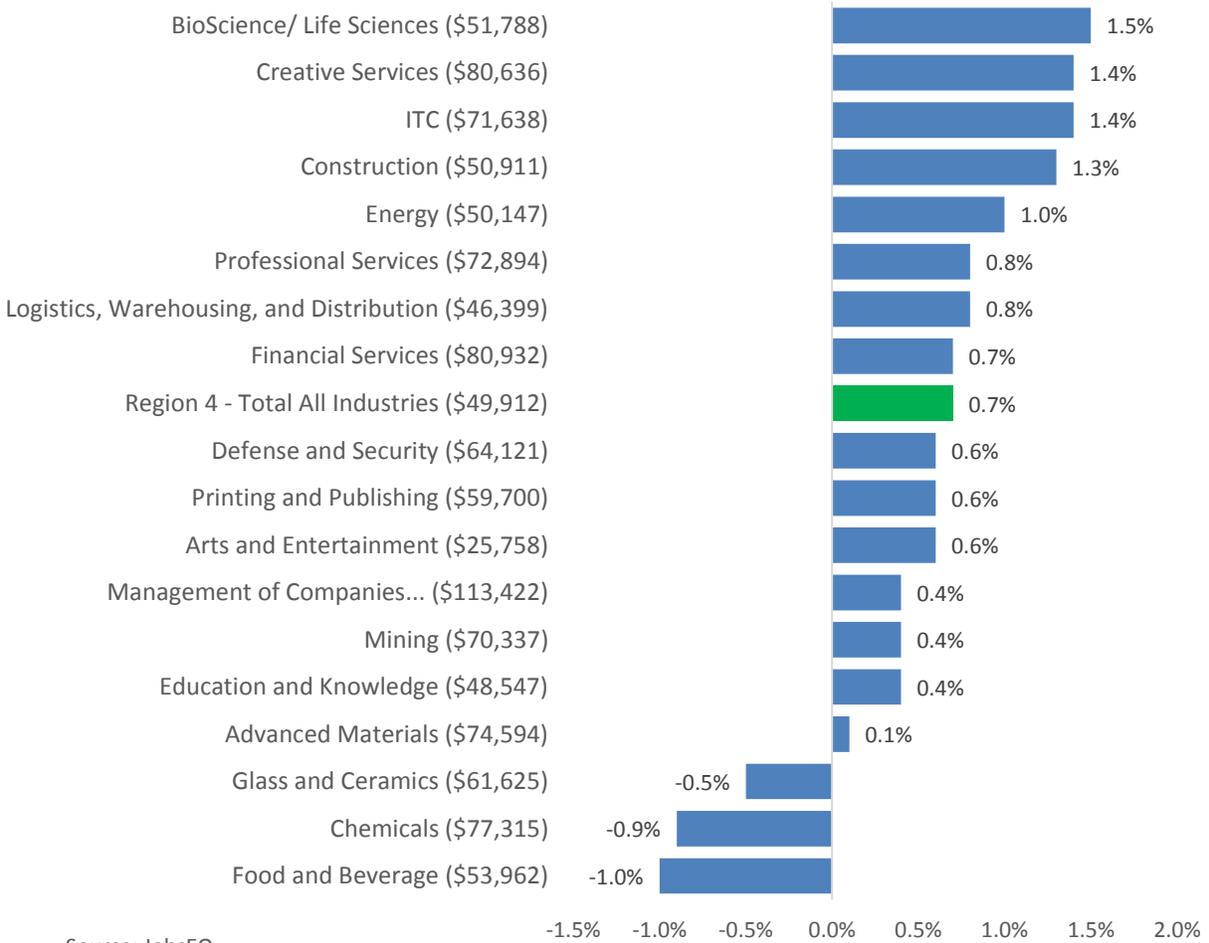
The lower right quadrant (low wages, high local competitiveness) offers further explanation for slower wage growth in the region over the last ten years. The two clusters in this quadrant—logistics, warehousing, and distribution and arts and entertainment—have outperformed what would be expected based on national industry growth and overall U.S. growth; however, wage growth has been slowed by growth in these clusters with below-average wages. The logistics, warehousing, and distribution cluster was dominated by growth in warehousing and storage industries, with an average wage of \$30,176. In the arts and entertainment sector, other amusement and recreation industries (with average wages of \$17,156) such as fitness centers accounted for much of the cluster’s local competitive growth.

The lower left quadrant (low wages, low local competitiveness) is the least interesting of the four for promoting high-growth high-wage jobs, and contains only one cluster just below the regional average wage. Job declines in the education and knowledge sector were driven by junior colleges such as ITT Technical Institute, as well as newspaper, periodical, book, and directory publishers.

Projected Growth

While shift-share analysis can give insight into past changes, it alone should not be used to infer future trends. Figure 12 below shows forecasted growth in employment over the next ten years for each cluster. Overall, employment in Region 4 across all industries is expected to grow at an annual average rate of 0.7% between 2017 and 2027. Eight of the clusters are forecast to grow at least as quickly as the regional average, led by bioscience/ life sciences (1.5%). Creative services and information technology and communications (ITC) are both expected to grow at an average annual rate of 1.4%, twice as quickly as the region as a whole. Seven of these eight fastest growing clusters also have average wages in 2016 greater than the regional average wage—only logistics, warehousing, and distribution has below-average wages.

Figure 12: Region 4 Clusters Average Annual Growth Forecast 2017Q1-2027Q1



Three clusters have negative growth forecasts over the next ten years. The fastest projected decline is in the food and beverage cluster, at an average annual rate of -1.0%. All three of the clusters forecast to decline have average annual wages higher than the regional average for all industries.

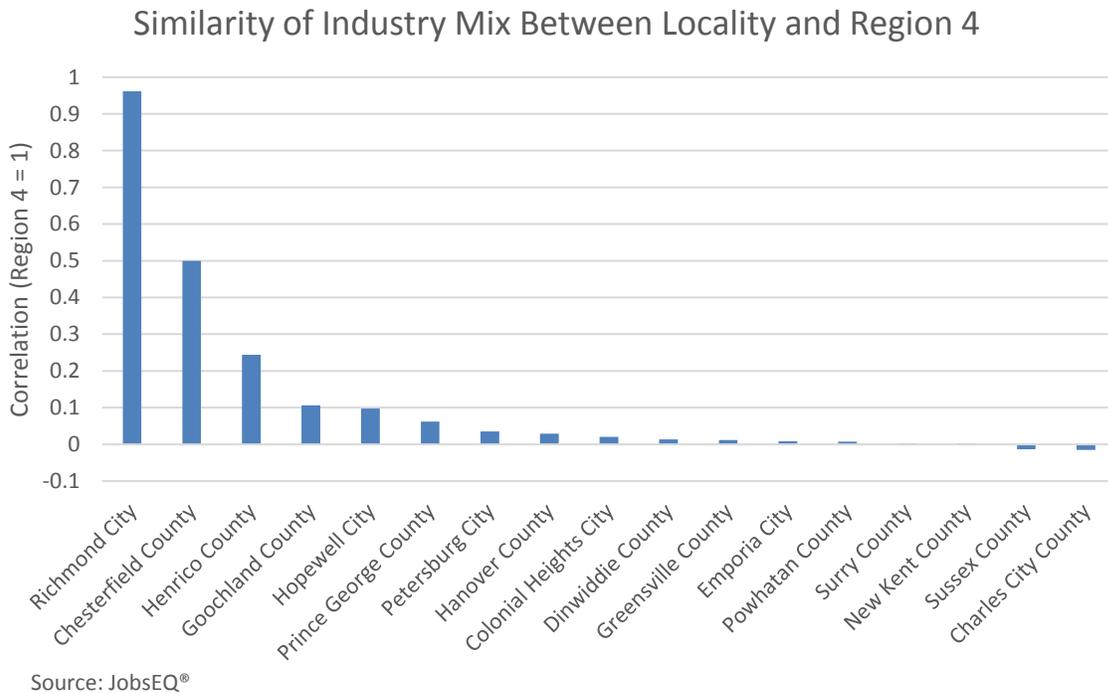
Intraregional Differences

Region 4 is a large geographic region with some significant variation between localities, while the metro area tends to dominate analysis of economic drivers due to the significantly larger economic base. It is unreasonable to expect that all clusters identified at the regional level will

apply to every locality, or that clusters that appear relatively small in the region as a whole are unimportant for some localities.

Richmond city and the two counties surrounding it have the closest industry mix to Region 4. Figure 13 below compares the similarity of the location quotient for each 4-digit NAICS industry in a locality with the LQ of the region overall. It is clear that the mix of industries in Richmond city, and to a lesser extent Chesterfield and Henrico, parallels the mix in Region 4; however, the similarities quickly drop for localities further removed from the metro center.

Figure 13



Analysis at an intraregional level can identify potential selective bets on clusters to support all parts of Region 4. The location quotient and average annual wages for each cluster were compiled for every locality in Region 4. These data were filtered for location quotients above 1.25, a general threshold indicating a competitive advantage for a region, and for clusters with average annual wages above the average annual wage for the locality.

The results of this analysis are shown in Table 12 below. For example, while wages in the logistics, warehousing, and distribution cluster for the region overall are generally below the average wages, the cluster's average wage of \$48,903 in Charles City is above the county's average wage for all industries (\$40,957), and the cluster's location quotient indicates it is more than twice as concentrated in the county's industry mix as those industries are nationwide; this suggests investment to expand the high-paying jobs in this cluster in Charles City could be an important part of a strategy to raise wages in the county. On the other hand, though animal slaughtering and processing is a relatively large industry within Greenville that could support the food and beverage cluster, it will not show in this table because the average wages of \$26,425 are well below the average wage for all industries in Greenville of \$37,242. Potential investment to support this cluster in Greenville should be sure to address strategies for higher wages.

Table 12: Sub-Regional High-LQ, High-Wage Clusters

Cluster	Locality	LQ	Average Annual Wages
Logistics, Warehousing, and Distribution	Charles City	2.71	\$48,903
Creative Services	Henrico	1.30	\$86,684
Construction	Charles City	2.30	\$53,404
	Chesterfield	1.41	\$52,135
	Hanover	1.91	\$48,999
	New Kent	4.15	\$48,133
	Powhatan	3.29	\$44,404
Energy	Charles City	1.44	\$64,345
	Surry	4.87	\$188,488
Management of Companies and Enterprises	Goochland	7.62	\$136,686
	Hanover	1.36	\$100,232
	Henrico	2.76	\$97,165
	Richmond City	3.82	\$124,120
Financial Services	Henrico	2.28	\$86,056
Chemicals	Chesterfield	1.66	\$78,014
	Dinwiddie	1.57	\$53,339
	Hopewell	15.01	\$90,484
Printing and Publishing	Charles City	1.34	\$54,729
Glass and Ceramics	Dinwiddie	4.68	\$50,716
	Hanover	1.32	\$120,988
	Sussex	5.38	\$52,657
	Petersburg	1.31	\$48,327
Mining	Charles City	2.70	\$51,661
	Sussex	3.31	\$58,840
Advanced Materials	Hopewell	1.38	\$83,959
Food and Beverage	Surry	3.59	\$73,009
Defense and Security	Powhatan	2.49	\$49,061
	Prince George	4.21	\$73,422
	Sussex	3.04	\$40,935
Professional Services	Henrico	1.28	\$71,789

Suggested Prioritization

Based on the above analysis the BioScience/ Life Sciences; Energy; Financial Services, and Logistics, Warehousing, and Distribution clusters have performed well historically, are significant drivers of employment growth and contributors to GDP, and have faster forecast growth over the next ten years than the regional average. Of these four, only Logistics, Warehousing and Distribution has below-average wages in the region, but growth in this cluster has the potential to raise wages at multiple skills levels from entry-level job openings and increased labor force participation to openings at the Ph.D. level in the research institutions in the region.

Defense and Security contributes significantly to region GDP, had high local competitiveness between 2006 and 2016, and pays above the regional average wage, but is forecast to grow at a slightly lower rate than the regional average across all industries. GO Virginia Region 4 project proposals could focus on areas to improve the growth forecast in this cluster.

Creative Services is a relatively smaller cluster in terms of GDP contribution in the region, but competed well locally over the last ten years, has high wages, a strong growth forecast over the next ten years, and is increasingly being used as a distinguisher of the RVA brand. The cluster could be a good bet, especially in conjunction with Information Technology and Communications throughout the region, to encourage innovation and entrepreneurship, attract and retain talent, and raise regional wages.

Advanced Materials, Glass and Ceramics, Chemicals, and Food and Beverage are significant historical drivers but are forecast to grow below-average or decline over the next ten years. These may represent areas for Region 4 projects to emphasize how they could flip this negative growth forecast regionally. Additionally, while these clusters may not represent the top priority for region-wide strategies, they may still be important employers for some localities. Proposed projects within these localities tied to these clusters can help ensure all parts of Region 4 benefit from GO Virginia.

WORKFORCE SKILLS AND JOB GAPS

This section details immediate and potential gaps in occupations that support clusters identified in the previous section as well as across industries in the region. Current demand is based on Real-Time Intelligence (RTI) gathered and analyzed by Chmura Economics & Analytics from online job postings. Long-term needs and gaps are based on JobsEQ analytics. Some of the prominent state and regional efforts to close gaps are summarized.

Skills Gaps

Skill gaps that are negatively impacting employers in the region must first be identified to implement programs to close them. Job openings identify an immediate skills gap for employers and opportunities for job seekers. Large numbers of job postings for individual occupations suggest an apparent skills gap as many businesses need the same skills. As shown in the table below, retail salespersons and first-line supervisors of retail sales workers top the list of jobs posted online in Region 4.⁴ The top three occupations by online job posting count typically do not require postsecondary education. Occupations with a high job post count that typically require at least a postsecondary non-degree award (such as an industry-recognized credential) are primarily in healthcare (registered nurses; medical and health services managers); logistics, warehousing, and distribution (heavy and tractor-trailer truck drivers), and information technology (applications software developers; network and computer systems administrators).

⁴ Counts of unique job postings may not equate with actual job demand. For example, job postings may be placed in anticipation of possible openings that do not materialize. Moreover, slight variations of ads may be placed such that the number of ads exceeds the actual number of openings.

Table 13: Region 4 Job Postings for Top 20 Occupations, June-July 2017

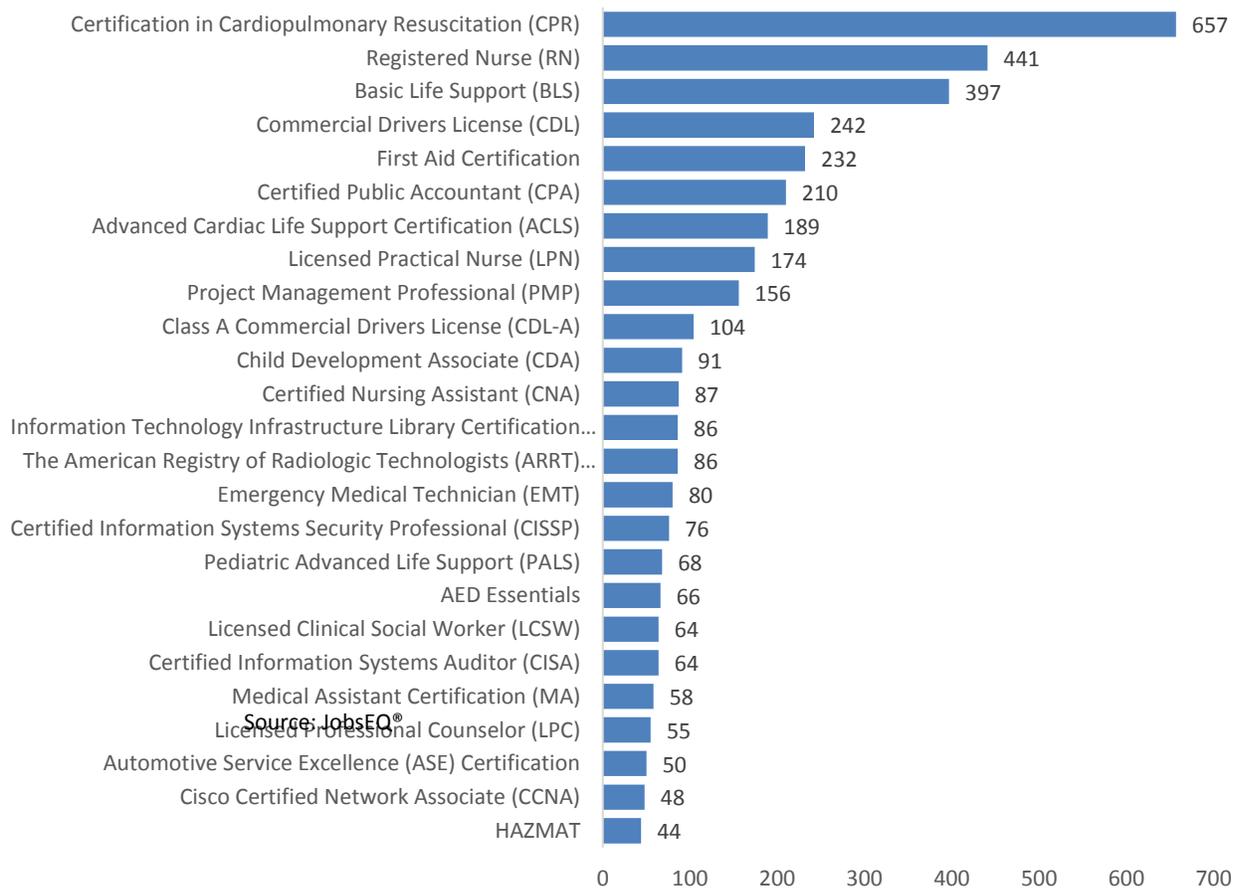
SOC	Occupation	Typical Entry-Level Education	Number
41-2031	Retail Salespersons	Less than high school	1,507
41-1011	First-Line Supervisors of Retail Sales Workers	High school diploma or equivalent	1,327
41-3099	Sales Representatives, Services, All Other	High school diploma or equivalent	1,083
29-1141	Registered Nurses	Bachelor's degree	913
15-1151	Computer User Support Specialists	Some college, no degree	879
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	Less than high school	697
53-3032	Heavy and Tractor-Trailer Truck Drivers	Postsecondary non-degree award	620
43-4051	Customer Service Representatives	High school diploma or equivalent	584
49-9071	Maintenance and Repair Workers, General	High school diploma or equivalent	583
11-9111	Medical and Health Services Managers	Bachelor's degree	562
15-1132	Software Developers, Applications	Bachelor's degree	538
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	High school diploma or equivalent	523
13-1111	Management Analysts	Bachelor's degree	522
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	High school diploma or equivalent	460
43-5081	Stock Clerks, Sales Floor	Less than high school	420
15-1142	Network and Computer Systems Administrators	Bachelor's degree	402
11-2021	Marketing Managers	Bachelor's degree	374
11-3031	Financial Managers, Branch or Department	Bachelor's degree	371
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	Less than high school	358
13-1071	Human Resources Specialists	Bachelor's degree	338

Source: JobsEQ®

Certifications requested in the text of online job postings primarily support the healthcare sector. Cardiopulmonary Resuscitation (CPR), registered nurse, and basic life support top the list of the top 25 certifications requested in job ads over this 30-day period—overall, 15 of the top 25 certifications are related to healthcare. Supporting the logistics, warehousing, and

distribution cluster, Commercial Driver’s License (CDL) was the 4th most requested certification (242 postings), and Class A CDL appeared in 104 posts. Five certifications in the top 25 support the information technology and communications cluster, including Project Management Professional (PMP), Information Technology Infrastructure Library Certification (ITIL), and Certified Information Systems Security Professional (CISSP). The Certified Information Systems Auditor certification supports both IT and the financial services cluster; Certified Public Accountant and Certified Internal Auditor are also requested in job postings from the financial services cluster.

Figure 14: Region 4 Openings by Certifications, June-July 2017



Source: JobEQ®

Skills and occupations that are in demand today may not be in demand in the months or years ahead when a student finishes a training program or education. For that reason, long-term gaps need to be considered in conjunction with current needs.

The approach taken here is to identify the apparent long-term skills gaps based on the total annual demand created from growth in industries needing the occupation as well as from positions that need to be filled because individuals are retiring or moving to a different occupation. In this case, a shortage of qualified workers could potentially occur if individuals are not being trained or educated to fill the openings.

The potential supply shortfall or gap is an underlying force that the labor market will resolve in one way or another, such as by employers recruiting from further distances for these occupations, wages going up to attract more candidates, and demand and wages both enticing more residents to get training for this occupation.

Over the next 10 years, the fastest growing occupation group in Region 4 is expected to be healthcare support occupations with a 2.1% year-over-year rate of growth. The occupation groups with the strongest projected growth in terms of the number of jobs expected to be added over this period are healthcare practitioners and technical occupations (+6,676 jobs) and construction and extraction occupations (+4,033). Over the same period, the highest replacement demand (occupation demand due to retirements and workers moving from one occupation to another) is expected in office and administrative support occupations (23,567 jobs) and sales and related occupations (22,509). Of particular note for replacement demand, more than half of the workforce is age 45 through 64 years old and nearing retirement in the utilities and manufacturing sectors.

Table 14: Region 4 Forecast Growth by Major Occupation

SOC	Title	Four Quarters Ending 2017q1	Forecast Over the Next 10 Years			
		Employment	Total Repl Demand	Total Growth Demand	Total Demand	Avg. Annual Growth Percent
31-0000	Healthcare Support Occupations	16,305	3,718	3,746	7,464	2.1%
29-0000	Healthcare Practitioners and Technical Occupations	39,723	9,016	6,676	15,692	1.6%
39-0000	Personal Care and Service Occupations	26,058	7,314	3,631	10,945	1.3%
47-0000	Construction and Extraction Occupations	30,814	5,799	4,033	9,832	1.2%
15-0000	Computer and Mathematical Occupations	20,646	3,222	2,719	5,941	1.2%
21-0000	Community and Social Service Occupations	14,137	3,190	1,517	4,707	1.0%
13-0000	Business and Financial Operations Occupations	44,975	10,342	3,707	14,049	0.8%
25-0000	Education, Training, and Library Occupations	36,989	8,014	3,190	11,204	0.8%
11-0000	Management Occupations	33,377	10,436	2,481	12,917	0.7%
49-0000	Installation, Maintenance, and Repair Occupations	25,536	6,405	1,865	8,270	0.7%
37-0000	Building and Grounds Cleaning and Maintenance Occupations	23,608	5,447	1,635	7,082	0.7%
35-0000	Food Preparation and Serving Related Occupations	53,176	20,654	3,371	24,025	0.6%
19-0000	Life, Physical, and Social Science Occupations	5,516	1,751	366	2,117	0.6%
41-0000	Sales and Related Occupations	69,436	22,509	3,811	26,320	0.5%
53-0000	Transportation and Material Moving Occupations	44,572	11,668	2,162	13,830	0.5%
23-0000	Legal Occupations	6,898	1,383	381	1,764	0.5%
27-0000	Arts, Design, Entertainment, Sports, and Media Occupations	10,510	3,647	421	4,068	0.4%
17-0000	Architecture and Engineering Occupations	9,211	2,358	396	2,754	0.4%
43-0000	Office and Administrative Support Occupations	104,235	23,567	2,851	26,418	0.3%
33-0000	Protective Service Occupations	17,141	4,121	579	4,700	0.3%
51-0000	Production Occupations	29,712	7,877	-862	7,015	-0.3%
45-0000	Farming, Fishing, and Forestry Occupations	1,123	422	-49	373	-0.4%
00-0000	Total - All Occupations	663,695	172,859	48,629	221,488	0.7%

Source: [JobsEQ®](#)

Data as of 2017Q1

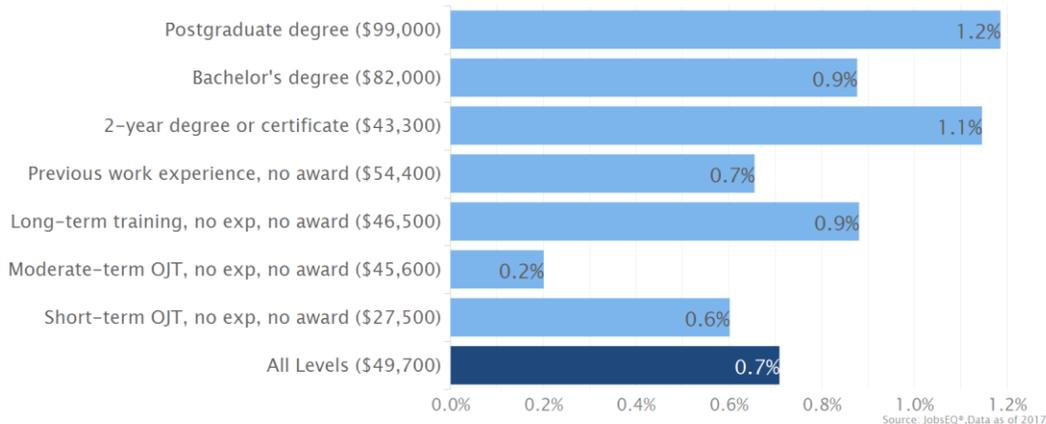
Note: Figures may not sum due to rounding.

Occupation employment data are estimated via industry employment data and the estimated industry/occupation mix. Industry employment data are derived from the Quarterly Census of Employment and Wages, provided by the Bureau of Labor Statistics and currently updated through 2016Q3, imputed where necessary with preliminary estimates updated to 2017Q1. Forecast employment growth uses national projections from the Bureau of Labor Statistics adapted for regional growth patterns.

Expected growth rates for occupations vary by the education and training required. While all employment in Region 4 is projected to grow at an average annual rate of 0.7% over the next ten years, occupations typically requiring a postgraduate degree are expected to grow 1.2% per year, those requiring a bachelor’s degree are forecast to grow 0.9% per year, and occupations

typically needing a 2-year degree or certificate are expected to grow 1.1% per year. The high growth forecast for 2-year degrees or certificates is consistent with numerous other studies of Virginia’s economy that have found a current and growing “middle skills” gap of jobs that typically require more than a high school diploma but not a four-year degree.

Figure 15: Annual Average Projected Job Growth by Training Required for Region 4



Employment by occupation data are estimates as of 2017Q1. Education levels of occupations are based on BLS assignments. Forecast employment growth uses national projections from the Bureau of Labor Statistics adapted for regional growth patterns.

Among occupations at the detailed level in Region 4, the largest projected potential shortfalls are for retail salespersons; cashiers; and combined food preparation and serving workers, including fast food workers. For these occupations, which typically do not require a formal educational credential for entry, there is a potential annual supply gap of at least 600 workers per occupation over the next decade. Waiters and waitresses had the fourth largest potential annual supply gap over this period at 579, followed by registered nurses (543); customer service representatives (505) and laborers and freight, stock, and material, movers, hand (448).

Most of the detailed occupations with the largest projected potential shortfalls have annual average wages below the regional average. Only two of the top ten have above-average wages—registered nurses; and accountants and auditors. Out of the 50 occupations with more than 100 annual openings projected, 16 occupations have above-average wages, and most of those sixteen typically require at least a bachelor’s degree to enter.

Table 15: Potential Occupation Gaps over 10 Years in Region 4: Occupations with Total Annual Demand > 100

SOC	Title	Typical Education Need For Entry	Current Employment 2017Q1	Avg. Annual Wages 2016	Annual Growth Demand	Annual Repl Demand	Total Annual Demand/Potential Supply Gap
41-2031	Retail Salespersons	Less than high school	18,779	\$25,700	692	160	852
41-2011	Cashiers	Less than high school	16,592	\$20,200	729	36	765
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	Less than high school	14,020	\$19,300	472	136	607
35-3031	Waiters and Waitresses	Less than high school	11,112	\$23,000	551	28	579
29-1141	Registered Nurses	Bachelor's degree	13,722	\$66,900	325	218	543
43-4051	Customer Service Representatives	High school diploma or equivalent	13,208	\$34,600	355	150	505
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	Less than high school	11,779	\$29,000	383	65	448
43-5081	Stock Clerks and Order Fillers	Less than high school	9,611	\$26,300	332	58	390
43-9061	Office Clerks, General	High school diploma or equivalent	15,120	\$31,200	331	44	375
13-2011	Accountants and Auditors	Bachelor's degree	7,311	\$78,000	217	82	299
11-1021	General and Operations Managers	Bachelor's degree	8,528	\$127,200	229	62	291
31-1014	Nursing Assistants	Postsecondary non-degree award	6,455	\$26,200	150	128	278
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	Less than high school	10,632	\$24,400	216	60	276
39-9021	Personal Care Aides	Less than high school	7,480	\$19,400	85	190	275
11-9199	Managers, All Other	Bachelor's degree	3,678	\$110,900	225	32	258
47-2061	Construction Laborers	Less than high school	5,285	\$29,400	140	86	226
53-3032	Heavy and Tractor-Trailer Truck Drivers	Postsecondary non-degree award	8,677	\$42,100	164	56	220
35-2014	Cooks, Restaurant	Less than high school	4,996	\$23,200	144	70	215
41-1011	First-Line Supervisors of Retail Sales Workers	High school diploma or equivalent	6,193	\$46,000	172	35	207
39-9011	Childcare Workers	High school diploma or equivalent	4,380	\$20,300	171	33	203
43-4171	Receptionists and Information Clerks	High school diploma or equivalent	5,275	\$29,600	143	52	195
37-2012	Maids and Housekeeping Cleaners	Less than high school	5,218	\$21,600	142	47	189
49-9071	Maintenance and Repair Workers, General	High school diploma or equivalent	5,640	\$38,500	153	35	187
29-2061	Licensed Practical and Licensed Vocational Nurses	Postsecondary non-degree award	3,875	\$40,800	105	75	180
43-1011	First-Line Supervisors of Office and Administrative Support Workers	High school diploma or equivalent	7,329	\$58,500	113	66	179
13-1111	Management Analysts	Bachelor's degree	6,188	\$83,200	112	66	178
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	High school diploma or equivalent	6,461	\$77,400	132	38	170
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	High school diploma or equivalent	4,064	\$35,800	127	38	165
37-3011	Landscaping and Groundskeeping Workers	Less than high school	5,154	\$27,200	122	41	164

Table 15: Potential Occupation Gaps over 10 Years in Region 4: Occupations with Total Annual Demand > 100

SOC	Title	Typical Education Need For Entry	Current Employment 2017Q1	Avg. Annual Wages 2016	Annual Growth Demand	Annual Repl Demand	Total Annual Demand/Potential Supply Gap
25-2021	Elementary School Teachers, Except Special Education	Bachelor's degree	5,168	\$59,000	112	44	156
41-3099	Sales Representatives, Services, All Other	High school diploma or equivalent	4,277	\$62,800	111	38	149
39-5012	Hairdressers, Hairstylists, and Cosmetologists	Postsecondary non-degree award	2,720	\$37,100	115	28	143
35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	Less than high school	1,759	\$20,400	135	8	143
25-9041	Teacher Assistants	Some college, no degree	4,159	\$25,800	101	35	136
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	Bachelor's degree	4,132	\$60,100	100	36	136
41-3021	Insurance Sales Agents	High school diploma or equivalent	3,011	\$79,100	102	31	133
15-1132	Software Developers, Applications	Bachelor's degree	3,848	\$99,900	64	66	130
35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	Less than high school	1,715	\$24,800	118	9	127
49-3023	Automotive Service Technicians and Mechanics	Postsecondary non-degree award	3,476	\$47,800	110	17	127
35-2021	Food Preparation Workers	Less than high school	3,334	\$22,700	103	23	126
31-1011	Home Health Aides	Less than high school	2,042	\$21,500	46	75	121
31-9092	Medical Assistants	Postsecondary non-degree award	2,574	\$30,700	55	59	114
33-3051	Police and Sheriff's Patrol Officers	High school diploma or equivalent	3,042	\$51,500	103	9	112
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	High school diploma or equivalent	8,325	\$37,100	89	19	108
13-1071	Human Resources Specialists	Bachelor's degree	3,215	\$65,700	90	15	105
23-1011	Lawyers	Doctoral or professional degree	4,051	\$143,900	76	28	104
15-1121	Computer Systems Analysts	Bachelor's degree	3,090	\$93,400	44	60	104
33-9032	Security Guards	High school diploma or equivalent	5,392	\$30,000	75	27	102
47-2111	Electricians	High school diploma or equivalent	3,126	\$48,200	55	46	101
53-7064	Packers and Packagers, Hand	Less than high school	3,305	\$25,000	91	10	101

[Source: JobsEQ®](#)

Occupation wages are as of 2016 and represent the average for all Covered Employment

Key occupations for each cluster are identified using a test of significance and dominance.⁵

Occupations that account for a substantial share of total employment (1% or greater) in the

⁵ This approach of significance and dominance was used in *The Commonwealth of Virginia WIOA Combined State Plan for July 1, 2016 through June 30, 2020*

given cluster are considered significant, while if 20% or greater of an occupation's total employment is in the cluster, it is considered dominant.

The table below presents the top thirty occupations, based on total annual demand projected, for occupations that meet the criteria of significance or dominance in at least one of the prioritized regional clusters and have average wages above the regional average of \$49,912.

Ten of the top twenty occupations are attainable with less than an associate's degree, including computer user support specialists; industrial machinery mechanics; and plumbers, pipefitters, and steamfitters. Another 18 occupations typically require a bachelor's degree, including registered nurses; accountants and auditors; and software developers.

Table 16: Top 30 Occupations Supporting Plan Clusters, with Above-Average Wages

SOC	Title	Typical Education Need For Entry	Current Employment 2017Q1	Avg. Annual Wages 2016	Total Annual Demand Over the Next 10 Years
29-1141	Registered Nurses	Bachelor's degree	13,722	\$66,900	543
13-2011	Accountants and Auditors	Bachelor's degree	7,311	\$78,000	299
11-1021	General and Operations Managers	Bachelor's degree	8,528	\$127,200	291
11-9199	Managers, All Other	Bachelor's degree	3,678	\$110,900	258
43-1011	First-Line Supervisors of Office and Administrative Support Workers	High school diploma or equivalent	7,329	\$58,500	179
13-1111	Management Analysts	Bachelor's degree	6,188	\$83,200	178
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	High school diploma or equivalent	6,461	\$77,400	170
41-3099	Sales Representatives, Services, All Other	High school diploma or equivalent	4,277	\$62,800	149
41-3021	Insurance Sales Agents	High school diploma or equivalent	3,011	\$79,100	133
15-1132	Software Developers, Applications	Bachelor's degree	3,848	\$99,900	130
15-1121	Computer Systems Analysts	Bachelor's degree	3,090	\$93,400	104
13-1161	Market Research Analysts and Marketing Specialists	Bachelor's degree	2,844	\$69,200	89
11-3031	Financial Managers	Bachelor's degree	2,723	\$151,700	89
13-1199	Business Operations Specialists, All Other	Bachelor's degree	4,576	\$76,400	77
11-9111	Medical and Health Services Managers	Bachelor's degree	1,636	\$115,900	73
15-1151	Computer User Support Specialists	Some college, no degree	2,866	\$51,500	72
13-2052	Personal Financial Advisors	Bachelor's degree	1,048	\$135,700	70
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	Bachelor's degree	2,269	\$70,100	68
47-1011	Supervisors of Construction and Extraction Workers	High school diploma or equivalent	3,146	\$63,000	68
29-1069	Physicians and Surgeons, All Other	Doctoral or professional degree	1,470	\$236,500	66
49-9041	Industrial Machinery Mechanics	High school diploma or equivalent	1,568	\$53,300	66
47-2152	Plumbers, Pipefitters, and Steamfitters	High school diploma or equivalent	2,117	\$51,000	63
33-2011	Firefighters	Postsecondary non-degree award	1,610	\$55,000	57
17-2051	Civil Engineers	Bachelor's degree	1,468	\$84,600	57
29-1123	Physical Therapists	Doctoral or professional degree	931	\$87,500	55
13-1031	Claims Adjusters, Examiners, and Investigators	High school diploma or equivalent	1,707	\$64,000	54
15-1133	Software Developers, Systems Software	Bachelor's degree	1,802	\$97,300	53
29-1171	Nurse Practitioners	Master's degree	852	\$89,400	53
13-2072	Loan Officers	Bachelor's degree	1,919	\$75,700	51
11-3021	Computer and Information Systems Managers	Bachelor's degree	1,674	\$145,700	49

Source: [JobsEQ®](#)

Training Pipeline

To identify potential gaps in the training pipeline, occupations are cross walked with postsecondary awards from regional institutions in the 2014-2015 academic year by Classification of Instructional Program (CIP) codes.⁶

This analysis is limited to only occupations that typically require a postsecondary award of an associate's degree or less. It is unreasonable to assume that all graduates stay within the region upon graduation—for example, there is only one Dentistry program in Virginia (at Virginia Commonwealth University), and many graduates relocate after completing the program. Indeed, a recent study analyzing college alumni LinkedIn profiles found 68% of alumni from two-year colleges remain in the area after attending, compared with 42% of alumni from four-year colleges.⁷

Thirty-two occupations have a potential annual gap of 5 or more. The largest potential gaps are for nursing assistants (with a potential gap of 236 per year), and heavy and tractor-trailer truck drivers (220).⁸ Twenty of these 32 are relevant to clusters in Region 4, primarily the bioscience/life sciences; logistics, warehousing, and distribution; and information technology and communications clusters. Eleven of these occupations have average annual wages greater than the average for the region.

⁶ To relate training programs to occupations, this report uses a modified version of the CIP to SOC crosswalk from the National Center for Education Statistics (NCES). While the crosswalk used is a very helpful crosswalk for estimating occupation production from training program awards data, it is neither perfect nor comprehensive. Indeed, it is hard to imagine such a crosswalk being perfect since many training program graduates for one reason or another do not end up employed in occupations that are most related to the training program from which they graduated.

⁷ <https://www.brookings.edu/research/what-colleges-do-for-local-economies-a-direct-measure-based-on-consumption/>

⁸ Note that data on awards for nursing assistants, and all data in IPEDS, do not include non-credit awards—for example, 48 candidates passed the National Nurse Assistant Assessment Program (NNAAP) test from J. Sargeant Reynolds in 2015, not to mention awards from nursing homes, hospitals, high schools, and other training providers. (Source: Virginia Board of Nursing)

Table 17: Potential Training Supply Gaps, Occupations That Typically Require an Associate’s Degree or Less

SOC	Title	Typical Entry-Level Education	Empl 2017 Q1	Avg. Annual Wages 2016	Relevant to Cluster(s)	Total Annual Demand Over the Next 10 Yrs	Awards 2014-2015	Potential Annual Training Gap
31-1014	Nursing Assistants	Postsecondary non-degree award	6,455	\$26,200	●	278	42	-236
53-3032	Heavy and Tractor-Trailer Truck Drivers	Postsecondary non-degree award	8,677	\$42,100	●	220	0	-220
25-9041	Teacher Assistants	Some college, no degree	4,159	\$25,800		136	0	-136
49-3023	Automotive Service Technicians and Mechanics	Postsecondary non-degree award	3,476	\$47,800		127	45	-82
33-2011	Firefighters	Postsecondary non-degree award	1,610	\$55,000	●	57	11	-46
29-2061	Licensed Practical and Licensed Vocational Nurses	Postsecondary non-degree award	3,875	\$40,800	●	180	139	-41
31-9097	Phlebotomists	Postsecondary non-degree award	656	\$32,000	●	33	0	-33
39-5011	Barbers	Postsecondary non-degree award	250	\$34,800		24	0	-24
19-4099	Life, Physical, and Social Science Technicians, All Other	Associate's degree	375	\$45,100		22	0	-22
29-2012	Medical and Clinical Laboratory Technicians	Associate's degree	848	\$38,500	●	37	18	-19
25-4031	Library Technicians	Postsecondary non-degree award	336	\$30,000	●	16	0	-16
49-2011	Computer, Automated Teller, and Office Machine Repairers	Some college, no degree	640	\$39,000	●	15	0	-15
31-2021	Physical Therapist Assistants	Associate's degree	353	\$50,300	●	25	10	-15
27-4011	Audio and Video Equipment Technicians	Postsecondary non-degree award	393	\$48,200		13	0	-13
29-2056	Veterinary Technologists and Technicians	Associate's degree	412	\$32,400		13	0	-13
29-2053	Psychiatric Technicians	Postsecondary non-degree award	545	\$28,300	●	13	0	-13
29-2031	Cardiovascular Technologists and Technicians	Associate's degree	301	\$61,600	●	12	0	-12
17-3022	Civil Engineering Technicians	Associate's degree	415	\$37,700	●	12	1	-11
29-2032	Diagnostic Medical Sonographers	Associate's degree	310	\$68,600	●	15	5	-10
49-3011	Aircraft Mechanics and Service Technicians	Postsecondary non-degree award	313	\$64,400	●	9	0	-9
31-2011	Occupational Therapy Assistants	Associate's degree	123	\$63,900	●	9	0	-9
31-9094	Medical Transcriptionists	Postsecondary non-degree award	321	\$30,800	●	9	0	-9
19-4031	Chemical Technicians	Associate's degree	283	\$48,400	●	8	0	-8
29-2035	Magnetic Resonance Imaging Technologists	Associate's degree	224	\$64,800	●	8	0	-8
15-1134	Web Developers	Associate's degree	679	\$73,600	●	30	23	-7
29-2057	Ophthalmic Medical Technicians	Postsecondary non-degree award	202	\$34,700		7	0	-7
29-9099	Healthcare Practitioners and Technical Workers, All Other	Postsecondary non-degree award	193	\$50,500	●	6	0	-6
43-4161	Human Resources Assistants, Except Payroll and Timekeeping	Associate's degree	668	\$38,600		6	0	-6
29-2021	Dental Hygienists	Associate's degree	861	\$76,900		30	24	-6

Source: JobsEQ®

To examine potential shortfalls in occupations which typically require a bachelor’s degree or higher, training concentration shows a comparison of the local rate of degree production to the national average. One-hundred percent is equal to the average rate of degree production in the nation for a particular occupation. For example, 110% is 10% above average, and 50% is half the national average. For occupations with a training concentration below 100%, the shortfall is the number of additional awards needed to bring the regional production up to the national average.

Thirty-five occupations have an estimated shortfall of at least 25 awards. The largest estimated shortfalls are for management analysts, registered nurses, and general and operations managers. Twenty-two of these 35 occupations are relevant to the identified regional clusters, especially in the information technology and communications and financial services clusters. Unsurprisingly given the advanced training required, almost all of these occupations have high average wages—only coaches and scouts have an average annual wage below the regional average.

Table 18: Potential Training Supply Gaps, Occupations That Typically Require a Bachelor’s Degree or Higher

SOC	Title	Typical Entry-Level Education	Empl 2017 Q1	Avg. Annual Wages 2016	Relevant to Cluster(s)	Awards 2014-2015	Training Concentration	Shortfall
13-1111	Management Analysts	Bachelor's	6,188	\$83,200	•	395	68%	188
29-1141	Registered Nurses	Bachelor's	13,722	\$66,900	•	937	85%	169
11-1021	General and Operations Managers	Bachelor's	8,528	\$127,200	•	643	80%	165
25-1199	Postsecondary Teachers, All Other	Doctoral or professional	855	\$58,200		52	24%	162
13-2011	Accountants and Auditors	Bachelor's	7,311	\$78,000	•	230	60%	153
25-2021	Elementary School Teachers, Except Special Education	Bachelor's	5,168	\$59,000		259	66%	133
15-1132	Software Developers, Applications	Bachelor's	3,848	\$99,900	•	70	35%	128
17-2051	Civil Engineers	Bachelor's	1,468	\$84,600	•	0	0%	98
27-2022	Coaches and Scouts	Bachelor's	1,311	\$34,000		69	43%	92
21-2021	Directors, Religious Activities and Education	Bachelor's	1,312	\$52,900		6	6%	88
23-1011	Lawyers	Doctoral or professional	4,051	\$143,900		147	63%	85
27-3031	Public Relations Specialists	Bachelor's	1,203	\$66,600	•	22	22%	76
13-2053	Insurance Underwriters	Bachelor's	711	\$65,400	•	61	45%	74
29-1127	Speech-Language Pathologists	Master's	559	\$78,100	•	0	0%	70
11-3031	Financial Managers	Bachelor's	2,723	\$151,700	•	9	12%	68

Table 18: Potential Training Supply Gaps, Occupations That Typically Require a Bachelor’s Degree or Higher

SOC	Title	Typical Entry-Level Education	Empl 2017 Q1	Avg. Annual Wages 2016	Relevant to Cluster(s)	Awards 2014-2015	Training Concentration	Shortfall
11-9111	Medical and Health Services Managers	Bachelor's	1,636	\$115,900	•	109	62%	67
25-9031	Instructional Coordinators	Master's	740	\$70,600		45	40%	66
13-2052	Personal Financial Advisors	Bachelor's	1,048	\$135,700	•	4	6%	61
15-1121	Computer Systems Analysts	Bachelor's	3,090	\$93,400	•	97	63%	57
15-2031	Operations Research Analysts	Bachelor's	798	\$95,400	•	0	0%	53
17-2071	Electrical Engineers	Bachelor's	871	\$98,800	•	27	34%	51
25-1192	Home Economics Teachers, Postsecondary	Master's	16	\$70,000		0	0%	46
17-1011	Architects, Except Landscape and Naval	Bachelor's	510	\$86,600	•	0	0%	43
13-2072	Loan Officers	Bachelor's	1,919	\$75,700	•	3	6%	40
25-2022	Middle School Teachers, Except Special and Career/Technical Education	Bachelor's	2,654	\$57,600		166	81%	39
21-1099	Community and Social Service Specialists, All Other	Master's	813	\$58,800		22	36%	38
13-2051	Financial Analysts	Bachelor's	1,430	\$92,200	•	5	11%	38
29-1031	Dietitians and Nutritionists	Bachelor's	268	\$64,500	•	0	0%	38
29-1071	Physician Assistants	Master's	460	\$100,800	•	0	0%	35
13-1161	Market Research Analysts and Marketing Specialists	Bachelor's	2,844	\$69,200	•	115	78%	32
11-9032	Education Administrators, Elementary and Secondary School	Master's	992	\$87,300		45	60%	30
25-2052	Special Education Teachers, Kindergarten and Elementary School	Bachelor's	707	\$59,000		13	31%	29
25-4021	Librarians	Master's	583	\$60,800		0	0%	26
11-9033	Education Administrators, Postsecondary	Master's	603	\$107,600		26	50%	25
15-1142	Network and Computer Systems Administrators	Bachelor's	2,117	\$83,400	•	39	62%	25

Source: JobsEQ®

In summary, there is a need for additional trained workers to support regional clusters and for pathways for workers to move from lower-skilled jobs that pay below-average wages into high-paying jobs. Many of the occupations with the highest forecast total demand require relatively little training and pay below-average wages. However, some of the most rapid forecast growth forecasts are for occupations that typically require a two-year degree or certificate. This growth aligns with myriad other studies in Virginia and the nation that show increasing demand and a potential gap for these “middle-skill” jobs. Thirty-two detailed occupations that typically require an associate’s degree or less have a potential annual training gap of five or more workers.

These include nursing assistants, heavy and tractor-trailer truck drivers, and automotive service technicians and mechanics. Among occupations that typically require at least a bachelor's degree, 35 detailed occupations have an estimated annual shortfall of at least 25 awards. The largest shortfalls are for management analysts, registered nurses, and general and operations managers. Approximately two-thirds of these occupations are substantially related to strong regional clusters, and these estimated gaps could potentially inhibit growth within clusters in Region 4.

APPENDIX

Cluster	NAICS	Description
Advanced Materials	2123	Nonmetallic Mineral Mining and Quarrying
	3162	Footwear Manufacturing
	3222	Converted Paper Product Manufacturing
	3241	Petroleum and Coal Products Manufacturing
	3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
	3255	Paint, Coating, and Adhesive Manufacturing
	3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing
	3259	Other Chemical Product and Preparation Manufacturing
	3261	Plastics Product Manufacturing
	3262	Rubber Product Manufacturing
	3271	Clay Product and Refractory Manufacturing
	3274	Lime and Gypsum Product Manufacturing
	3279	Other Nonmetallic Mineral Product Manufacturing
	3311	Iron and Steel Mills and Ferroalloy Manufacturing
	3312	Steel Product Manufacturing from Purchased Steel
	3313	Alumina and Aluminum Production and Processing
	3314	Nonferrous Metal (except Aluminum) Production and Processing
	3315	Foundries
	3321	Forging and Stamping
	3323	Architectural and Structural Metals Manufacturing
	3326	Spring and Wire Product Manufacturing
	3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing
	3328	Coating, Engraving, Heat Treating, and Allied Activities
	3329	Other Fabricated Metal Product Manufacturing
	3332	Industrial Machinery Manufacturing
	3333	Commercial and Service Industry Machinery Manufacturing
	3335	Metalworking Machinery Manufacturing
	3339	Other General Purpose Machinery Manufacturing
	3344	Semiconductor and Other Electronic Component Manufacturing
	3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing

Advanced Materials	3351	Electric Lighting Equipment Manufacturing
	3353	Electrical Equipment Manufacturing
	3359	Other Electrical Equipment and Component Manufacturing
	3363	Motor Vehicle Parts Manufacturing
	3364	Aerospace Product and Parts Manufacturing
	3391	Medical Equipment and Supplies Manufacturing
	5413	Architectural, Engineering, and Related Services
	5417	Scientific Research and Development Services
Arts and Entertainment	3399	Other Miscellaneous Manufacturing
	4239	Miscellaneous Durable Goods Merchant Wholesalers
	4871	Scenic and Sightseeing Transportation, Land
	4872	Scenic and Sightseeing Transportation, Water
	4879	Scenic and Sightseeing Transportation, Other
	5121	Motion Picture and Video Industries
	5122	Sound Recording Industries
	5151	Radio and Television Broadcasting
	5152	Cable and Other Subscription Programming
	5615	Travel Arrangement and Reservation Services
	7111	Performing Arts Companies
	7112	Spectator Sports
	7113	Promoters of Performing Arts, Sports, and Similar Events
	7114	Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures
	7115	Independent Artists, Writers, and Performers
	7121	Museums, Historical Sites, and Similar Institutions
	7131	Amusement Parks and Arcades
	7132	Gambling Industries
	7139	Other Amusement and Recreation Industries
	7211	Traveler Accommodation
7212	RV (Recreational Vehicle) Parks and Recreational Camps	
BioScience/ Life Sciences	333	Machinery Manufacturing
	3254	Pharmaceutical and Medicine Manufacturing
	3332	Industrial Machinery Manufacturing
	3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
	3391	Medical Equipment and Supplies Manufacturing

BioScience/ Life Sciences	4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers
	4461	Health and Personal Care Stores
	5417	Scientific Research and Development Services
	5622	Waste Treatment and Disposal
	6214	Outpatient Care Centers
	6215	Medical and Diagnostic Laboratories
	6216	Home Health Care Services
	6219	Other Ambulatory Health Care Services
	6221	General Medical and Surgical Hospitals
	6222	Psychiatric and Substance Abuse Hospitals
	6223	Specialty (except Psychiatric and Substance Abuse) Hospitals
	6231	Nursing Care Facilities (Skilled Nursing Facilities)
	6232	Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities
	6233	Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly
	6239	Other Residential Care Facilities
Chemicals	3251	Basic Chemical Manufacturing
	3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing
	3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
	3254	Pharmaceutical and Medicine Manufacturing
	3255	Paint, Coating, and Adhesive Manufacturing
	3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing
	3259	Other Chemical Product and Preparation Manufacturing
	3261	Plastics Product Manufacturing
	3262	Rubber Product Manufacturing
	3271	Clay Product and Refractory Manufacturing
	3272	Glass and Glass Product Manufacturing
	3273	Cement and Concrete Product Manufacturing
	3274	Lime and Gypsum Product Manufacturing
	3279	Other Nonmetallic Mineral Product Manufacturing
	4246	Chemical and Allied Products Merchant Wholesalers
4247	Petroleum and Petroleum Products Merchant Wholesalers	
Construction	23	Construction

Creative Services	5413	Architectural, Engineering, and Related Services
	5414	Specialized Design Services
	5415	Computer Systems Design and Related Services
	5418	Advertising, Public Relations, and Related Services
Defense and Security	2371	Utility System Construction
	3259	Other Chemical Product and Preparation Manufacturing
	3329	Other Fabricated Metal Product Manufacturing
	3342	Communications Equipment Manufacturing
	3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
	3364	Aerospace Product and Parts Manufacturing
	3366	Ship and Boat Building
	3369	Other Transportation Equipment Manufacturing
	3391	Medical Equipment and Supplies Manufacturing
	4231	Motor Vehicle and Motor Vehicle Parts and Supplies Merchant Wholesalers
	4238	Machinery, Equipment, and Supplies Merchant Wholesalers
	5415	Computer Systems Design and Related Services
	5417	Scientific Research and Development Services
	5616	Investigation and Security Services
	8114	Personal and Household Goods Repair and Maintenance
	9221	Justice, Public Order, and Safety Activities
	9261	Administration of Economic Program
	9271	Space Research and Technology
9281	National Security and International Affairs	
Education and Knowledge Creation	5111	Newspaper, Periodical, Book, and Directory Publishers
	5191	Other Information Services
	6112	Junior Colleges
	6113	Colleges, Universities, and Professional Schools
	6114	Business Schools and Computer and Management Training
	6115	Technical and Trade Schools
	6116	Other Schools and Instruction
	6117	Educational Support Services
	2111	Oil and Gas Extraction
	2121	Coal Mining
	2122	Metal Ore Mining
	2131	Support Activities for Mining

Energy	2211	Electric Power Generation, Transmission and Distribution
	2212	Natural Gas Distribution
	2213	Water, Sewage and Other Systems
	2371	Utility System Construction
	2379	Other Heavy and Civil Engineering Construction
	2382	Building Equipment Contractors
	3241	Petroleum and Coal Products Manufacturing
	3324	Boiler, Tank, and Shipping Container Manufacturing
	3331	Agriculture, Construction, and Mining Machinery Manufacturing
	3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing
Energy	3336	Engine, Turbine, and Power Transmission Equipment Manufacturing
	3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
	3353	Electrical Equipment Manufacturing
	3359	Other Electrical Equipment and Component Manufacturing
	4235	Metal and Mineral (except Petroleum) Merchant Wholesalers
	4236	Household Appliances and Electrical and Electronic Goods Merchant Wholesalers
	4247	Petroleum and Petroleum Products Merchant Wholesalers
	4471	Gasoline Stations
	4543	Direct Selling Establishments
	4861	Pipeline Transportation of Crude Oil
	4862	Pipeline Transportation of Natural Gas
	4869	Other Pipeline Transportation
	5239	Other Financial Investment Activities
	5324	Commercial and Industrial Machinery and Equipment Rental and Leasing
	5331	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
	5413	Architectural, Engineering, and Related Services
	5416	Management, Scientific, and Technical Consulting Services
	5417	Scientific Research and Development Services
9261	Administration of Economic Program	
	521	Monetary Authorities-Central Bank

Financial Services	522	Credit Intermediation and Related Activities
	523	Securities, Commodity Contracts, and Other Financial Investments and Related Activities
	524	Insurance Carriers and Related Activities
	525	Funds, Trusts, and Other Financial Vehicles
	533	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
Food and Beverage	3113	Sugar and Confectionery Product Manufacturing
	3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing
	3115	Dairy Product Manufacturing
	3116	Animal Slaughtering and Processing
	3117	Seafood Product Preparation and Packaging
	3118	Bakeries and Tortilla Manufacturing
	3119	Other Food Manufacturing
	3121	Beverage Manufacturing
	3122	Tobacco Manufacturing
Glass and Ceramics	2122	Metal Ore Mining
	3271	Clay Product and Refractory Manufacturing
	3272	Glass and Glass Product Manufacturing
	3273	Cement and Concrete Product Manufacturing
	3279	Other Nonmetallic Mineral Product Manufacturing
	3328	Coating, Engraving, Heat Treating, and Allied Activities
Information Technology and Communications	2382	Building Equipment Contractors
	3332	Industrial Machinery Manufacturing
	3333	Commercial and Service Industry Machinery Manufacturing
	3336	Engine, Turbine, and Power Transmission Equipment Manufacturing
	3341	Computer and Peripheral Equipment Manufacturing
	3342	Communications Equipment Manufacturing
	3343	Audio and Video Equipment Manufacturing
	3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
	3346	Manufacturing and Reproducing Magnetic and Optical Media
	3353	Electrical Equipment Manufacturing
	3359	Other Electrical Equipment and Component Manufacturing
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	

Information Technology and Communications	4236	Household Appliances and Electrical and Electronic Goods Merchant Wholesalers
	5112	Software Publishers
	5171	Wired Telecommunications Carriers
	5172	Wireless Telecommunications Carriers (except Satellite)
	5174	Satellite Telecommunications
	5179	Other Telecommunications
	5182	Data Processing, Hosting, and Related Services
	5191	Other Information Services
	5415	Computer Systems Design and Related Services
	5416	Management, Scientific, and Technical Consulting Services
	5417	Scientific Research and Development Services
	9261	Administration of Economic Program
	Logistics, Warehousing, and Distribution	4811
4812		Nonscheduled Air Transportation
4821		Rail Transportation
4831		Deep Sea, Coastal, and Great Lakes Water Transportation
4832		Inland Water Transportation
4841		General Freight Trucking
4842		Specialized Freight Trucking
4851		Urban Transit Systems
4855		Charter Bus Industry
4859		Other Transit and Ground Passenger Transportation
4861		Pipeline Transportation of Crude Oil
4862		Pipeline Transportation of Natural Gas
4869		Other Pipeline Transportation
4881		Support Activities for Air Transportation
4882		Support Activities for Rail Transportation
4883		Support Activities for Water Transportation
4884		Support Activities for Road Transportation
4885		Freight Transportation Arrangement
4889		Other Support Activities for Transportation
4921		Couriers and Express Delivery Services
4922		Local Messengers and Local Delivery
4931	Warehousing and Storage	
5324	Commercial and Industrial Machinery and Equipment Rental and Leasing	

	5416	Management, Scientific, and Technical Consulting Services
	5619	Other Support Services
Management of Companies and Enterprises	55	Management of Companies and Enterprises

Mining	2122	Metal Ore Mining
	2123	Nonmetallic Mineral Mining and Quarrying
	2131	Support Activities for Mining
	4821	Rail Transportation
	5324	Commercial and Industrial Machinery and Equipment Rental and Leasing
Printing and Publishing	3231	Printing and Related Support Activities
	3259	Other Chemical Product and Preparation Manufacturing
	3399	Other Miscellaneous Manufacturing
	5111	Newspaper, Periodical, Book, and Directory Publishers
	5151	Radio and Television Broadcasting
	5152	Cable and Other Subscription Programming
	5191	Other Information Services
	5414	Specialized Design Services
	5416	Management, Scientific, and Technical Consulting Services
	5418	Advertising, Public Relations, and Related Services
	5419	Other Professional, Scientific, and Technical Services
Professional Services	3231	Printing and Related Support Activities
	5171	Wired Telecommunications Carriers
	5182	Data Processing, Hosting, and Related Services
	5191	Other Information Services
	5313	Activities Related to Real Estate
	5411	Legal Services
	5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services
	5416	Management, Scientific, and Technical Consulting Services
	5417	Scientific Research and Development Services
	5419	Other Professional, Scientific, and Technical Services

PART TWO: STAKEHOLDER ENGAGEMENT

We complemented the Chmura data analyses with a set of stakeholder engagement activities.

A brief survey was distributed to business-based organizations throughout the region to obtain input from their members about the drivers of higher paying jobs and the industry clusters best positioned to provide these.

We conducted focus groups with local government officials, business organizations, human resource directors, millennials, community college presidents, and groups involved in setting economic development priorities.

We also conducted one-on-one interviews with local and regional economic development officials, university representatives and business leaders.

The stakeholder engagement process focused on obtaining ideas on recommendations on four major themes relevant to GO Virginia and the Regional Council’s charge: 1) workforce development and talent attraction; 2) cluster priorities; 3) catalyzing innovation; 4) site development.

After the Interim Report was presented to the Regional Council, six working groups were established to identify specific opportunities and challenges and to develop a framework that could guide eventual projects. The recommendations of the working groups are included in each section.

WORKFORCE, WORKFORCE, WORKFORCE

Secular trends in the world economy have profoundly altered the drivers of regional competitiveness in Virginia during the past half-century. In the modern knowledge-based economy, intellectual capital and a highly skilled workforce are the currency of competitive advantage. Our stakeholder engagement process demonstrated just how deeply this belief is embedded throughout Region 4. Almost everyone to whom we spoke-entrepreneurs,

manufacturers, economic development officials, local government administrators, community college presidents- emphasized that a high-quality workforce and attracting and retaining talent was crucial to the region’s future. If location, location, location is the mantra of the real estate industry, workforce, workforce, workforce is the equivalent in contemporary economic development.

Stakeholders expressed their ideas about how the region should accomplish this with thoughtfulness and passion. They articulated perspectives on K-12 education, on the impact of state educational mandates on skill development, on the relative value of credentials vs. degrees, on the impact of the region’s reputation on external recruitment, on how the region can win in the competition for young professionals, and why the lack of a broadband infrastructure in rural areas is not about “shopping online” but providing young people with the skills to flourish in 21st Century economy.

In a survey we distributed to primarily business stakeholders, the “availability of a skilled workforce” was the highest rated response among nine items when we asked respondents what was important to promoting higher paying jobs in the region. 86% of respondents said that it was Extremely Important or Very Important to creating higher paying jobs.

Importance to Producing Higher paying jobs	% Rating Very and Extremely Important
Recruiting new businesses	75%
Growing existing businesses	93%
A vibrant entrepreneurial culture	83%
Excellent university STEM programs	90%
Attracting and retaining young professionals	88%
Availability of a skilled workforce	96%
Excellence in one or two industry clusters	44%

Effective workforce development programs	87%
Available ready sites	59%

In our stakeholder engagement interviews and meetings, business leaders, educators and government officials identified two distinct concerns about workforce issues in the region. In each part of Region 4, interviewees expressed concern that the workforce development system was not fully synchronized to meet the needs of employers for skilled positions. Stakeholders in both areas of the region also spoke of the challenge in attracting and retaining talented college graduates and millennials, though our surveys indicated that this is perceived to be a more pressing issue in the metro RVA area.

Workforce Skills

Stakeholders that focused on the middle skills gap pointed to three specific areas of concern.

1. Leveraging existing resources more effectively:

Almost every school district in the region has invested significant resources in career and technical education. Yet despite notable successes, there is a widespread sense that program outcomes could be much improved. Local government officials often referred to continuing discontent from employers about the quality of graduates. Multiple reasons were advanced to explain why outcomes weren't matching up with resources. Many stakeholders believe that the collaboration between career education and business could be far stronger. Several focus group participants asserted that the obstacles to better program outcomes were not always under the control of the local school system and objected to what they considered state over-regulation. They did not believe that the SOL system was sufficiently flexible for students who would not be immediately attending college. They felt that regulations about time that must be spent in the actual school building inhibited the growth of apprentice programs that could be more effective. In addition, while career and technical education tracks are

oversubscribed in some jurisdictions, many interviewees noted that enrollment is not necessarily well aligned with job opportunities,

2. Changing the culture to provide students and parents with better information about career options and opportunities earlier in the educational process:

Several stakeholders felt that schools are much better organized to support students who plan to attend college immediately after high school than to serve graduates who are unlikely to pursue this path- counseling is perceived to be primarily directed at students pursuing college admission and counselors are perceived to be far more knowledgeable about advanced degrees than certifications and credentials.

In addition, stakeholders noted that it is important to provide parents and students information at an earlier age, so they can better understand career pathways and align their academic programs with the skills that are needed. Many school systems have recently adopted a career pathways approach, starting to speak about careers in middle school. But there is a sense that a broader cultural change may be necessary to ensure that career options that do not require a college degree are equally valued.

3. Credentials and Industry Certifications vs. Degrees:

Community college leaders noted that there has been a considerable shift in the technical education that they offer. There is a decreased emphasis on degree-based programs and increased focus on the concept of stackable credentials, which is a “new system intended to meet both the “demand side needs of employers and the supply side needs of individual workers.” In a stackable credential system, an individual acquires short-term certifications that are recognized by industry and, as they proceed in their career, acquire more certifications that allow them to advance, obtain higher wages and, even perhaps, a degree. (Austin, Mellow, Rosin and Seltzer) In this respect, an individual might obtain a basic manufacturing certificate that provides entrée to a \$15 an hour job, but then obtains a series of more specialized certificates that enable

significant upward mobility. Refining the credential system so that it operates in the most efficient and cost-effective manner is perceived to be a genuine opportunity for transforming advanced career-based education.

The challenges have certainly not gone unnoticed by those concerned about improving workforce development. Numerous state efforts, local initiatives and public-private partnerships are currently in place to address the identified challenges in workforce programs. A sampling of what is now occurring includes the following:

- *The Virginia Plan for Higher Education*- Become the best educated state by 2030
- *“Cyber Virginia”*- Increase training and growth in cyber security
- *Governor’s Council on Youth Entrepreneurship*- Encourage young adults to become entrepreneurs
- *Expanding the Registered Apprenticeship Program*- Give fiscal support for targeted occupations
- *VRIF/ VRIC*- Foster job creation through collaborative research
- *Commonwealth of Virginia Workforce Innovation and Opportunity Act Combined State Plan*- Increase business engagement in workforce development and fill in demand jobs
- *CCAM Apprentice Academy*- Train workers directly on machinery they will be operating
- *Career and Technical Education*-Reinvent CTE and develop career pathways for middle school students
- *Bridging Richmond*- Engage the community to address shared workforce and education
- *CodeRVA*- Start a new regional public high school focusing on computer science that will enable students to graduate also with industry certifications and an Associate’s degree from J. Sargeant Reynolds C.C. .
- *Regional Workforce Development Boards*- Better align skills and credentials with immediate and future needs of employers.

Given the extraordinary range of activities targeted to enhancing workforce development, the challenge for the Regional Council is how to leverage its resources on models that can overcome significant obstacles in the most effective way.

Attracting and Retaining Professionals with College and Graduate Degrees

The issue of attracting and retaining talented professionals with college and graduate degrees was a second issue that emerged in our stakeholder discussions.

A focus group with Human Resource Directors from major companies in the region provided considerable insight. For the most part, they were positive about their capacity to attract quality talent. A major company with good salaries and benefits may receive more than a hundred applications for a single position. But the HR Directors also noted that it is quite difficult to attract talent in technical areas that are emerging in the new economy- cybersecurity, data analytics, specialized actuarial fields.

On one hand, they attributed the challenge to an undersupply in the field with companies competing for a scarce degree. But they also described a more general obstacle they were facing in recruiting talent from outside the region. The HR Directors emphasized that quality of place has become a far more important factor in attracting talent than ever before. In their minds, the reputation of Richmond in the rest of the country still lags the reality of what the region is becoming. The HR Directors felt that they had to overcome a sense from people outside the area that Richmond was still the Capital of the Confederacy and not the ideal place for professionals who wanted to live in a vibrant, culturally diverse location. They said that if they can bring people here, the impression often changed, but that it is important to understand how important a role the overall brand of the region plays in the global competition for talent.

Another key component of the regional workforce composition is related to the national demographic shift in which the relative mix of older and younger workers is leading to an intense competition for millennials, especially talented young professionals. In the Richmond region, John Martin and his colleagues at SIR have conducted a series of studies exploring the

advantages and challenges that RVA has in this competition. His findings have been simultaneously encouraging and sobering.

In a study conducted for Richmond's Future, SIR found that, in general, college students and young professionals who live in the region had positive perceptions about RVA. College student respondents, for example, agreed that RVA has a rich history, access to water, excellent higher education options, a great food scene, an active arts scene, embraces creativity, and is diverse.

Young professionals who live in RVA shared many of the college student views. Nearly four in five (79%) young professionals agreed RVA is a great place to live (84%), a place for people who love culture (78%), a good place to work (77%), and a good place to raise a family (74%). Four in five (80%) young professionals feel they can make a difference in RVA, and 78% would choose RVA if they had to make the decision all over again. The most positive attributes about RVA that were regularly cited by college students and young professionals were a great food scene, an urban living environment, and RVA's creativity and innovation

At the same time, the study revealed RVA's challenges in becoming a magnet for young professionals. Only 26% of the college students in the study said that they believed it was easier to find a job in RVA than outside of the region. Additionally, fewer than 50% of the college students who participated in one of the studies felt that the RVA area provided a "variety of employment opportunities."

The findings of a statewide survey of millennials that Professor Quentin Kidd produced for Christopher Newport's Wason Center for Public Policy were consistent with the SIR report. Kidd's panel survey of more than 2000 Virginia millennials is the most comprehensive statewide analysis of millennial opinion ever produced in the Commonwealth. Once again, the overall satisfaction rate of RVA millennials with the region is quite positive, but their concern with job opportunities is striking. In RVA, only 11% of millennials say that there are "more than enough jobs" to go around, while 47% say there are too few jobs, and 42% report that there are "just enough jobs."

Our focus group of young professionals explored this issue in depth. Two themes were especially salient. First, several participants noted that they had “happened” into their jobs in RVA, through friends, mentors at the university, or after returning from another place to live at home while they were re-thinking their life options. At least in this group, there weren’t many individuals who had been involved in an organized and coordinated effort to link college students and recent graduates with job opportunities, either with established companies or startups.

In addition, the participants noted that one of their concerns was the lack of “career or employment density” in the region. Most of the participants noted that they had challenging and rewarding jobs. But they were less sure about how they might obtain opportunities outside their current employment. They weren’t certain that RVA had a range of options that ambitious young people could access, with a couple of individuals noting that the choices seemed to be waiting your turn, leaving town or becoming an entrepreneur.

Our focus group with HR directors did indicate that many companies do have firm-based internship-based and summer programs that recruit at the region’s colleges and universities. Major companies in RVA do appear to be very intentional and organized in seeking future employees- it was clear that not all students “just happen” to find employment. Yet there is not a regionally based organized effort to take advantage of the education corridor that exists along I-64 from Charlottesville to Virginia Beach that will make RVA an employment destination for talented Virginia college graduates.

Workforce Working Group Takeaways

The workforce group that was convened after the interim report focused on the key issues that had been raised in the data analysis and stakeholder engagement activities. The members reinforced the prominence that stakeholders had given to workforce. They noted that GO Virginia would not create higher paying jobs on its own, but that it could support strategies that would construct a broader and more efficient pipeline of skilled individuals who could fill open positions today and, more importantly, succeed in the workforce of tomorrow. The working

group examined and proposed a set of short and intermediate term steps that should be taken to address specific issues and shortages. Yet the members also expressed a strong desire to see GO Virginia address the institutional and cultural barriers that would enable the region and the Commonwealth to be proactive in developing the skills needed in the new economy. They felt that the creation of GO Virginia offers a distinct opportunity to highlight the need for significant reforms.

1. Examine and modify obsolete state educational and occupational regulations:

State educational and occupational regulations can negatively impact the capacity for individuals to acquire marketable skills. For example, state regulations about the length of apprenticeship programs in the skilled trades have not been adjusted in line with the tools and techniques available in the contemporary workplace. It may be well be possible to accelerate the timetable in several apprenticeship areas without compromising quality, enabling employers to attract and retain qualified workers where there are current shortages.

2. Target populations where immediate impacts are possible:

Workforce programs targeted at specific populations could produce substantial short-term wins. Studies have indicated that individuals between the ages of 20-25 who dropped out of colleges or universities and are currently employed in relatively low wage positions are very receptive to training opportunities that can provide a genuine career path and higher wages. Developing initiatives that can attract these individuals into areas where there is a clearly defined regional need could be very successful.

The same is true of individuals transitioning out of the military. Identifying individuals who might stay or relocate to the region, informing them of job opportunities 12-18 months before the transition occurs, and utilizing available training programs to provide business-ready skills could have a substantial positive impact on the workforce.

3. Transform educational institutions to re-value career and technical education and promote the cultural changes necessary to influence student and parental choice:

Working group members noted that several European countries, especially Germany, have developed cultures in which skilled trades and college/university education are both highly valued. In the United States, almost 2/3 of students are targeted for college/university, a number far higher than in Germany. While our culture of individual choice would clearly prevent the wholesale adoption of a German-based system, the large percentage of students who leave without completing a four-year degree, but with substantial debt, calls for reinventing our educational pathways. Providing students and parents with better information about the jobs of the future and the education required to obtain these, improving the capacity of high school counselors to provide career-based choices to students and being rewarded for doing so, and better aligning K-12 CTE programs with occupations that afford access to middle class lifestyles would be key elements in a cultural transformation.

4. Develop effective means of business–education collaboration:

There is an extraordinary range of activities that businesses engage in with school, colleges and universities to attract the future workforce. In many instances, however, this could be done far more effectively and efficiently, from CTE programs to attracting and retaining young professionals in the regions. Initiatives that provide cost-effective, collaborative ways of linking businesses to high school CTE programs, of developing business collaborations on community college training curricula, and providing employment opportunities that will persuade college graduates in the I-64 educational corridor from Staunton to Virginia Beach to come to RVA will be instrumental in meeting the region's workforce challenges.

5. Brand the region more effectively:

The national accolades that the region has recently received may be better known by those who already living here than by individuals and families who are considering relocating. Human Resource directors indicate that they still face hurdles in convincing people in competitive new economy positions to relocate- in the contemporary economy, continued attention should be paid to regional branding.

6. Performance measures

The working group identified possible performance measures as the number of credentials obtained in high wage areas, tracking the number of individuals who move into higher paying jobs, the alignment of CTE course enrollment with identified area of high need, and shifts in career choices and career understanding of young people.

CLUSTERS: STAKEHOLDER PERSPECTIVES

Many stakeholders to whom we spoke do not necessarily think in terms of regional clusters when addressing the area's economic future. In fact, we received pushback from a few stakeholders about the concept. People in the metro Richmond area often point to the "balanced" economy as an advantage and do not necessarily want to move toward an economy skewed toward a small subset of industries. In addition, our stakeholders felt that the NAICS codes under industry clusters do not adequately capture the convergence that is rapidly occurring between clusters.

Yet our stakeholders also recognize that the components of RVA's balanced economy have changed dramatically over time and may today be changing more rapidly than ever. They clearly understand the importance of the new economy clusters in health, life sciences, and information technology. And they understand that retaining a strong foothold in manufacturing will require an entirely different quality of workforce preparation.

Logistics: Can It Provide Above Average Wages?

Every cluster analysis produced in the last two decades has pointed to logistics as an industry where the region has a natural competitive advantage due to its extraordinarily favorable location for shipping and distribution. A short list of these advantages includes:

- A location within 750 miles of two-thirds of the U.S. population;
- Accessibility to the growing deep-water Port of Virginia (drive of two hours or less via Routes 460 or 58), which becomes even more significant with the re-opening of the Panama Canal;
- The signing of a 40-year lease of the Richmond Marine Terminal (formerly the Port of Richmond) with the Port of Virginia and the establishment of regular barge service between Hampton Roads and Richmond.
- The district's excellent road and rail network – I-95, I-85, I-295, Routes 460 & 58,
- The intersection of CSX & Norfolk Southern lines at Collier Yard in Petersburg;
- Fort Lee's logistics mission and home to the Army Logistics University
- The Defense Logistics Agency facility at Bellwood that employs 3000 individuals, mostly civilians, as the central hub for aviation supply in the military,
- The presence of large distribution facilities, including Amazon, Wal-Mart, Food Lion,
- The development of a collaborative research capacity at Virginia universities through the formation of the Commonwealth Center for Advanced Logistics Systems (CCALS)

Given these obvious advantages of our location, many stakeholders believe it would be foolish for the region to ignore the opportunities that logistics can provide.

For example, the growing connection to the Port of Virginia (POV) provides a major opportunity for the enhancement of the logistics cluster. With the growth of the POV and its direct connection to the Richmond Marine Terminal, the possibility of an inland port at RVA is being seriously discussed. Consultants have been engaged to provide a baseline analysis of what could be done and what infrastructure improvements would be necessary to bring the idea to

fruition. In addition, as a result of an invitation from Richmond's Future to Thomas R. Frantz, chairman of GO Virginia's Hampton Roads Council, for a presentation on a possible Hampton Roads-RVA mega-region, business leaders from both areas have been regularly meeting to discuss the possibility of collaborative activity that can be mutually beneficial. This level of business-community to business-community engagement has never previously occurred. But it certainly has the potential for exploring how the unique asset of the POV can benefit each region.

Yet the logistics cluster does not necessarily meet the GO Virginia requirement of higher paying jobs with wages that are above the regional and/or sub-regional average. Managerial jobs meet this criterion. And so do openings for long haul truckers with commercial drivers' licenses as salaries, enhanced by routine overtime, exceed the regional and sub-regional averages. This is not the case, however, with much of the work involved with conventional warehousing and distribution.

The creation of the Commonwealth Center for Advanced Logistics System is an initiative that brings together 5 public universities- University of Virginia, Longwood University, Virginia State University, Old Dominion University, and Virginia Commonwealth University- to provide a recognized research capacity in logistics that can be utilized by private sector companies and public agencies such as the Defense Department, the Department of Energy or the Department of Transportation. At the moment, CCALS' major line of research is focused on improving efficiency at the Port of Virginia. It has the potential, however, of applying the methods and data analytics involved in transportation to a much broader range of activities that can have a major impact on profitability- in medicine, pharmaceuticals, consumer goods- anywhere it is critical to getting a good or service delivered on time in the right place.

Under any circumstance, Region 4's locational advantages will ensure that logistics remains a central industry cluster, though automation could have a significant impact on the need for entry level positions in warehousing. The challenge for the region is demonstrate how transportation and distribution facilities can be related to clusters that provide above average

wages such as quality manufacturing and how creativity of logistics based research can add value to value to businesses as diverse as health care and energy that need to ensure the efficient and reliable delivery of its services.

Logistics Working Group Takeaways

The logistics working group specifically addressed the connection between logistics and higher paying jobs. First, members noted that the NAICS codes do not fully capture the scope of contemporary logistics work. The majority of NAICS codes under logistics relate directly to air, rail, bus and water transit systems, to support services for these systems, and to warehousing and storage. Several jobs that would be located under these codes, especially those in warehousing and storage, pay below average wages. Management, scientific and technical consulting is the only code that directly captures the work that most people who consider themselves logisticians perform. U.S. Department of Labor Statistics indicate that the average wage for a logistician-analyzing and coordinating an organization's supply chain- has an annual median pay in Virginia of \$86,300 per year and that the Commonwealth is 4th nationally in total employment for logisticians. (USDOL Occupational Employment and Wages, May 2016, 13-1081, Logisticians)

Even more importantly, the working group noted that contemporary logistics has applications that extend far beyond the transportation industries recognized in the NAICS codes and that logistics, as an activity, has begun to converge with clusters such as information technology and advanced manufacturing. Perhaps most importantly, logistics is an integral feature of the predictive analytics that powers the new economy. Any organization or industry that needs to deliver a service in a timely and efficient manner requires logistics solutions- a hospital managing its drug supply and usage; energy companies moving power along grids; and a state government trying to procure goods in the most cost-effective ways- all essentially rely on contemporary logistics.

The working group emphasized three major points with respect to potential projects related to the future of logistics in the region.

1. Focus on the ports

Logistics initiatives should continue to exploit the competitive advantages that its location provides and the opportunities that will emerge from its strengthened relationship with the Port of Virginia. At the same time, the working group stressed that capitalizing on locational advantages must extend beyond becoming a hub for the warehousing and distribution of goods to developing opportunities for higher wage jobs such as manufacturing. A recent study for the Richmond Planning District Commission detailed a variety of scenarios that could potentially accompany a build-out around the Richmond Marine Terminal. The study concluded a build-out that emphasized manufacturing opportunities would provide more substantial wage opportunities than one that focused solely on distribution activities.

2. Logistics and the region's unique defense installations

The working group also pointed to the unique defense-related activities in the region. While the members of the group acknowledged that GO Virginia is, overall, attempting to reduce dependence on the variability on federal defense spending, they believed it was important to recognize the strong linkage in the region between defense and logistics. The mission of the military installations in the region is not focused on direct fighting capabilities, but on high level logistics and security training that is likely to remain important in the foreseeable future. The Defense Logistics Agency, the Army Logistics University in Fort Lee, and the designation of Fort Pickett for security training for embassies and other overseas installations represent an asset that provides significant high wage civilian employment opportunities.

3. Arcing logistics to other clusters

The working group noted that future of logistics will also be driven by its linkage to other high growth, high wage clusters such as information technology, health and bioscience, and manufacturing. The advanced data science and the predictive analytics

that are characteristic of logistics will provide fertile employment for people well trained in the discipline. Logistics-based data science will be increasingly important to multiple areas of the new economy, such as pharmaceutical engineering, autonomous vehicles and energy delivery systems.

4. Performance measures

The working group addressed performance measures that would be important in framing logistics-based or logistics-related projects. This would include an increase in the number of logistics-related positions, the linkage of distribution/warehousing to higher value activities, and the economic impact of efficiencies brought about by advanced logistics analysis.

Advanced Manufacturing: A Turnaround for Southside?

In our survey that was distributed to business groups, slightly over 50% of the respondents rated advanced manufacturing as Extremely Important or Very Important to promoting higher paying jobs in the future. It rated considerably below health and life sciences, information technology, and professional and business services. It ranked relatively similarly to finance and insurance. But the aggregate ranking of advanced manufacturing obscures the large intra-regional differences in perceptions of its significance. While only a slim majority of respondents from the membership of the Greater Richmond Chamber of Commerce believe that it will be important to promoting higher paying jobs in the future, 96% of respondents from the Hopewell-Prince George Chamber of Commerce where manufacturing remains prominent believe that it is.

The background data about the manufacturing cluster in the region provide ambivalent signals about its future. On one hand, it is a cluster that is declining in terms of overall employment and contribution to the regional GDP. Employment levels may also be further negatively impacted by automation. But this is only part of the story. Manufacturing remains a significant contributor to the regional GDP and to overall employment. Wages in the manufacturing sector are relatively high, especially in areas such as advanced materials and chemicals where the

region is relatively well positioned. And there is good reason to believe major manufacturing companies are considering relocating and/or adding to their operations to the region.

The decision by Rolls Royce to locate a manufacturing facility in Prince George was an important initial indication that the region can attract globally competitive firms in advanced manufacturing. The subsequent creation of the Commonwealth Center for Advanced Manufacturing adjacent to Rolls Royce as a state of the art research facility to provide production ready business solutions to member companies by leveraging the talents within CCAM and at Virginia research universities was a signal of the state's commitment to the cluster. Moreover, state government, the Tobacco Commission, and several public-private partnerships have supported programs and facilities in community colleges and higher education centers throughout Southside Virginia, from Prince George to Martinsville, that focus on developing a workforce with the skills that will attract advanced manufacturers (and ultimately a network of suppliers), including the establishment of collaborative centers of excellence at community colleges in the region.

The momentum in attracting advanced manufacturers has proceeded more slowly than perhaps originally imagined or desired. Persuading firms that Virginia and our region can produce a skilled and globally competitive workforce remains an important consideration. In addition, there are substantial infrastructure challenges related to site development in the region. The absence of broadband and the difficulty of bringing water to potential sites were frequently cited in stakeholder discussions.

At the same time, the concerted effort at the state and regional levels to promote advanced manufacturing represents the largest and most coordinated effort to revive the economy of southside Virginia regions that have been in fiscal distress for decades. Striving to surmount the continuing obstacles is likely to be a more sensible bet than any other alternative for the region. The challenge for the Council is to consider where the leverage points are that help to catalyze an economic turnaround in the more fiscally stressed areas of the region.

Advanced Manufacturing Working Group Takeaways

The Advanced Manufacturing Working Group convened after the distribution of the Interim Report emphasized that the region does possess substantial competitive opportunities in this cluster. Participants noted that significant strength already exists in advanced materials and chemicals, with supporting activities such as contracting and turnaround services readily available.

Higher education in Virginia, especially the Commonwealth's community colleges, has become increasingly focused on workforce issues that are important to the sector and initiatives such as the formation of the Apprentice Academy at CCAM are on track. Moreover, the defense and military installations in the Commonwealth represent a unique advantage in the competition for talent. Participants also identified a set of challenges that should be addressed to take best advantage of the opportunities in this cluster. They noted that it was very important to ensure that the technical training programs needed for an industry were available to residents within a 30-60-mile radius. In addition, they felt that there needed to be a more effective, long-term workforce strategy directed at youth. They believed that programs for individuals transitioning out of the military were fragmented and not very well coordinated. And they expressed concern that Virginia has not done an especially good job in telling this story and highlighting its advanced manufacturing assets nationally and internationally.

The working group offered several specific recommendations that would enable the region take better advantage of the opportunities and address the challenges for advanced manufacturing.

1. Develop a coordinated program for attracting and training transitioning military members:

Companies such as Rolls Royce have had considerable success with the individuals they have recruited who are leaving military service. At least 650 individuals per year transition out of Fort Lee. There are several programs that currently have resources to support transitioning military members. Yet these resources could be better coordinated to bring together employers and individuals transitioning out of the military

in an appropriate time frame before decisions are made about a post-military residence. If companies could be brought together in a hub, the region could take much better advantage of the opportunity. In fact, this could be a GO Virginia project that could span multiple regions.

2. Develop a coordinated program for working with youth on career choices that tracks career interests and results in a measurable way:

Better ways can be developed for reaching out to young people and getting them excited about the opportunities that can be available to them in the workforce of tomorrow. The infrastructure of established programs such as Skills USA and Virginia First can be utilized to develop 21st Century instruments for teaching students about careers in the merging economy. It is important to do this in a manner that collects data about student in interests and preferences that can be tracked over time.

3. Strengthen university programs that can support advanced manufacturing in the region:

Virginia State University has the only manufacturing engineering program located between Georgia and Pennsylvania. It has the potential to become an extremely valuable asset to the region. Strengthening its connection with existing businesses and enhancing the coop program could provide a significant competitive recruiting advantage.

4. Enhance Virginia's branding of advanced manufacturing:

Communicating about Virginia's manufacturing assets and system of support will be crucial to succeeding in the global competitive environment. Working group participants believe that insufficient attention has been directed to this aspect of economic competitiveness. They recommend a regional and/or multi-region initiative to communicate to stakeholders within the region and to potential employers from the outside the region the assets we already possess and the initiatives underway.

5. Performance measures

The working group identified a set of performance measures that were relevant to their recommendations. These included: tracking middle and high school career interests over time, tracking collaboration among companies that have common workforce development interests, and increasing the percentage of individuals transitioning out of the military in the region who remain here and utilize training opportunities.

Health, Biosciences, Life Sciences: Developing “Tradeable” Services and Products

Health and life sciences is the cluster that stakeholder survey respondents identified as the most important industry to increasing higher paying jobs in the region. 89% said that it was Extremely or Very Important. Moreover, it was the cluster where respondents believed the region was best prepared. 60% of respondents said that we had excellent programs in science and technology in the region.

Health care is, overall, a high paying industry and the median wage typically exceeds regional and sub-regional averages. The existence of comprehensive health care services with a wide range of specialists is a quality of life selling point for economic development officials trying to convince a company to relocate. But health care is not necessarily viewed as a “tradeable” cluster that provides a competitive advantage for a region.

The competitive advantage in health care occurs when medical facilities in a region become a destination for groups and individuals from outside the area seeking a service or a specialty that they cannot access at home. Think of the national advertising campaign that M.D. Anderson conducts on behalf of its highly rated cancer treatments; or children’s hospitals that treat complex diseases; or company headquarters that congregate in a city such as Nashville, assembling a significant array of business talent that begin to spinoff smaller specialty firms.

It also occurs when health care is explicitly connected to research capacities that bring not only talented individuals but external research dollars to an area, often with federal and foundation

funding. For the most part, medical research is not funded by local dollars, but by external funders supporting talented individuals and groups within a region.

Competitive advantages also occur when medical-related researchers begin to form companies in the broad category of life sciences-developing drug treatments, methods and instruments of drug delivery, health and wellness products, innovations geared to specific age groups or populations such as children, seniors, or cancer survivors. Those developments are relevant to groups and individuals outside the region and succeed in the marketplace with their targeted consumer groups.

When our stakeholders spoke to us about the possibilities in health care and life sciences, they were talking about the prospects of translating scientific expertise into products and services that would succeed in the marketplace, about how collaborations among engineers, medical researchers, and artists could create new forms of medical services, or about how the region's traditional expertise in areas such as finance and insurance could be put into the service of enabling research insights to be commercialized in unique ways.

The biosciences and life sciences cluster in RVA exhibits more variation in its commercialization activities than ever before. At Virginia Commonwealth University, licensing revenues at Innovation Gateway, the university office for commercialization of faculty research and inventions, have increased from \$1.3 million in 2012-2013 to \$6.88 Million in 2016-2017. Major innovations include the following.

The development of a vaccine for Lyme disease in Dr. Richard Marconi's lab that has a 97% per cent success rate in dogs. It has quickly become a commercial success, bringing in millions of dollars in licensing revenues. Funding has been obtained to start the process of developing and receiving approval for a human vaccine.

Sanyal Biotechnology was started from the research conducted in the lab of Dr. Arun Sanyal. The company breeds mice called "DIAMOND mice" that develop liver disease similar to obese humans, due to high-fat and high-sugar Western diets. The mice are modeled specifically to

form a liver condition known as NASH, or non-alcoholic steatohepatitis. NASH is a leading cause of liver-related mortality and can lead to cirrhosis of the liver and liver cancer, for which there's no cure. Since the DIAMOND mice already have advanced liver problems, pharmaceutical companies can better test and understand faster how their drugs perform on people.

Dr. Frank Gupton of the VCU School of Engineering has led an interdisciplinary team in the "Medicine for All" initiative that has received a total of \$40M from the Gates Foundation, plus grants from additional funders to reinvent the processes by which small molecule drugs are manufactured and distributed. The goal is to sharply reduce steps, time, energy, waste, inputs and ultimately cost in the process. Such reductions will greatly expand the reach and impact of current philanthropic efforts to combat HIV and malaria. The breakthroughs also promise to revolutionize the generic drug industry in the US, and increase access to affordable medication, in Virginia and worldwide. The new and simplified chemistry will enable reengineering of the manufacturing process in to multiple platforms - from large scale continuous flow to very small-scale "pharmacy on demand".

Health, Life Sciences, Bioscience Working Group Takeaways

The Health, Life Sciences, and Bioscience working group detailed the region's existing strengths in this cluster, identified key opportunities, and suggested a possible direction in meeting workforce challenges.

1. Recognize the indispensable contribution of VCU to the cluster:

The working group emphasized that VCU is at the core of this cluster in the region. It has a major medical school, one of the state's highest ranked hospitals, the only dental school in the Commonwealth, a full array of allied health science programs, an extensive research portfolio and increasingly mature activities in the commercialization arena. The developing linkage between the School of Engineering and the health sciences represents an area of significant competitive opportunity. VCU's capacity to serve as a talent magnet for scientific innovators is an asset that only a handful of regions possess.

2. The location of a metropolitan innovation district adjacent to a major life science and bioscience university enhances the opportunity for cluster development:

Downtown Richmond has become the heart of the region's innovation district, attracting entrepreneurs, start-up companies and, increasingly, the innovation groups of mature companies. In many regions across the country, the separation of research universities from business innovation centers aggravates the challenges of commercializing scientific research. The essential co-location of the two in RVA offers a unique linkage opportunity.

3. Utilize the McGuire VA Medical Center as an emerging asset:

McGuire VAMC is a national leading center for research as well as care in the VA system. It has access to considerable resources to support research and a new appetite for public private partnerships to develop innovations into improved patient care. McGuire VAMC's Director, John Brandecker, is eager to catalyze significant change and improvement. McGuire VAMC is a key potential resource for growing the bioscience/life science industry in our region. Potential projects could build new capabilities in conjunction with VCU and industry to compete for large opportunities currently out of our reach. One discussion underway is a major investment in cancer research and care in partnership with Massey Cancer Center. In addition, partnerships and projects focused on veterans are a natural fit for the region and the Commonwealth.

4. Enhance programs linking students to businesses:

Virginia Bio Foundation (affiliated with Virginia Bio) is developing an innovative program with Christopher Newport University and William & Mary, that is scalable to other colleges and universities in the region, across the I-64 corridor or statewide. A key need at these schools is to inform their students about the variety and details of careers in this rapidly expanding field, and to introduce them to real people in industry they can

identify with who can describe career options, bring their own job to life, share insights, tips and tricks from their career journey, and identify potential employers. This program in development will be a web-based, coordinated and comprehensive package of webinars introducing 24 diverse individuals from across the many aspects of the Virginia life science industry to the students. Every other week at the same time, one individual will tell his or her story, sharing information about careers or jobs that are available or unfolding, and make themselves available for audience questions. The webinars will be built into the curriculum of the participating schools, and hundreds of students will participate. In person events will be planned throughout the year to energize the program.

5. Performance measures

These will include dollar amounts for commercializing research, number of new companies formed (including student-started firms), number of entrepreneurs linked to researchers, numbers and amount of funding for new companies, and grants received by new companies from federal and state programs.

Information Technology and Innovation: The Cluster of Clusters

The cluster analysis data presented above noted that the Information Technology cluster, while providing higher than average wages, has declined in employment over time in Region 4. Yet in our stakeholder survey, information technology was seen by more than 76% of respondents as Extremely Important or Very Important to providing higher paying jobs for the region in the future. Moreover, the cluster analysis data indicated that Information Technology will be an area of above average job growth for the foreseeable future.

In our focus groups, it became evident that information technology and all that it may entail (information systems, software engineering, specific business applications, data analytics, etc.) is not perceived only as a separate cluster to be enhanced, but as essential to the innovations that will occur across multiple clusters. Information technology is the cluster of clusters.

Stakeholders may not believe that RVA will be a national center for banking, but they do think

that financial technologies developed in RVA can impact businesses across the globe. The region is headquarters to an impressive array of very successful insurance companies. Our stakeholders did not necessarily see growth in this industry cluster as crucial to higher paying jobs in the future. But they did point to technologies such as those used by Compare.com as an example of how RVA can be an innovation leader in insurance and other clusters.

INNOVATION

The data in the baseline indicators section noted that the percentage of new jobs in the region created by young companies (24%) in Region 4, although increasing, lagged the statewide (26.2%) and national averages (26.1%) in 2015. The same is true of the number of new jobs created by small companies. They created 30.9% of the new jobs in Region 4 compared to 36.4% statewide and 36.2% nationally. In 2015, firms greater than 10 years old accounted for 64.9% of the new jobs created compared to 62.3% in both Virginia and the nation. This is, in many ways, not surprising given the region's performance over time in attracting an above average number of Fortune 500 companies and in its reliance on manufacturing in the southern part of the region.

Unfortunately, these data about young companies and job creation do not necessarily capture the place-based efforts to create innovation districts that are a prominent feature of new economy cities and is taking shape in downtown Richmond. Among GO Virginia stakeholders, there is a clear sense that innovation and entrepreneurship is an important component of a regional economic strategy and vital to future prosperity. In our survey (primarily of business leaders), more than 80% of respondents maintained that the development of a vibrant entrepreneurial culture was Extremely Important or Very Important to the creation of higher paying jobs

Today, RVA is receiving considerable attention as one of the country's most innovative and creative mid-sized regions. The area's reputation, once inextricably tied to and defined by its Civil War history, is becoming increasingly linked to the quality of life it offers its residents and to attractions that are magnets for visitors. The region's rave reviewed restaurants, celebrity

chefs and craft breweries have combined to create a food scene where national accolades are commonplace. Anchored by the nation's number one rated public university School of the Arts at VCU, the region is better known for artistic creativity than any similarly sized metro area in the country. A revitalized downtown, with condos and apartments populated by empty nesters and young professionals, has given a new appeal to urban living while residents can also enjoy significant outdoor recreational activities. Tourism magazines that look at our restaurants, museums, and architecturally compelling hotels label RVA a must-visit. The recent international bike races brought global attention and recognition to the region's cultural renaissance.

Within economic development circles, there is a growing, albeit not uniform, belief that a region's economic appeal is related to the quality of life that it can provide individuals and families who have the talent and skill to choose where they want to live. In recent years, the vibe that has accompanied the RVA's cultural revival has become increasingly attached to its economic transformation. The region has received national recognition for the innovation ecosystem it is creating for the new economy. In 2015, CNBC rated Richmond as one of the 20 best places to start a business. In 2013, Forbes Magazine pointed to Richmond's "quality of life and strategic location," ranking RVA as one of the 10 up and coming cities for entrepreneurs globally, along with cities such as Austin, Raleigh Durham, Sao Paulo and Sydney. This year, Rolling Out Magazine ranked Richmond as one of the nation's top ten cities for Black Entrepreneurs. Most recently, Entrepreneur Magazine ranked Richmond 3rd in a group of new hot cities for startups, citing its "amazing arts and cultural scene." As economic development experts put greater weight on the importance of "place" in the competition for talent, RVA can boast of an asset that few regions of its size possess.

In the language of economic development, the creation of an effective "innovation ecosystem" is widely recognized as essential for the capacity of a region to capitalize on creative entrepreneurial energy, whether in new firms, spinoffs, or with innovation units of mature companies. A panel of scholars brought together by the National Governor's Association identified six key elements that make an innovation system effective:

1. Sustaining capital formation and access
2. Encouraging entrepreneurship, especially the networks that nurture it.
3. Leveraging the assets and intellectual capital of higher education in a focused manner
4. Creating a talent advantage with high level educational attainment
5. Strengthening the competitiveness of existing industry
6. Promoting global exports

Many of these elements are currently operative in Region 4. We have seen the creation of angel investors and venture groups that support various stages of development, from startups through companies that have exhibited a successful business model. While it had at one time been very difficult for RVA to compete with the dollars available for entrepreneurs in larger metropolitan areas, the disadvantage is less pronounced today as new economy companies rely more on brainpower and software than on bricks and mortar. The major research institutions in the region, Virginia Commonwealth University, its affiliated Virginia Biotechnology Research Park, and the newly defined nonprofit, Activation Capital, have focused efforts more directly at encouraging and catalyzing innovation- through the creation of the DaVinci Center, developing a clearer approach to commercialization, and supporting collaborations across the region. In addition, the region has recently created an initiative, Metro Richmond Exports, that has brought together a network of businesses, university experts, and local economic development offices behind a strategy for promoting global exports as a way of enhancing the local economy. The innovation ecosystem may not be that large, but its components are clearly taking shape.

Stakeholders highlighted one especially interesting indicator of the growing vibrancy of the innovation district in downtown Richmond. In several cities, established companies have moved all or part of their operations from campus-like atmospheres in the suburbs to downtown. This trend is now visible in RVA as several mature firms have moved their innovation units downtown. CarMax, a company that transformed the used car industry 20 years ago, has moved its innovation group from the suburbs to the city. Capital One, a company that transformed the credit card industry, has established offices in downtown. And Owens and Minor, a national leader in health care logistics, has also relocated a part of its operation.

The data available on the innovation community in RVA and the surrounding region is only beginning to be collected. Activation Capital has formulated a robust set of ecosystem metrics that will enable the region to track progress about the number of start companies, employment levels, awards received by start-ups, the amount of funding obtained, the number of research and creative spaces, and the number and amount of Small Business Innovation Research and Small Business Technology Transfer Awards. New Richmond Ventures (NRV) has been tracking start up activity for several years, using a region-based focus that encompasses much of GO Virginia Region 4, but is not perfectly congruent as it also includes Fredericksburg to the north and Charlottesville to the west. Of the 179 startup companies that have been identified by New Richmond Ventures, 103 have an IT Tech foundation and 42 have a health care focus. Companies with an IT foundation range across industry clusters: an energy company developing wireless charging stations for electric vehicles, a health and wellness company that offers home-based food delivery; a company that utilizes cutting-edge Ag tech to manufacture plant based ingredients that can be used in a variety of foods; and technology companies that develop applications relevant to the insurance and financial service industries.

In some instances, these may be clear spinoffs from existing industries in the region's long-established clusters. In others, however, the innovation efforts are combining the region's traditional strengths in unique ways. Efforts are underway at VCU (in partnership with universities such as MIT), supported by historically large grants from the Gates Foundation, to link the production of pharmaceuticals needed on the military battlefield or in undeserved rural Africa to on-demand engineering and manufacturing processes. Other innovations are striving to combine the region's traditional strength in financial services with food technologies in rural and urban agricultural areas to promote the contemporary interest in health and wellness. While companies may begin within a clearly defined cluster, their innovations continually redefine industry segments and clusters.

Our meeting with stakeholders in the region's new economy identified several challenges in growing the region's ecosystem. Talent recruitment and retention was frequently raised. Obtaining specialized expertise that was not offered through a well-defined degree program

can be a hurdle, though executives did recognize that it was not reasonable to expect an engineering or business school to base its curriculum on their limited recruitment needs. As noted in the talent attraction section, human resource directors at major companies believe that, despite all the wonderful publicity the region has received, it takes a long time for a location's reputation to be transformed among potential recruits and that a reputation that "lagged reality" was still an obstacle in attracting new economy talent.

More generally, however, the issue of what could be labeled "new economy density," a point raised by the young professionals to whom we spoke, was reiterated by stakeholders and by HR directors. Density is considered important to new economy stakeholders in terms of the breadth and depth of the network that is located where they are working. It makes it easier to find partners, mentors and collaborators, to understand what ideas are truly gaining traction in the business world, and to become familiar with the range of options that can be pursued during a career. In addition, it is a recruitment challenge. One CEO mentioned that it was difficult recruiting experienced high level senior executives to their new economy company since a "back up plan" if things didn't work out was difficult to identify and "trailing spouses" often find it challenging to find employment equivalent to their current position.

In terms of the larger innovation ecosystem, stakeholders also noted that the region lacked a signature space such as Durham's American Underground and Denver's Galvanize that the most vibrant new economy regions have developed to catalyze innovative and entrepreneurial activities, promoting a sense of community and common purpose among a group of risk-takers. Typically, these spaces bring together hundreds of innovators from various stages in the business cycle, from startups to the innovation groups embedded within mature firms, who are dedicated to building the economy of the future in areas such as IT, finance, health care and data analytics-. Signature spaces serve the practical purpose of providing a wide range of services- infrastructure support, shared IT and back office operations, mentoring, funding advice- in an accessible and collaborative manner. But the space also serves a crucial branding function for the region- telling both residents and people everywhere that a location is on the cutting edge of innovation.

What was perhaps most clear from our stakeholders is their belief that innovation is central to the future success of the region and that RVA may be reaching a tipping point. They believe that initiatives that increase the density of the innovation community and brand RVA as a genuine competitor are essential to rebranding the region as a new economy player.

Innovation/Information Technology Working Group Takeaways

1. Align educational initiatives more closely with new economy needs:

The working group pointed to several educational goals and initiatives that would support the innovation ecosystem. Members recommended that the council set a goal of dramatically increasing both the number of computer science and electrical engineering degrees in RVA and the percentage of graduates who remain in the region. They suggested that innovative programs be created for adults who want to be retrained or reskilled for new economy jobs, such as a CodeRVA for adults in the workforce, be established.

2. Make big bets in areas where we have a significant competitive advantage: health cybersecurity

Survey data indicated that business leaders believed that cybersecurity will be increasingly important to higher paying jobs, but it was also an area where the region is currently not well prepared. Members of the working group suggested that health care cybersecurity is an area where national leadership has not been established and where the region can combine existing strengths in life sciences and technology to develop a highly competitive position.

3. Recruit individuals from higher risk backgrounds into innovation and technology fields:

HR Directors that we interviewed in the stakeholder process emphasized the critical importance they place on developing a diverse workforce that draws from all segments of the population. Working group members believe that the region has a special

opportunity to recruit students from backgrounds that have been traditionally underrepresented in fields related to information technology and innovation. Working group members believe very strongly that it is important for the regional and state GO Virginia efforts to focus on ensuring that all segments of the population can prosper and compete for higher paying jobs. The working group noted that the importance of “pipeline,” mentoring and internship programs that provide at-risk students with the information and skills to flourish in the new economy.

4. Develop a RVA 2.0:

The rebranding of the region as RVA has been successful, especially among young adults, in providing the area with a more distinctive identity, one that focused attention on the cultural attractions, outdoor recreation opportunities, and food and beer scenes that make for a very appealing quality of life. The working group believes that it is crucial for the region to take the next step in this process and become recognized nationally for the vibrancy and depth of its innovation community to become a destination for great talent. This could include the creation of a center or hub for regional innovation; an increased focus on student entrepreneurship; and a directed effort and branding the region to the audiences vital in creating new economy companies.

5. Performance measures

These will include increases in the number of graduates and certificates in crucial information technology, software development, and engineering fields. The number of graduates and certificates achieved by students from traditionally underrepresented groups will also be measured. Performance measures will also call for increasing the percentage of new companies as part of the region’s overall industry mix.

SITES AND BUILDINGS

Background

Having the right product, in the right place, at the right time is the key to success for an economic development project, especially those with a manufacturing or distribution component. Competition is international, with offerings of "ready to go" sites and aggressive incentive packages.

The economic development site selection process has become both easier and more sophisticated in the past ten years. Prospects can easily go to the Web, enter the parameters for a site in a geographic area of their choosing and review the candidate sites in detail.

Often, the sites are narrowed before the prospect ever visits. When the prospect does arrive, they want to be shown the sites that most closely meet their selection criteria. For example, the criteria could include a mileage proximity to an interstate or airport, rail, utility infrastructure, etc.

"Ready to go" sites means just that – ready to go. The phrase is used in referring to open land that is prepared, zoned, and has all the required infrastructure in place. The site can be a stand-alone listing or it could be in a developed business park. It could also be a mega-site which is a much larger site with the required accessibility and infrastructure typical of mega projects. When prospects visits, time is generally very limited, and needs to be spent satisfying them that a site(s) is available and that that the team stands ready to assist in any way possible to insure a positive location decision. In traditional economic development, the site must work before anything else happens. Once this is resolved, addressing other factors such as education, workforce, and quality of life can follow.

Virginia Site and Building Inventory

The main depository of site data and information is "Virginia Scan". This can be found at www.yesvirginia.org and is free of charge. The Virginia Economic Development Partnership (VEDP) maintains the database with dedicated staff to validate the information and to

continuously engage with the local and regional economic development groups as well as developers and brokers.

There is also a YesVA app at the Apple store and on Google Play for IOS and Android devices. This database is comprehensive, easy to use, and site searches can be made by entering search criteria. Everything above 5 acres and 10,000 square feet for buildings can be entered into the system. Exceptions are made for smaller sizes depending on the locality; and the localities are responsible for maintaining and updating the records.

Site and Building Readiness

There is a growing concern in the Commonwealth that the availability of ready sites is becoming marginal. The Virginia Economic Development Partnership (VEDP) has an initiative, the Virginia Business Ready Sites Program (VBRSP) to support readiness development for sites of 100 contiguous acres or above. (The qualifying acreage was recently reduced from 250 acres by the General Assembly). The goal is to "develop a pool of potential sites across the Commonwealth that are well prepared and positioned for selection and development by prospective economic development projects that are ready to commit to the construction of a facility."

The program defines 5 tiers for the readiness of sites and a locality can apply for a grant as it moves a site through the ascending tier levels. The ranking system was developed by the private sector under a concept that is common among engineers and developers. According to the guidelines, the grant application is based on 5 priorities – Viability, Alignment, Economic Impact, Commitment, and Leveraged Resources. The grants are “awarded to assist with the costs associated with the development required to increase a site’s currently designated Tier Level to the *next* Tier Level” and grant dollars get larger at each Tier Level. The applicant must match the grants dollar for dollar. The program is administered by the VEDP and is subject to the availability of funds and an appropriation from the General Assembly. Tier levels 4 and 5 are typically the levels that are sought by active prospects. Tier 5 is a “ready to go site” and Tier 4 is for sites that can essentially be “ready to go” in 6 to 12 months. The upgrading of sites to Tier 4

and Tier 5 is an important issue because, according to VEDP, "the Commonwealth currently does not have an adequate number of such sites".

Region 4 Site Assessment

It is difficult to provide a fully accurate portrait of site readiness in Region 4 because there appears to be variable participation in the state's Ready Sites program by the localities. We do know that there are currently 994 records of available sites statewide and, in Region 4, there are 245 records (25% of the state total). For buildings, there are 1,796 records statewide and in Region 4 there are 535 (30% of state total). There are 58 sites that have 100 contiguous acres or more in all localities except Charles City, Hopewell, Powhatan, and Richmond. But only 7 of the 58 sites in Region 4 have been officially tiered. In most instances, if a site has not been tiered, it means that it doesn't meet a minimal level of readiness. But even this is not always the case as it is dependent on a locality applying for tiering.

We were able, however, to make some considered assessments of the site and building readiness situation in Region 4. Research conducted by the Greater Richmond Partnership (GRP) indicates that most prospect requests for sites are in manufacturing and distribution. The GRP also notes that 90% of prospects are looking for buildings while 10% of prospects are focused primarily on the site. GRP data also indicate that prospects are interested in larger buildings today than they were 20 years ago. It is not uncommon for a prospect to inquire about a building with more than 100,000 square feet with 30 feet high ceilings. We were not able to identify any available building in the region with these dimensions.

Issues with site development were also explicitly raised in our focus group with stakeholders in the Crater District, as participants suggested that the absence of infrastructure such as broadband and water/sewer connections was a tremendous obstacle to industry recruiting efforts. One major site in Region 4 that has been high on the Crater District's priority list is the Mid Atlantic Advanced Manufacturing Center in Greenville County, a certified industrial mega site. Greenville County is poised and ready to handle a large project but it will take

approximately one year to complete the utility infrastructure at a cost of approximately \$5+ million.

GO Virginia, through the Collaborative Jobs Act, may provide Region 4 localities with an opportunity to work together on site development. The legislation enables localities that produce a specified number of jobs through a joint project to share in the income tax revenue from the new employees. This is a new and powerful incentive for localities to collaborate. Site development could be a perfect use of this incentive.

Sites and Buildings Working Group Takeaways

The Sites and Buildings Working Group examined the data produced in the Interim Report, addressed the key opportunities with sites and buildings in the region, and suggested performance measures that would be important to gauging project proposals.

1. The Buildings Challenge

The members concurred with the VEDP assessment that increasing the number of available sites and buildings should be an essential component of the region's economic development strategy. Members believed that an important element of state-local collaboration is for localities to utilize the Ready Sites Program more extensively, but also noted that the costs involved in constructing a spec building or in bringing adequate infrastructure to a site in a rural location are prohibitive for localities.

The working group suggested that the current process of bringing buildings on line is not meeting the current demand and will certainly not be adequate to the projected need. Good buildings generate economic development traffic, both for new business and existing business expansion. Shell buildings that are 100,000 square feet, have 30-foot ceilings, are air conditioned, are expandable and have full infrastructure are in high demand.

Manufacturers with precision equipment also require stable foundations that will not be impacted by road or rail conditions outside the facility. Currently, the region is not able to meet this demand. In fact, the working group heard from a member with a well-established

existing business that has been searching for more than 18 months for an appropriate facility.

2. Shell Buildings Initiative

The working group recommended that creative approaches be adopted that would enable the region and the state to target more substantial resources at the need to generate a larger quantity of desirable buildings, a need not currently being met by pure market forces. They suggested that it would be helpful to establish a “shell building program” in which public-private partnerships were utilized to bring buildings on line far more rapidly than is possible in the current framework. One suggestion was to explore the possibility of having the Virginia Retirement System participate in a manner as has been done in Alabama with the Robert Trent Jones Golf Trail. In any case, members felt that accelerating the building and site development process was crucial to success in the contemporary competitive environment.

3. Smaller Spaces for New Economy Firms

The working group also identified the need for smaller spaces to accommodate the region’s emerging new economy. It is important to be able to retain start-up companies as these become successful and require additional space. The capacity to find an appropriate building with 2,000-5,000 square feet has been identified by those involved in the region’s innovation ecosystem as an important factor in ensuring that a company that takes root in the region can grow here as well. The recent expansion of Nutirati (nutrient extracts from chickpeas) is a positive example of space that happened to be available at the right time.

4. Performance Measures

The working group recommended that performance measures associated with projects involved with sites and buildings focus on increasing the number of ready to go sites, increasing tier listed sites, increasing sites that have become tier 4 or tier 5, and, most importantly, increasing the number of desirable shell buildings in the region.

FRAMEWORK FOR MOVING FORWARD

The purpose of the Economic Growth and Diversification Plan is not to detail specific project ideas that the Council should endorse. It is designed, instead, to allow Council members to understand the data that will impact their choices and to provide a framework for making project selections after these are officially proposed. The data indicate that Council members will have to weigh a variety of factors in choosing an activity or cluster to support and incentivize. The recommendations that follow outline a framework that the Council might employ as it considers proposals in the major subject areas discussed in this report.

1. *Skilled Workforce—The Council should consider how resources and investments can be best leveraged to ensure that workforce development investments demonstrate how business can be a more effective partner in reducing skill gaps and preparing the workforce of the future. It should also ensure that projects can address the long-term workforce challenges identified by the working groups.*

The existing range and number of workforce initiatives now is almost too large to catalogue. It would be impossible for the Council to reorganize and streamline the workforce system as these programs have multiple purposes, different funding sources, and are subject to complex state and federal regulations. The Council can, however, support models that promise more effective use of dollars through collaborations that involve business more centrally in designing offerings, curricula and curricula adjustments.

2. *Attracting and Retaining Millennials—The Council should consider more effective ways of attracting and retaining graduates from the I-64 educational corridor that extends from Staunton to Virginia Beach and that includes more than half of the public university college students, the state’s major historically black colleges and universities (HBCUs), significant private universities, and the majority of medical students.*

With the graying of the nation’s population, the competition between regions for young professionals grows more intense. The RVA region has many advantages on the quality of

life issues that matter to the millennial generation. The region is also centrally located in the heart of Virginia's education corridor. It can take better advantage of this asset by developing more creative and effective ways of linking colleges and university students to potential employers to highlight the range of available career opportunities in the region. The continuing recruitment and retention of highly educated young professionals is crucial to sustaining the momentum that the region has exhibited in clusters such as health and life sciences, advanced logistics, and business and professional services where data analytics is a major component.

- 3. Clusters-Health, Life Sciences, Biosciences—The Council should consider health, life science and wellness innovations that not only assist the region's population, but that develop products, processes, firms and institutions that provide "tradeable" competitive advantages.*

In recent years, the life sciences and biosciences cluster in the region has become far more varied and complex. Drug discovery was once the dominant business activity in the cluster. Today, there are dozens of efforts to commercialize the range of expertise the region possesses in the life sciences and biosciences, ranging from pharmaceutical engineering to health and wellness products. Stakeholders in the region believe that the health, life sciences, biosciences cluster is crucial to promoting higher paying jobs in the region. The Council should consider ways to enhance the infrastructure that will enable "tradeable" activities to flourish.

- 4. Clusters-Advanced Manufacturing—The Plan recommends that Council should consider how advanced manufacturing initiatives can make significant progress in addressing the challenges of workforce preparation and site development.*

A significant commitment has been made by the Commonwealth of Virginia to promoting advanced manufacturing as a major component of a potential economic revival in the state's economically stressed regions. In our region, the successful recruitment of Rolls Royce, the creation of the Commonwealth Center for Advanced Manufacturing, and the development of community college workforce programs to support the industry have been

important initiatives toward this end. The work in this regard, however, is by no means complete. Succeeding in the global competition for advanced manufacturing facilities will require greater success in workforce preparation and more attention to ready site development.

5. *Clusters-Logistics—The Council should consider how average wages in the region’s logistics cluster could be enhanced by linking initiatives to other clusters such as manufacturing that pay higher wages and by focusing on the research based applications of advanced logistics that can improve bottom line business processes.*

The region’s natural locational advantages have made logistics an important growth industry. Yet for GO Virginia purposes, it is a cluster with below average wages, largely because of the number of jobs, many part-time, in warehousing and distribution. The region has several emerging logistics opportunities related to the linkages with the growing activity level at the Port of Virginia. The Council should consider how these opportunities could be linked to other clusters such as manufacturing where wages are above the regional average. In addition, the region is developing research capacity in logistics through the Commonwealth Center for Advanced Logistics Systems and its five-member universities that focus on how logistics can improve business processes in any organization concerned with the timely and efficient delivery of a product or service.

6. *Innovation—The Council should consider how it can help build upon the national accolades the region has recently received for having one of the most hospitable climates for innovation and starting a business. The build out of an innovation ecosystem will be crucial to the capacity of the region to remain competitive in a rapidly changing global economy.*

The fundamental identity of the RVA region has been significantly redefined over the past decade. RVA has been increasingly recognized for its unique cultural attractions and enviable quality of life. Completing these assets with a vibrant innovation and entrepreneurial community will favorably position the region in the new economy competition. Government should not become involved in picking winners and losers among

new companies. But it can help to shape the climate in which an innovation district takes root and flourishes through tax policy, regulations, zoning and land use decisions. The Council should consider ideas that will enable the region's emergent innovation district to become even more successful.

7. *Sites—The Council should consider how the number of desirable, “ready-to-go” buildings and sites can be significantly increased. As GO Virginia develops, the Council should encourage localities to participate in joint site development through the Collaborative Jobs Act.*

The General Assembly passed the Collaborative Jobs Act as part of the GO Virginia legislative package. When fully implemented, this legislation will offer a new and powerful incentive for local governments to work together on economic development. If two or more local governments work together on a project that will provide a certain number of jobs, the participating jurisdictions will share in the state income tax revenue that is produced for 5 years. This program can transform the way state government and localities partner on projects. The Council should encourage its use.

POSTSCRIPT

The leadership of GROW Capital Jobs Foundation believes it has fulfilled GO Virginia's requirements to produce a thorough Economic Growth and Diversification Plan for its region. Our plan analyses the challenges and opportunities there are to contribute to building a 21st century economy in the Crater and Richmond Regional Planning Districts.

Members of the GROW Capital Jobs Council received an Interim Report on the plan July 25, 2017, and had the opportunity to react and comment initially on its scope and findings. A completed draft of the plan was emailed to all members for comments in advance of the Council's meeting on August 25, 2017. That would provide an opportunity for final comments and changes before anticipated approval.

But the plan must receive final approval, or suggested modifications, by the state GO Virginia Board at its meeting on September 12, 2017. With that state approval, the GROW Capital Jobs Council can then solicit collaborative proposals from its localities and other entities for projects that meet state requirements to fill higher paying jobs in the region's economy.

As the Council's support organization, GROW Capital Jobs Foundation staff believes the primary lesson learned is that our economy is changing rapidly. Most every person, or source, consulted in the information-gathering process revealed undiscovered and new developments or additional people to consult. New insight was developed at every stage that broadened and enhanced understanding of the rapid transformation into a 21st century business ecosystem.

As a result, GROW Capital Jobs Foundation intends to continue pursuing that rapid evolution to assure that its efforts remain forward-looking, and not just reflective of the business environment in the past. Our plan will not be static. It will be a living, work in-progress plan because staff proposes to continue to meet with stakeholders periodically throughout our region and to update the plan where appropriate. Perhaps most importantly, the Foundation was extraordinarily heartened by the commitment to collaboration that was evidenced throughout the region. This bodes very positively for the GO Virginia initiative.

Acknowledgements

The Foundation expresses its appreciation to Christine Chmura and Patrick Clapp of Chmura Economics and Analytics who provided the extensive data analysis summarized in the plan.

The plan's principal consultant, Dr. Bob Holsworth of DecideSmart, brought a relevant background from years of work on similar projects, but he undoubtedly spent much more time talking with stakeholders than he initially envisioned to refine his insight. His associates, Will Davis, former head of economic development, and Lane Ramsey, former county manager, both in Chesterfield County, contributed valuable insight. The Foundation wants to express its thanks to Bob and his DecideSmart team for their above-and-beyond efforts.

3 Core Strategies

The principal goal of the GROW Capital Jobs Regional Council is to grow our own higher paying jobs. The Council developed three core strategies that will enable the region to compete successfully in the economy of the future.

1. Integrate business with education to create a highly qualified workforce that will enable individuals and families to flourish in tomorrow's economy.
2. Stimulate growth in bioscience, manufacturing and logistics utilizing advanced technology.
3. Capitalize on the region's growing reputation as a center of innovation and entrepreneurship.

Transition from Data to Cluster Selection

The GROW Capital Jobs Council selected health/bioscience, advanced manufacturing, advanced logistics and information technology/innovation as the focus areas for the plan. The Council reviewed previous studies and the data produced specifically for this report. It designed a process for receiving input from stakeholders throughout the region about their priorities. And the Council remained attentive to the intra-regional differences in terms of cluster strength and opportunity.

Cluster-based research

The region's two major economic development organizations, the Greater Richmond Partnership and Virginia's Gateway Region have commissioned empirically-based cluster research efforts for almost two decades. The studies have consistently identified a relatively stable set of clusters as ones where the region has the greatest competitive advantage and opportunity.

Greater Richmond Partnership Clusters

Health/bioscience
Logistics
Advanced Manufacturing
Management of companies
Information Technology
Finance/Insurance
Food beverage

Virginia's Gateway Region Clusters

Global Logistics and Distribution
Advanced Manufacturing/Aerospace
Food/Natural Products Manufacturing
Natural and Renewable Energy

Research conducted for the GROW Capital Jobs Council supplemented the previous analyses and provided greater nuance by examining clusters along three dimensions: overall contribution to GDP, average wages in each industry cluster, and forecasted growth in each cluster from 2017-2027.

- Clusters that had above average wages and high local competitiveness included creative services, financial services, defense, and health/bioscience.
- Clusters that had above average wages but not above average local competitiveness included professional services, information technology, and chemicals and advanced materials.
- Logistics had slightly below average wages, but high local competitiveness.
- The research conducted for the Council also detailed significant interregional differences, emphasizing that the manufacturing clusters (advanced materials, chemicals, etc.) that might have below average projected growth region-wide still made important contributions to the regional GDP and could be extremely important to specific sub-regions.

Council members paid attention to data that examined forecasted growth in each cluster for the next 10 years.

Regional Average Annual Growth Forecast 2017-2027

INDUSTRY	AVERAGE GROWTH FORECAST
All Industries	.7%
Bioscience	1.5%
Information Technology	1.4%
Creative Services	1.4%
Construction	1.3%
Energy	1.0%
Professional Services	.8%
Logistics	.8%
Financial Services	.7%
Mgmt. of Companies	.4%
Advanced Materials	.1%
Chemicals	-.9%
Food and Beverage	-1.0%

Stakeholder engagement on clusters

Our stakeholder engagement process, conducted through surveys and focus groups, attempted to probe view on the clusters that were most important to the future of the region, to elicit ideas about best opportunities, and to identify critical challenges.

- Thinking about the future economy, stakeholders clearly identified health/bioscience and information technology as the region's most important clusters for the future.

The stakeholder perspective on this issue was perfectly consistent with the forecasted growth data that had been presented to council members.

- There were, however, some significant intra-regional differences. Stakeholders from the Crater and rural parts of the district, while also highlighting health/bioscience and information technology, were more likely than their metro counterparts to emphasize the importance of advanced manufacturing (chemicals, advanced materials, aerospace) and logistics as vital to future prosperity.
- Many stakeholders also expressed in very clear terms their uneasiness with the manner that clusters were defined, especially as this was manifested in the NAICS codes (or job categories) included under each cluster. They noted that the job codes did not capture the changes occurring in the economy and did not reflect the work that was being performed within the cluster today.
- This was especially true of information technology. Stakeholders strongly believed that information technology was no longer a separate cluster, but was increasingly becoming the foundation of all clusters, especially with the emergent innovation economy. New Richmond Ventures presented data that indicated that IT innovation was at the root of the clear majority of new companies formed in the region (regardless of official cluster category).

Council Involvement and Dialogue

Council members were actively engaged in the process of responding to the research and selecting the cluster areas highlighted in the plan. Council members participated in the six working groups formed in response to the Interim Report and engaged in thoughtful dialogue at their regular meetings.

- Council members focused on clusters that were "tradeable" in the manner defined by Go Virginia, resulting in out-of-state revenues. They focused on clusters or sub-clusters that were not simply providing necessary services for existing consumers and business, but could be significantly competitive nationally and globally. For this reason, clusters and sub clusters that primarily depend on growth in other business sectors- construction, much of business and professional services, and financial deposit services- were acknowledged to be regionally significant but not prioritized as part of the Plan.
- Council members focused on clusters that had significant growth potential, but also paid attention to sub-regional challenges and opportunities. Health/bioscience and Information

technology ranked highest in terms of both the data about forecasted average growth and stakeholder views about the importance of the clusters to higher paying jobs in the future. Advanced manufacturing and advanced logistics both have a scope that is region-wide, but council members recognized that these clusters may be more crucial to certain sections of the region.

If council members had simply utilized forecasted growth data for the entirety of the region, advanced manufacturing (advanced materials and chemicals) might not have been prioritized. But council members acknowledged the continuing contribution that this cluster makes to the GDP of the region and sub-region. They also recognized that the region and the state have made significant investments in revitalizing the sector that have paid substantial dividends in attracting companies such as Rolls Royce and maintaining a hub for chemical-based industries. Advanced manufacturing remains one of the best bets for maintaining and increasing high paying jobs in the sub-region.

- Council members made a considered decision to define information technology not simply as a separate cluster, but also as the foundation for the Innovation Ecosystem that has become crucial to the development of new businesses in the region with potential scale-up opportunities. This decision also impacted the way council members responded to clusters such as financial services/insurance and business and professional services that have been highlighted in previous cluster analyses. It is not that the Council is diminishing the importance of these industries, but it is suggesting that future opportunities that are “tradeable” (such as the formation of Compare.com) are likely to have Information technology at the core.
- At the end, the Council’s recommendations are consistent with previous studies conducted in the region, with the data generated specifically for the plan and with the ideas advanced in the stakeholder engagement process. Health/bioscience, information technology, advanced manufacturing (especially advanced materials and chemicals) and logistics have been identified as important regional or sub-regional clusters in every study that has been conducted.
- The conclusions were also consistent with the Council members’ understanding of the changes occurring in contemporary economic development strategies, changes that make information technology the foundation of multiple clusters, that make the availability of a skilled workforce an essential competitive advantage, and that highlight the importance of innovation to a region’s national and global brand.

Workforce Development and Site/Buildings Enhancement

The Council also prioritized activities related to workforce and sites/buildings that cut across multiple clusters. Council members believe that these enabling activities are essential to the region's future success. In particular, council members focused on workforce development, endorsing more effective coordination between business and education as a core strategy

Workforce Development

- The emphasis that council members and stakeholders placed on the role that workforce development, talent attraction, and talent retention will play in enabling the region to grow higher paying jobs could not have been stronger. It was central to the dialogue about each cluster and what would be required for the region to increase its national and global competitiveness. The establishment of more effective partnerships between business and educational institutions was identified as a strategy relevant to every cluster that council members prioritized.
- Councilmembers and stakeholders spent considerable time exploring the range of available programs, identifying challenges and proposing practical ways of addressing these. Council members did not simply say that the "region needs more credentials in manufacturing, chemical operators, etc.", but grappled with how the barriers and obstacles could be overcome. For example, council members detailed why manufacturing firms concerned about retention of qualified workers have a strong preference for individuals who acquire appropriate credentials locally. In addition, they identified specific steps that could be taken with populations such as transitioning military, college dropouts, and at-risk youth to enhance the middle skills workforce pipeline. They also examined how community college credentialing programs could work with employers that required similar skills
- Council members and stakeholders also grappled with specific challenges in developing the workforce for positions in clusters such as health/bioscience and information technology that require bachelor's and often advanced degrees. Human resource experts along with subject area experts were convened to address how the region could retain more graduates along the I-64 educational corridors and attract talent from around the globe. Once again, a set of specific recommendations were made about business-university collaboration, scale-ups of promising recruitment programs, and utilizing the expertise in the region's creative services sector to enhance communication strategies about the region's opportunities.

Site and Building Enhancement

The plan's recommendations with respect to sites and building is primarily related to the critical infrastructure required for the clusters that were identified as priorities to the region's future.

- The development of sites and buildings have been highlighted by Governor McAuliffe and Stephen Moret, CEO of the Virginia Economic Development Partnership, as a crucial

underpinning of the Commonwealth's economic development strategy. Developing an adequate inventory of sites and building will be an essential component of attracting out-of-state businesses to the Commonwealth.

- In the more rural areas of the region, this is a pressing issue in attracting manufacturing firms, suppliers and distribution facilities. Land is relatively readily available, but few sites have the necessary broadband and utility infrastructure that will enable the site to be competitive with what may be available in other states. Moreover, individual localities rarely have the resources to provide the local dollars needed to supplement VEDP's grants for site enhancement.
- Council members believed that it was important to highlight this challenge and offer recommendations for addressing it- using the Collaborative Jobs Act, denser development on existing sites, new forms of financing multiple buildings constructed simultaneously- since it is a major barrier to successful recruitment, especially in the more rural areas.
- Council members also addressed the potential for developing a signature site and scale-up sites for the emerging innovation economy. Stakeholders noted that the innovation ecosystem in the region lacks a signature site on the scale that other regions mentioned as new economy hubs have developed. In addition, the availability of scale-up sites for successful start-ups has become an identified challenge within the innovation community.

Attention to Rural Parts of the Region

The Grow Capital Jobs Council was committed to a region-wide perspective that identified common interests and goals that were shared across both metro and rural areas. The membership of the Council included business, governmental and educational leaders from all sections of the region and the Council worked collaboratively and cooperatively. Half of the Council's six working groups were chaired by individuals with significant involvement in the rural sections of the region. At the same time, the Council recognized that economic, demographic, and educational conditions vary considerable from the metro to the rural areas and that the Plan needed to address the distinctive challenges faced by each kind of locale.

Data presentations

- The economic overview section of the plan outlined the general demographic and economic conditions of the region and then clearly demonstrated the distinctions between the localities in the metro and more rural areas (pp. 14-25, 39-41). Prior to the Interim Report, the Council received at one of its first meetings a summary of the research that had been previously completed in the region that illustrated differences in educational attainment, infrastructure development, population growth, and income levels.

Stakeholder Engagement

- The stakeholder engagement process identified workforce development as the most important single issue that transcended intra-regional differences. This was especially true in relation to

the development of middle-skills capacities. The stakeholder engagement process confirmed the workforce skills analysis that indicated in both metro and rural areas that jobs requiring technical training beyond high school was a growth area where the demand is not being met.

At the same time, the plan noted that the lack of broadband in the region's rural areas was making it more difficult to provide the career education and that broadband was an essential component of workforce development in the contemporary economy.

Cluster Selection and Rural Interests

- The Council's cluster selection process reflected the attention that members paid to recognizing the needs evident in the metro and rural parts of the region. The decision by the Council to highlight advanced manufacturing and advanced logistics reinforces the strategies endorsed in the Crater Planning District's Comprehensive Economic Development Strategy.
- The Council recognized that advanced manufacturing, notably advanced materials and chemicals, has not been growing as a contributor to regional GDP (a phenomenon that is neither unique to Virginia or any other state), its revival represents an important opportunity that is related to a statewide emphasis on revitalizing manufacturing in the Commonwealth's more rural regions.
- The Council also highlighted advanced logistics as an important area of opportunity. While the logistics cluster clearly ranges across all parts of the region, it has been very important as a source of employment in the more rural areas. For example, the report notes that in Charles City County, logistics has been the source of jobs with wages higher than the local average. (p.41)

Sites and Buildings

- The sites and buildings section of the report is important to all sections of the region, but has special relevance to the rural areas. The cost of bringing infrastructure-broadband and utilities-to sites and constructing buildings of 100,000+ square feet with 30-foot ceilings has limited the capacity of rural locales to attract manufacturing firms. Stephen Moret, CEO of the Virginia Economic Development Partnership, has drawn attention to the lack of site/building inventory in the Commonwealth and noted that addressing this is necessary to meet rural economic development goals. The Council's plan is consistent with VEDP's emphasis, recommending the use of the Collaborative Jobs Act to promote inter-jurisdictional collaboration on site and building development, enhancing state-local collaboration on site development and endorsing innovative efforts to increase the pace of building construction.