Appendix I: Data Compilation

Revised - August 10, 2017

Prepared for:

Central Virginia Partnership for Economic Development
2211 Hydraulic Road, Suite 104
Charlottesville, VA 22901

camoin associates
ECONOMIC DEVELOPMENT

In collaboration with:

THOMAS P. MILLER & ASSOCIATES

innovation policyworks

GLS GLOBAL LOCATION STRATEGIES

This document serves as a preliminary data report to be used in preparing the Economic Growth and Diversification Plan for Region 9 of the GO Virginia Initiative. The information provided herein will serve as a foundation for more in-depth planning and coordination to promote the growth of high-income jobs within the Commonwealth of Virginia.

The Project Team

The following consultant teams collaborated in assembling the data provided in this report:

Camoin Associates

Project Coordination; Economic Base Analysis

Thomas P. Miller & Associates

Occupational Analysis; Business Survey Administration

Innovation Policyworks

Innovation and Entrepreneurship Inventory Analysis

Global Location Strategies

Site Location and Analysis

Table of Contents

Executive Summary

Prepared by:

camoin associates
ECONOMIC DEVELOPMENT

THOMAS P. MILLER & ASSOCIATES

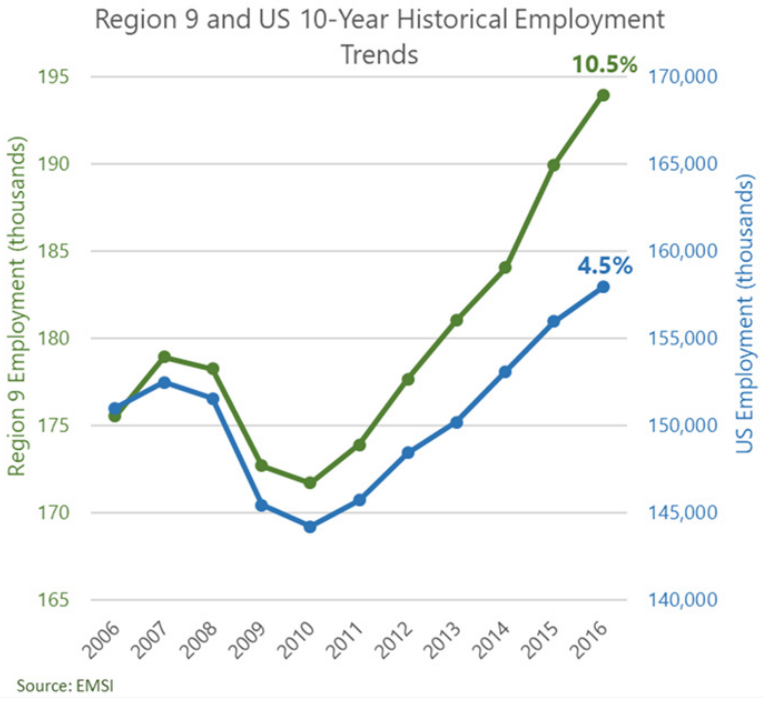
innovation policyworks

GLS GLOBAL LOCATION STRATEGIES

Economic Base Analysis Summary

The Economic Base Analysis will help in revealing Region 9's competitive advantages, which will be crucial in determining targeted industries for future economic development. This analysis takes into consideration historical and projected industry data for Region 9 (like jobs, average earnings, and number of establishments), as well as data drawn by county and planning district commission regions to evaluate local nuances in employment.

Between 2006 and 2016, Region 9 added nearly 18,500 net jobs, or roughly 10.5% growth. Though the region lost over 7,000 jobs during the economic downturn of 2008 and 2009, it quickly recovered and has shown steady growth over the last six years. Between 2006-2016, job growth was concentrated in the Thomas Jefferson Planning District Commission jurisdiction, while the counties that comprise Rappahannock-Rapidan Regional Commission experienced a combined -1% decline in overall employment. Employment gains in the TJPDC region were largely driven by the counties of Louisa, Greene and Albemarle, along with the City of Charlottesville, all of which experienced 15% or higher job growth. Overall, employment in Region 9 is projected to continue an upward trajectory, adding an additional 28,800 (15% growth) over the 2016 - 2026 time period. Average earnings per job in Region 9 totaled $52,976 as of 2016, which falls about $7,370 short of average earnings per job across the United States ($62,349).



Overview of Regional Employment							
Geography	2006 Jobs	2016 Jobs	2026 Jobs (projected)	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change
Thomas Jefferson Planning District Commission	114,121	133,099	155,699	18,978	17%	22,600	17%
Rappahannock-Rapidan Regional Commission	61,396	60,864	67,062	(532)	(1%)	6,198	10%
Region 9	175,518	193,962	222,762	18,444	11%	28,800	15%

Source: EMSI Q2 2017 Dataset

**Numbers may not add due to rounding*

Industry Overview and Trends

For this analysis, industry data was organized using the North American Industry Classification System (NAICS), using 2-digit NAICS codes for broad industry movements and 4-digit (or, if necessary, 6-digit) NAICS codes for more granular sub-sector investigation. Industry names have been highlighted for readability.

- Both job growth and total jobs in Region 9 are dominated by government-related industries, with five of the top 20 highest-growing industries over the past decade being in either local or state government.

Government (NAICS 90) added over 11,500 jobs in the years spanning 2006-2016, an increase of 28%, while the same industry remained virtually stagnant across the U.S. The expansion of public sector hospitals and public educational institutions heavily contributed to increased employment, supporting nearly 70% (nearly 8,000 jobs) of job growth in the governmental sector.

- **Administrative and Support and Waste Management and Remediation Services (NAICS 56)** saw the highest level of net job growth (35%) of all major economic sectors between 2006 and 2016. This high growth may be due in part to the shift to more temporary employment opportunities following the 2008 economic recession. Therefore, gains in this industry should be observed as a shift in employment as opposed to net gain in jobs.
- **Utilities (NAICS 22)** grew by nearly 9% between 2006 and 2016 largely as a result of additional employment at the North Anna Nuclear Generation Station in Louisa County. However, this level of growth is not expected to be sustained into the future. Projections estimate virtually no net change in jobs within the utilities industry within the next ten years, barring a major investment in the industry.
- **Arts, Entertainment, and Recreation (NAICS 71)** saw double the percentage growth of an already high-growth industry. Over the last 10 years the industry grew 31% in the region, versus 16% in the nation. This growth was driven by new jobs in **Promoters of Performing Arts, Sports, and Similar Events (NAICS 7113)**, **Museums, Historical Sites, and Similar Institutions (NAICS 7121)** and **Other Amusement and Recreation Industries (NAICS 7131)**. Average annual earnings in these sub-sectors are relatively low compared to other positions, ranging between $21,000 and $37,000 annually.
- While the **Manufacturing (NAICS 31)** sector declined by just over 1,000 jobs across Region 9, these losses were less than anticipated based on national and internal industry factors. Additionally, several specialties within the industry experienced persistent growth, especially throughout Nelson and Orange counties. **Beverage Manufacturing (NAICS 3121)** stands out, having seen nearly 300% growth in the past 10 years with a Location Quotient of 5 (indicating five times greater density in the region than elsewhere in the United States). The two 6-digit NAICS industry sub-sectors driving growth in beverage manufacturing are **Soft Drink Manufacturing (NAICS 312111)** and **Breweries (NAICS 312120)**, both of which grew by roughly 960%. Workers in these sub-sectors are estimated to have average annual earnings of over $50,000. Other manufacturing subsectors that demonstrated job growth over the observed period include **Aerospace Product and Parts Manufacturing (NAICS 3364, 149% job growth)** and **Ventilation, Heating, AC and Commercial Refrigeration Equipment Manufacturing (NAICS 3334, 580% job growth)**.
- **Professional, Scientific, and Technical services (NAICS 54)** also demonstrated notable growth over 2006-2016, adding just over 1,580 jobs across the region, with 58% of those jobs added in Albemarle County, and another 38% added in Fauquier County in the northern portion of Region 9. The majority of growth in this industry was concentrated in the subsector of **Computer Systems Design and Related Services (NAICS 3415)**, which added 1,126 jobs, and expanded by 84 establishments. This growth is expected to continue over the next ten years to 2026, adding nearly 2,300 (or 19% net growth).
- Among the dominant industry sub-sectors with high rates of self-employment, average earnings are typically well below the national average. Of the top 20 industry sub-sectors in the region for self-employment, **Legal Services (NAICS 5411)** is the only sub-sector with average annual earnings greater than average earnings in the rest of the US.

Industry Competitiveness and Shift Share Analysis

Shift Share Analysis analyzes changes in employment within a region to discern the extent to which these changes were the result of broad economic movements, nationwide industry trends, or regional competitiveness. Eliminating the former two components ensures that economic development planning does not target industries that are not well-suited for the region and only growing as a result of exogenous macroeconomic growth.

Region 9 has a net positive competitive effect of 11,603 jobs, indicating an overall strong positive competitive positioning when compared to the national economy. This is in large part a result of its **Government (NAICS 90)** sub-sector, in particular **Education and Hospitals (State Government) (NAICS 9026)**. When Government sub-sectors are eliminated, the total net competitiveness of the region drops by nearly 95%, but remains positive.

The most competitive 4-digit NAICS industries in the region heavily overlap with the fastest-growing industries, suggesting that growth in these industries is primarily the result of industry competitiveness within the region, and not external economic factors. Additionally, **Manufacturing (NAICS 31)**, **Finance and Insurance (NAICS 52)**, and **Real Estate Rental and Leasing (NAICS 53)** all declined at a lower rate than the rest of the nation or saw growth despite a nation-wide decline, indicating strong regional competitiveness in spite of national industry decline.

Preliminary Cluster Identification

In addition to the attached analysis, a preliminary high-level identification of potential target industries was performed, identifying five industry clusters within Region 9, with a focus on industries with higher wages (as set forth by the GO Virginia Initiative). The industries identified are not guaranteed to be the same as those which are ultimately recommended; rather, these preliminary clusters are the result of a broad analysis which identifies potential avenues to selecting the industry sectors that will eventually be chosen for future focus. The industries identified are:

- State Government Services,
- Education and Knowledge Creation,
- Electric Power Generation and Transmission,
- Business Services, and
- Aerospace Vehicles and Defense.

While these preliminary clusters provide an early look at industries that may be targeted in the future, additional data and stakeholder interviews will help to solidify targeted industries.

Occupational Analysis Summary

The Occupational Analysis is intended to help Region 9 understand past, current and future demographics trends that may impact the availability of its current and future workforce to meet the needs of companies within its target industries. The analysis looks at key occupations within the region, including the current number of jobs, growing jobs, median hourly earnings, and annual openings. Data on the key occupations required to staff companies within the region's target industries is also included.

Demographic and Labor Force Characteristics

This portion of the analysis includes demographics trends, including population, educational attainment, and commuting patterns, as well as employment data. Key findings include:

- Within Region 9, the largest county by population is Albemarle County, with more than 106,000 residents. It is about 35% larger than the next largest county, Fauquier County.
- The overall population within the region has grown at the rate of 5% over the past five years and is projected to grow near 4% through 2021.
- While the region is growing, its population is aging. The 35-54 age cohort declined nearly by 4,300 over the past five years, and is projected to have a further decline of 3,000. The over 65 cohort is projected to experience the greatest growth over the next five years. The aging workforce, along with the decline of those in the prime working age of 35-54 may indicate potential challenges with employers able to find replacements for those retiring, as well as being able to fill new positions.
- Educational attainment within the region is similar to Virginia. Rates of those with at least a Bachelor's degree are higher than the US average. Overall, the region is highly educated.
- Over the past twenty years, employment rose from 147,700 to the current high in 2016 of 206,560. During the same period the unemployment rate peaked at 6.6% at the height of the recession and is now at 3.5%.
- Commuting patterns indicated that a net 22,000 workers leave the region for jobs, with 71,000 workers commuting out and 49,000 commuting in. The top destinations for those leaving the region include Prince William County, Loudon County, and Henrico County.

Occupational Analysis

The occupational analysis looks at key occupations within the region. Occupations are classified by SOC Codes[1]. Data includes current employment by occupation, as well as previous growth trends and projections. The following highlights include:

- The top broad occupations within the region include Office and Administrative Support (27,136 jobs); Sales and Related (18,660 jobs); Education (16,829 jobs); Food Preparation and Serving Related (16,107 jobs); and Healthcare Practitioners and Technical (12,412 jobs). Over the past five years, these occupations had the highest number of annual openings. Median hourly earnings across all occupations range from $10.87/hr. for Food Preparation and Serving Related to $40.67/hr. for Management.

[1] SOC (Standard Occupation Code) is a system used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. The code uses are hierarchical with broad occupations at the 2-digit level to specific occupations at the 5-digit level. This analysis includes both.

- At the 5-digit SOC level, top occupations include Retail Salespersons (5,804); Office Clerks, General (4,993); Cashiers (4,921); Postsecondary Teachers (4,724); and Registered Nurses (3,964). Median hourly earnings for the top occupations at this level range from $9.14/hr. to $48.94/hr. for General and Operations Managers.
- Since 2011, many of the growing occupations have been within the healthcare industry and include Personal Care Aides (1,028 new jobs); Registered Nurses (784 new jobs); and Nursing Assistants (219 new jobs). This trend is projected to continue over the next five years through 2021: Registered Nurses (621 new jobs); Personal Care Aides (532 new jobs); and Nursing Assistants (223 new jobs). Median hourly earnings for each are Registered Nurses, $31.22/hr.; Personal Care Aides, $9.44/hr.; and Nursing Assistants, $12.49/hr.

Staffing Patterns by Industry

The recommended industries for Region 9 include Biotechnology; Finance and Business Services; Information Technology and Communication; Light Manufacturing; and Food and Beverage Manufacturing. The following illustrates the top occupations that are required to staff companies within these industry sectors:

- Biotechnology: The top occupations in this sector include Biological Technicians; Medical Scientists, Except Epidemiologists; Software Developers; and Biochemists and Biophysicists. The required entry levels for these occupations is high, with all requiring at least a Bachelor's Degree. Over the next five years, growth is expected within Medical Scientists ($36.54/hr.); Biological Technicians ($19.10/hr.); and Biochemists and Biophysicists ($40.71/hr.).
- Finance and Business Services: Occupations within Financial and Business Services are numerous within the region. Those employing at least 500 workers include Accountants and Auditors; Management Analysts; Lawyers; Insurance Sales Agents; and Software Developers, Applications. Of these top five, educational requirements range from a High School Diploma for Insurance Sales Agents to a Doctoral degree for Lawyers. Over the next five years, the greatest growth is projected to be within Software Developers, Applications ($43.67/hr.).
- Information Technology and Communication: Within the Information Technology and Communication industry, occupations that employ over 500 workers include Management Analysis; Electricians; Software Developers, Applications; and Software Developers, Systems Software. Except for Electricians, these occupations require at least a Bachelor's degree. Over the next five years, Software Developers, Applications ($43.67/hr.) will continue to add the most jobs, followed by Computer Systems Analysts ($39.31/hr.) and Management Analysts ($41.10/hr.).
- Light Manufacturing: There are seven occupations within this sector that employ at least 200 hundred workers within the region. They include Team Assemblers; Sales Representatives, Wholesale and Manufacturing; First-Line Supervisors of Production and Operating Workers; Cabinetmakers and Bench Carpenters; Sawing Machine Setters, Operators, and Tenders, Wood; Laborers and Freight, Stock, and Material Movers, Hand; and Inspectors, Testers, Sorters, Samplers, and Weighers. Over the next five years, Packaging and Filling Machine Operators and Tenders, Wood ($11.99/hr.) is projected to add the most jobs.
- Food and Beverage Manufacturing: Packaging and Filling Machine Operators and Tenders ($11.99/hr.); Retail Salespersons ($10.69/hr.); and Sales Representatives, Wholesale and Manufacturing ($24.04/hr.) make up the three largest occupations that are required to staff companies within the Food and Beverage Manufacturing sector. These sectors also made up the most growth over the past five years, and are projected to add the most jobs through 2021.

Business Workforce Survey Summary

The Business Workforce Survey was designed to quantify the extent of workforce challenges and opportunities that exist in the 11 locality region. The questions embedded in the survey were aimed at identifying employment numbers and projections; skill needs and gaps; education and training needs; desired industry-recognized credentials; and business expansion needs and was disseminated by GO Virginia Region 9 via email to business leaders across the region. In total, responses from individuals at 142 companies were analyzed as part of this study.

The top industry sectors to participate in the survey were Professional, Scientific, and Technical Services (15%); Agriculture, Forestry, Fishing, and Hunting (8%); Health Care and Social Assistance (8%); and Accommodation and Hospitality (8%).

Industries Represented by Respondents	
Industry	Responses
Professional, Scientific, and Technical Services	21
Agriculture, Forestry, Fishing, and Hunting	12
Health Care and Social Assistance	11
Accommodation and Hospitality	11

As these industries and other grow over the next ten years, the hiring within these industries are also projected to grow, Agriculture, Forestry, Fishing, and Hunting (57%); Professional, Scientific, and Technical Services (53%); Health Care and Social Assistance (43%); and Accommodation and Hospitality (30%). It is worth noting that Information Technology was the only industry with more than one survey respondent (4) that was anticipating 100% increased hiring due to growth. In addition, Professional, Scientific, and Technical Services was the top industry for three of the four skill levels: professional skills, technical skills, and entry-level/support skills. As these industries plan to increase hire over the next decade, it is important for the region to prepare the talent pool with the skills and training necessary to successfully fill these positions and hit the ground running.

Companies noted that their greatest workforce challenges included the following:

- Hiring a qualified workforce (28%),
- Supplying desired salaries and benefits (25%),
- Overcoming soft skills (12%), and
- Employee retainment (9%)

The top industry challenges companies reported include:

- Having a talented workforce (22%);
- Following governmental regulations and compliance (14%);
- Funding (11%); and
- Competition (8%)

In order to overcome these challenges, companies proposed various strategies and ideas. The most popular response category was for increased funding (15%) followed by a more concentrated push for career technical education (11%) and additional job training workshops sponsored by the Region 9 Council. While funding may be the most difficult solution, investing more in training workshops has a realistic outcome, especially considering the shared goal industries have with the council in preparing a talented workforce.

Of the top five employability skills that companies faced when hiring, three were analytical skills such as problem solving (67%), critical thinking (62%), and decision-making (55%).

Top 5 Difficult/Very Difficult to Find Employability Skills	
Skill Set	Response
Problem Solving	67%
Critical Thinking	62%
Initiative	59%
Decision-Making	55%
Dependability & Reliability	52%

Although a majority of businesses hire on average 0-9 employees per year (75%), the most difficult type of position to fill is within skilled trade, with 56% of companies indicating that hiring for these positions is either difficult or very difficult. This is reflective of the tone in responses that the workforce is unqualified to fill positions. To that end, only 29% of companies indicated that hiring for entry-level/support positions are either difficult or very difficult. It is worth noting, however, that all type of positions were reportedly filled on average between 1-6 months. The only type of position that took more than a year to fill was professional which is concerning considering these positions typically require more analytical skills. Training for these position types should be geared toward ensuring the workforce is not only qualified and prepared, but also analytically centered.

With the highest rated average, companies reported that the greatest barrier to retention of employees included:

- Pay (2.4),
- Benefits (2.2),
- Healthcare and wellness (2.0), and
- Lack of internal advancement opportunities (2.1)

Career advancement opportunities that are offered most often by companies include access to training/education programs (38), paid conference attendance (35), mentorship (33), and classroom training (30). For training programs that are needed but not offered in the area, several of the responses were industry specific; however, one noteworthy request was to provide training programs with flexible evening hours. These programs could serve both employees and employers effectively by providing employees with additional skill sets to advance within their career while not having to become absent from work.

Innovation and Entrepreneurship Asset Inventory Summary

In order to support a targeted cluster, a region needs to have not only the businesses that form the core of economic activity, and the workforce to operate the businesses, but also the organizations that support the businesses. For clusters that rely on innovation for their competitive advantage, local sources of innovation are critical, because research shows that new ideas diffuse over a relatively short distance, often less than 50 miles. For clusters that are dynamic, with a balanced inventory of large and small, young and old firms, entrepreneurship is critical to provide diversity, a pathway for the commercialization of new ideas, and to foster creativity.

Our research into Region 9's innovation and entrepreneurship assets can be summarized in the following findings:

- The distribution of innovation and entrepreneurial assets in Region 9 is unevenly distributed, with one concentration in Fauquier County and the other in Charlottesville/Albemarle County.
- Job creation was strongest across Region 9 by young firms, while small firms are fairly uniformly present.
- Both innovation and entrepreneurship are focused on two potential clusters: biomedical/life science/biotechnology and information technology.
- The entrepreneurial ecosystem is stronger than it was in 2011, and is competitive with peer regions.

Distribution of Innovation and Entrepreneurial Assets

Overall, Region 9 is fairly innovative. Patent intensity in Region 9, measured by patents awarded in 2016 per 1000 population in 2016 is 1.55, compared to 0.397 for Virginia and 1.038 for the US as a whole.

The distribution of innovation and entrepreneurial assets is essentially bimodal, meaning there are two separate groups of assets: one in Charlottesville and Albemarle County and the other in Fauquier County, especially in Warrenton. This holds true for all assets evaluated, although there are a few programs and sources of innovation in Culpeper.

For instance, 78% of the 1487 patents issued in Region 9 in the past five years went to inventors with home addresses in Charlottesville or Crozet, with the next highest number being 103 for Warrenton. All but two of the 53 companies receiving equity were in the Charlottesville MSA. Twenty-six of the Region 9 SBIR/STTR winners in 2016 were in Albemarle County and Charlottesville; there was one winner in Fauquier County and none in the other counties.

Job Creation by Young and Small Firms

In all of Region 9, almost all businesses are small, with roughly 70 percent having between 2-9 employees. Similarly, the number of self-employed or sole proprietors in Region 9 is also relatively constant among the counties, hovering around 10-15% of the total number of establishments. (Interestingly, Rappahannock County, the smallest county, also has the highest percentage of sole proprietors compared to total employment, exceeding 50%.) Job creation by small firms in Region 9 has been steady since 2000 except in Charlottesville and Fauquier County, where there was a substantial drop in 2010 (likely a result of the Great Recession). Average small firm job creation in Charlottesville had recovered somewhat by 2015.

Since economic growth is often associated with young firms (less than five years old), rather than small firms per se, we looked at job growth by young firms as a percentage of total growth in each county. All of the counties show job creation from young firms exceeding 25% of total employment growth. Madison County shows the greatest percentage growth in 2015 at 46.5%, and the greatest increase since 2000.

Innovation and Entrepreneurship Targeted Clusters

Innovation and entrepreneurial activity in Region 9 is heavily concentrated in two clusters: biomedical/life science/biotechnology and information technology. This is highly likely to be a result of the strengths of UVA and also the influence of the federal government and government contractors' strengths in Northern Virginia.

UVA's research and development expenditures are concentrated in its School of Medicine and its School of Engineering and Applied Sciences. Federal research and development grants and contracts to UVA mirror these strengths, as do the distribution of its large research centers and institutes.

Not surprisingly, faculty disclosures of patentable inventions also fall largely into these two fields, consistent with findings from the 2011-12 *Regional Existing and Target Industry Analysis*.

Indications are that the entrepreneurial community also falls into these two major segments. Region 9 companies raised at least $129,942,000 through 53 funding events since 2011, and have a total of $233,745,000 in equity to date. Of these equity infusions, 46% were in the biomedical/life sciences, and 38% in information and communications technology. Biomedical/life sciences included: healthcare, biotechnology, medical devices and pharmaceuticals. Information and communications technology included: E-commerce, Internet and social media, network security and applications in healthcare, analytics, and financial analytics (FinTech). Similarly, SBIR/STTR winners largely fall into these two categories.

The federal government contracting community, which in Northern Virginia is largely linked with Information and Communications Technology, spills over into Region 9. One hundred and three patents were issued to Warrenton inventors between September 2011 and December 2016; only 7 stayed in Warrenton, while 12 were directly assigned to Northern Virginia entities and at least another 53 were assigned to companies headquartered elsewhere with locations in Northern Virginia. All of these patents were focused on aerospace and information technology applications, suggesting a strong connection to federal contracting. The largest assignees are federal contractors such as Exxon, BAE, Lockheed Martin, and Raytheon.

Innovation Culture

The culture of a place (or an organization) has been shown to directly impact the likelihood that creative and innovative ideas will emerge. Two measures that are often correlated with a supportive innovation culture in a place are diversity and creativity. Here we measure diversity by looking at age, race and origin. The City of Charlottesville and Albemarle County exhibit more diversity, consistent with their higher innovation, creative occupations, educational attainment and high-tech employment.

Strong Entrepreneurial Support System

The dramatic increase in equity funding, including 9 exits plus the explosion of entrepreneurial support organizations in Region 9 since 2011, is a strong indication of the health of the ecosystem. With new programs such as i.Lab, the three incubators in Fauquier County, the UVA Seed Fund, just to name a few, Region 9 compares favorably to its peer regions:

- Columbia/Jefferson City, Missouri
- Willamette Valley, Oregon
- East Central Region, Illinois
- Northeast Georgia
- West Alabama

All five peer regions are rural areas within 100 miles of a major metropolitan area (St. Louis, MO; Portland, OR, Indianapolis, IN, Atlanta, GA and Birmingham, AL, respectively) along a major transportation corridor. Each includes the home of a major state-funded, research university.

Themes arising from this peer comparison include:

- For many universities, moving from a model of teaching, research and service to one that more explicitly includes economic development is a long-term evolution. Each of the universities highlighted here is in some stage of this evolution, with most having significant research, technology transfer, entrepreneurial support, and research commercialization activities.
- The places studied vary in the tightness of the connection between the university and local/regional economic development, with most having a greater relationship in the university's home community and diminishing impact in rural communities farther away.
- The areas vary considerably in their attention to the issue of inclusion, with Columbia/Jefferson City, Missouri and West Alabama, explicitly and prominently seeking to extend economic prosperity to all of its citizens, regardless of their location (urban and rural), and actively seeking ways to connect the poorest to better jobs, higher skills and more supportive neighborhoods. The issue of inclusion is one that is just coming to prominence in the technology community and for universities as well.
- The places studied that are doing better seem to have accomplished an integrated approach to economic development that embraces traditional business attraction as well as innovation and entrepreneurship support, workforce development, and place-making. Transportation, excellence in K-12, arts and culture all play a part in the approach.
- Two of the places have made significant investments in broadband (East Central Region, Illinois and Willamette Valley, Oregon), and two have focused on air service (Willamette Valley, Oregon and Columbia/Jefferson City, Missouri), both essential infrastructure for a knowledge-based or creative economy.

Site Selection Summary

Project Scope

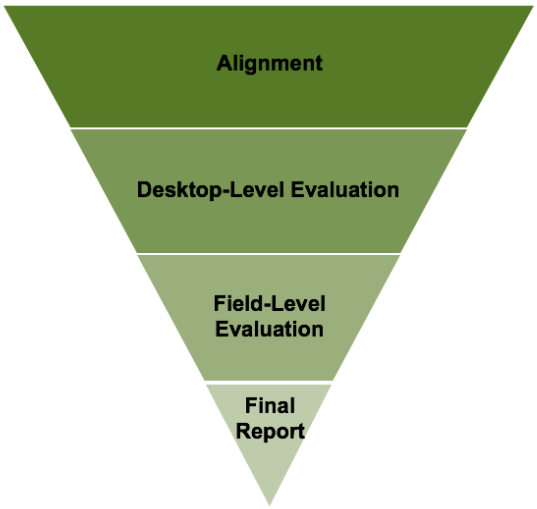
As part of the GO Virginia Region 9 initiative, Global Location Strategies (GLS) evaluated an identified set of existing sites throughout the region to assess their readiness for recruitment of commercial/industrial capital investment projects. Using a variety of data collection sources and subsequent analyses, this report details the sites evaluated, competitiveness of sites on recommended target industries, and action items that can be pursued to make the sites more competitive.

Project Alignment

The beginning of the site evaluation scope started with an alignment meeting to ensure that the project's process and outcomes align with the client's wants and expectations. As a result of the alignment call with the Central Virginia Partnership, site criteria were prioritized. It was decided that existing, established sites would be the primary focus of the site evaluation. It was agreed that the sites should be distributed throughout the whole of the region. The sites prioritized were sites that were further along in the development process (clearing, grading, etc.) and had more due diligence information available (geotechnical, wetlands, ESA). After soliciting site information from local economic developers, GLS worked with the Central Virginia Partnership to rank and eliminate sites for further analysis. The result of the first, high level screening yielded six sites:

- Culpeper County: McDevitt/Crown Jewel Site
- Greene County: Rapidan - Lamm Site
- Fauquier County: Vint Hill Business Park
- Fluvanna County: Williams Heritage / Alexander Site
- Louisa County: Ferncliff Business Park
- Orange County: Thomas E. Lee Business Park

Figure 1: GLS Methodology



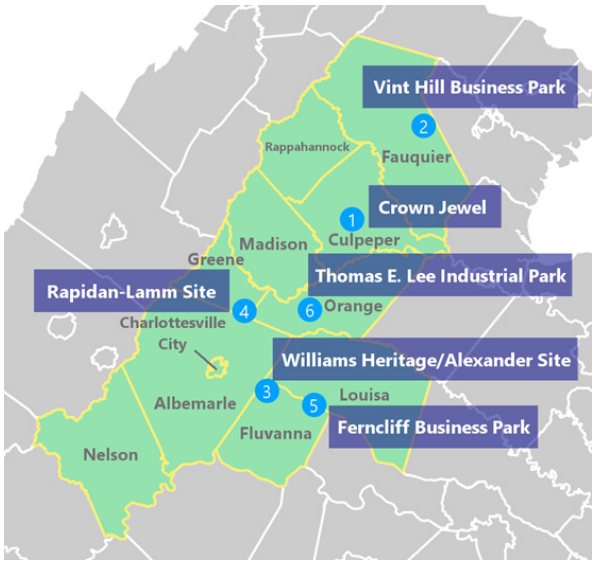


Figure 2: Region 9 Sites and Major Highways

This site analysis, was well as additional conclusions and suggestions moving forward, is available in **Appendix II – Site Evaluation and Conclusions**.

Data Collection

"Request for Information" (RFI) questionnaires were distributed to local economic developers for each of the six sites. All questionnaires were completed and submitted to GLS by the week of July 3rd, 2017.

All six sites which completed a questionnaire received a virtual site tour. A virtual site tour takes the form of a web conference with local economic developers and utility representatives. The "tour" is done by screen-sharing Google Earth and "touring" the site and surrounding area. The virtual site tour is an opportunity to fill in gaps in the RFI questionnaire and gain greater insight from the community about their knowledge and intentions for the site. All virtual site tours were completed on July 5 and July 6.

From the desktop-level data gathering, a preliminary evaluation was conducted on each of the six sites. Both a preliminary "Must" screening, which filters sites based on necessary features, and a SWOT Analysis were performed to evaluate the characteristics of the site.

Site Visits

During the week of July 17, 2017, GLS representatives visited all six sites. Each visit lasted approximately half a day, and included a tour of the site and community, as well as meetings with economic developers and other community representatives. Data gathered on the site visits helped to further facilitate understanding of the sites, the community, and available infrastructure.

Site Evaluation Summaries

**Detailed site profiles, SWOT analysis, explanation of target industry competitiveness, and list of site improvement action items can all be found in provided appendix.*

Culpeper County: McDevitt/Crown Jewel Site

Culpeper County's McDevitt/Crown Jewel site is located less than a mile east of the Town of Culpeper. The land is gently sloping from northeast to southwest, and 122 of its 155 acres can be considered contiguous and developable. Neighbors include a wastewater treatment plant, two data centers, and a community college campus. The site is primarily accessed via McDevitt Drive, and is located less than a half mile from US 29. The targeted property is made up of four owners, and the zoning is split between Industrial and Rural.

Due to the site's existing neighbors, the McDevitt/Crown Jewel site has access to many existing utility supply lines, including electricity, gas, water, and wastewater with a large, expandable electrical substation located on site that could support up to a 40 MW load without requiring significant upgrades. Dark fiber communication lines are also in proximity, making the site a good fit for IT operations. Neighboring operations have proven that data centers can work in the area. The site could also support small, light manufacturing facilities, but due to the sloping topography of the site, potential operations will likely have to be limited in footprint to minimize extensive earthwork. Rezoning all parcels to Industrial would assist in the marketability of the site and decrease perceived risk associated with changing zoning classifications.

Strengths

- Gas, electric, water, and wastewater are already on-site or adjacent to the site.
- Over 1 MGD excess water capacity available.
- Extensive electrical capacity, 50 MW, can be made available today.
- Established road access to site.

Weaknesses

- Apparent wetlands onsite. Proper delineation needed to determine site developability.
- Future planned access road to Germanna Community College needs to be further addressed, as it could impede potential development plans.
- No Phase I ESA completed.
- Rezoning is required for target industries.

Competitive for Following Industries

- IT/Communications
- Light Manufacturing

Recommended Site Improvement Action Items

- Completion of Phase I ESA
- Rezoning
- Preliminary Geotechnical Study
- Wetlands Delineation
- Secure Option on all Parcels

Fauquier County: Vint Hill Business Park

The Vint Hill Business Park is currently home to a server assembly and data center, OVH, and an FAA terminal radar approach control (TRACON) facility as well as Northrop Grumman an aerospace and defense company. They have plots currently available ranging from 3 to 45 acres of developable area. The park has multiple on-site access roads, and can be reached from Highway 215, approximately 1.5 miles off US 29. The business park is in a well-populated area including residents with high educational attainment, and has access to all major utility services except for industrial wastewater. A new, large veteran's center is planned for acreage adjacent to the business park. The proposed parcels are zoned as Planned Commercial Industrial District.

The Vint Hill sites reap a number of benefits from their location. With established neighboring business operations, the sites have access to all necessary utilities. The business park is also located in a high-income community with good schools, which is very attractive for those looking to locate outside of the D.C. area. The Vint Hill site is particularly well suited for IT operations, business and financial services, or high value-add light assembly (e.g. medical devices, aerospace, electronics) with the community capable of providing an educated, currently out-commuting, workforce.; however, the surrounding uses would generally be prohibitive for any kind of heavier industrial operation.

Strengths

- Attractive location and community with easy access to D.C. market.
- Exiting utility infrastructure (electric, natural gas, water, and wastewater) within the park. Dark fiber being brought into community.
- Highway frontage and plentiful road access.
- Highly educated workforce that is primarily commuting out of the county for work.

Weaknesses

- High wage area may prevent certain industries from considering community.
- Preference for 'smart industry' will limit flexibility of industries that will fit within the site.

Competitive for Following Industries

- IT/Communications
- Finance/Business Services

Recommended Site Improvement Action Items

- Wetlands Delineation
- Preliminary Geotechnical Study

Fluvanna County: Williams Heritage / Alexander Site

The Williams Heritage/Alexander site in Fluvanna County is the least characterized of the sites evaluated. The site was only recently identified as a potential industrial opportunity, and therefore no site preparation or characterization has been done. The 156-acre site is located adjacent to Highway 250, just 2 miles from I-64. The property is heavily wooded, has notable elevation changes, minimal utilities onsite, and is bordered on the west by a residential neighborhood. Zoning is currently Agriculture and would have to be changed in order to utilize site as an industrial property.

In its raw state, the Williams Heritage/Alexander site has flexibility in regards to how it can be developed. It will likely have access to water and sewer by 2019, with possible access to gas and sufficient access to electric. With necessary utilities, the site could support light manufacturing or food and beverage manufacturing activities. However, the cost of bringing natural gas to site may be prohibitive. Due diligence activities should take priority moving forward, as more accurate site information will aid in more precise industry targeting. By doing some preliminary site preparation (clearing of trees, possible grading) and establishing a plan for bringing in infrastructure, this site would be more marketable for future prospects.

Strengths

- Highway frontage on Hwy 250 and easy access to I-64 and Charlottesville area.
- Close to electrical substation.

Weaknesses

- Heavily treed site, making it difficult to see property.
- Lack of water, wastewater, and natural gas infrastructure onsite.
- No due diligence studies completed.
- Multiple owners of property.
- Rezoning required for target industries.

Competitive for Following Industries

- Following further due diligence onsite and extension of utilities, site would likely be good fit for Light Manufacturing and Agricultural Value Added

Recommended Site Improvement Action Items

- Site Clearing
- Engineering Study (for Utilities)
- Phase I ESA

Greene County: Rapidan Center

The Rapidan property is a 65-acre site that is advanced in the development process. The site was cleared, graded, and prepared for a previous retail opportunity that did not materialize. Configuration of the site is roughly rectangular, and could support a single large development, or two or more smaller developments. The site is located directly on US 29, and neighbors a handful of retail and commercial operations to the north, with residential areas to the south and east including a large apartment complex bordering the property. Current zoning of the parcel is listed as B-2 for General Business.

The preparation activities that have already been performed on the Rapidan site put it at an advantage in comparison to other sites, as potential buyers will not have to spend the time or money on these items. While the site itself could possibly support a light manufacturing facility, the surrounding residential areas of the site prevent this location from being a good fit for heavier industrial operations. Due to the significant residential development nearby, the site would likely be limited to commercial, retail, or office space. The County Board of Supervisors has also expressed a desire to avoid any operation with large truck activity. Office space could be provided to companies coming out of the UVA Research Park and are looking to commercialize. County and local community could partner with local developer to help build a small business park with available office space.

Strengths

- Significant highway frontage and access to US 29.
- Site clearing has been completed
- Sewer, water, and electrical infrastructure onsite.

Weaknesses

- Currently planned VDOT road splits property and may restrict development of site.
- Natural gas located one mile away.
- Location next to residential areas are deterrent for certain industries.

Competitive for Following Industries

- Best fit is Finance/Business Services. Site is well suited for business park.
- Moderate opportunity exists for attracting IT/Communications or Biomedical/Biotechnology company.

Recommended Site Improvement Action Items

- Completion of Phase I ESA. If previous studies can be found and made available, then an update of these studies would be required.
- Coordination with developers on constructing business park. Office space users are not likely to build their own space.

Louisa County: Ferncliff Business Park

The Ferncliff Business Park is a rural industrial park located in Louisa County. The park is 104 contiguous acres, with approximately 70 developable acres remaining. Forty greenfield acres to its southeast were also recently purchased. Current users in the park include Patriot Aluminum and Cavalier Produce. Two speculative buildings have just been built and can be joined for a combined floor size of 55,450 square feet. The park is located between Highway 250 (Three Notch'd Road) and I-64, and is accessed via Highway 250, a half mile from I-64's Exit 143. With the exception of the additional 40 acres (zoning of this parcel is to be determined), the entire industrial park is zoned Industrial and Commercial.

Ferncliff is well suited to support several industries that do not require natural gas. The sites could be used for projects that fall within the identified industry targets of light manufacturing and agricultural value add, again with the caveat that they cannot supply natural gas. If Three Notch'd Road could be expanded from two lanes to four, the location could be a good fit for a distribution center or similar project due to its interstate proximity. It is doubtful that the site could support large footprint requirements due to the topography of the park.

Strengths

- Exceptional highway and interstate access with close proximity to Charlottesville.
- Available water, sewer, and electric infrastructure.
- Over 1 MGD excess water capacity available.
- Zoning allows for light to medium industrial uses.

Weaknesses

- Natural gas line is four miles away.
- Lack of available workforce would make it difficult to attract company of 100+ employees.

Competitive for Following Industries

- Site is most competitive for Food and Beverage and Light Manufacturing.
- Due to existing manufacturing users within the park, along with lack of robust electrical infrastructure and capacity, site is not competitive for a data center or similar operation.

Recommended Site Improvement Action Items

- Market the site for user with large truck counts, design, permitting and funding for the installation of turn lane and/or signaled entrance.
- Attract a wider array of industrial uses, design, permitting and funding for extension of natural gas.
- Complete necessary studies (wetlands delineation, preliminary geotechnical study) on recently purchased 40 acres.

Orange County: Thomas E. Lee Industrial Park

The Thomas E. Lee Industrial Park in Orange County has multiple parcels available for development. There is an 8-acre site with 100,000 square foot building pad in place. The 8-acre parcel adjoins a 16.8-acre parcel that is not currently under the county's control. Though the 16.8-acre is adjacent to a rail line, there is significant concern on any potential for bringing the rail into the site due to significant elevation change. There is also a non-adjacent 5-acre parcel that could support smaller operations. The park is rurally located, over 2.5 miles from the town of Orange. Most major utilities are already within the park, with the notable exception of natural gas, which is located more than two miles away. All sites within the park are adequately zoned I-2, Industrial.

The T. E Lee sites could successfully support light manufacturing operations or potential food processing facility. There is not currently natural gas on site, but access could be extended to the site with an estimated cost of $1.5 million. Most industries will likely face transportation issues, as the closest interstate is approximately 18 miles away. Additional opportunity exists for the area if dark fiber is successfully brought in, but current marketing efforts should not focus on any IT or financial service type industry until this becomes a reality.

Strengths:

- Sites are pad-ready, and the majority of land owned by economic development authority.
- Established light industrial neighbors.
- Phase I completed on Lot 5A and Lot A.
- Geotechnical study completed.

Weaknesses:

- Control of Site 10 by 84 Lumber. Site also has significant topography challenges (rail will be difficult to bring to site) and no Phase I has been completed.
- Natural gas line not onsite, cost of $1.5 MM to bring to site.
- Transportation access to interstate

Competitive for Following Industries

- Light Manufacturing would be primary target.
- Moderate opportunity for Food and Beverage Manufacturing.

Recommended Site Improvement Action Items

- Option Lot 10 to establish control and price of land.
- Detailed engineering study and plan to bring natural gas to site.
- Coordinate with owners of Lot 10 to conduct Phase I ESA.

Economic Base Analysis

Prepared by:

camoin associates
ECONOMIC DEVELOPMENT

Introduction

As part of a larger economic development research planning process through the GO Virginia Initiative, Camoin Associates completed an Economic Base Analysis for the 11-locality geography of Region 9. The data outlined below establishes an understanding of historic and projected employment trends, which will provide the foundation for developing targeted industries for the region. This Economic Base Analysis is comprised of five related sections:

- **Employment Trends Analysis** – Details historic and projected changes in industry employment.
- **Location Quotient Analysis** – Lists industries that are particularly concentrated within the region.
- **Shift Share Analysis** – Examines the region's competitiveness compared to the rest of the nation.
- **Additional Analysis** – Exhibits additional information that will be useful in later research.
- **Preliminary Industry Cluster Analysis** – Provides early estimations of potential targeted industry clusters.

Primary Data Sources

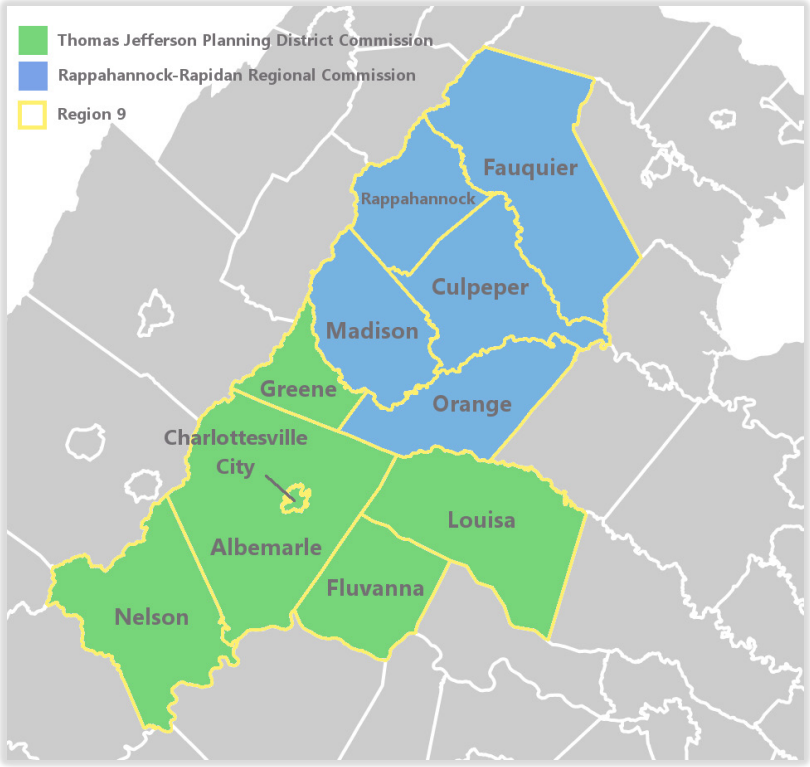
Camoin Associates subscribes to Economic Modeling Specialists Intl. (EMSI), a proprietary data provider that aggregates economic data from approximately 90 sources, including the U.S. Census Bureau and the U.S. Departments of Health and Labor using specialized proprietary processes and models to estimate current statistics and predict future trends. EMSI industry data, in our experience, is more complete than most or perhaps all local data sources. This is because local data sources typically miss significant employment counts by industry because data on sole proprietorships and contractual employment (i.e. 1099 contractor positions) is not included and because certain employment counts are suppressed from BLS/BEA figures for confidentiality reasons when too few establishments exist within a single NAICS code. Visit www.economicmodeling.com for additional information.

Geographies Studied

Region 9 incorporates eleven localities in Central Virginia, listed in Figure 1 to the right. The region is already home to the Central Virginia Partnership for Economic Development, comprised of Albemarle, Culpeper, Fluvanna, Greene, Louisa, Nelson, Madison, and Orange Counties, plus the independent City of Charlottesville. Included in the region, but not in the Central Virginia Partnership, are the Counties of Rappahannock and Fauquier. Additionally, this report will also examine the two planning districts within the region: the Rappahannock-Rapidan Regional Commission (highlighted in blue) and Thomas Jefferson Planning District Commission (highlighted in green).

In addition to the region described above, the United States will be used as a benchmark against which information about the region can be compared.

Figure 1: Map of Region 9

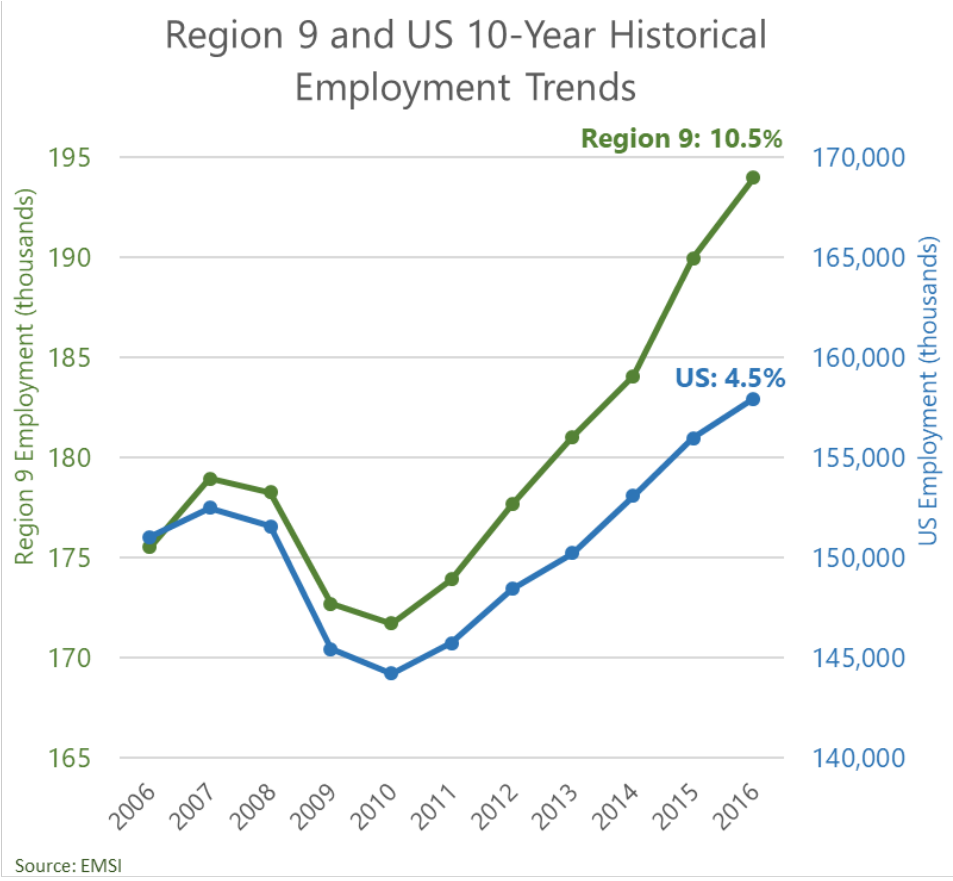


Industry and Employment Trend Analysis

The North American Classification Standard (NAICS) will be used to identify industries in this analysis. The standard is maintained by the U.S. Census Bureau and is used by Federal statistical agencies in classifying business establishments. Under this standard, industries are organized into 2-digit through 6-digit levels. The use of 2-digit codes shows the highest aggregate NAICS code level representing broad categories such as "retail trade," whereas the use of 6-digit industry codes presents a finer level of detail like "fruit and vegetable markets." For this analysis, the 2-digit and 4-digit levels are utilized. These levels provide the balance of comprehensiveness and specificity needed to best understand the region's industrial characteristics. Six-digit codes are utilized when a high level of precision is considered necessary for discussion. Industry names are shown in bold for readability. Note that **Unclassified Industries (NAICS 9999)** and **Private Households (NAICS 8141)** are not listed in any tables, as they are not directly relevant to the economic development planning intended with this analysis.

Between 2006 and 2016, the region added nearly 18,500 jobs, or roughly 10.5% growth. Though the region lost over 7,000 jobs during the economic downturn of 2008 and 2009, it quickly recovered and has shown steady growth since (as shown in the graph to the below).

Figure 2: Region 9 and US 10-Year Historical Employment Trends



20-Year Trends and Projections

The following tables (Tables 1 and 2), on page 20, break down 10-year historical and 10-year projected trends in employment within the region, organized in descending order by 2-digit NAICS code. Negative values are highlighted in red. Additionally, all 2-digit NAICS industries with greater than a 5% share of all jobs in the region have been graphed across 10 years of historical and 5 years of forecasted data in Figure 3, see page 21.

Key Findings From this Analysis

- **Crop and Animal Production (NAICS 11)** and **Management of Companies and Enterprises (NAICS 55)** are the only two industries anticipated to see continual decline over the projected period between 2006 and 2016, given current industry trends. Decline for Crop and Animal Production is anticipated to accelerate, while the decline in jobs for Management of Companies and Enterprises will remain roughly constant between both periods.

- **Utilities (NAICS 22)** grew by nearly 9% between 2006 and 2016 as a result of additional employment at the North Anna Nuclear Generation Station in Louisa County, however this level of growth is not expected to be sustained into the future.

- Although **Manufacturing (NAICS 31)** declined by roughly 11% between 2006 and 2016, projections estimate the industry to rebound to its original size by 2026. The same cannot be said for **Construction (NAICS 23)**, which lost close to 6,000 net jobs in the last 10 years and is projected to only recover just over 400 of them back.

- **Finance and Insurance (NAICS 52)** has remained stagnant over the examined period, adding only 11 net jobs over 10 years. Future projections are more positive, with an estimated 640 net new jobs (a 17% increase) anticipated by 2026.

- **Administrative and Support and Waste Management and Remediation Services (NAICS 56)** saw the highest level of growth over the observed period, growing 35% between 2006 and 2016. This high growth may in some part be the result of a shift to more temporary employment opportunities following the 2008 economic recession. If this is the case, the trend is not expected to reverse going forward—Projections place this industry as the industry with the second-highest level of growth between 2016 and 2026, with the addition of over 2,000 jobs (23% growth).

- **Government (NAICS 90)**, by far the largest industry in the region, has shown strong and steady growth in the last decade. In the 2006 – 2016 period, the industry had the fourth-highest level of net job growth. This will slow down to 17% net growth projected between 2016 and 2026.

Table 1: Region 9 Historical 2-Digit NAICS Industry Employment Trends, 2006 - 2016

Region 9 Historical 2-Digit NAICS Industry Employment Trends, 2006 - 2016					
NAICS	Description	2006 Jobs	2016 Jobs	2006 - 2016 Change	2006 - 2016 % Change
11	Crop and Animal Production	4,418	4,371	(47)	(1%)
21	Mining, Quarrying, and Oil and Gas Extraction	281	256	(25)	(9%)
22	Utilities	1,475	1,604	129	9%
23	Construction	18,235	12,507	(5,728)	(31%)
31	Manufacturing	10,008	8,918	(1,090)	(11%)
42	Wholesale Trade	4,186	3,182	(1,004)	(24%)
44	Retail Trade	19,327	20,256	929	5%
48	Transportation and Warehousing	3,070	3,188	118	4%
51	Information	3,360	2,952	(408)	(12%)
52	Finance and Insurance	3,758	3,769	11	0%
53	Real Estate and Rental and Leasing	2,963	3,126	163	6%
54	Professional, Scientific, and Technical Services	10,387	11,968	1,581	15%
55	Management of Companies and Enterprises	2,255	2,145	(110)	(5%)
56	Administrative and Support and Waste Management and Remediation Services	6,575	8,903	2,328	35%
61	Educational Services	3,129	4,049	920	29%
62	Health Care and Social Assistance	14,369	18,055	3,686	26%
71	Arts, Entertainment, and Recreation	3,003	3,959	956	32%
72	Accommodation and Food Services	13,856	16,451	2,595	19%
81	Other Services (except Public Administration)	9,888	11,242	1,354	14%
90	Government	40,974	52,528	11,554	28%
99	Unclassified Industry	<10	535	Insf. Data	Insf. Data
Total		175,518	193,962	18,444	11%

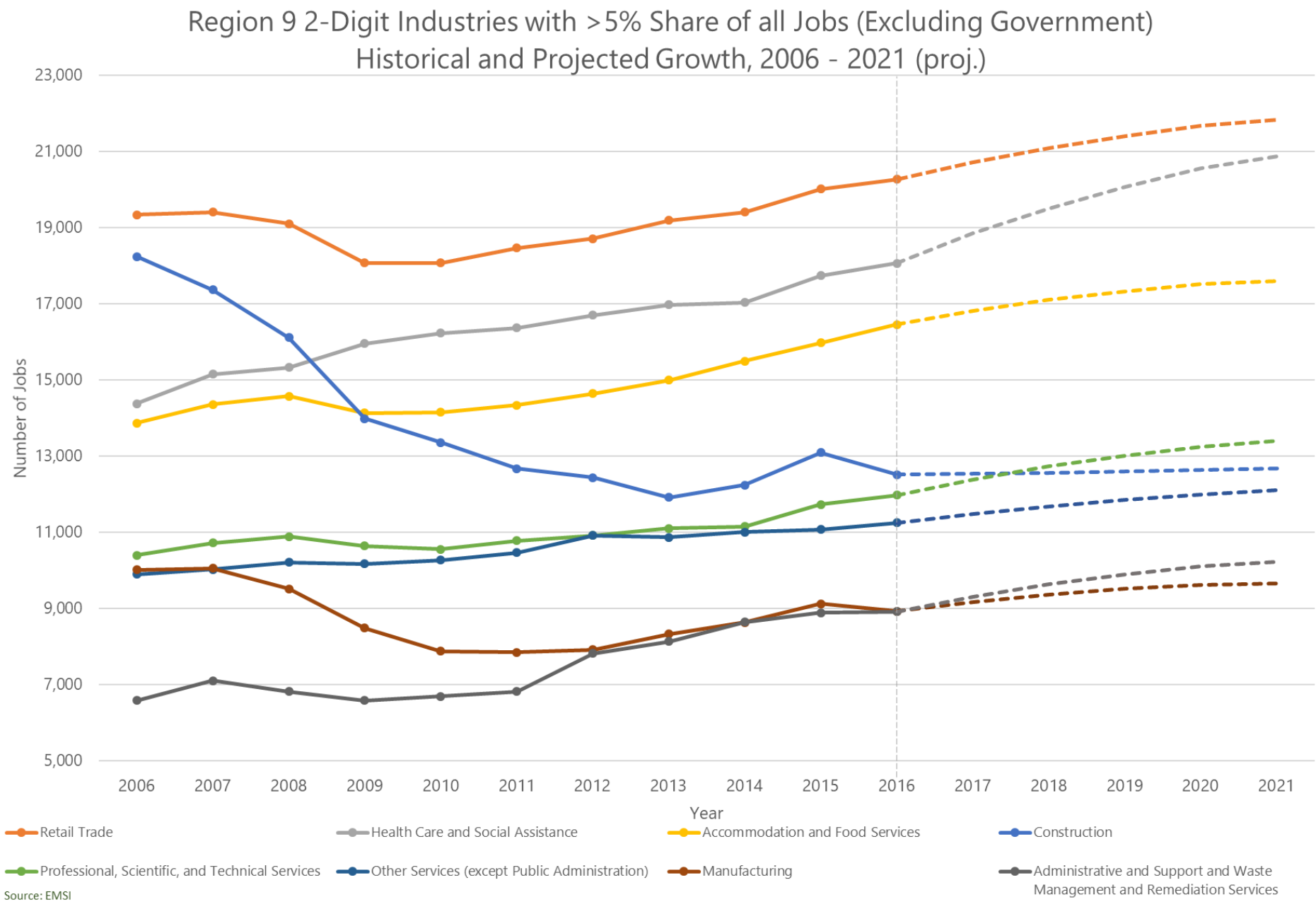
Source: EMSI Q2 2017 Dataset

Table 2: Region 9 Projected 2-Digit NAICS Industry Employment Trends, 2016 - 2026

Region 9 Projected 2-Digit NAICS Industry Employment Trends, 2016 - 2026					
NAICS	Description	2016 Jobs	2026 Jobs (projected)	2016 - 2026 Change	2016 - 2026 % Change
11	Crop and Animal Production	4,371	4,293	(78)	(2%)
21	Mining, Quarrying, and Oil and Gas Extraction	256	296	40	16%
22	Utilities	1,604	1,605	1	0%
23	Construction	12,507	12,944	437	3%
31	Manufacturing	8,918	9,962	1,044	12%
42	Wholesale Trade	3,182	3,465	283	9%
44	Retail Trade	20,256	22,818	2,562	13%
48	Transportation and Warehousing	3,188	3,644	456	14%
51	Information	2,952	3,035	83	3%
52	Finance and Insurance	3,769	4,409	640	17%
53	Real Estate and Rental and Leasing	3,126	3,654	528	17%
54	Professional, Scientific, and Technical Services	11,968	14,266	2,298	19%
55	Management of Companies and Enterprises	2,145	2,048	(97)	(5%)
56	Administrative and Support and Waste Management and Remediation Services	8,903	10,932	2,029	23%
61	Educational Services	4,049	4,823	774	19%
62	Health Care and Social Assistance	18,055	22,824	4,769	26%
71	Arts, Entertainment, and Recreation	3,959	4,653	694	18%
72	Accommodation and Food Services	16,451	18,142	1,691	10%
81	Other Services (except Public Administration)	11,242	12,688	1,446	13%
90	Government	52,528	61,288	8,760	17%
99	Unclassified Industry	535	972	437	82%
Total		193,962	222,762	28,800	15%

Source: EMSI Q2 2017 Dataset

Figure 3: Region 9 2-Digit Industries with >5% Share of All Jobs (Excluding Government) Historical and Projected Growth, 2006 - 2021 (proj.)



Historical Employment Trends Compared to the United States: 2-digit NAICS

Total employment in the region saw more than twice the percentage level of growth as the rest of the country (11% compared to 5%) over the last decade. In five industries, employment in the region demonstrated particularly high growth compared to the United States.

- **Real Estate and Rental and Leasing (NAICS 53)** saw growth that was the complete reverse of national trends—while the industry declined nationally by 6% over the last decade, this industry grew by 6% within the region.
- The percentage growth in the **Administrative and Support and Waste Management and Remediation Services (NAICS 56)** industry was quintuple that of the rest of the country, with 35% growth in the region and 7% growth across the US. Sub-sectors within this industry include industries like **Office Administrative Services (NAICS 5611)**, **Travel Arrangement and Reservation Services (NAICS 5615)**, and **Services to Buildings and Dwellings (NAICS 5617)**. As previously noted, this growth may be the result of a shift towards temporary employment within the region that is disproportionate with the rest of the nation.
- **Arts, Entertainment, and Recreation (NAICS 71)** saw double the percentage growth of an already high-growth industry. Over the last 10 years the industry grew 31% in the region, versus 16% in the nation. This growth was driven by new jobs in **Promoters of Performing Arts, Sports, and Similar Events (NAICS 7113, 87 new jobs)**, **Museums, Historical Sites, and Similar Institutions (NAICS 7121, 279 new jobs)**, and **Other Amusement and Recreation Industries (NAICS 7139, 558 new jobs)**.
- While the nation's jobs in **Other Services (except Public Administration) (NAICS 81)** grew by only 3% between 2006 and 2016, within the region this industry grew by 14% and added nearly 1,400 jobs.
- **Government (NAICS 90)** is an employment leader within the region, adding over 11,500 jobs in the last 10 years and growing 28% in the region while remaining virtually stagnant across the US. This growth has mostly been driven by government-run higher education and healthcare facilities, which differ from private institutions in **Healthcare and Social Assistance (NAICS 62)** and **Educational Services (NAICS 61)**.

Conversely, three industries saw significant decline within Region 9 compared to growth at the national level.

- Though the industry did not fare well in general across the United States over the last 10 years, employment within **Construction (NAICS 23)** fell by over 30% within the region. **Residential Building Construction (NAICS 2361)**, **Building Equipment Contractors (NAICS 2382)**, and **Building Finishing Contractors (NAICS 2383)** each lost over 1,000 net jobs between 2006 and 2016.
- While employment in **Wholesale Trade (NAICS 42)** declined by just over 1% across the US, within Region 9 it declined by just under 24%. While most sub-sectors within this industry saw decline, **Lumber and Other Construction Materials Merchandising (NAICS 4233)** in particular declined by almost 450 jobs (or 70%) over 10 years.
- **Management of Companies and Enterprises (NAICS 55)** grew by 24% across the US between 2006 and 2016, but declined by 5% in the region over that same period. The diverge between regional and national trends in this industry may warrant further analysis. Note that sub-sectors within this industry are only differentiated at the 6-digit NAICS code level. In the past 10 years, **Offices of Bank Holding Companies (NAICS 551111)** was completely eliminated, losing all 96 jobs. During that same time, **Offices of Other Holding Companies (NAICS 551112)** saw its jobs halve, from 93 to 46. Losses from these sub-sectors were more than made up by **Corporate, Subsidiary, and Regional Managing Offices (NAICS 551114)** which gained 467 jobs over the observed period.

Table 3 compares historical trends by 2-digit NAICS codes for all industries in Region 9 compared to trends at the national level. Industries that significantly differed from national trends are highlighted in either green or red.

Table 3: 2-Digit NAICS Industry Trends – Region 9

2-Digit NAICS Industry Trends - Region 9 vs United States					
NAICS	Description	Region 9		United States	
		2006 - 2016 Change	2006 - 2016 % Change	2006 - 2016 Change	2006 - 2016 % Change
11	Crop and Animal Production	(47)	(1%)	11,303	1%
21	Mining, Quarrying, and Oil and Gas Extraction	(25)	(9%)	19,146	3%
22	Utilities	129	9%	13,527	2%
23	Construction	(5,728)	(31%)	(1,540,051)	(15%)
31	Manufacturing	(1,090)	(11%)	(1,858,571)	(13%)
42	Wholesale Trade	(1,004)	(24%)	(73,052)	(1%)
44	Retail Trade	929	5%	264,563	2%
48	Transportation and Warehousing	118	4%	538,375	11%
51	Information	(408)	(12%)	(250,393)	(8%)
52	Finance and Insurance	11	0%	(261,893)	(4%)
53	Real Estate and Rental and Leasing	163	6%	(163,706)	(6%)
54	Professional, Scientific, and Technical Services	1,581	15%	1,472,035	17%
55	Management of Companies and Enterprises	(110)	(5%)	436,914	24%
56	Administrative and Support and Waste Management and Remediation Services	2,328	35%	648,340	7%
61	Educational Services	920	29%	786,141	24%
62	Health Care and Social Assistance	3,686	26%	3,914,735	25%
71	Arts, Entertainment, and Recreation	956	32%	363,931	16%
72	Accommodation and Food Services	2,595	19%	2,093,337	18%
81	Other Services (except Public Administration)	1,354	14%	212,239	3%
90	Government	11,554	28%	261,338	1%
99	Unclassified Industry	Insf. Data	Insf. Data	41,164	17%
Total		193,962	11%	6,929,423	5%

Source: EMSI Q2 2017 Dataset

Significant growth (> 10 percentage points) compared to United States

Significant decline (> 10 percentage points) compared to United States

Industry Growth by County

Table 4 demonstrates county by county historical change in jobs in Region 9 over 2006-2016. Albemarle, Charlottesville, Culpeper, Greene, Louisa, Nelson and Orange Counties all demonstrated net positive growth over the last ten years. The largest overall job gains were seen in Charlottesville (8,154), Albemarle (7,801) and Louisa (2,287). Whereas, Fauquier, Fluvanna, Madison and Rappahannock Counties saw a net decline of jobs, with Madison losing the greatest number of positions (740).

Table 4: Historical Change in Jobs by Region 9 Counties, 2006 - 2016

Historical Change in Jobs by Region 9 Counties, 2006-2016												
NAICS	Industry Description	Albemarle County	Charlottesville City	Culpeper County	Fauquier County	Fluvanna County	Greene County	Louisa County	Madison County	Nelson County	Orange County	Rappahannock County
11	Crop and Animal Production	228	(29)	(145)	(371)	(18)	8	9	(162)	62	354	16
21	Mining, Quarrying, and Oil and Gas Extraction	2	0	(29)	2	Insf. Data	(12)	Insf. Data	0	Insf. Data	0	0
22	Utilities	Insf. Data	56	26	(26)	(48)	(1)	179	(23)	(19)	Insf. Data	0
23	Construction	(1,427)	(606)	(371)	(1,788)	(181)	(180)	(214)	(94)	(231)	(477)	(161)
31	Manufacturing	(733)	(96)	(454)	97	(182)	(85)	(229)	77	358	147	9
42	Wholesale Trade	8	(92)	(472)	(420)	(4)	5	27	(29)	(5)	(13)	(12)
44	Retail Trade	309	(1,015)	352	305	49	310	674	(270)	(29)	259	(13)
48	Transportation and Warehousing	28	(32)	85	(53)	(5)	(35)	759	(10)	6	(618)	Insf. Data
51	Information	(57)	(149)	(82)	(111)	14	2	(13)	(7)	(10)	(26)	30
52	Finance and Insurance	74	172	(112)	(40)	(2)	(16)	(14)	2	(9)	(29)	(14)
53	Real Estate and Rental and Leasing	81	31	46	51	(82)	(12)	1	(6)	(6)	52	7
54	Professional, Scientific, and Technical Services	924	(329)	127	597	(2)	193	55	14	53	(25)	(28)
55	Management of Companies and Enterprises	(90)	153	(98)	(67)	Insf. Data	Insf. Data	(6)	Insf. Data	Insf. Data	0	Insf. Data
56	Administrative and Support and Waste Management and Remediation Services	371	1,550	44	12	91	116	64	(1)	(13)	58	34
61	Educational Services	206	276	38	149	118	93	(1)	(33)	4	58	12
62	Health Care and Social Assistance	1,960	(285)	641	412	(7)	124	289	25	114	378	34
71	Arts, Entertainment, and Recreation	517	447	90	(134)	34	26	3	9	6	(34)	(6)
72	Accommodation and Food Services	599	914	428	303	(82)	135	292	(95)	(12)	85	29
81	Other Services (except Public Administration)	692	228	(85)	176	(21)	44	195	(52)	135	0	42
90	Government	3,989	6,785	146	459	(186)	(11)	191	(104)	78	239	(31)
99	Unclassified Industry	93	173	14	82	Insf. Data	Insf. Data	46	27	16	42	24
Total		7,801	8,154	191	(364)	(480)	719	2,287	(740)	497	408	(28)

Source: EMSI Q2 2017 Dataset

Industry Growth by Planning District Commission

The Thomas Jefferson Planning District Commission is the southernmost of the two planning district councils in Region 9. The area has seen a net increase of nearly 19,000 jobs from 2006 to 2016, driven largely by high growth in Louisa, Charlottesville City, Greene, and Albemarle Counties (all of which experienced 15% growth or greater).

Conversely, the Rappahannock-Rapidan Regional Commission experienced a net decline in regional job growth, losing 532 net jobs. Industries hit the hardest by job loss include **Construction (NAICS 23, 29% decline), Manufacturing (NAICS 31, 16% decline)** and **Transportation and Warehousing (NAICS 48, 9% decline)**.

Table 5: Thomas Jefferson and Rappahannock-Rapidan Historical Industry Trends

Thomas Jefferson and Rappahannock-Rapidan Historical Industry Trends					
NAICS	Industry Description	Thomas Jefferson		Rappahannock-Rapidan	
		2006 - 2016 Change	2006 - 2016 % Change	2006 - 2016 Change	2006 - 2016 % Change
11	Crop and Animal Production	260	16%	(307)	(11%)
21	Mining, Quarrying, and Oil and Gas Extraction	2	2%	(28)	(18%)
22	Utilities	195	15%	(66)	(31%)
23	Construction	(2,839)	(29%)	(2,889)	(35%)
31	Manufacturing	(967)	(16%)	(122)	(3%)
42	Wholesale Trade	(59)	(3%)	(946)	(39%)
44	Retail Trade	296	2%	632	9%
48	Transportation and Warehousing	722	50%	(604)	(37%)
51	Information	(211)	(9%)	(197)	(21%)
52	Finance and Insurance	204	8%	(193)	(16%)
53	Real Estate and Rental and Leasing	13	1%	150	15%
54	Professional, Scientific, and Technical Services	896	12%	685	23%
55	Management of Companies and Enterprises	55	3%	(164)	(43%)
56	Administrative and Support and Waste Management and Remediation Services	2,178	51%	149	6%
61	Educational Services	695	33%	224	22%
62	Health Care and Social Assistance	2,196	23%	1,490	31%
71	Arts, Entertainment, and Recreation	1,032	53%	(76)	(7%)
72	Accommodation and Food Services	1,845	19%	748	18%
81	Other Services (except Public Administration)	1,274	22%	81	2%
90	Government	10,844	36%	710	7%
99	Unclassified Industry	Insf. Data	Insf. Data	189	Insf. Data
Total		18,978	17%	(532)	(1%)

Source: EMSI Q2 2017 Dataset

Dominant Industries by 2016 Employment

Table 6 lists the same 2-digit NAICS industries as previously shown, sorted in descending order by job count in 2016. Also included are each industry's percentage share of all jobs within Region 9, as well as the average annual pay that workers in the industry command, compared to similar workers across the US.

Over 27% of all jobs in the region are in **Government (NAICS 90)**. It is by far the dominant industry in the region, being over twice as large as the next largest industry, **Retail Trade (NAICS 44)**, and nearly as large as the next three largest industries combined. Of the industries listed, the four top industries share over half of all jobs in the region.

Table 6: Region 9 Top 2-Digit NAICS Industries by Job Count

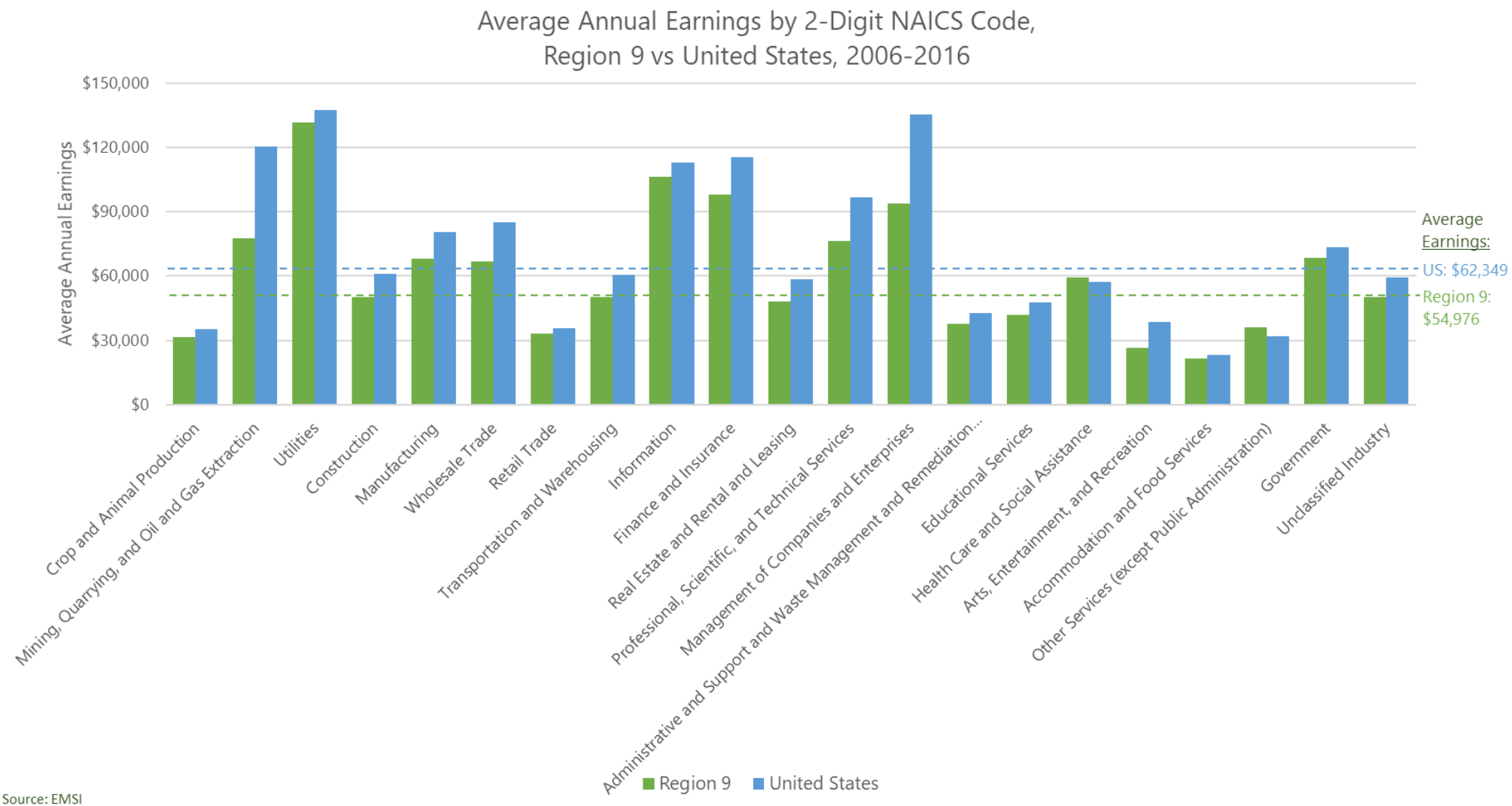
Region 9 Top 2-Digit NAICS Industries by Job Count						
NAICS	Description	2016 Jobs	2006 - 2016 % Change	% of All Jobs (2016)	Avg. Earnings Per Job	Avg. Earnings Per Job (US)
90	Government	52,528	28%	27%	$68,616	$73,624
44	Retail Trade	20,256	5%	10%	$32,927	$35,739
62	Health Care and Social Assistance	18,055	26%	9%	$59,142	$57,396
72	Accommodation and Food Services	16,451	19%	8%	$21,603	$23,224
23	Construction	12,507	(31%)	6%	$50,190	$60,879
54	Professional, Scientific, and Technical Services	11,968	15%	6%	$76,455	$96,644
81	Other Services (except Public Administration)	11,242	14%	6%	$35,989	$31,856
31	Manufacturing	8,918	(11%)	5%	$67,933	$80,355
56	Administrative and Support and Waste Management and Remediation Services	8,903	35%	5%	$37,799	$42,514
11	Crop and Animal Production	4,371	(1%)	2%	$31,661	$35,292
61	Educational Services	4,049	29%	2%	$41,785	$47,603
71	Arts, Entertainment, and Recreation	3,959	32%	2%	$26,669	$38,589
52	Finance and Insurance	3,769	0%	2%	$98,152	$115,377
48	Transportation and Warehousing	3,188	4%	2%	$50,078	$60,635
42	Wholesale Trade	3,182	(24%)	2%	$66,949	$85,048
53	Real Estate and Rental and Leasing	3,126	5%	2%	$48,193	$58,450
51	Information	2,952	(12%)	2%	$106,323	$113,098
55	Management of Companies and Enterprises	2,145	(5%)	1%	$93,853	$135,201
22	Utilities	1,604	9%	1%	$131,419	$137,571
99	Unclassified Industry	535	Insuf. Data	0%	$50,363	$59,105
21	Mining, Quarrying, and Oil and Gas Extraction	256	(9%)	0%	$77,496	$120,583
Total		193,962	11%	100%	$54,976	$62,349

Source: EMSI Q2 2017 Dataset

Comparison of Average Annual Earnings: Region 9 versus the United States

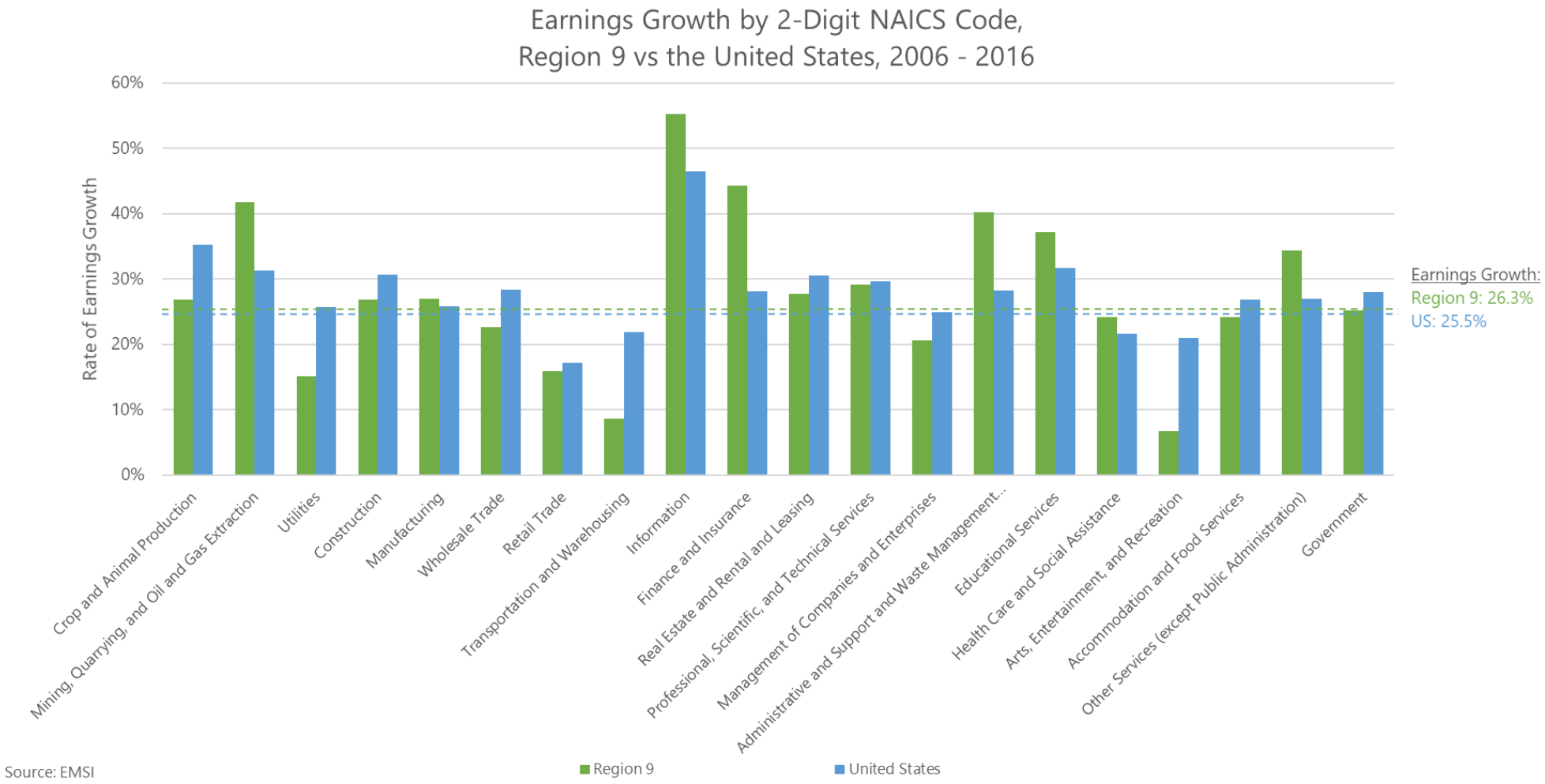
Figure 4 on the following page depicts the comparison of average annual earnings between workers in Region 9 and workers across the US for all 21, 2-digit NAICS industries. Of all industries, **Health Care and Social Assistance (NAICS 62)** and **Other Services (Except Public Administration) (NAICS 81)** are the only industries in which average annual earnings are higher in Region 9 than across the rest of the US. Average growth in worker earnings between 2006 and 2016, as shown in Figure 5, exceeded the national average (26.3% growth vs 25.5% growth), with earnings in eight of 20 industries growing faster than the national average over the last decade. The **Information (NAICS 51)** sector saw a 55% increase in earnings, from roughly $69,000 to $117,000 a year. This was the greatest absolute and percent increase out of all industries. **Finance and Insurance (NAICS 52)**; **Other Services (Except Public Administration) (NAICS 81);** and **Mining, Quarrying, and Oil and Gas Extraction (NAICS 21)** have also seen more than 40% earnings growth in the last 10 years, well above industry growth across the US.

Figure 4: Average Annual Earnings by 2-Digit NAICS Code, Region 9 vs United States



Source: EMSI

Figure 5: Earnings Growth by 2-Digit NAICS Code, Region 9 vs the United States, 2006 - 2016



Source: EMSI

*Note: **Unclassified Industry (NAICS 99)** is not included in this figure, as there is insufficient data to accurately assess industry growth within the region.

Location Quotient Analysis

Overview

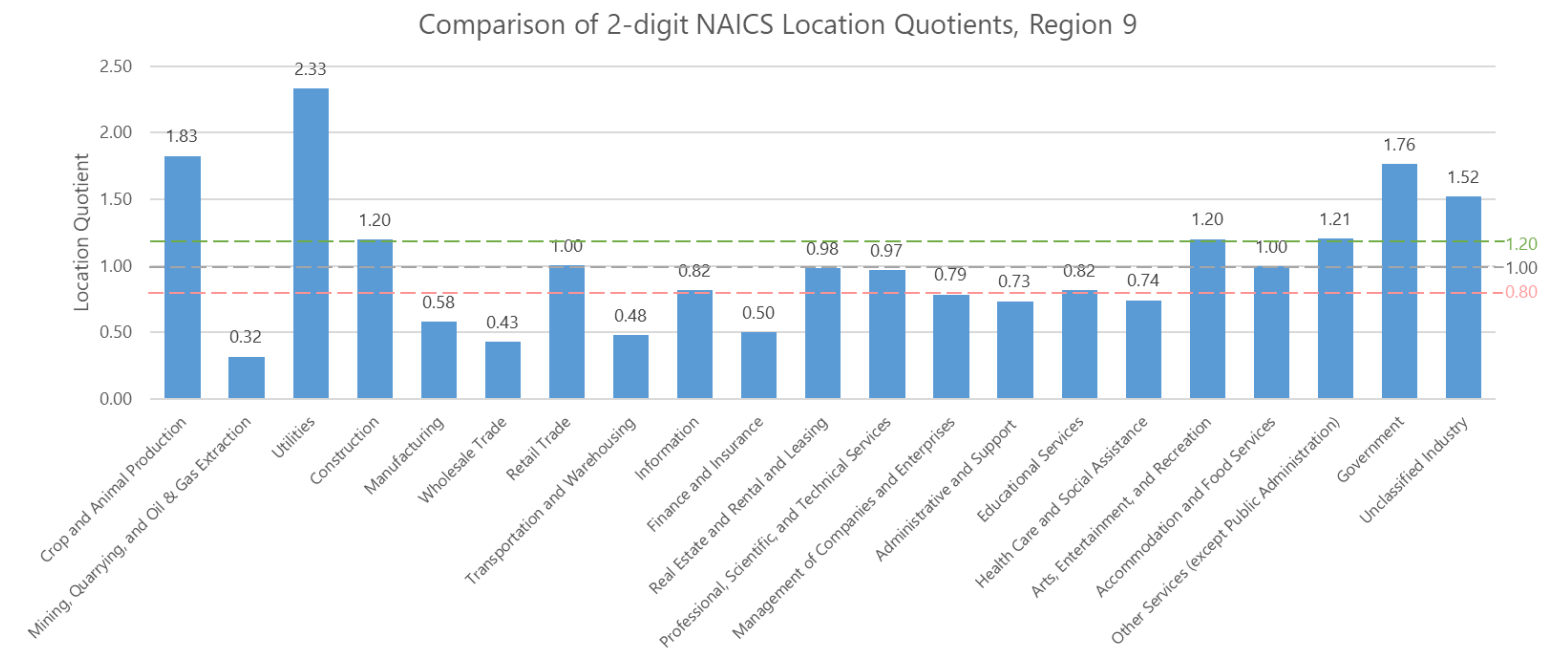
Location Quotient (LQ) analysis compares a specific geographic region to a larger reference area by quantifying how concentrated a particular industry, demographic group, or other variable is as compared to the larger geography. For this analysis, employment by industry in the region is compared to the nation to identify which industries are more highly concentrated in the region than at the national level.

LQ is calculated by dividing the percent of jobs within each industry locally by the percent of jobs in the same industry at the national level. For example, if the Finance and Insurance industry accounts for 2% of jobs in a region and at the national level this industry has 1% of the total jobs, the region has a LQ of 2.0 (0.02 ÷ 0.01 = 2). In this example, the local community employs twice as many individuals in the industry as expected based on national employment patterns. Typically, only values above 1.20 or below 0.80 are considered "significant" findings in LQ analysis. Industries with both a high LQ and high employment numbers are assumed to produce more than what is needed locally (i.e. a surplus) and export their products and services.

The following graph depicts the LQs of all 2-digit NAICS industries. Industries with LQs greater than 1.20 (the green line) are particularly concentrated within the region. These industries include **Crop and Animal Production (NAICS 11, LQ of 1.83)**, **Utilities (NAICS 23, LQ of 2.33)**, **Other Services (Except Public Administration) (NAICS 81, LQ of 1.21)**, and **Government (NAICS 90, LQ of 1.52)**. Firms within the **Unclassified Industries (NAICS 1.52, LQ of 1.52)** code have not reported their classification to the Bureau of Labor Statistics.

Industries with LQs below 0.80 (the red line) are defined as being significantly underrepresented within the region. Nearly half of all 2-digit NAICS classifications (8 out of 21) can be considered significantly underrepresented compared to the rest of the United States. Identifying the causes of this underrepresentation, and whether there is unmet demand within the region that could be captured by promoting new business start-up, will be a key focus in further analysis.

Figure 6: Comparison of 2-Digit NAICS Location Quotients, Region 9



Source: EMSI

Table 7 depicts the 4-digit NAICS codes with the highest LQs in the region. **Beverage Manufacturing (NAICS 3121)** stands out having seen nearly 300% growth in the past 10 years, and currently has an LQ of 5.00. This strong growth and high concentration within the region shows potential for the Craft Beverage Industry to be a driver of economic development. The two 6-digit NAICS industry sub-sectors driving growth in beverage manufacturing are **Soft Drink Manufacturing (NAICS 312111)** and **Breweries (NAICS 312120)**, both of which grew by roughly 960% and have average annual earnings of over $50,000.

Table 7: Region 9 Top 30 4-Digit NAICS Industries by Location Quotient

Region 9 Top 30 4-Digit NAICS Industries by Location Quotient							
NAICS	Description	2006 Jobs	2016 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 Location Quotient	Avg. Earnings Per Job
1152	Support Activities for Animal Production	297	338	41	14%	6.70	$42,039
9026	Education and Hospitals (State Government)	15,713	23,709	7,996	51%	6.44	$70,859
1132	Forest Nurseries and Gathering of Forest Products	<10	19	Insf. Data	Insf. Data	5.97	$23,977
3121	Beverage Manufacturing	367	1,414	1,047	285%	5.00	$35,230
3211	Sawmills and Wood Preservation	470	580	110	23%	4.95	$60,744
5259	Other Investment Pools and Funds	36	28	(8)	(22%)	4.53	$84,236
5251	Insurance and Employee Benefit Funds	<10	18	Insf. Data	Insf. Data	3.61	$81,314
3322	Cutlery and Handtool Manufacturing	210	163	(47)	(22%)	3.48	$34,988
4442	Lawn and Garden Equipment and Supplies Stores	405	693	288	71%	3.44	$39,089
7121	Museums, Historical Sites, and Similar Institutions	364	643	279	77%	3.23	$37,065
2211	Electric Power Generation, Transmission and Distribution	1,441	1,547	106	7%	3.18	$133,626
1133	Logging	266	300	34	13%	3.16	$43,852
5615	Travel Arrangement and Reservation Services	321	757	436	136%	2.58	$52,132
5111	Newspaper, Periodical, Book, and Directory Publishers	1,523	1,310	(213)	(14%)	2.57	$104,071
8139	Business, Professional, Labor, Political, and Similar Organizations	825	1,299	474	57%	2.41	$87,715
9029	State Government, Excluding Education and Hospitals	4,506	6,241	1,735	39%	2.23	$73,791
7114	Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures	92	98	6	7%	2.22	$102,825
2123	Nonmetallic Mineral Mining and Quarrying	236	252	16	7%	2.21	$76,763
1110	Crop Production	1,449	2,153	704	49%	2.07	$28,714
3369	Other Transportation Equipment Manufacturing	18	83	65	361%	2.04	$64,007
8133	Social Advocacy Organizations	250	520	270	108%	2.03	$52,544
6114	Business Schools and Computer and Management Training	180	182	2	1%	2.03	$74,479
1120	Animal Production and Aquaculture	1,922	1,035	(887)	(46%)	1.94	$32,311
6111	Elementary and Secondary Schools	1,875	2,555	680	36%	1.90	$41,418
7212	RV (Recreational Vehicle) Parks and Recreational Camps	168	151	(17)	(10%)	1.89	$24,692
2389	Other Specialty Trade Contractors	2,802	2,293	(509)	(18%)	1.88	$48,254
8132	Grantmaking and Giving Services	181	316	135	75%	1.79	$69,426
4869	Other Pipeline Transportation	19	19	0	0%	1.77	$101,479
4541	Electronic Shopping and Mail-Order Houses	1165	887	(278)	(24%)	1.75	$49,090
2373	Highway, Street, and Bridge Construction	885	702	(183)	(21%)	1.75	$59,540
6117	Educational Support Services	92	362	270	293%	1.74	$65,001

Source: EMSI Q2 2017 Dataset

Shift Share Analysis

A Shift Share Analysis distinguishes an industry's employment growth in a specific area that is attributable to local competitive advantages or disadvantages from growth which is attributable to overall national employment trends or national employment trends in that industry.

The shift share analysis helps to answer the question, "*Why is employment growing or declining in this local industry*?" To do this, shift share analysis splits regional job growth into three components: industrial mix effect, national growth effect, and regional competitiveness effect. The following tables shows where the region may have a particular competitive advantage compared to the other geographies (past and projected). A shift share analysis is based on four factors:

Industrial Mix Effect – The industrial mix effect represents the share of regional industry growth explained by the growth of the specific industry at the national level. To arrive at this number, the national growth rate of the total economy is subtracted from the national growth rate of the specific industry, and this growth percentage is applied to the regional jobs in that industry.

National Growth Effect – The national growth effect explains how much of the regional industry's growth is explained by the overall growth of the national economy; if the nation's whole economy is growing, you would generally expect to see some positive change in each industry in your local region (the proverbial "rising tide that lifts all boats" analogy).

Expected Change – This is the rate of growth of the particular industry at the national level. Algebraically, the expected change is the sum of the industrial mix and the national growth effects.

Regional Competitive Effect – The regional competitive effect is the most interesting of the three indicators. It explains how much of the change in a selected industry is due to some unique competitive advantage that the region possesses, because the growth cannot be explained by national trends in that industry or the economy as whole. This effect is calculated by taking the total regional growth of the given industry and subtracting the national growth for that same industry. Note that this effect can be positive even as regional employment in the industry declines. This would indicate that regional decline is less than the national decline.

Key Findings from this Analysis

- The region has a positive competitive effect of 11,603 jobs, indicating a strong positive competitive positioning.
- Most of Region 9's competitiveness is a result of its **Government (NAICS 90)** sector industries, in particular **Education and Hospitals (State Government) (NAICS 9026)**. When Government sub-sectors are eliminated, the total net competitiveness of the Region drops by nearly 95%, but remains positive.
- **Manufacturing (NAICS 31)**, **Finance and Insurance (NAICS 52)**, and **Real Estate Rental and Leasing (NAICS 53)** are three industries that declined at a lower rate than the rest of the nation, or saw growth despite a nation-wide decline, indicating strong regional competitiveness in spite of national industry decline.
- The most competitive 4-digit NAICS industries in Region 9 heavily overlap with the fastest-growing 4-digit NAICS industries, suggesting that growth in these industries is primarily the result of industry competitiveness within the region, and not external economic factors.

Table 8: Top Industry Shift Share by 2-Digit NAICS Code, 2006 - 2016

Top Industry Shift Share by 2-Digit NAICS, 2006 - 2016					
NAICS	Description	Ind. Mix Effect	Nat'l Growth Effect	Expected Change	Competitive Effect
11	Crop and Animal Production	(177)	203	26	(73)
21	Mining, Quarrying, and Oil and Gas Extraction	(4)	13	9	(33)
22	Utilities	(31)	68	37	92
23	Construction	(3,636)	837	(2,799)	(2,929)
31	Manufacturing	(1,752)	459	(1,293)	203
42	Wholesale Trade	(242)	192	(50)	(954)
44	Retail Trade	(571)	887	316	613
48	Transportation and Warehousing	200	141	341	(223)
51	Information	(417)	154	(263)	(144)
52	Finance and Insurance	(327)	172	(155)	165
53	Real Estate and Rental and Leasing	(312)	136	(176)	339
54	Professional, Scientific, and Technical Services	1,300	477	1,777	(195)
55	Management of Companies and Enterprises	448	103	551	(661)
56	Administrative and Support and Waste Management and Remediation Services	161	302	463	1,865
61	Educational Services	616	144	760	160
62	Health Care and Social Assistance	2,886	659	3,545	141
71	Arts, Entertainment, and Recreation	334	138	472	484
72	Accommodation and Food Services	1,916	636	2,552	43
81	Other Services (except Public Administration)	(169)	454	285	1,070
90	Government	(1,434)	1,880	446	11,108
99	Unclassified Industry	0	0	0	534
Total		(1,213)	8,055	6,842	11,603
Total Not Including Government		221	6,174	6,398	495

Source: EMSI Q2 2017 Dataset

Table 9: Region 20 Most Competitive 4-Digit NAICS Industries

Top 20 Most Competitve 4-Digit NAICS Industries								
NAICS	Industry	Job Change (2006 - 2016)	Ind Mix Effect	Nat Growth Effect	Expected Change	Competitive Effect	2016 Location Quotient	2016 Earnings Per Worker
9026	Education and Hospitals (State Government)	7,996	717	721	1,438	6,558	6.44	$70,859
6241	Individual and Family Services	2,614	604	26	630	1,984	1.09	$26,716
9029	State Government, Excluding Education and Hospitals	1,735	(418)	207	(211)	1,946	2.23	$73,791
6211	Offices of Physicians	1,594	216	87	303	1,292	1.10	$122,107
3121	Beverage Manufacturing	1,047	99	17	116	930	5.00	$35,230
9036	Education and Hospitals (Local Government)	896	(451)	455	4	891	1.03	$54,774
1110	Crop Production	704	(78)	67	(11)	714	2.07	$28,714
4529	Other General Merchandise Stores	1,065	386	56	442	624	0.98	$27,010
5613	Employment Services	501	(126)	74	(52)	553	0.48	$32,084
7225	Restaurants and Other Eating Places	2563	1,627	434	2,061	502	0.95	$19,391
8139	Business, Professional, Labor, Political, and Similar Organizations	474	(22)	38	16	459	2.41	$87,715
5611	Office Administrative Services	500	41	6	47	453	1.03	$93,775
5615	Travel Arrangement and Reservation Services	436	(27)	15	(12)	448	2.58	$52,132
4451	Grocery Stores	755	156	152	308	447	1.21	$26,012
5111	Newspaper, Periodical, Book, and Directory Publishers	(213)	(709)	70	(639)	426	2.57	$104,071
9012	Federal Government, Military	296	(115)	68	(47)	343	0.74	$48,944
5415	Computer Systems Design and Related Services	1,126	740	77	817	308	1.09	$105,318
4442	Lawn and Garden Equipment and Supplies Stores	288	(9)	19	10	279	3.44	$39,089
9039	Local Government, Excluding Education and Hospitals	426	(170)	328	158	268	1.10	$61,162
5311	Lessors of Real Estate	266	(30)	30	0	265	0.96	$44,688
3364	Aerospace Product and Parts Manufacturing	269	(2)	8	6	263	0.75	$86,595

Source: EMSI Q2 2017 Dataset

Additional Analysis

Largest 4-Digit NAICS Industries (by 2016 Job Count)

Key Findings From this Analysis

- Of the 20 industries listed below, 9 have LQs high enough that they could be considered significantly concentrated (above 1.20) within the region.
- Four of the five largest 4-digit NAICS industries in Region 9 are in some form of **Government (NAICS 90XX)** sub-sectors.
- The three industries in this table that saw decline in the past 10 years are also the only **Construction (NAICS 23XX)** sub-sectors listed. These three sub-sectors have collectively declined by roughly 3,000 jobs in the observed period:
    - **Building Equipment Contractors (NAICS 2382)** lost 1,001 net jobs.
    - **Residential Building Construction (NAICS 2361)** lost 1,487 net jobs.
    - **Other Specialty Trade Contractors (NAICS 2389)** lost 509 net jobs.

Table 10: Region 9 Top 20 4-Digit NAICS Industries by Job Count

Region 9 Top 20 4-Digit NAICS Industries by Job Count							
NAICS	Description	2006 Jobs	2016 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 Location Quotient	Avg. Earnings Per Job
9026	Education and Hospitals (State Government)	15,713	23,709	7,996	51%	6.44	$70,859
7225	Restaurants and Other Eating Places	9,460	12,023	2,563	27%	0.95	$19,391
9036	Education and Hospitals (Local Government)	9,916	10,812	896	9%	1.03	$54,774
9039	Local Government, Excluding Education and Hospitals	7,140	7,566	426	6%	1.10	$61,162
9029	State Government, Excluding Education and Hospitals	4,506	6,241	1,735	39%	2.23	$73,791
4451	Grocery Stores	3,316	4,071	755	23%	1.21	$26,012
5617	Services to Buildings and Dwellings	3,457	4,047	590	17%	1.19	$26,844
6211	Offices of Physicians	1,889	3,483	1,594	84%	1.10	$122,107
6241	Individual and Family Services	564	3,178	2,614	463%	1.09	$26,716
6221	General Medical and Surgical Hospitals	2,941	3,014	73	2%	0.54	$64,607
7211	Traveler Accommodation	2,709	2,836	127	5%	1.23	$27,887
5415	Computer Systems Design and Related Services	1,687	2,813	1,126	67%	1.09	$105,318
2382	Building Equipment Contractors	3,665	2,664	(1,001)	(27%)	0.96	$51,781
6111	Elementary and Secondary Schools	1,875	2,555	680	36%	1.90	$41,418
9011	Federal Government, Civilian	2,206	2,411	205	9%	0.68	$133,216
7139	Other Amusement and Recreation Industries	1,832	2,390	558	30%	1.44	$21,255
2361	Residential Building Construction	3,852	2,365	(1,487)	(39%)	1.68	$47,097
2389	Other Specialty Trade Contractors	2,802	2,293	(509)	(18%)	1.88	$48,254
4529	Other General Merchandise Stores	1,220	2,285	1,065	87%	0.98	$27,010
1110	Crop Production	1,449	2,153	704	49%	2.07	$28,714

Source: EMSI Q2 2017 Dataset

Highest-Growth 4-Digit NAICS Industries (by Aggregate Job Growth)

Key Findings From this Analysis

- Both job growth and total jobs are dominated by government industries, with five of the top 20 highest-growing industries over the past decade being in either local or state government. Together these industries have added over 11,000 jobs within the region since 2006.
    - Over 70% of this growth can be attributed to **Education and Hospitals (State Government) (NAICS 9026)** alone, which grew by nearly 8,000 jobs in the last 10 years.
- Individual Family Services (NAICS 6241), Office Administration Services (NAICS 5611), Beverage Manufacturing (NAICS 3121), and Travel Arrangement and Reservation Services (NAICS 5615) have all grown by more than 100% over the observed period, while at the same time adding more than 400 new employees.

Table 11: Top 20 4-Digit NAICS Industries by Aggregate Job Growth

Top 20 4-Digit NAICS Industries by Aggregate Job Growth							
NAICS	Description	2006 Jobs	2016 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 Location Quotient	Avg. Earnings Per Job
9026	Education and Hospitals (State Government)	15,713	23,709	7,996	51%	6.44	$70,859
6241	Individual and Family Services	564	3,178	2,614	463%	1.09	$26,716
7225	Restaurants and Other Eating Places	9,460	12,023	2,563	27%	0.95	$19,391
9029	State Government, Excluding Education and Hospitals	4,506	6,241	1,735	39%	2.23	$73,791
6211	Offices of Physicians	1,889	3,483	1,594	84%	1.10	$122,107
5415	Computer Systems Design and Related Services	1,687	2,813	1,126	67%	1.09	$105,318
4529	Other General Merchandise Stores	1,220	2,285	1,065	87%	0.98	$27,010
3121	Beverage Manufacturing	367	1,414	1,047	285%	5.00	$35,230
9036	Education and Hospitals (Local Government)	9,916	10,812	896	9%	1.03	$54,774
4451	Grocery Stores	3,316	4,071	755	23%	1.21	$26,012
1110	Crop Production	1,449	2,153	704	49%	2.07	$28,714
6111	Elementary and Secondary Schools	1,875	2,555	680	36%	1.90	$41,418
5617	Services to Buildings and Dwellings	3,457	4,047	590	17%	1.19	$26,844
7139	Other Amusement and Recreation Industries	1,832	2,390	558	30%	1.44	$21,255
5416	Management, Scientific, and Technical Consulting Services	1,444	1,985	541	37%	0.98	$80,807
5613	Employment Services	1,616	2,117	501	31%	0.48	$32,084
5611	Office Administrative Services	140	640	500	357%	1.03	$93,775
8139	Business, Professional, Labor, Political, and Similar Organizations	825	1,299	474	57%	2.41	$87,715
5615	Travel Arrangement and Reservation Services	321	757	436	136%	2.58	$52,132
9039	Local Government, Excluding Education and Hospitals	7,140	7,566	426	6%	1.10	$61,162

Source: EMSI Q2 2017 Dataset

Self-Employment in Region 9

Table 13 below lists 4-digit NAICS codes that are of particular interest based on their number of self-employed individuals, overall size, and 10-year historical growth.

Key Findings From this Analysis

- A large portion of the industries that saw decline in self-employment were in construction. Building Finishing Contractors (NAICS 1383); Residential Building Construction (NAICS 2361); Other Specialty Contractors (NAICS 2389); Foundation, Structure, and Building Exterior Contractors (NAICS 2381); and Building Equipment Contractors (NAICS 2382). All of which shed a combined 1,183 self-employed jobs over the last 10 years.
- Self-employed jobs in industries within the **Professional, Scientific, and Technical Services (NAICS 54XX)** sector saw mixed movements, but ultimately grew by a net 196 jobs across all sub-sectors.
- Overall, industries with high self-employment in Region 9 tend to have lower wages. Of the 20 industries listed, none have average annual earnings greater than $40,000 (with the exception of **Legal Services (NAICS 5411)**, which has nearly $75,000 in average annual earnings).

Table 12: Top 20 Industries by Self-Employed Job Count

Top 20 Industries by Self-Employed Job Count							
NAICS	Description	2010 Jobs	2016 Jobs	2010 - 2016 Change	2010 - 2016 % Change	2016 Location Quotient	Avg. Earnings Per Job
5617	Services to Buildings and Dwellings	1,498	1,488	(10)	(1%)	1.30	$15,423
1110	Crop Production	635	941	306	48%	2.12	$22,868
2383	Building Finishing Contractors	1,132	661	(471)	(42%)	0.97	$22,584
2361	Residential Building Construction	867	658	(209)	(24%)	1.04	$22,584
5416	Management, Scientific, and Technical Consulting Services	588	647	59	10%	1.37	$36,456
2389	Other Specialty Trade Contractors	846	579	(267)	(32%)	1.06	$22,584
1120	Animal Production and Aquaculture	1,191	491	(700)	(59%)	1.77	$23,232
6244	Child Day Care Services	629	413	(216)	(34%)	0.75	$11,552
7115	Independent Artists, Writers, and Performers	415	402	(13)	(3%)	1.05	$12,849
6116	Other Schools and Instruction	328	356	28	9%	1.33	$14,221
8121	Personal Care Services	310	328	18	6%	0.38	$17,667
5311	Lessors of Real Estate	234	292	58	25%	0.94	$33,293
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	215	288	73	34%	1.09	$31,445
2381	Foundation, Structure, and Building Exterior Contractors	405	285	-120	(30%)	1.03	$22,584
2382	Building Equipment Contractors	388	272	(116)	(30%)	0.87	$22,584
5413	Architectural, Engineering, and Related Services	273	269	(4)	(1%)	1.80	$36,546
8111	Automotive Repair and Maintenance	233	269	36	15%	0.75	$20,613
5411	Legal Services	307	267	-40	(13%)	0.80	$74,713
5419	Other Professional, Scientific, and Technical Services	157	265	108	69%	1.16	$23,064
7223	Special Food Services	195	240	45	23%	1.24	$21,328

Source: EMSI Q2 2017 Dataset

Preliminary Cluster Identification

Before performing a deep analysis of the industry clusters within Region 9, a high-level preliminary analysis was performed on industries within the region. This preliminary cluster analysis identifies and groups 6-digit industries into basic clusters, then assigns each an index value which then is used to compare it to other industry clusters.

The scale used is benchmarked only to industries within the region, and *does not* take into consideration industry performance in any other geographies. Industries in other geographies are only used when calculating each industry's Regional Competitiveness and Regional Specialization, defined below. The goal of this preliminary cluster analysis is to achieve a high-level understanding of potential industry clusters worth investigating in further detail. Clusters identified in the final report will likely utilize different definitions.

The six performance metrics evaluated are:

Earnings Potential – The priority placed on ensuring that the industry provides high annual earnings per worker. Because high-paying jobs are considered a key priority for the GO Virginia Initiative, this metric is considered "Very Important" and assigned a multiplier of 4x.

Growth - The priority placed on industries that have seen high job growth within the region. This metric is considered "Important" and has been assigned a multiplier of 2x.

Regional Competitiveness – The priority placed on industries whose job growth has exceeded industry job growth across the rest of the United States. This metric is considered "Important" and has been assigned a multiplier of 2x.

Regional Specialization – The priority placed on the industry's concentration within the region compared to the rest of the United States. Industries that are more concentrated within the region are favored. Because encouraging specialized jobs is not a priority for the GO Virginia initiative, this metric is considered "Not Very Important" and has been assigned a multiplier of 1x.

Gross Regional Product – The priority placed on the level of contribution an industry has on Gross Regional Product (GRP). Since the GO Virginia initiative is focused more on adding jobs without consideration of changes to GRP, this metric is considered "Not Very Important" and has been assigned a multiplier of 1x.

Industry cluster definitions are included in Attachment A.

Region 9 Top 5 Existing Industry Clusters

	Industry Cluster	Sub-sectors in Cluster	Jobs (2016)	Job Growth (2006 – 2016)
	State Government Services	1	6,241	**39%**
	Education and Knowledge Creation	12	20,099	**117%**
	Electric Power Generation & Transmission	3	1,133	**10%**
	Financial Services	11	1,023	**-10%**
	Aerospace Vehicles and Defense	4	939	**-24%**
	All Industries	1,001	222,762	**11%**

Attachment A: Preliminary Industry Cluster Definitions

State Government Services		
NAICS	Industry	Jobs
902999	State Government, Excluding Education and Hospitals	6,241
Total		6,241

Source: EMSI

Education and Knowledge Creation		
NAICS	Industry	Jobs
541711	Research and Development in Biotechnology	98
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	936
541720	Research and Development in the Social Sciences and Humanities	109
611310	Colleges, Universities, and Professional Schools	249
611410	Business and Secretarial Schools	20
611430	Professional and Management Development Training	154
611691	Exam Preparation and Tutoring	145
611699	All Other Miscellaneous Schools and Instruction	107
611710	Educational Support Services	362
813920	Professional Organizations	602
902612	Colleges, Universities, and Professional Schools (State Government)	17,261
903619	All Other Schools and Educational Support Services (Local Government)	55
Total		20,099

Source: EMSI

Electric Power Generation and Transmisison		
NAICS	Industry	Jobs
221112	Fossil Fuel Electric Power Generation	76
221113	Nuclear Electric Power Generation	927
221121	Electric Bulk Power Transmission and Control	130
Total		1,133

Source: EMSI

Aerospace Vehicles and Defense		
NAICS	Industry	Jobs
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	500
336411	Aircraft Manufacturing	10
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	88
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	341
Total		939

Source: EMSI

Financial Services		
NAICS	Industry	Jobs
522291	Consumer Lending	77
522292	Real Estate Credit	79
522298	All Other Nondepository Credit Intermediation	26
522310	Mortgage and Nonmortgage Loan Brokers	28
522390	Other Activities Related to Credit Intermediation	61
523110	Investment Banking and Securities Dealing	24
523120	Securities Brokerage	170
523910	Miscellaneous Intermediation	37
523920	Portfolio Management	298
523930	Investment Advice	201
523999	Miscellaneous Financial Investment Activities	22
Total		1,023

Source: EMSI

Attachment B: Commission and Locality Industry Trends

All Industries highlighted in purple have a location quotient greater than 1.20.

Albemarle County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	938	1,166	1,317	228	24%	151	13%	1.56
21	Mining, Quarrying, and Oil and Gas Extraction	56	58	86	2	4%	28	48%	0.23
22	Utilities	<10	29	39	Insf. Data	Insf. Data	10	34%	0.14
23	Construction	4,154	2,727	2,725	(1,427)	(34%)	(2)	(0%)	0.84
31	Manufacturing	2,914	2,181	2,089	(733)	(25%)	(92)	(4%)	0.46
42	Wholesale Trade	638	646	710	8	1%	64	10%	0.28
44	Retail Trade	5,625	5,934	6,518	309	5%	584	10%	0.94
48	Transportation and Warehousing	674	702	791	28	4%	89	13%	0.34
51	Information	777	720	775	(57)	(7%)	55	8%	0.64
52	Finance and Insurance	979	1,053	1,258	74	8%	205	19%	0.45
53	Real Estate and Rental and Leasing	964	1,045	1,181	81	8%	136	13%	1.05
54	Professional, Scientific, and Technical Services	3,482	4,406	5,663	924	27%	1,257	29%	1.14
55	Management of Companies and Enterprises	1,514	1,424	1,305	(90)	(6%)	(119)	(8%)	1.67
56	Administrative and Support and Waste Management and Remediation Services	1,921	2,292	2,655	371	19%	363	16%	0.61
61	Educational Services	918	1,124	1,295	206	22%	171	15%	0.73
62	Health Care and Social Assistance	4,527	6,487	8,429	1,960	43%	1,942	30%	0.86
71	Arts, Entertainment, and Recreation	1,381	1,898	2,104	517	37%	206	11%	1.85
72	Accommodation and Food Services	3,101	3,700	4,096	599	19%	396	11%	0.72
81	Other Services (except Public Administration)	2,343	3,035	3,515	692	30%	480	16%	1.04
90	Government	15,723	19,712	21,843	3,989	25%	2,131	11%	2.12
99	Unclassified Industry	0	93	169	93	Insf. Data	76	82%	0.85
Total		52,630	60,431	68,561	7,801	15%	8,130	13%	

Source: EMSI

Charlotteseville City County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	45	16	26	(29)	(64%)	10	63%	0.03
21	Mining, Quarrying, and Oil and Gas Extraction	0	0	0	0	0%	0	0%	0.00
22	Utilities	71	127	158	56	79%	31	24%	0.75
23	Construction	2,323	1,717	1,685	(606)	(26%)	(32)	(2%)	0.67
31	Manufacturing	926	830	1,015	(96)	(10%)	185	22%	0.22
42	Wholesale Trade	738	646	704	(92)	(12%)	58	9%	0.36
44	Retail Trade	4,662	3,647	3,331	(1,015)	(22%)	(316)	(9%)	0.73
48	Transportation and Warehousing	411	379	459	(32)	(8%)	80	21%	0.23
51	Information	1,517	1,368	1,258	(149)	(10%)	(110)	(8%)	1.54
52	Finance and Insurance	1,278	1,450	1,876	172	13%	426	29%	0.78
53	Real Estate and Rental and Leasing	687	718	861	31	5%	143	20%	0.91
54	Professional, Scientific, and Technical Services	3,179	2,850	2,907	(329)	(10%)	57	2%	0.93
55	Management of Companies and Enterprises	300	453	518	153	51%	65	14%	0.67
56	Administrative and Support and Waste Management and Remediation Services	1,130	2,680	3,820	1,550	137%	1,140	43%	0.90
61	Educational Services	870	1,146	1,392	276	32%	246	21%	0.94
62	Health Care and Social Assistance	3,810	3,525	4,981	(285)	(7%)	1,456	41%	0.59
71	Arts, Entertainment, and Recreation	342	789	1,153	447	131%	364	46%	0.97
72	Accommodation and Food Services	4,882	5,796	6,282	914	19%	486	8%	1.42
81	Other Services (except Public Administration)	2,424	2,652	2,904	228	9%	252	10%	1.16
90	Government	10,006	16,791	22,202	6,785	68%	5,411	32%	2.29
99	Unclassified Industry	0	173	313	173	Insf. Data	140	81%	2.00
Total		39,601	47,755	57,843	8,154	21%	10,088	21%	

Source: EMSI

Culpeper County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	534	389	261	(145)	(27%)	(128)	(33%)	1.79
21	Mining, Quarrying, and Oil and Gas Extraction	95	66	69	(29)	(31%)	3	5%	0.91
22	Utilities	81	107	130	26	32%	23	21%	1.71
23	Construction	1,729	1,358	1,471	(371)	(21%)	113	8%	1.43
31	Manufacturing	1,630	1,176	1,141	(454)	(28%)	(35)	(3%)	0.84
42	Wholesale Trade	867	395	389	(472)	(54%)	(6)	(2%)	0.59
44	Retail Trade	2,100	2,452	2,786	352	17%	334	14%	1.34
48	Transportation and Warehousing	183	268	334	85	46%	66	25%	0.45
51	Information	476	394	390	(82)	(17%)	(4)	(1%)	1.20
52	Finance and Insurance	338	226	196	(112)	(33%)	(30)	(13%)	0.33
53	Real Estate and Rental and Leasing	215	261	346	46	21%	85	33%	0.90
54	Professional, Scientific, and Technical Services	810	937	985	127	16%	48	5%	0.83
55	Management of Companies and Enterprises	132	34	20	(98)	(74%)	(14)	(41%)	0.14
56	Administrative and Support and Waste Management and Remediation Services	911	955	920	44	5%	(35)	(4%)	0.87
61	Educational Services	97	135	159	38	39%	24	18%	0.30
62	Health Care and Social Assistance	1,829	2,470	2,893	641	35%	423	17%	1.12
71	Arts, Entertainment, and Recreation	180	270	366	90	50%	96	36%	0.90
72	Accommodation and Food Services	898	1,326	1,572	428	48%	246	19%	0.88
81	Other Services (except Public Administration)	1,030	945	971	(85)	(8%)	26	3%	1.11
90	Government	3,297	3,443	3,559	146	4%	116	3%	1.27
99	Unclassified Industry	0	14	24	14	Insf. Data	10	71%	0.42
Total		17,431	17,622	18,985	191	1%	1,363	8%	

Source: EMSI

Fauquier County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	1,126	755	532	(371)	(33%)	(223)	(30%)	2.38
21	Mining, Quarrying, and Oil and Gas Extraction	61	63	66	2	3%	3	5%	0.59
22	Utilities	58	32	21	(26)	(45%)	(11)	(34%)	0.35
23	Construction	4,592	2,804	2,621	(1,788)	(39%)	(183)	(7%)	2.03
31	Manufacturing	908	1,005	1,228	97	11%	223	22%	0.49
42	Wholesale Trade	873	453	454	(420)	(48%)	1	0%	0.46
44	Retail Trade	2,897	3,202	3,931	305	11%	729	23%	1.20
48	Transportation and Warehousing	429	376	385	(53)	(12%)	9	2%	0.43
51	Information	267	156	190	(111)	(42%)	34	22%	0.33
52	Finance and Insurance	580	540	577	(40)	(7%)	37	7%	0.54
53	Real Estate and Rental and Leasing	356	407	423	51	14%	16	4%	0.96
54	Professional, Scientific, and Technical Services	1,537	2,134	2,600	597	39%	466	22%	1.30
55	Management of Companies and Enterprises	244	177	124	(67)	(27%)	(53)	(30%)	0.49
56	Administrative and Support and Waste Management and Remediation Services	768	780	828	12	2%	48	6%	0.49
61	Educational Services	412	561	692	149	36%	131	23%	0.86
62	Health Care and Social Assistance	2,370	2,782	3,038	412	17%	256	9%	0.86
71	Arts, Entertainment, and Recreation	576	442	423	(134)	(23%)	(19)	(4%)	1.01
72	Accommodation and Food Services	2,098	2,401	2,656	303	14%	255	11%	1.09
81	Other Services (except Public Administration)	1,893	2,069	2,377	176	9%	308	15%	1.67
90	Government	4,062	4,521	4,834	459	11%	313	7%	1.14
99	Unclassified Industry	0	82	150	82	Insf. Data	68	83%	1.77
Total		26,107	25,743	28,149	(364)	-1%	2,406	9%	

Source: EMSI

Fluvanna County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	131	113	151	(18)	(14%)	38	34%	1.84
21	Mining, Quarrying, and Oil and Gas Extraction	<10	33	51	Insf. Data	Insf. Data	18	55%	1.59
22	Utilities	143	95	96	(48)	(34%)	1	1%	5.42
23	Construction	781	600	665	(181)	(23%)	65	11%	2.25
31	Manufacturing	305	123	113	(182)	(60%)	(10)	(8%)	0.31
42	Wholesale Trade	108	104	134	(4)	(4%)	30	29%	0.55
44	Retail Trade	321	370	443	49	15%	73	20%	0.72
48	Transportation and Warehousing	115	110	134	(5)	(4%)	24	22%	0.65
51	Information	24	38	52	14	58%	14	37%	0.41
52	Finance and Insurance	67	65	74	(2)	(3%)	9	14%	0.34
53	Real Estate and Rental and Leasing	128	46	48	(82)	(64%)	2	4%	0.56
54	Professional, Scientific, and Technical Services	179	177	211	(2)	(1%)	34	19%	0.56
55	Management of Companies and Enterprises	<10	0	0	Insf. Data	Insf. Data	0	0%	0.00
56	Administrative and Support and Waste Management and Remediation Services	439	530	734	91	21%	204	38%	1.71
61	Educational Services	139	257	374	118	85%	117	46%	2.03
62	Health Care and Social Assistance	418	411	423	(7)	(2%)	12	3%	0.66
71	Arts, Entertainment, and Recreation	67	101	129	34	51%	28	28%	1.20
72	Accommodation and Food Services	348	266	218	(82)	(24%)	(48)	(18%)	0.63
81	Other Services (except Public Administration)	330	309	302	(21)	(6%)	(7)	(2%)	1.29
90	Government	1,397	1,211	1,142	(186)	(13%)	(69)	(6%)	1.59
99	Unclassified Industry	0	<10	14	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.83
Total		5,446	4,966	5,508	(480)	(9%)	542	11%	

Source: EMSI

Greene County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	51	59	68	8	16%	9	15%	1.10
21	Mining, Quarrying, and Oil and Gas Extraction	38	26	13	(12)	(32%)	(13)	(50%)	1.47
22	Utilities	11	10	15	(1)	(9%)	5	50%	0.65
23	Construction	615	435	484	(180)	(29%)	49	11%	1.86
31	Manufacturing	158	73	87	(85)	(54%)	14	19%	0.21
42	Wholesale Trade	78	83	111	5	6%	28	34%	0.50
44	Retail Trade	422	732	1,005	310	73%	273	37%	1.62
48	Transportation and Warehousing	113	78	63	(35)	(31%)	(15)	(19%)	0.52
51	Information	25	27	43	2	8%	16	59%	0.34
52	Finance and Insurance	69	53	58	(16)	(23%)	5	9%	0.31
53	Real Estate and Rental and Leasing	52	40	49	(12)	(23%)	9	23%	0.56
54	Professional, Scientific, and Technical Services	123	316	512	193	157%	196	62%	1.14
55	Management of Companies and Enterprises	0	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.07
56	Administrative and Support and Waste Management and Remediation Services	160	276	346	116	73%	70	25%	1.01
61	Educational Services	76	169	199	93	122%	30	18%	1.52
62	Health Care and Social Assistance	218	342	408	124	57%	66	19%	0.63
71	Arts, Entertainment, and Recreation	46	72	73	26	57%	1	1%	0.98
72	Accommodation and Food Services	247	382	477	135	55%	95	25%	1.03
81	Other Services (except Public Administration)	192	236	298	44	23%	62	26%	1.13
90	Government	940	929	973	(11)	(1%)	44	5%	1.39
99	Unclassified Industry	<10	11	19	Insf. Data	Insf. Data	8	73%	1.36
Total		3,635	4,354	5,306	719	20%	952	22%	

Source: EMSI

Louisa County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	87	96	107	9	10%	11	11%	0.73
21	Mining, Quarrying, and Oil and Gas Extraction	24	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.02
22	Utilities	937	1,116	1,076	179	19%	(40)	(4%)	29.59
23	Construction	1,395	1,181	1,605	(214)	(15%)	424	36%	2.06
31	Manufacturing	1,467	1,238	1,260	(229)	(16%)	22	2%	1.47
42	Wholesale Trade	175	202	276	27	15%	74	37%	0.50
44	Retail Trade	692	1,366	1,890	674	97%	524	38%	1.23
48	Transportation and Warehousing	91	850	1,103	759	834%	253	30%	2.34
51	Information	33	20	19	(13)	(39%)	(1)	(5%)	0.10
52	Finance and Insurance	120	106	111	(14)	(12%)	5	5%	0.26
53	Real Estate and Rental and Leasing	82	83	103	1	1%	20	24%	0.47
54	Professional, Scientific, and Technical Services	237	292	370	55	23%	78	27%	0.43
55	Management of Companies and Enterprises	44	38	58	(6)	(14%)	20	53%	0.25
56	Administrative and Support and Waste Management and Remediation Services	415	479	549	64	15%	70	15%	0.72
61	Educational Services	32	31	45	(1)	(3%)	14	45%	0.11
62	Health Care and Social Assistance	310	599	769	289	93%	170	28%	0.45
71	Arts, Entertainment, and Recreation	86	89	98	3	3%	9	10%	0.49
72	Accommodation and Food Services	212	504	625	292	138%	121	24%	0.56
81	Other Services (except Public Administration)	385	580	768	195	51%	188	32%	1.14
90	Government	1,527	1,718	1,897	191	13%	179	10%	1.05
99	Unclassified Industry	0	46	86	46	Insf. Data	40	87%	2.39
Total		8,349	10,636	12,817	2,287	27%	2,181	21%	

Source: EMSI

Madison County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	375	213	142	(162)	(43%)	(71)	(33%)	4.52
21	Mining, Quarrying, and Oil and Gas Extraction	0	0	0	0	0%	0	0%	0.00
22	Utilities	23	0	0	(23)	(100%)	0	0%	0.00
23	Construction	445	351	388	(94)	(21%)	37	11%	1.71
31	Manufacturing	238	315	426	77	32%	111	35%	1.04
42	Wholesale Trade	90	61	73	(29)	(32%)	12	20%	0.42
44	Retail Trade	1,034	764	758	(270)	(26%)	(6)	(1%)	1.92
48	Transportation and Warehousing	36	26	28	(10)	(28%)	2	8%	0.20
51	Information	22	15	17	(7)	(32%)	2	13%	0.20
52	Finance and Insurance	34	36	38	2	6%	2	6%	0.24
53	Real Estate and Rental and Leasing	31	25	35	(6)	(19%)	10	40%	0.40
54	Professional, Scientific, and Technical Services	108	122	148	14	13%	26	21%	0.50
55	Management of Companies and Enterprises	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.04
56	Administrative and Support and Waste Management and Remediation Services	156	155	177	(1)	(1%)	22	14%	0.65
61	Educational Services	373	340	347	(33)	(9%)	7	2%	3.50
62	Health Care and Social Assistance	280	305	367	25	9%	62	20%	0.64
71	Arts, Entertainment, and Recreation	11	20	25	9	82%	5	25%	0.30
72	Accommodation and Food Services	312	217	194	(95)	(30%)	(23)	(11%)	0.67
81	Other Services (except Public Administration)	231	179	196	(52)	(23%)	17	9%	0.97
90	Government	747	643	829	(104)	(14%)	186	29%	1.10
99	Unclassified Industry	0	27	48	27	Insf. Data	21	78%	3.94
Total		4,556	3,816	4,238	(740)	-16%	422	11%	

Source: EMSI

Nelson County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	420	482	503	62	15%	21	4%	7.88
21	Mining, Quarrying, and Oil and Gas Extraction	<10	<10	11	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.42
22	Utilities	97	78	63	(19)	(20%)	(15)	(19%)	4.43
23	Construction	606	375	327	(231)	(38%)	(48)	(13%)	1.41
31	Manufacturing	254	612	916	358	141%	304	50%	1.56
42	Wholesale Trade	45	40	69	(5)	(11%)	29	73%	0.21
44	Retail Trade	312	283	283	(29)	(9%)	0	0%	0.55
48	Transportation and Warehousing	47	53	52	6	13%	(1)	(2%)	0.31
51	Information	37	27	30	(10)	(27%)	3	11%	0.30
52	Finance and Insurance	59	50	45	(9)	(15%)	(5)	(10%)	0.26
53	Real Estate and Rental and Leasing	80	74	91	(6)	(8%)	17	23%	0.91
54	Professional, Scientific, and Technical Services	203	256	342	53	26%	86	34%	0.81
55	Management of Companies and Enterprises	<10	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.08
56	Administrative and Support and Waste Management and Remediation Services	183	170	165	(13)	(7%)	(5)	(3%)	0.55
61	Educational Services	57	61	74	4	7%	13	21%	0.48
62	Health Care and Social Assistance	242	356	432	114	47%	76	21%	0.57
71	Arts, Entertainment, and Recreation	35	41	45	6	17%	4	10%	0.49
72	Accommodation and Food Services	823	811	868	(12)	(1%)	57	7%	1.92
81	Other Services (except Public Administration)	234	369	438	135	58%	69	19%	1.55
90	Government	710	788	874	78	11%	86	11%	1.03
99	Unclassified Industry	0	16	28	16	Insf. Data	12	75%	1.75
Total		4,460	4,957	5,664	497	11%	707	14%	

Source: EMSI

Orange County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	622	976	1,082	354	57%	106	11%	6.83
21	Mining, Quarrying, and Oil and Gas Extraction	0	0	0	0	0%	0	0%	0.00
22	Utilities	52	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.24
23	Construction	1,192	715	711	(477)	(40%)	(4)	(1%)	1.15
31	Manufacturing	1,120	1,267	1,556	147	13%	289	23%	1.38
42	Wholesale Trade	544	531	511	(13)	(2%)	(20)	(4%)	1.21
44	Retail Trade	1,084	1,343	1,687	259	24%	344	26%	1.12
48	Transportation and Warehousing	954	336	290	(618)	(65%)	(46)	(14%)	0.85
51	Information	73	47	42	(26)	(36%)	(5)	(11%)	0.22
52	Finance and Insurance	203	174	170	(29)	(14%)	(4)	(2%)	0.39
53	Real Estate and Rental and Leasing	341	393	475	52	15%	82	21%	2.07
54	Professional, Scientific, and Technical Services	376	351	387	(25)	(7%)	36	10%	0.48
55	Management of Companies and Enterprises	0	0	0	0	0%	0	0%	0.00
56	Administrative and Support and Waste Management and Remediation Services	389	447	573	58	15%	126	28%	0.62
61	Educational Services	75	133	144	58	77%	11	8%	0.45
62	Health Care and Social Assistance	313	691	970	378	121%	279	40%	0.48
71	Arts, Entertainment, and Recreation	251	217	219	(34)	(14%)	2	1%	1.11
72	Accommodation and Food Services	697	782	837	85	12%	55	7%	0.79
81	Other Services (except Public Administration)	694	694	715	0	0%	21	3%	1.25
90	Government	2,183	2,422	2,796	239	11%	374	15%	1.36
99	Unclassified Industry	0	42	76	42	Insf. Data	34	81%	1.99
Total		11,162	11,570	13,245	408	4%	1,675	14%	

Source: EMSI

Rappahannock County Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	89	105	104	16	18%	(1)	(1%)	4.02
21	Mining, Quarrying, and Oil and Gas Extraction	0	0	0	0	0%	0	0%	0.00
22	Utilities	0	0	0	0	0%	0	0%	0.00
23	Construction	404	243	264	(161)	(40%)	21	9%	2.14
31	Manufacturing	88	97	131	9	10%	34	35%	0.58
42	Wholesale Trade	31	19	32	(12)	(39%)	13	68%	0.24
44	Retail Trade	177	164	186	(13)	(7%)	22	13%	0.75
48	Transportation and Warehousing	17	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.12
51	Information	110	140	218	30	27%	78	56%	3.54
52	Finance and Insurance	31	17	<10	(14)	(45%)	Insf. Data	Insf. Data	0.21
53	Real Estate and Rental and Leasing	27	34	41	7	26%	7	21%	0.97
54	Professional, Scientific, and Technical Services	154	126	140	(28)	(18%)	14	11%	0.94
55	Management of Companies and Enterprises	0	<10	<10	Insf. Data	Insf. Data	Insf. Data	Insf. Data	0.24
56	Administrative and Support and Waste Management and Remediation Services	104	138	165	34	33%	27	20%	1.05
61	Educational Services	80	92	104	12	15%	12	13%	1.71
62	Health Care and Social Assistance	52	86	113	34	65%	27	31%	0.33
71	Arts, Entertainment, and Recreation	26	20	19	(6)	(23%)	(1)	(5%)	0.56
72	Accommodation and Food Services	238	267	315	29	12%	48	18%	1.48
81	Other Services (except Public Administration)	133	175	203	42	32%	28	16%	1.73
90	Government	380	349	338	(31)	(8%)	(11)	(3%)	1.08
99	Unclassified Industry	0	24	46	24	Insf. Data	22	92%	6.33
Total		2,141	2,113	2,446	(28)	-1%	333	16%	

Source: EMSI

Thomas Jefferson Planning Commission Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	1,672	1,932	2,171	260	16%	239	12%	1.18
21	Mining, Quarrying, and Oil and Gas Extraction	124	126	162	2	2%	36	29%	0.23
22	Utilities	1,261	1,456	1,448	195	15%	(8)	(1%)	3.08
23	Construction	9,874	7,035	7,490	(2,839)	(29%)	455	6%	0.98
31	Manufacturing	6,024	5,057	5,480	(967)	(16%)	423	8%	0.48
42	Wholesale Trade	1,782	1,723	2,005	(59)	(3%)	282	16%	0.34
44	Retail Trade	12,035	12,331	13,470	296	2%	1,139	9%	0.89
48	Transportation and Warehousing	1,451	2,173	2,601	722	50%	428	20%	0.48
51	Information	2,412	2,201	2,177	(211)	(9%)	(24)	(1%)	0.89
52	Finance and Insurance	2,572	2,776	3,421	204	8%	645	23%	0.54
53	Real Estate and Rental and Leasing	1,993	2,006	2,334	13	1%	328	16%	0.92
54	Professional, Scientific, and Technical Services	7,402	8,298	10,005	896	12%	1,707	21%	0.98
55	Management of Companies and Enterprises	1,870	1,925	1,894	55	3%	(31)	(2%)	1.03
56	Administrative and Support and Waste Management and Remediation Services	4,248	6,426	8,268	2,178	51%	1,842	29%	0.77
61	Educational Services	2,092	2,787	3,378	695	33%	591	21%	0.82
62	Health Care and Social Assistance	9,525	11,721	15,442	2,196	23%	3,721	32%	0.70
71	Arts, Entertainment, and Recreation	1,958	2,990	3,601	1,032	53%	611	20%	1.32
72	Accommodation and Food Services	9,613	11,458	12,567	1,845	19%	1,109	10%	1.01
81	Other Services (except Public Administration)	5,908	7,182	8,225	1,274	22%	1,043	15%	1.12
90	Government	30,304	41,148	48,931	10,844	36%	7,783	19%	2.01
99	Unclassified Industry	<10	346	629	Insf. Data	Insf. Data	283	82%	1.44
Total		114,121	133,099	155,699	18,978	17%	22,600	17%	

Source: EMSI

Rappahannock-Rapidan Planning Commission Historical Industry Trends									
NAICS	Industry Description	2006 Jobs	2016 Jobs	2026 Jobs	2006 - 2016 Change	2006 - 2016 % Change	2016 - 2026 Change	2016 - 2026 % Change	2016 Location Quotient
11	Crop and Animal Production	2,746	2,439	2,122	(307)	(11%)	(317)	(13%)	3.25
21	Mining, Quarrying, and Oil and Gas Extraction	157	129	135	(28)	(18%)	6	5%	0.51
22	Utilities	214	148	157	(66)	(31%)	9	6%	0.69
23	Construction	8,361	5,472	5,454	(2,889)	(35%)	(18)	(0%)	1.67
31	Manufacturing	3,983	3,861	4,482	(122)	(3%)	621	16%	0.80
42	Wholesale Trade	2,405	1,459	1,460	(946)	(39%)	1	0%	0.63
44	Retail Trade	7,292	7,924	9,348	632	9%	1,424	18%	1.25
48	Transportation and Warehousing	1,619	1,015	1,044	(604)	(37%)	29	3%	0.49
51	Information	948	751	858	(197)	(21%)	107	14%	0.66
52	Finance and Insurance	1,186	993	988	(193)	(16%)	(5)	(1%)	0.42
53	Real Estate and Rental and Leasing	970	1,120	1,320	150	15%	200	18%	1.12
54	Professional, Scientific, and Technical Services	2,985	3,670	4,261	685	23%	591	16%	0.94
55	Management of Companies and Enterprises	384	220	154	(164)	(43%)	(66)	(30%)	0.26
56	Administrative and Support and Waste Management and Remediation Services	2,327	2,476	2,663	149	6%	187	8%	0.65
61	Educational Services	1,037	1,261	1,445	224	22%	184	15%	0.81
62	Health Care and Social Assistance	4,845	6,335	7,382	1,490	31%	1,047	17%	0.83
71	Arts, Entertainment, and Recreation	1,045	969	1,052	(76)	(7%)	83	9%	0.94
72	Accommodation and Food Services	4,244	4,992	5,575	748	18%	583	12%	0.96
81	Other Services (except Public Administration)	3,980	4,061	4,462	81	2%	401	10%	1.39
90	Government	10,669	11,379	12,356	710	7%	977	9%	1.22
99	Unclassified Industry	0	189	344	189	Insf. Data	155	82%	1.71
Total		61,396	60,864	67,062	(532)	-1%	6,198	10%	

Source: EMSI

Occupational Analysis

Prepared by:

THOMAS P. MILLER & ASSOCIATES

Demographic and Labor Force Characteristics

Population

For Region 9, the largest county by population is Albemarle County. It is about 35% larger than the next largest county, Fauquier County. The smallest county is Rappahannock County with a population of 7,361. The overall population within the region experienced healthy growth of near 5% over the past five years, and is projected to continue to grow at a rate of just under 4% through 2021. Over the past five years, the City of Charlottesville experienced the fastest growth rate (7.7%), followed by Albemarle County (6.3%). Both localities accounted for around 9,600 new residents, which made up nearly half of the overall population growth. Over the next five years, both counties are projected to continue to grow, albeit at a slightly slower pace. While the region as a whole grew over the past five years, three of the counties Madison County, Nelson County, and Rappahannock County all saw population declines. Nelson County experienced the greatest decline of 295 residents, or two percent. Over the next five years growth within these three counties is projected to remain flat with slight declines.

Table 2: Population Demographics, 2011-2021

Region 9 Demographics, 2011-2021							
Region	2011	2016	2021 (proj.)	2011-2016		2016-2021	
				# Change	% Change	# Change	% Change
Albermarle County	100,639	106,940	111,934	6,301	6.3%	4,994	4.7%
Culpeper County	47,330	50,096	52,472	2,766	5.8%	2,375	4.7%
Fauquier County	66,160	69,518	72,223	3,359	5.1%	2,705	3.9%
Fluvanna County	25,977	26,350	26,945	372	1.4%	595	2.3%
Greene County	18,728	19,329	19,937	601	3.2%	607	3.1%
Louisa County	33,515	34,934	36,308	1,419	4.2%	1,374	3.9%
Madison County	13,168	13,114	13,099	(54)	(0.4%)	(15)	(0.1%)
Nelson County	15,050	14,755	14,685	(295)	(2.0%)	(70)	(0.5%)
Orange County	33,858	35,772	37,377	1,914	5.7%	1,605	4.5%
Rappahannock County	7,500	7,361	7,302	(139)	(1.9%)	(59)	(0.8%)
Charlottesville City	43,720	47,072	49,236	3,353	7.7%	2,164	4.6%
Region 9	405,645	425,242	441,518	19,597	4.8%	16,275	3.8%

Source: EMSI Q2 2017 Dataset

Ethnicity

The largest ethnic group within the region is White (327,009), followed by Black (50,725). While the population classified as White is projected to add the greatest number of residents, all ethnic groups are also projected to grow: Hispanic (3,108 new residents); Two or More Races (1,328 new residents); Asian (1,244 new residents); and Black (1,157 new residents).

Table 2: Race/Ethnicity, 2011-2019

Race/Ethnicity (Region 9)							
Race/Ethnicity	2011	2016	2021 (proj.)	2011-2016		2016-2021	
				# Change	% Change	# Change	% Change
White	315,960	327,009	336,302	11,049	3.5%	9,294	2.8%
Black	49,248	50,725	51,882	1,477	3.0%	1,157	2.3%
Asian	10,079	11,667	12,911	1,588	15.8%	1,244	10.7%
American Indian/Alaska Native	914	1,071	1,178	158	17.3%	107	9.9%
Native Hawaiian/Pacific Islander	165	215	253	50	30.5%	38	17.6%
Two or More Races	8,389	10,071	11,399	1,682	20.1%	1,328	13.2%
Hispanic	20,891	24,484	27,592	3,593	17.2%	3,108	12.7%
Total	405,645	425,242	441,518	19,597	4.8%	16,275	3.8%

Source: EMSI Q2 2017 Dataset

Population by Age Cohort

The greatest population by age cohort overall over the last five years and projected through the next five to 2021 is found overall within those over the age of 65. So, while the region is growing, its population is aging. Along with this, the cohort aged 35-54 saw declines of nearly 4,300 over the past five years. This trend is expected to continue with a further loss of approximately 3,000 over the next five years. The aging workforce, along with the decline of those in the prime working age of 35-54 may indicate potential challenges with employers being able to find replacement workers for those retiring, as well as being able to fill new positions.

Table 3: Population by Age Cohort, 2011-2021

Age Cohort (Region 9)							
				2011-2016		2016-2021	
Age Group	2011	2016	2021	# Change	% Change	# Change	% Change
Under 19	102,037	103,007	105,653	970	1.0%	2,646	2.6%
20-34	79,865	84,135	87,994	4,270	5.3%	3,859	4.6%
35-54	111,614	107,335	104,271	(4,279)	(3.8%)	(3,064)	(2.9%)
55-64	53,725	58,499	60,274	4,775	8.9%	1,775	3.0%
Over 65	58,404	72,265	83,325	13,861	23.7%	11,059	15.3%

Source: EMSI Q2 2017 Dataset

Median Income and Poverty Rates

The median income within the region ranges from $47,118 in Nelson County to $91,609 in Fauquier County. Compared to the median household income for Virginia, four counties are higher (Orange County, Culpeper County, Albemarle County, and Fauquier County). The poverty rate for individuals ranges from 5.6% in Fauquier County to 25.8% in Charlottesville.

Table 4: Median Income and Poverty Rates

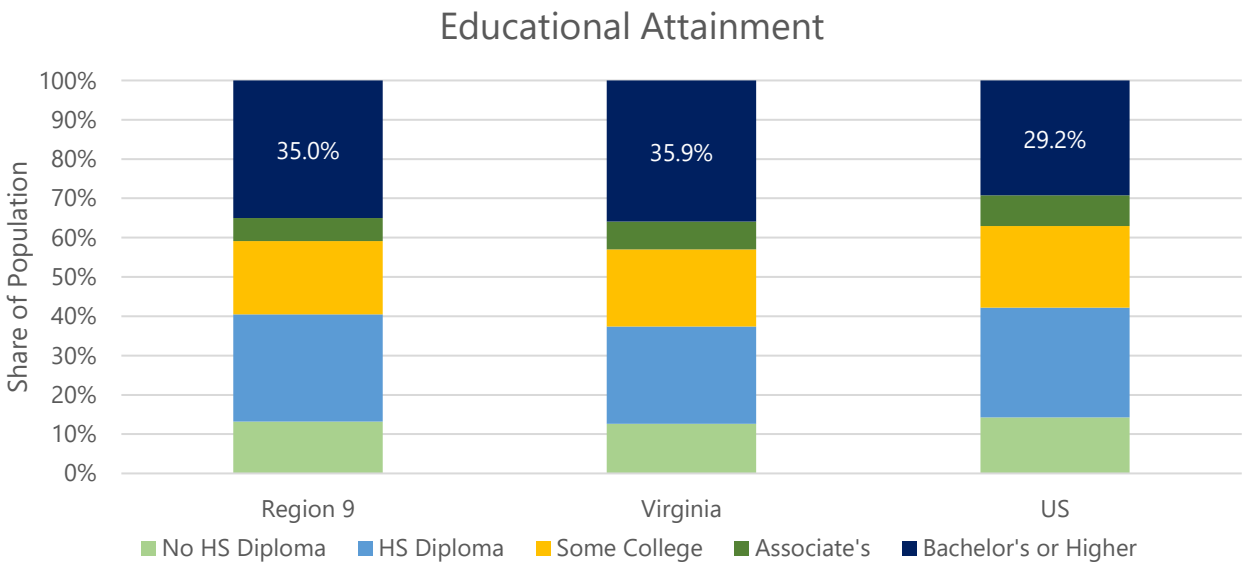
Median Income and Poverty Rates			
Region	Median Household Income	Poverty Rate (Individuals)	Poverty Rate (Famiy)
Albermarle County	$68,449	10.2%	6.8%
Culpeper County	$66,697	9.3%	6.5%
Fauquier County	$91,609	5.6%	3.9%
Fluvanna County	$63,938	6.6%	5.5%
Greene County	$61,550	9.9%	5.7%
Louisa County	$57,829	10.0%	5.7%
Madison County	$47,736	12.4%	10.0%
Nelson County	$47,118	14.7%	9.0%
Orange County	$65,166	12.1%	8.5%
Rappahannock County	$57,210	9.9%	5.7%
Charlottesville City	$49,775	25.8%	10.8%
Virginia	$65,015	11.5%	8.2%
United States	$53,889	15.5%	11.3%

Source: ACS 5-Year Esimates (2015)

Educational Attainment

Educational attainment within the region is very similar to Virginia. Those with a Bachelor's Degree or higher is 35% in the region, which is just below the state rate of 35.9%. Notably, the rate is much higher than the US average. Those with a high school diploma in the region is higher (27.3%) versus the state (24.8%). However, the percentage of those with an Associate's degree is smaller in the region (5.9%) as compared to the state (7.1). Overall, the population within the region is highly educated.

Chart 1: Educational Attainment



Source: EMSI Q2 2017

Labor Force Participation

The labor force participation rate is a critical indicator in measuring the level of engagement of a community's workforce. The region has 209,158 in the labor force, which makes up 62.6% of the regional population over the age of 16. For the individual counties, the highest labor force participation rate is found within Fauquier County (68.5%), while the lowest is 57.7% in Nelson County. Looking at the averages for each locality over the past five years, unemployment has ranged from 2.9% in Rappahannock County to 8.1% in Louisa County.

Table 5: Labor Force Participation

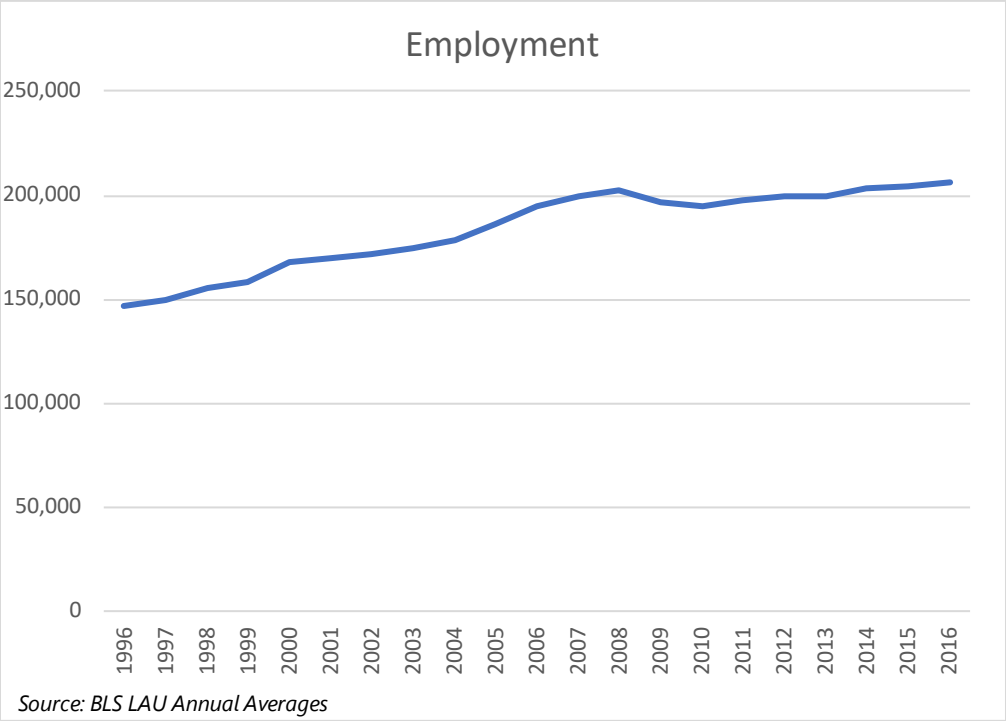
Region 9 Labor Force, 2015						
Region	Population (Over 16)	In Labor Force	Employed	Unemployed	Labor Force Participation	Unemployment Rate
Albermarle County	83,759	50,464	48,206	1,883	60.2%	3.7%
Culpeper County	37,459	23,933	22,103	1,746	63.9%	7.3%
Fauquier County	53,262	36,496	34,515	1,823	68.5%	5.0%
Fluvanna County	21,038	12,772	12,076	660	60.7%	5.2%
Greene County	14,876	9,686	8,932	709	65.1%	7.3%
Louisa County	27,573	17,491	16,077	1,414	63.4%	8.1%
Madison County	10,679	6,388	5,965	423	59.8%	6.6%
Nelson County	12,306	7,096	6,694	402	57.7%	5.7%
Orange County	27,900	16,377	15,024	1,292	58.7%	7.9%
Rappahannock County	6,261	3,677	3,570	107	58.7%	2.9%
Charlottesville City	38,945	24,778	23,605	1,063	63.6%	4.3%
Region 9	334,058	209,158	196,767	11,522	62.6%	5.5%

Source: ACS 5-Year Esimates (2015)

Employment Trends, 1996-2016

Over the past twenty years, employment within the region rose from 147,757 in 1996 to the current high of 206,560 in 2016. Prior to the recession, employment peaked at 202,615 in 2008 and fell to a low of 194,343 in 2010. Since 2010 employment has steadily increased to the current level of 206,560.

Chart 2: Twenty Year Regional Employment Trends

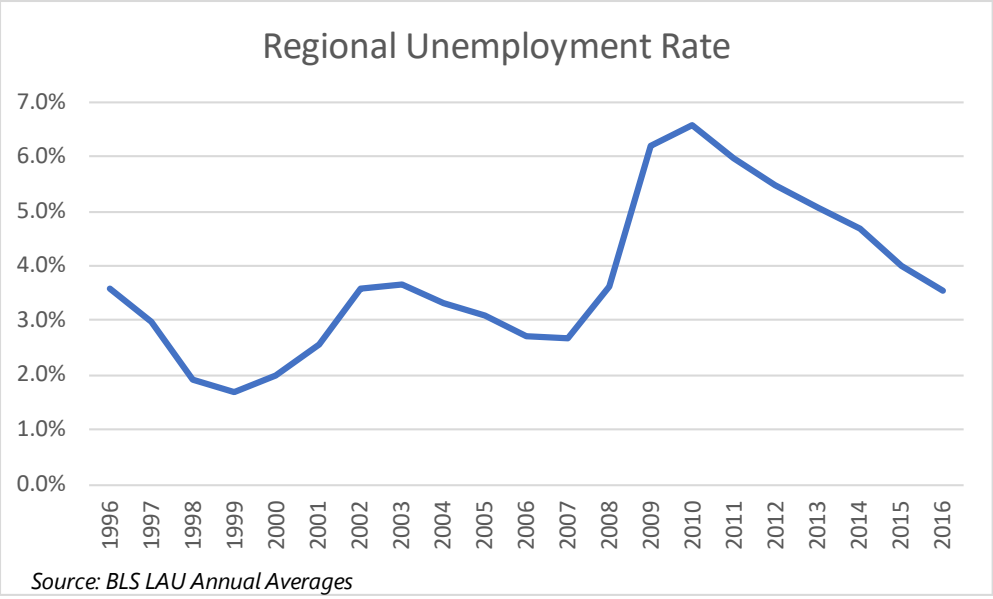


Source: BLS LAU Annual Averages

Unemployment Trends, 1996-2016

Over the past twenty years, the lowest unemployment rate with the region was 1.7% in 1999. Unemployment peaked at 6.6% in 2010 at the height of the recession. Since 2010 employment has steadily fallen to 3.5%, which is near the 1996 rate of 3.6%.

Chart 3: Twenty Year Regional Unemployment Trends



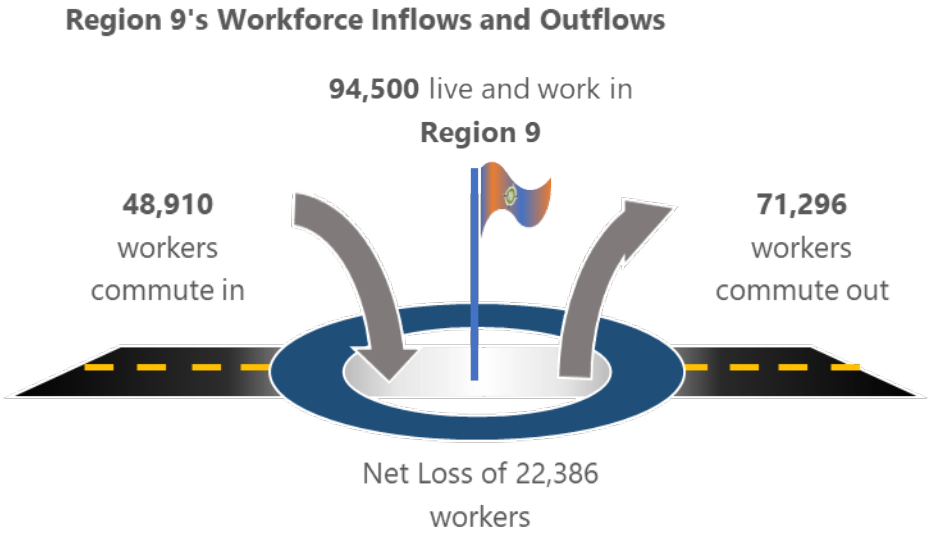
Source: BLS LAU Annual Averages

Commuting Patterns

Commuting patterns are a helpful way to understand regional inflows and outflows amongst the workforce within the region. These data points measure the number and destination of both inbound and outbound workers. If a region has a larger number of outbound workers than inbound, there may be either fewer or less desirable job opportunities within that region. Thus, residents are leaving the region for work opportunities. Conversely, if there are more inbound workers, the region may have a greater number of available jobs. A region's proximity to large urban centers can affect this as well. For example, if a region is within proximity to a major city, there are going to be more job opportunities within that large city, so residents may be willing to commute outside of the region.

The region as a whole has 48,910 workers who commute into the region, while 71,296 workers commute outside of the region for work. There are 94,500 workers who both work and live within the region. The top counties of origin of workers who commute into the region include: Augusta County (2,997); Prince William County (2,957); Fairfax County (2,835); and Spotsylvania County (2,735). The top destination for workers commuting outside the region include: Prince William County (7,226); Loudoun County (4,001); and Henrico County (3,112).

Chart 2: Commuting Patterns

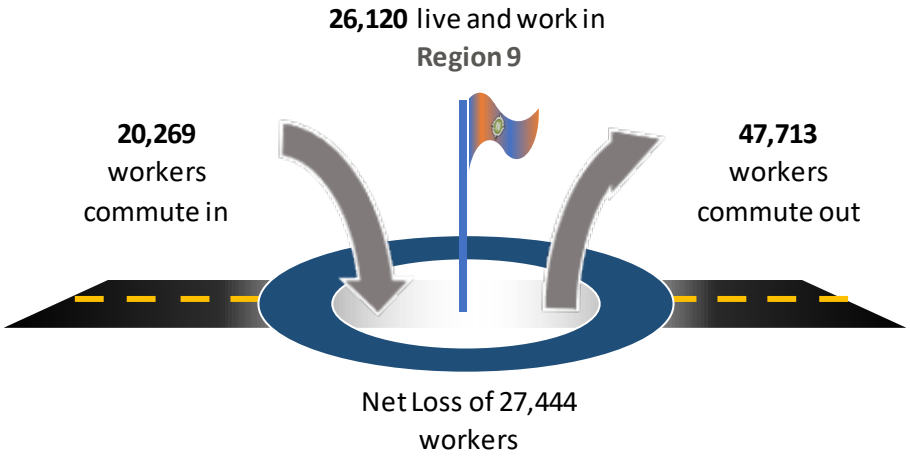


Source: US Census on the Map, 2014

Rappahannock-Rapidan Regional Commission

The Rappahannock-Rapidan Regional Commission has 20,269 workers who commute into the region, with 47,713 commuting out. There are 26,2120 who both live and work within the region. The top counties of origin of workers who commute into the region include: Prince William County (2,183); Spotsylvania County (1,652); and Fairfax County (1,367). The top destinations for workers commuting outside the region include: Fairfax County (10,038) and Prince William County (6,429).

Rappahannock-Rapidan Workforce Inflows and Outflows

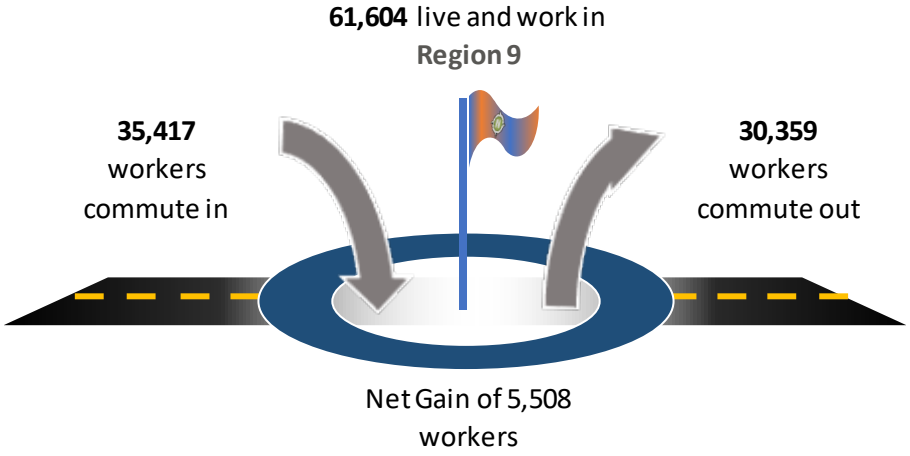


Source: US Census on the Map, 2014

Thomas Jefferson Planning District Commission

The Thomas Jefferson Planning District Commission has 35,417 workers who commute into the region, with 30,359 commuting out. There are 61,604 who both live and work within the region. The top counties of origin of workers who commute into the region include: Augusta County (2,712); Orange County (1,856); Waynesboro (1,709); and Fairfax County (1,468). The top destinations for workers commuting outside the region include: Fairfax County (2,867); Henrico County (1,804); and Orange County (1,729).

Thomas Jefferson Workforce Inflows and Outflows



Source: US Census on the Map, 2014

Occupational Analysis

Top Occupations 2-Digit SOC Codes

By broad occupational mix, the top five occupational categories include Office and Administrative Support (27,136); Sales and Related (18,660); Education (16,829); Food Preparation and Serving Related (16,107); and Healthcare Practitioners and Technical (12,412). These occupations also had the greatest number of annual openings over the past five years. Median hourly earnings range from $10.87/hr. for Food Preparation and Serving Related to $40.67/hr. for Management.

Table 6: Current Occupational Mix, 2011-2016

Current Occupational Mix, 2011 - 2016					
Occupations	2016 Jobs	2011 - 2016 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Office and Administrative Support	27,136	2,619	0.93	$16.64	1,541
Sales and Related	18,660	1,661	0.95	$14.97	1,145
Education, Training, and Library	16,829	954	1.52	$24.31	1,015
Food Preparation and Serving Related	16,107	2,118	1.00	$10.87	1,107
Healthcare Practitioners and Technical	12,412	1,842	1.18	$33.16	883
Construction and Extraction	10,023	194	1.16	$18.17	541
Business and Financial Operations	9,974	1,482	1.03	$32.74	610
Management	9,825	799	0.93	$40.67	539
Personal Care and Service	9,208	1,453	1.17	$10.92	697
Transportation and Material Moving	8,810	746	0.70	$15.07	560
Building and Grounds Cleaning and Maintenance	8,676	1,022	1.19	$11.69	516
Installation, Maintenance, and Repair	6,442	513	0.88	$20.78	419
Production	6,163	588	0.54	$16.95	465
Computer and Mathematical	5,777	807	1.08	$38.71	335
Protective Service	4,685	845	1.08	$18.92	369
Healthcare Support	4,643	533	0.87	$13.76	315
Arts, Design, Entertainment, Sports, and Media	4,097	296	1.18	$21.67	273
Community and Social Service	3,344	585	1.06	$21.27	267
Life, Physical, and Social Science	2,755	274	1.77	$35.36	193
Architecture and Engineering	2,607	98	0.82	$37.53	151
Farming, Fishing, and Forestry	2,277	282	1.53	$15.20	186
Military	1,788	176	0.74	$17.56	82
Legal	1,722	192	1.08	$39.79	103

Source: EMSI Q2 2017 Dataset

Top Occupations 5-Digit SOC Codes

Further analysis by 5-digit SOC codes shows that the top occupations in the region include: Retail Salespersons (5,804); Office Clerks, General (4,993); Cashiers (4,921); Postsecondary Teachers (4,724); and Registered Nurses (3,964). Median hourly earnings range from $9.14/hr. for Childcare Workers to $48.94/hr. for General and Operations Managers. For these top occupations, Postsecondary Teachers had the greatest number of annual openings.

Table 7: Top Occupations by 5-Digit SOC Codes

Top Occupations - 5-Digit SOC					
Occupations	2016 Jobs	2011 - 2016 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Retail Salespersons	5,804	451	0.99	$10.69	324
Office Clerks, General	4,993	532	1.22	$14.95	293
Cashiers	4,921	505	1.13	$9.27	336
Postsecondary Teachers	4,724	483	2.55	$30.06	457
Registered Nurses	3,964	784	1.13	$31.22	301
Combined Food Preparation and Serving Workers, Including Fast Food	3,629	446	0.88	$9.24	221
Waiters and Waitresses	3,247	476	1.02	$11.20	268
Personal Care Aides	3,137	1,028	1.33	$9.44	239
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	2,920	454	0.92	$11.41	193
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	2,904	208	0.86	$17.11	133
Stock Clerks and Order Fillers	2,771	429	1.15	$11.61	185
Landscaping and Groundskeeping Workers	2,575	296	1.63	$11.90	146
Bookkeeping, Accounting, and Auditing Clerks	2,404	136	1.11	$18.66	81
Maids and Housekeeping Cleaners	2,359	200	1.27	$10.12	131
Elementary School Teachers, Except Special Education	2,167	53	1.26	$29.63	88
General and Operations Managers	2,165	231	0.79	$48.94	108
Customer Service Representatives	2,082	305	0.63	$14.68	146
Teacher Assistants	2,020	71	1.25	$11.54	93
Nursing Assistants	2,016	219	1.11	$12.49	127
Childcare Workers	1,899	(16)	1.22	$9.14	105

Source: Emsi Q2 2017 Dataset

Growing Occupations 5-Digit SOC Codes, 2011-2016

Since 2011, many of the growing occupations are those within healthcare, including: Personal Care Aides (1,028 new jobs); Registered Nurses (784 new jobs); and Nursing Assistants (219 new jobs). The number of annual openings for these occupations were high as well. Median wages range from $9.24/hr. for Combined Food Preparation and Serving Workers, Including Fast Food to $48.94/hr. for General and Operations Managers.

Table 8: Growing Occupations by 5-Digit SOC Codes, 2011-2016

Top Growing Occupations 2011-2016 - 5-Digit SOC					
Occupations	2016 Jobs	2011 - 2016 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Personal Care Aides	3,137	1,028	1.33	$9.44	239
Registered Nurses	3,964	784	1.13	$31.22	301
Office Clerks, General	4,993	532	1.22	$14.95	293
Cashiers	4,921	505	1.13	$9.27	336
Postsecondary Teachers	4,724	483	2.55	$30.06	457
Waiters and Waitresses	3,247	476	1.02	$11.20	268
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	2,920	454	0.92	$11.41	193
Retail Salespersons	5,804	451	0.99	$10.69	324
Combined Food Preparation and Serving Workers, Including Fast Food	3,629	446	0.88	$9.24	221
Stock Clerks and Order Fillers	2,771	429	1.15	$11.61	185
Customer Service Representatives	2,082	305	0.63	$14.68	146
Landscaping and Groundskeeping Workers	2,575	296	1.63	$11.90	146
Cooks, Restaurant	1,553	292	1.03	$11.28	107
First-Line Supervisors of Office and Administrative Support Workers	1,891	281	1.03	$24.52	94
Correctional Officers and Jailers	714	259	1.33	$16.45	80
Accountants and Auditors	1,799	239	1.04	$33.02	108
Security Guards	1,424	239	0.98	$13.55	101
General and Operations Managers	2,165	231	0.79	$48.94	108
Maintenance and Repair Workers, General	1,757	222	0.98	$17.49	107
Nursing Assistants	2,016	219	1.11	$12.49	127

Source: Emsi Q2 2017 Dataset

Growing Occupations 5-Digit SOC Codes, 2016-2021

Over the next five years, many of the growing occupations are projected to be within the healthcare industry. These occupations include: Registered Nurses (621 new jobs); Personal Care Aides (532 new jobs); and Nursing Assistants (223 new jobs). These occupations are also projected to have the greatest number of annual openings. Other growing occupations include Postsecondary Teachers (532 new jobs) and Retail Salespersons (493 new jobs). Median hourly earnings range from $9.24/hr. for Combined Food Preparation and Serving Workers, Including Fast Food to $48.94/hr. for General and Operations Managers.

Table 9: Growing Occupations by 5-Digit SOC Codes, 2016-2021

Top Growing Occupations Projected 2016-2021 - 5-Digit SOC					
Occupations	2016 Jobs	2016-2021 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Registered Nurses	3,964	621	1.13	$31.22	228
Postsecondary Teachers	4,724	587	2.55	$30.06	239
Personal Care Aides	3,137	532	1.33	$9.44	134
Retail Salespersons	5,804	493	0.99	$10.69	327
Office Clerks, General	4,993	429	1.22	$14.95	204
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	2,920	344	0.92	$11.41	133
Stock Clerks and Order Fillers	2,771	300	1.15	$11.61	153
Cashiers	4,921	297	1.13	$9.27	287
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	2,904	295	0.86	$17.11	95
Combined Food Preparation and Serving Workers, Including Fast Food	3,629	283	0.88	$9.24	180
Waiters and Waitresses	3,247	270	1.02	$11.20	220
Customer Service Representatives	2,082	269	0.63	$14.68	109
General and Operations Managers	2,165	241	0.79	$48.94	106
Nursing Assistants	2,016	223	1.11	$12.49	96
First-Line Supervisors of Office and Administrative Support Workers	1,891	218	1.03	$24.52	74
Maintenance and Repair Workers, General	1,757	214	0.98	$17.49	92
Laborers and Freight, Stock, and Material Movers, Hand	1,700	210	0.53	$11.25	96
Cooks, Restaurant	1,553	206	1.03	$11.28	86
Landscaping and Groundskeeping Workers	2,575	204	1.63	$11.90	95
Correctional Officers and Jailers	714	196	1.33	$16.45	62

Source: Emsi Q2 2017 Dataset

Staffing Patterns by Industry

Biotechnology

The top occupations required to staff companies within the Biotechnology sector include Biological Technicians; Medical Scientists, Except Epidemiologists; Software Developers; and Biochemists and Biophysicists. The required entry levels for these occupations is high, with all requiring at least a Bachelor's Degree. For these top occupations, the greatest growth over the past five years has been within Software Developers, Systems Software and Social Scientists and Related Workers, All Other. Over the next five years, growth is expected within Medical Scientists, Biological Technicians, and Biochemists and Biophysicists. Median hourly earnings range from $14.68/hr. for Customer Service Representatives to $60.28/hr. for Architectural and Engineering Managers.

Table 10: Staffing Patterns for Biotechnology

Staffing Patterns for Biotechnology - 25 or More Employees								
Occupations	Employed in Industry Group (2011)	Employed in Industry Group (2016)	Employed in Industry Group (2021)	Change (2011 - 2016)	Change (2016-2021)	% of Total Jobs in Industry Group (2016)	Median Hourly Earnings	Typical Entry Level Education
Biological Technicians	140	140	147	0	7	5.5%	$19.10	Bachelor's
Medical Scientists, Except Epidemiologists	126	126	134	0	8	5.0%	$36.45	Doctoral
Software Developers, Systems Software	79	94	97	15	3	3.7%	$43.11	Bachelor's
Biochemists and Biophysicists	73	73	79	0	6	2.9%	$40.71	Doctoral
Team Assemblers	61	68	71	7	3	2.7%	$15.20	HS Diploma
Electrical and Electronic Equipment Assemblers	44	52	53	8	1	2.1%	$16.79	HS Diploma
General and Operations Managers	47	50	53	3	3	2.0%	$48.94	Bachelor's
Software Developers, Applications	43	49	51	6	2	1.9%	$43.67	Bachelor's
Mechanical Engineers	47	45	47	(2)	2	1.8%	$41.23	Bachelor's
Electronics Engineers, Except Computer	36	43	44	7	1	1.7%	$49.59	Bachelor's
Office Clerks, General	37	40	43	3	3	1.6%	$14.95	HS Diploma
Microbiologists	39	39	41	0	2	1.5%	$52.05	Bachelor's
Electrical Engineers	35	38	39	3	1	1.5%	$45.47	Bachelor's
Electromechanical Equipment Assemblers	28	35	35	7	0	1.4%	$14.03	HS Diploma
Market Research Analysts and Marketing Specialists	27	32	35	5	3	1.3%	$25.20	Bachelor's
Customer Service Representatives	25	32	35	7	3	1.3%	$14.68	HS Diploma
First-Line Supervisors of Production and Operating Workers	28	30	31	2	1	1.2%	$26.93	HS Diploma
Architectural and Engineering Managers	28	30	31	2	1	1.2%	$60.28	Bachelor's
Accountants and Auditors	27	29	31	2	2	1.2%	$33.02	Bachelor's
Business Operations Specialists, All Other	28	29	31	1	2	1.2%	$35.17	Bachelor's
Industrial Engineers	28	29	31	1	2	1.2%	$39.95	Bachelor's
Purchasing Agents, Except Wholesale, Retail, and Farm Products	26	28	30	2	2	1.1%	$31.71	Bachelor's
Social Scientists and Related Workers, All Other	17	28	31	11	3	1.1%	$47.27	Bachelor's
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	26	27	29	1	2	1.0%	$17.11	HS Diploma
Inspectors, Testers, Sorters, Samplers, and Weighers	23	26	27	3	1	1.0%	$15.51	HS Diploma
Bookkeeping, Accounting, and Auditing Clerks	25	26	26	1	0	1.0%	$18.66	Some college
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	25	26	26	1	0	1.0%	$24.04	HS Diploma

Source: EMSI Q2 2017 Dataset

Finance and Business Services

Occupations within Financial and Business Services are numerous within the region. Those employing at least 500 workers include Accountants and Auditors; Management Analysts; Lawyers; Insurance Sales Agents; and Software Developers, Applications. Of these top five, educational requirements range from a High School Diploma for Insurance Sales Agents to a Doctoral degree for Lawyers. Over the past five years, Software Developers, Applications added the most jobs (102). It is also projected to continue to add the most jobs over the next five years. Median hourly earnings for the top jobs within this industry sector range from $12.34/hr. for Counter and Rental Clerks to $62.06/hr. for Computer and Information Systems Managers.

Table 10: Staffing Patterns for Finance and Business Services

Staffing Patterns for Finance and Business Services - 25 or More Employees								
Occupations	Employed in Industry Group (2011)	Employed in Industry Group (2016)	Employed in Industry Group (2021)	Change (2011 - 2016)	Change (2016 - 2021)	% of Total Jobs in Industry Group (2016)	Median Hourly Earnings	Typical Entry Level Education
Accountants and Auditors	662	734	807	72	73	4.5%	$33.02	Bachelor's
Management Analysts	532	620	695	88	75	3.8%	$41.10	Bachelor's
Lawyers	544	565	589	21	24	3.5%	$50.63	Doctoral
Insurance Sales Agents	446	522	577	76	55	3.2%	$22.31	HS Diploma
Software Developers, Applications	403	505	629	102	124	3.1%	$43.67	Bachelor's
Office Clerks, General	435	480	527	45	47	3.0%	$14.95	HS Diploma
Bookkeeping, Accounting, and Auditing Clerks	421	441	455	20	14	2.7%	$18.66	Some college
Customer Service Representatives	346	414	484	68	70	2.5%	$14.68	HS Diploma
Software Developers, Systems Software	336	404	483	68	79	2.5%	$43.11	Bachelor's
Real Estate Sales Agents	342	375	413	33	38	2.3%	$19.61	HS Diploma
Market Research Analysts and Marketing Specialists	267	326	387	59	61	2.0%	$25.20	Bachelor's
Paralegals and Legal Assistants	296	315	341	19	26	1.9%	$23.34	Associate's
Computer Systems Analysts	253	308	385	55	77	1.9%	$39.31	Bachelor's
Personal Financial Advisors	248	298	351	50	53	1.8%	$52.18	Bachelor's
Maintenance and Repair Workers, General	229	290	344	61	54	1.8%	$17.49	HS Diploma
General and Operations Managers	252	285	331	33	46	1.8%	$48.94	Bachelor's
Secretaries and Administrative Assistants	254	269	302	15	33	1.7%	$17.11	HS Diploma
Sales Representatives, Services, All Other	214	237	282	23	45	1.5%	$27.52	HS Diploma
First-Line Supervisors of Office and Administrative Support Workers	192	229	259	37	30	1.4%	$24.52	HS Diploma
Receptionists and Information Clerks	201	222	231	21	9	1.4%	$13.07	HS Diploma
Computer User Support Specialists	180	221	274	41	53	1.4%	$23.90	Some college
Architects, Except Landscape and Naval	180	209	219	29	10	1.3%	$31.13	Bachelor's
Graphic Designers	193	202	212	9	10	1.2%	$21.70	Bachelor's
Managers, All Other	146	200	229	54	29	1.2%	$35.36	Bachelor's
Veterinarians	153	187	204	34	17	1.2%	$40.31	Doctoral
Veterinary Assistants and Laboratory Animal Caretakers	138	168	182	30	14	1.0%	$13.49	HS Diploma
Counter and Rental Clerks	120	166	193	46	27	1.0%	$12.34	Less than HS
Property, Real Estate, and Community Association Managers	147	164	187	17	23	1.0%	$25.84	HS Diploma
Computer and Information Systems Managers	125	151	186	26	35	0.9%	$62.06	Bachelor's
Legal Secretaries	149	151	154	2	3	0.9%	$23.37	HS Diploma

Source: EMSI Q2 2017 Dataset

Information Technology and Communication

Within the Information Technology and Communication industry, occupations that employ over 500 workers include Management Analysts; Electricians; Software Developers, Applications; and Software Developers, Systems Software. Except for Electricians, these occupations require at least a Bachelor's degree. Over the past five years, Software Developers, Applications and Management Analysts added the most jobs. Over the next five years, Software Developers, Applications will continue to add the most jobs, followed by Computer Systems Analysts and Management Analysts. Median hourly earnings for the top occupations within this sector range from $14.68/hr. for Customer Service Representatives to $43.67/hr. for Software Developers, Applications.

Table 10: Staffing Patterns for Information Technology and Communication

Staffing Patterns for Information Technology and Communication - 120 or More Employees								
Occupations	Employed in Industry Group (2011)	Employed in Industry Group (2016)	Employed in Industry Group (2021)	Change (2011 - 2016)	Change (2016 - 2021)	% of Total Jobs in Industry Group (2016)	Median Hourly Earnings	Typical Entry Level Education
Management Analysts	510	585	653	75	68	5.1%	$41.10	Bachelor's
Electricians	545	571	592	26	21	5.0%	$19.30	HS Diploma
Software Developers, Applications	480	564	687	84	123	4.9%	$43.67	Bachelor's
Software Developers, Systems Software	477	533	609	56	76	4.6%	$43.11	Bachelor's
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	407	417	399	10	(18)	3.6%	$20.84	Some college
Plumbers, Pipefitters, and Steamfitters	330	315	294	(15)	(21)	2.7%	$20.63	HS Diploma
Computer Systems Analysts	261	304	378	43	74	2.7%	$39.31	Bachelor's
Office Clerks, General	244	250	264	6	14	2.2%	$14.95	HS Diploma
Market Research Analysts and Marketing Specialists	212	247	291	35	44	2.2%	$25.20	Bachelor's
General and Operations Managers	232	241	265	9	24	2.1%	$48.94	Bachelor's
Customer Service Representatives	227	235	260	8	25	2.0%	$14.68	HS Diploma
Sales Representatives, Services, All Other	207	229	263	22	34	2.0%	$27.52	HS Diploma
Computer User Support Specialists	196	229	282	33	53	2.0%	$23.90	Some college
Bookkeeping, Accounting, and Auditing Clerks	169	164	164	(5)	0	1.4%	$18.66	Some college
Computer and Information Systems Managers	139	157	190	18	33	1.4%	$62.06	Bachelor's
Computer Programmers	144	149	162	5	13	1.3%	$37.07	Bachelor's
Network and Computer Systems Administrators	131	147	173	16	26	1.3%	$38.04	Bachelor's
Managers, All Other	109	145	164	36	19	1.3%	$35.36	Bachelor's
Biological Technicians	139	139	146	0	7	1.2%	$19.10	Bachelor's
Secretaries and Administrative Assistants	132	133	144	1	11	1.2%	$17.11	HS Diploma
Accountants and Auditors	126	132	146	6	14	1.1%	$33.02	Bachelor's
Sales Representatives, Wholesale and Manufacturing	140	130	136	(10)	6	1.1%	$24.04	HS Diploma
First-Line Supervisors of Construction Trades and Extraction Workers	137	129	123	(8)	(6)	1.1%	$27.04	HS Diploma
Business Operations Specialists, All Other	116	125	141	9	16	1.1%	$35.17	Bachelor's
Medical Scientists, Except Epidemiologists	124	124	132	0	8	1.1%	$36.45	Doctoral
Web Developers	94	122	150	28	28	1.1%	$28.68	Associate's

Source: EMSI Q2 2017 Dataset

Light Manufacturing

There are seven occupations within this sector that employ at least 200 workers within the region. They include Team Assemblers; Sales Representatives, Wholesale and Manufacturing; First-Line Supervisors of Production and Operating Workers; Cabinetmakers and Bench Carpenters; Sawing Machine Setters, Operators, and Tenders, Wood; Laborers and Freight, Stock, and Material Movers, Hand; and Inspectors, Testers, Sorters, Samplers, and Weighers. Over the past five years, the greatest growth was within Sales Representatives, Wholesale and Manufacturing. Over the next five years, Packaging and Filling Machine Operators and Tenders is projected to add the most jobs. Most of these occupations require a High School Diploma. Median hourly earnings for these top occupations range from $10.69/hr. for Retail Salespersons to $48.94/hr. for General and Operations Managers.

Table 11: Staffing Patterns for Light Manufacturing

Staffing Patterns for Light Manufacturing - 80 or More Employees								
Occupations	Employed in Industry Group (2011)	Employed in Industry Group (2016)	Employed in Industry Group (2021)	Change (2011 - 2016)	Change (2016 - 2021)	% of Total Jobs in Industry Group (2016)	Median Hourly Earnings	Typical Entry Level Education
Team Assemblers	322	368	397	46	29	4.3%	$15.20	HS Diploma
Sales Representatives, Wholesale and Manufacturing	206	274	299	68	25	3.2%	$24.04	HS Diploma
First-Line Supervisors of Production and Operating Workers	232	265	282	33	17	3.1%	$26.93	HS Diploma
Cabinetmakers and Bench Carpenters	208	240	233	32	(7)	2.8%	$16.72	HS Diploma
Sawing Machine Setters, Operators, and Tenders, Wood	159	221	249	62	28	2.6%	$12.64	HS Diploma
Laborers and Freight, Stock, and Material Movers, Hand	174	220	249	46	29	2.6%	$11.25	Less than HS
Inspectors, Testers, Sorters, Samplers, and Weighers	184	213	220	29	7	2.5%	$15.51	HS Diploma
General and Operations Managers	162	188	199	26	11	2.2%	$48.94	Bachelor's
Packaging and Filling Machine Operators and Tenders	113	182	219	69	37	2.1%	$11.99	HS Diploma
Heavy and Tractor-Trailer Truck Drivers	144	171	185	27	14	2.0%	$18.03	Some college
Office Clerks, General	125	146	153	21	7	1.7%	$14.95	HS Diploma
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	106	139	157	33	18	1.6%	$13.66	HS Diploma
Maintenance and Repair Workers, General	106	127	136	21	9	1.5%	$17.49	HS Diploma
Industrial Truck and Tractor Operators	87	115	133	28	18	1.3%	$14.31	Less than HS
Shipping, Receiving, and Traffic Clerks	103	115	117	12	2	1.3%	$15.21	HS Diploma
Electrical and Electronic Equipment Assemblers	137	114	108	(23)	(6)	1.3%	$16.79	HS Diploma
Stock Clerks and Order Fillers	83	112	121	29	9	1.3%	$11.61	Less than HS
Retail Salespersons	55	111	134	56	23	1.3%	$10.69	Less than HS
Customer Service Representatives	93	107	114	14	7	1.3%	$14.68	HS Diploma
Software Developers, Systems Software	109	105	104	(4)	(1)	1.2%	$43.11	Bachelor's
Purchasing Agents, Except Wholesale, Retail, and Farm Products	94	105	109	11	4	1.2%	$31.71	Bachelor's
Bookkeeping, Accounting, and Auditing Clerks	90	101	100	11	(1)	1.2%	$18.66	Some college
Industrial Engineers	88	100	108	12	8	1.2%	$39.95	Bachelor's
Printing Press Operators	96	92	97	(4)	5	1.1%	$17.76	HS Diploma
Accountants and Auditors	76	88	92	12	4	1.0%	$33.02	Bachelor's
Managers, All Other	74	87	98	13	11	1.0%	$35.36	Bachelor's
Industrial Machinery Mechanics	66	86	104	20	18	1.0%	$21.91	HS Diploma
Production, Planning, and Expediting Clerks	70	83	88	13	5	1.0%	$19.33	HS Diploma
Helpers--Production Workers	78	81	88	3	7	1.0%	$10.79	Less than HS

Source: EMSI Q2 2017 Dataset

Food and Beverage Manufacturing

Packaging and Filling Machine Operators and Tenders; Retail Salespersons; and Sales Representatives, Wholesale and Manufacturing make up the three largest occupations that are required to staff companies within the Food and Beverage Manufacturing sector. These sectors also made up the most growth over the past five years, and are projected to add the most jobs through 2021. However, Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders are projected to add several new jobs. Most of the occupations within this sector have minimal educational requirements. Median hourly earnings for the occupations within this sector range from $9.27/hr. for Cashiers to $48.94 for General and Operations Managers.

Table 12: Staffing Patterns for Food and Beverage Manufacturing

Staffing Patterns for Food and Beverage Manufacturing - 20 or More Jobs								
Occupations	Employed in Industry Group (2011)	Employed in Industry Group (2016)	Employed in Industry Group (2021)	Change (2011 - 2016)	Change (2016 - 2021)	% of Total Jobs in Industry Group (2016)	Median Hourly Earnings	Typical Entry Level Education
Packaging and Filling Machine Operators and Tenders	85	156	197	71	41	8.8%	$11.99	HS Diploma
Retail Salespersons	56	112	136	56	24	6.3%	$10.69	Less than HS
Sales Representatives, Wholesale and Manufacturing	47	96	115	49	19	5.5%	$24.04	HS Diploma
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	40	72	92	32	20	4.1%	$19.48	HS Diploma
Demonstrators and Product Promoters	32	67	79	35	12	3.8%	$15.38	HS Diploma
Driver/Sales Workers	29	59	71	30	12	3.3%	$10.72	HS Diploma
Laborers and Freight, Stock, and Material Movers, Hand	29	52	66	23	14	3.0%	$11.25	Less than HS
Heavy and Tractor-Trailer Truck Drivers	26	52	64	26	12	2.9%	$18.03	Some college
Light Truck or Delivery Services Drivers	25	52	61	27	9	2.9%	$12.97	HS Diploma
Stock Clerks and Order Fillers	22	44	53	22	9	2.5%	$11.61	Less than HS
Waiters and Waitresses	21	42	51	21	9	2.4%	$11.20	Less than HS
First-Line Supervisors of Production and Operating Workers	23	42	52	19	10	2.3%	$26.93	HS Diploma
Food Batchmakers	20	40	52	20	12	2.3%	$11.69	HS Diploma
General and Operations Managers	20	37	46	17	9	2.1%	$48.94	Bachelor's
Bakers	25	30	34	5	4	1.7%	$11.63	Less than HS
Industrial Truck and Tractor Operators	18	30	40	12	10	1.7%	$14.31	Less than HS
Industrial Machinery Mechanics	15	30	41	15	11	1.7%	$21.91	HS Diploma
Managers, All Other	17	28	34	11	6	1.6%	$35.36	Bachelor's
Maintenance and Repair Workers, General	14	25	31	11	6	1.4%	$17.49	HS Diploma
Office Clerks, General	13	24	29	11	5	1.4%	$14.95	HS Diploma
Mixing and Blending Machine Setters, Operators, and Tenders	13	24	30	11	6	1.3%	$16.35	HS Diploma
Inspectors, Testers, Sorters, Samplers, and Weighers	14	23	30	9	7	1.3%	$15.51	HS Diploma
Cashiers	14	22	25	8	3	1.2%	$9.27	Less than HS
Bartenders	11	21	27	10	6	1.2%	$12.99	Less than HS
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	14	21	27	7	6	1.2%	$13.39	Less than HS

Source: EMSI Q2 2017 Dataset

Attachment A: Occupational Analysis by Planning Commission

Rappahannock-Rapidan Top Occupations 2-Digit SOC Codes

Table 13: Rappahannock-Rapidan Occupational Mix

Current Occupational Mix					
Occupations	2016 Jobs	2011 - 2016 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Office and Administrative Support	7,260	388	0.79	$17.08	331
Sales and Related	6,557	547	1.07	$14.71	393
Food Preparation and Serving Related	4,918	634	0.97	$10.29	332
Education, Training, and Library	4,802	283	1.38	$23.01	250
Construction and Extraction	4,109	(21)	1.52	$18.53	187
Management	3,664	(10)	1.11	$39.36	174
Transportation and Material Moving	3,383	262	0.85	$15.98	203
Personal Care and Service	3,243	346	1.31	$11.32	203
Building and Grounds Cleaning and Maintenance	3,084	307	1.34	$11.72	167
Business and Financial Operations	2,708	124	0.89	$35.31	136
Production	2,489	346	0.69	$16.89	202
Healthcare Practitioners and Technical	2,458	(35)	0.75	$35.58	125
Installation, Maintenance, and Repair	2,366	202	1.03	$21.33	148
Computer and Mathematical	1,637	147	0.97	$43.08	77
Healthcare Support	1,383	100	0.82	$13.53	80
Protective Service	1,257	(22)	0.92	$24.45	75
Farming, Fishing, and Forestry	1,198	70	2.56	$15.07	91
Arts, Design, Entertainment, Sports, and Media	1,079	76	0.99	$20.83	70
Community and Social Service	1,063	61	1.07	$22.64	64
Legal	688	47	1.37	$47.67	36
Architecture and Engineering	616	44	0.61	$37.84	43
Military	549	27	0.72	$15.62	20
Life, Physical, and Social Science	353	(2)	0.72	$37.18	24

Source: Emsi Q2 2017 Dataset

Rappahannock-Rapidan Top Occupations 5-Digit SOC Codes

Table 14: Rappahannock-Rapidan Top Occupations by 5-Digit SOC Codes

Top Occupations - 5-Digit SOC					
Occupations	2016 Jobs	2011 - 2016 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Cashiers	1,949	186	1.42	$9.25	125
Retail Salespersons	1,895	222	1.03	$10.18	118
Combined Food Preparation and Serving Workers, Including Fast Food	1,612	244	1.25	$8.94	107
Office Clerks, General	1,245	93	0.97	$14.84	52
Landscaping and Groundskeeping Workers	1,207	144	2.43	$11.46	68
Personal Care Aides	995	299	1.35	$10.54	72
Stock Clerks and Order Fillers	972	156	1.28	$11.67	63
Elementary School Teachers, Except Special Education	910	20	1.69	$28.22	40
Waiters and Waitresses	893	95	0.89	$9.47	68
Farmers, Ranchers, and Other Agricultural Managers	832	(175)	4.40	$14.88	38
Construction Laborers	818	59	1.60	$14.02	36
Heavy and Tractor-Trailer Truck Drivers	799	38	1.08	$19.06	43
Maids and Housekeeping Cleaners	778	73	1.34	$10.34	46
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	776	83	0.78	$11.77	37
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	763	49	2.47	$13.70	51
General and Operations Managers	735	53	0.85	$55.35	31
Childcare Workers	725	(28)	1.49	$9.06	37
Registered Nurses	716	(61)	0.65	$33.55	34
Substitute Teachers	691	20	2.90	$13.74	26
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	689	31	0.65	$17.30	20

Source: Emsi Q2 2017 Dataset

Thomas Jefferson Top Occupations 2-Digit SOC Codes

Table 15: Thomas Jefferson Occupational Mix

Current Occupational Mix					
Occupations	2016 Jobs	2011 - 2016 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Office and Administrative Support	19,876	2,231	0.99	$16.48	1,210
Sales and Related	12,103	1,114	0.90	$15.11	752
Education, Training, and Library	12,027	671	1.59	$24.86	765
Food Preparation and Serving Related	11,190	1,485	1.01	$11.12	775
Healthcare Practitioners and Technical	9,954	1,877	1.38	$32.56	758
Business and Financial Operations	7,266	1,358	1.09	$31.78	475
Management	6,161	809	0.85	$41.46	365
Personal Care and Service	5,966	1,108	1.11	$10.70	493
Construction and Extraction	5,914	215	1.00	$17.93	354
Building and Grounds Cleaning and Maintenance	5,593	716	1.11	$11.67	350
Transportation and Material Moving	5,428	485	0.62	$14.50	357
Computer and Mathematical	4,140	660	1.12	$36.88	257
Installation, Maintenance, and Repair	4,076	311	0.81	$20.47	271
Production	3,674	242	0.47	$17.00	262
Protective Service	3,428	867	1.15	$16.90	293
Healthcare Support	3,261	435	0.89	$13.86	235
Arts, Design, Entertainment, Sports, and Media	3,018	220	1.27	$21.97	202
Life, Physical, and Social Science	2,403	277	2.24	$35.08	169
Community and Social Service	2,280	523	1.05	$20.61	204
Architecture and Engineering	1,991	54	0.91	$37.44	108
Military	1,239	149	0.74	$18.41	62
Farming, Fishing, and Forestry	1,079	212	1.06	$15.35	95
Legal	1,033	144	0.94	$34.83	67

Source: Emsi Q2 2017 Dataset

Thomas Jefferson Top Occupations 5-Digit SOC Codes

Table 16: Thomas Jefferson Top Occupations by 5-Digit SOC Codes

Top Occupations - 5-Digit SOC					
Occupations	2016 Jobs	2011 - 2016 Change	2016 LQ	Median Hourly Earnings	Annual Openings
Postsecondary Teachers	4,469	327	3.52	$30.21	410
Retail Salespersons	3,909	229	0.98	$10.94	206
Office Clerks, General	3,748	438	1.33	$14.99	242
Registered Nurses	3,249	846	1.34	$30.71	267
Cashiers	2,972	320	0.99	$9.27	211
Waiters and Waitresses	2,354	381	1.08	$11.85	201
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	2,214	175	0.96	$17.04	113
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	2,144	372	0.99	$11.28	156
Personal Care Aides	2,142	729	1.33	$8.93	166
Combined Food Preparation and Serving Workers, Including Fast Food	2,018	203	0.71	$9.46	114
Stock Clerks and Order Fillers	1,800	274	1.08	$11.58	121
Bookkeeping, Accounting, and Auditing Clerks	1,790	122	1.21	$18.61	67
Maids and Housekeeping Cleaners	1,581	126	1.24	$10.01	84
Customer Service Representatives	1,531	259	0.68	$14.16	110
General and Operations Managers	1,430	178	0.76	$45.67	77
Nursing Assistants	1,422	184	1.14	$12.55	95
Landscaping and Groundskeeping Workers	1,369	153	1.26	$12.27	78
First-Line Supervisors of Office and Administrative Support Workers	1,368	245	1.09	$23.90	75
Teacher Assistants	1,344	58	1.22	$11.01	65
Accountants and Auditors	1,290	195	1.09	$32.42	78

Source: Emsi Q2 2017 Dataset

Business Workforce Survey Analysis

Prepared by:

THOMAS P. MILLER & ASSOCIATES

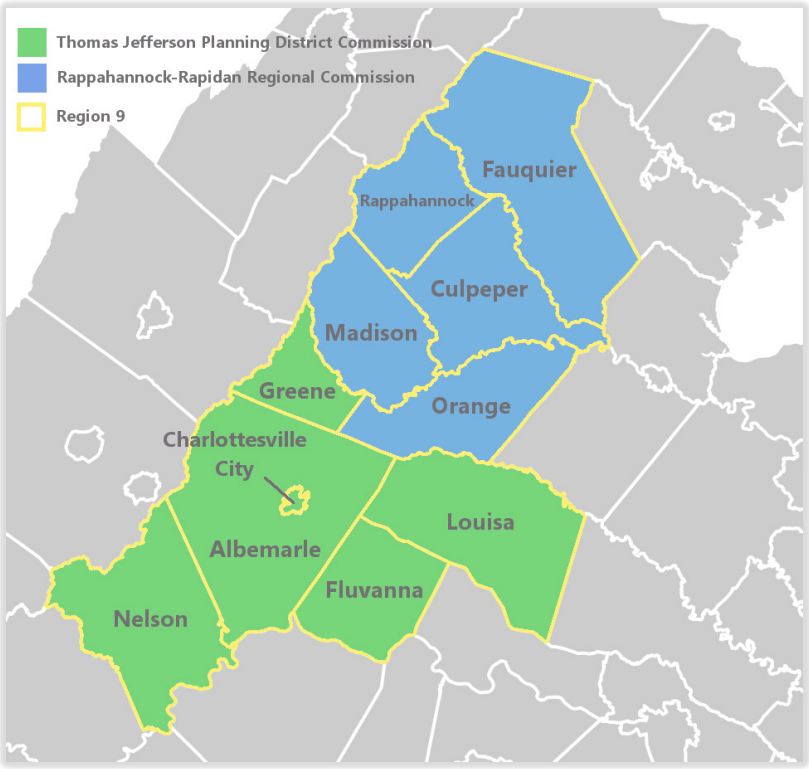
Business Survey Analysis

A survey was developed in partnership with GO Virginia Region 9 Council to determine the workforce talent needs of businesses in the 11-locality region of Albemarle, Culpeper, Fauquier, Fluvanna, Greene, Louisa, Madison, Nelson, Orange, and Rappahannock Counties and the City of Charlottesville. The survey included questions about employment numbers and projections, skills needs and gaps, education and training needs, training challenges, and desired industry recognized credentials.

In total, responses from 142 companies were analyzed as part of this study. The companies represented by survey respondents are located in the following counties in Table 1. It is worth noting that for those who selected "Other", twelve (12) operate in other select counties, six (6) operate statewide, and one (1) each operates in North America and globally.

Locality of Survey Respondents		
Counties	Responses	
Albemarle	30	21%
Culpeper	54	38%
Fauquier	33	23%
Fluvanna	25	18%
Greene	23	16%
Louisa	21	15%
Madison	39	28%
Nelson	19	14%
Orange	65	46%
Rappahannock	16	11%
City of Charlottesville	22	16%
Other	20	14%

Table 1: Locality of Survey Respondents



The companies represented by survey respondents conduct business in the following industries below in Table 2:

Industries Represented by Respondents	
Industry	Responses
Professional, Scientific, and Technical Services	21
Agriculture, Forestry, Fishing, and Hunting	12
Health Care and Social Assistance	11
Accommodation and Hospitality	11
Finance and Insurance	10
Arts, Entertainment, and Recreation	10
Construction	9
Government	9
Wholesale or Retail Trade	9
Educational Services	8
Manufacturing	7
Real Estate and Rental and Leasing	6
Transportation and Warehousing	5
Information Technology	4
Non-Profit	4
Utilities	1
Public Administration	1
Administrative and Support and Waste Managemen	1

Table 2: Industries Represented by Respondents

Drilling deeper, companies also identified their industry sub-sector in their own words to provide more specificity. Table 3 below shows how participants defined their own industries.

Represented Industry Sub-Sectors	
Industry	Industry Sub-Sector & Response
Accommodation & Hospitality	Bed & Breakfast (8) Campground (1) Farm/Winery (1) Hotel (1)
Agriculture, Forestry, Fishing, & Hunting	Agritourism (4) Agriculture Manufacturing (2) Agriculture Production (2) Aggregation & Distribution (2) Agriculture Maintenance (1)
Arts, Entertainment, & Recreation	Newspaper/Media (3) Historical Attraction/Tourism (2) Art (2) Performing Arts (1) Sporting Events (1) Festival (1)
Construction	Residential/Commerical (2) Highway (2) Land Development (2) General Contracting (2) Electrical (1)

Represented Industry Sub-Sectors (cont'd)	
Industry	Industry Sub-Sector & Response
Finance & Insurance	Banking (4) Insurance (3) Accounting (3)
Government	Local/County Services (4) Public Services (2) Economic Development (2) Education (1)
Health Care & Social Assistance	Healthcare Facility (6) Social Services (4) In-Home Care (1)
Information Technology	Web Design (2) Internet (1) Software Development (1)
Manufacturing	Adhesive Production (2) Small Repair Components (2) Clothing (1) Foundry (1) Brewery Production (1)
Non-Profit	Religious Institution (1) Social Services (1) Education (1) Regulatory (1)
Professional, Scientific, & Technical Service	Legal (5) Consulting (4) Automotive Service Repair (2) Marketing (2) Accounting (1) Architecture (1) HVAC (1) Pet/Animal Services (1) Office Supplies (1)
Real Estate & Rental & Leasing	Sales (2) Development (1) Rental/Leasing (1)
Transportation & Warehousing	Warehousing/Storage (2) Transportation (2) Vehicle Repair (1)
Wholesale or Retail Trade	Antique/Vintage/Consignment/Gift (4) Coffee (2) Furniture (1) Hardware (1) Payment Solutions (1)

Table 3: Industry Sub-Sectors

Employment Size and Growth

Most of the companies who responded have less than 50 full-time employees (74%), 21% have between 50 and 499 employees and the remaining 6% have 500 employees or more. Additionally, the majority of companies who responded employ fewer than 10 full-time employees (62%); less than half of that figure employs 50 or more (26%).

Companies in the Government industry were most likely to report having more than 100 employees whereas companies that were most likely to report having more than 1,000 employees were within Finance and Insurance; Government; Health Care and Social Assistance; and Transportation and Warehousing. Other industries tend to report smaller numbers of employees. One company in the Transportation and Warehousing industry was the only one that currently employs at least 1,000 or more full-time employees.

A majority of companies have plans for expanding locally or regionally (52%). The industries most likely to report that they anticipate local and regional expansion are reported in Table 4 below.[2]

Percentage of Companies by Industry Anticipating Expansion Locally/Regionally	
Industry	Percentage
Information Technology	100%
Public Administration	100%
Restaurant, Food Service	100%
Educational Services	71%
Construction	67%
Wholesale or Retail Trade	60%
Agriculture, Forestry, Fishing, and Hunting	57%
Manufacturing	57%
Professional, Scientific, and Technical Services	53%
Non-Profit	50%
Real Estate and Rental and Leasing	50%
Arts, Entertainment, and Recreation	43%
Health Care and Social Assistance	43%
Government	33%
Accommodation and Hospitality	30%
Finance and Insurance	25%
Transportation and Warehousing	25%
Utilities	N/A
Administative and Support and Waste Management	N/A

Table 4: Percentage of Companies by Industry Anticipating Expansion Locally/Regionally

Over the next 1-2 years, all but two industries anticipate adding new employees due to growth. On average, the largest amount of growth, as indicated by company respondents, is within Manufacturing (17 new employees per respondent), Construction (11 new employees per respondent), and Health Care and Social Assistance (10 new employees per respondent). However, over the next 3-5 years, one company in the Information Technology industry anticipates adding 100 new employees.

Looking even further towards the future, a majority of responding companies are likely to add new employees in the next 5-10 years due to growth (79%) with Construction adding the most. Of the seven companies within the Construction industry who responded, they anticipate adding, on average, 25 new employees over the next 5-10 years. Within Health Care and Social Assistance, three of the companies that responded anticipate adding, on average, 20 new employees, as indicated in Table 5. It is worth noting that Health Care and Social Assistance is among the top industries adding new employees in each timeframe. Overall, companies report the greatest

[2] "N/A" refers to a blank response from the survey participant.

percentage of available new jobs will be professional positions, followed by entry-level and skilled trade positions. The lowest reported percentage of new jobs were technical positions.

Top 3 Industries Looking to Add Employers at Each Level				
	Professional	Technical	Skilled Trade	Entry-Level/Support
1	Professional, Scientific, and Technical Services	Professional, Scientific, and Technical Services	Construction	Professional, Scientific, and Technical Services
2	Construction	Construction	Professional, Scientific, and Technical Services	Manufacturing
3	Educational Services / Finance and Insurance / Health Care and Social Assistance	Manufacturing	Manufacturing	Construction

Table 5: Top 3 Industries to Add Employers at Each Level

When asked whether or not they had plans to move out of Region 9 in Virginia, companies overwhelmingly reported no (94%). Those who indicated otherwise employ a labor force of less than ten; however, one respondent employs 100-499 employees within the manufacturing industry. This company's intention for moving was to "expand their regional footprint."

Companies across all industries reported experiencing a number of challenges to operating their businesses within the region. The top three identified challenges were having a talented workforce (45), following compliance/regulation (28), and funding (23). Similarly, having a qualified workforce (33) ranked among the top of the list for workforce challenges companies face, followed by salary/benefits (18), and soft skills (14).

Figure 1: Top Industry Challenges

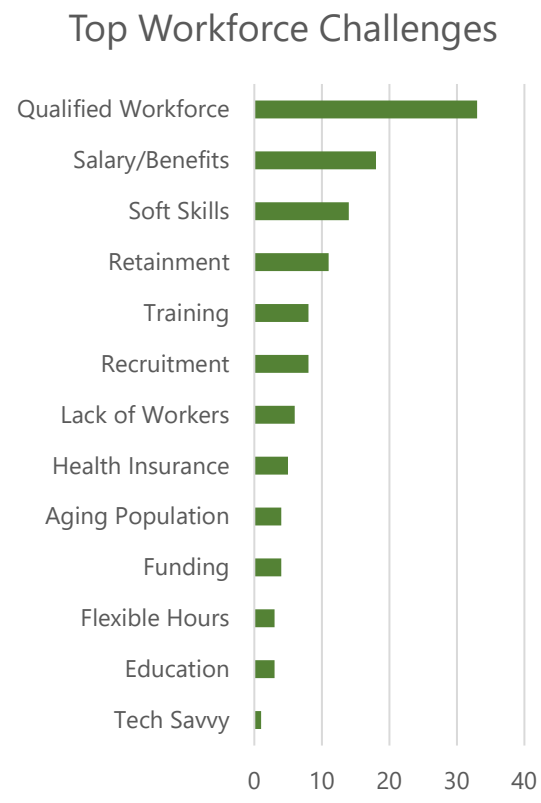


Figure 2: Top Workforce Challenges

Companies reported various ways the Region 9 Council can aid them in addressing these challenges. The most popular method was to help identify funding streams to aid in recruiting and retaining new hires. The next two most common methods, invest in career and technical education and offer more job training/workshops, both aim to better qualify the workforce. These methods are reflective of the top industry and workforce challenges. It is worth noting that while possession of soft skills was among the top ranked workforce challenges, only 3 companies reported it as something Region 9 Council could help them address.

Figure 3: Strategies to Address Workforce Challenges

Employee Recruitment

The majority of companies that responded to the survey reported hiring an average of 0-9 employees per year (75%). The categories of 10-24 and 25-99 annual employee additions were each chosen by 11% of respondents, while only 3% reported hiring 100 or more employees annually.

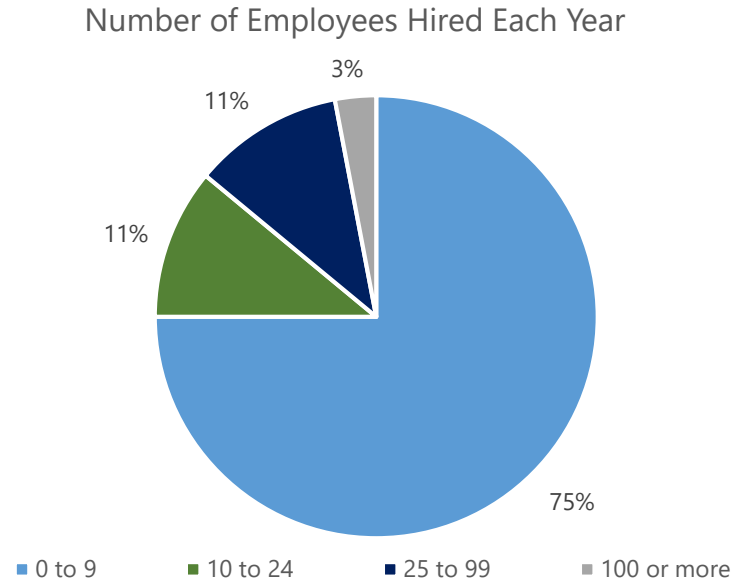


Figure 4: Number of Employees Hired Each Year

A majority of companies utilize online job postings (e.g., company website, online state employment portal, Indeed.com, etc.) to recruit new employees, followed by employee referrals and educational institutions.

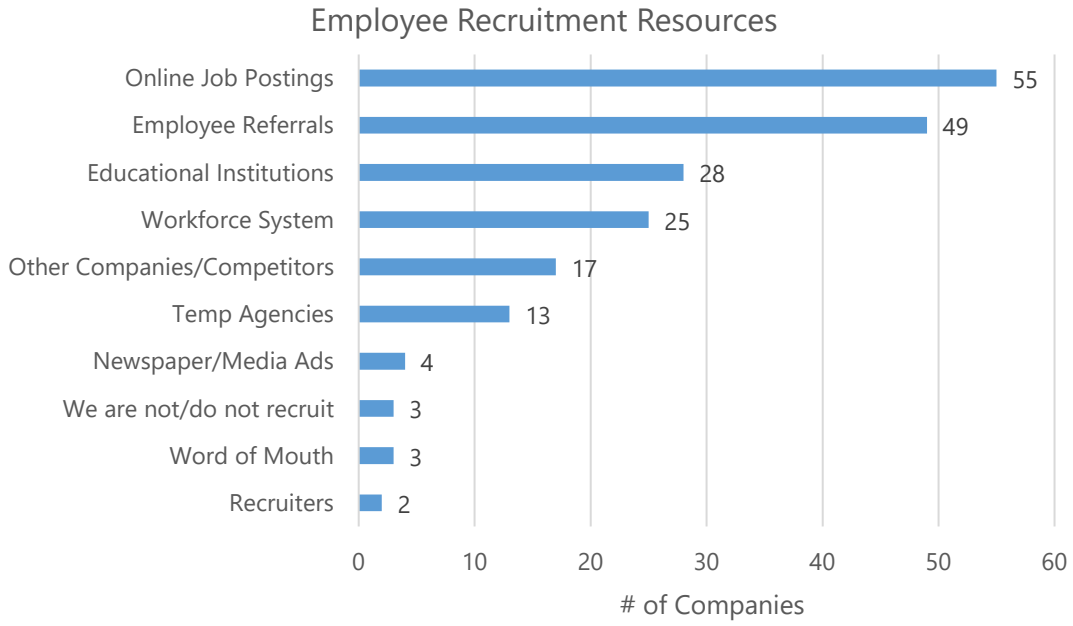


Figure 5: Employee Recruitment Resources

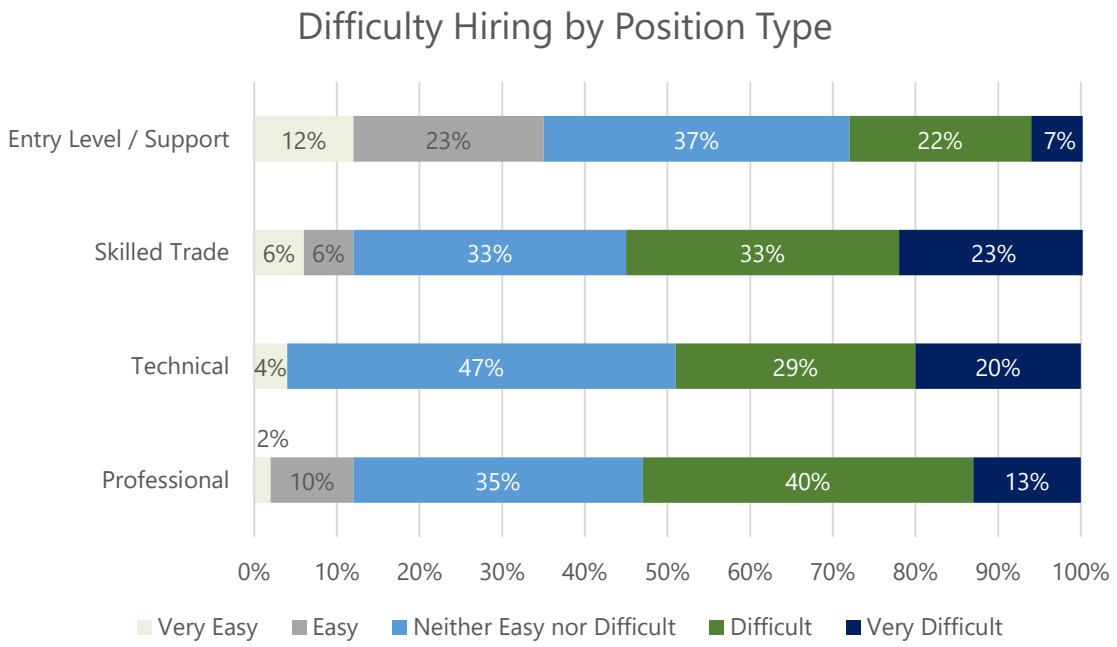


Figure 6: Difficulty Hiring by Position Type

Companies reported that the greatest difficulty with hiring employees is at the skilled trade level with 56% of companies indicating that hiring for these positions is either difficult or very difficult. On the other hand, while companies reported the most difficulty in retaining individuals in entry-level/support jobs, they also reported the most ease at filling positions of the entry level/support (35% reported these positions as easy or very easy to fill).

While companies reported receiving qualified applicants for each job type, they were outnumbered by the amount of responses for unqualified applicants. Technical job types received the largest share of unqualified applicants, followed by skilled trade and professional. Entry-level/support job types were reported having the greatest share of qualified applicants, nearly doubling that of skilled trade and tripling that of technical job types.

The top three technical/occupational skills or credentials that companies reported most difficult to find when hiring were IT software, Electrician, and HVAC/Plumbing. The word cloud below reflects all of the responses and their reoccurrence in the results (the larger the word, the more frequent the response).[3]

[3] Responses that were not repeated/mentioned once were not including in this analysis.

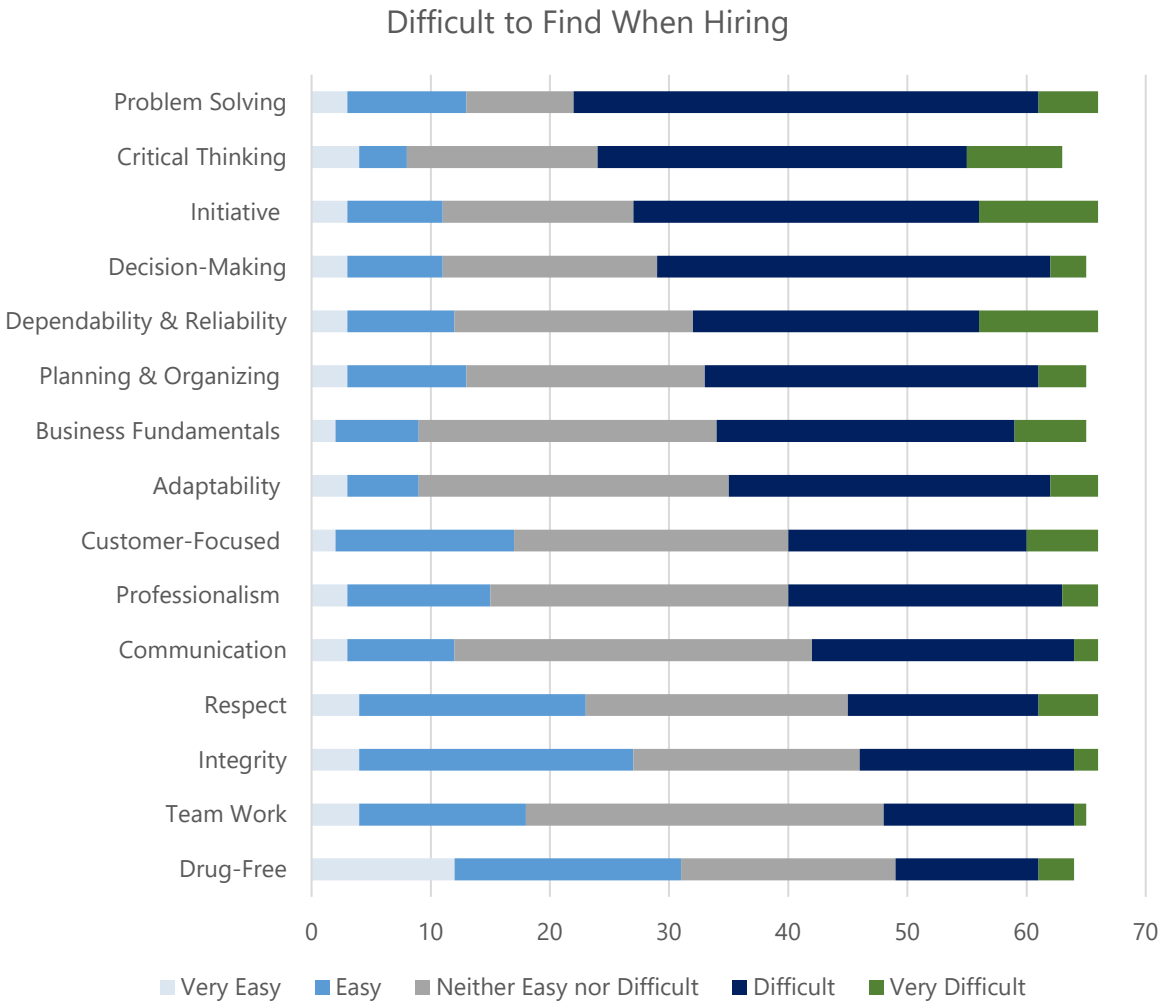


Figure 7: Difficult to Find When Hiring

Necessary job skills are often unique to a specific field or business type, so this survey focused on general employability skills that are applicable across company type. The most difficult employability skills were analytical skills such as critical thinking, problem solving, and decision-making. However, the least difficult employability skills to find when hiring were soft skills such as drug-free, integrity, and respect.

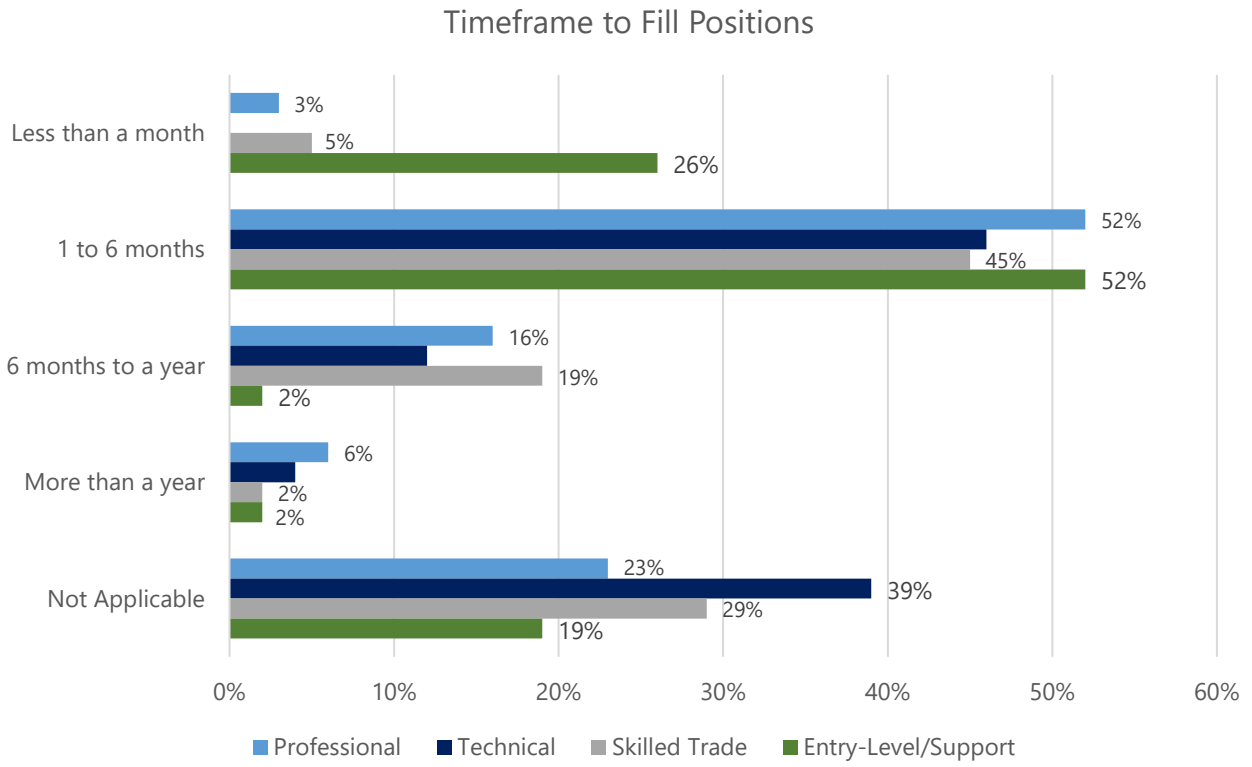


Figure 8: Timeframe to Fill Positions

The most common timeframe for filling all position types is between 1 to 6 months. Within this timeframe, entry-level/support and professional job type ranked the same; however, from 6 months to a year, entry-level positions tend to be filled quicker whereas professional positions tend to take longer.

Companies were asked how much they agreed with the following statements:

Question	Please rate how much you agree with each of the following statements:
1	*The applicant pool in my area is large enough to fill the jobs companies have available.*
2	*Individuals in the applicant pool in my area have the skills I need to hire.*
3	*The individuals in the applicant pool in my area who have the skills I need are available for hire.*

Table 14: Opinion of Applicants in the Talent Pool

Less than 15% of companies reported that the applicant pool in their area is large enough to fill the jobs companies have available whereas 13% reported that individuals in the applicant pool in their areas have the skills needed to hire. Companies are experiencing difficulty in hiring qualified applicants based upon of the lack of skills they possess which could pose a concern for industries who rely on a talented and qualified workforce to fill those positions. Only 10% of companies reported that the individuals in the applicant pool in their area who possess the necessary skills are available for hire, creating a competition amongst local companies hiring a skilled workforce.

Just under half of all respondents reported that local education and training programs do not graduate enough people to fill their company's needs (46%) whereas 21% reported they do. 37% of companies either disagreed or strongly disagreed that local education and training programs provide graduates with the skills necessary to be hired.

Employee Retention

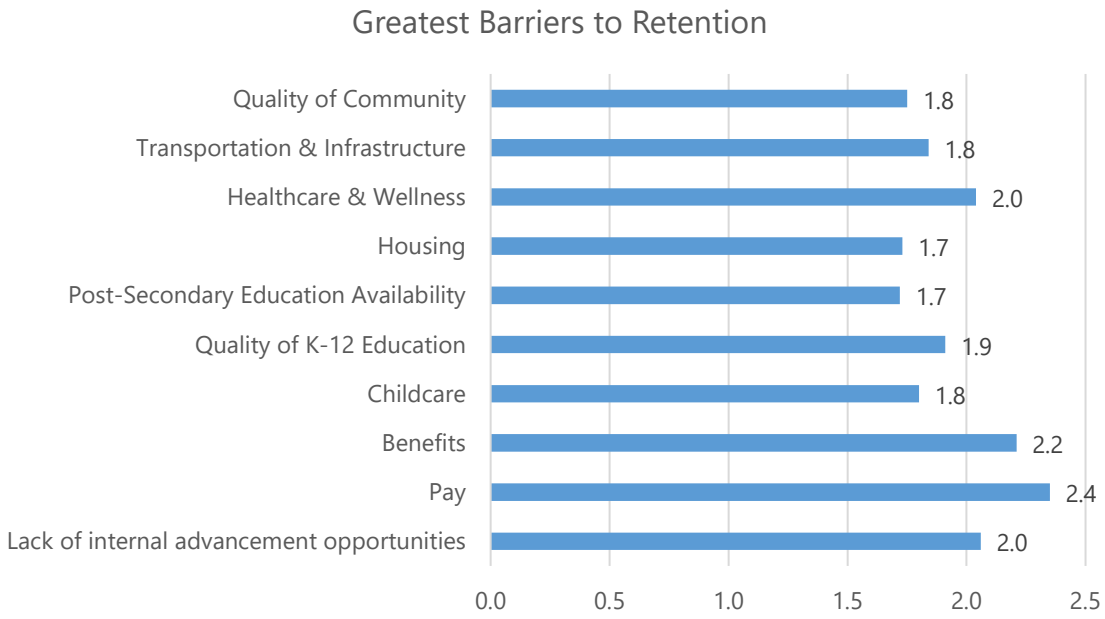


Figure 9: Greatest Barriers to Employee Retention

The greatest barriers to workforce retention as noted by companies were pay, benefits, healthcare and wellness, and lack of internal advancement opportunities. Companies from all industries reported pay as the greatest barrier to retention with the exception of Administrative and Support and Waste Management; Non-Profit; Restaurant, Food Service; Transportation and Warehousing; and Utilities.

Employee Training

Nearly all companies offer some type of education or training program for employee advancement with the most frequented selection being access to training or education programs hosted by another organization or company (58.5%). Two (2) companies from the real estate and rental leasing industry, one (1) from manufacturing, one (1) from construction, and one (1) from accommodation and hospitality do not offer any type of education/training program for career advancement. For those who selected other, responses included scholarships (2), safety programs (1), and in-house onboarding (3).

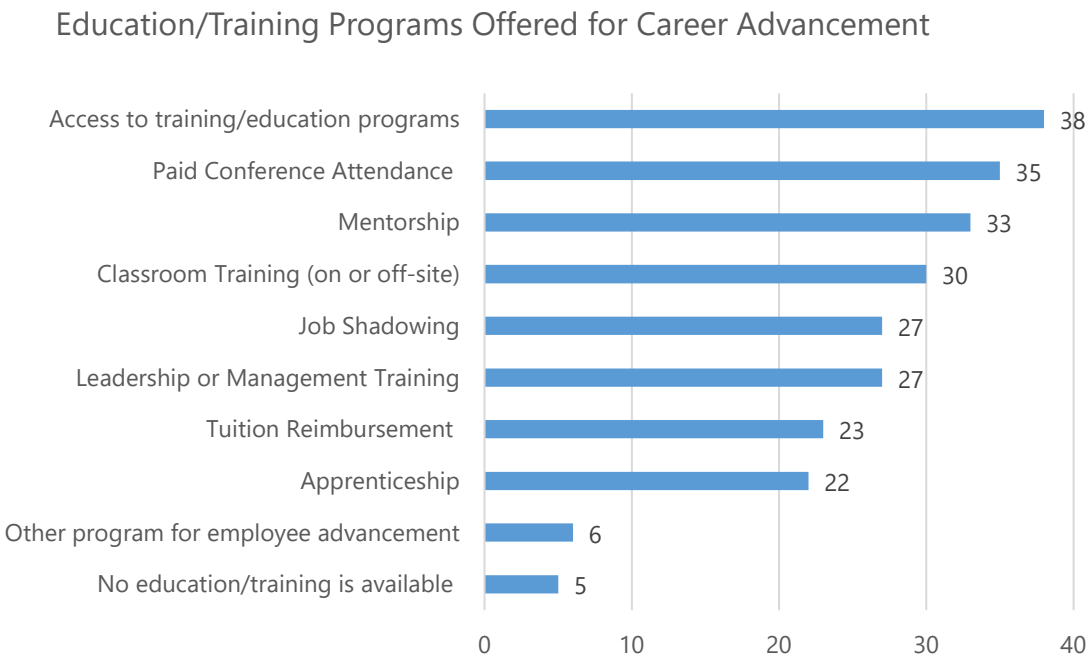


Figure 10: Education/Training Programs Offered for Career Advancement

When asked to indicate education and training programs that are needed but not offered in the area, companies varied in responses. Of the fifteen responses, several were industry specific including offering some type of hospitality, food service, mechanic, maintenance, and custodial training. For education programs, responses were more aligned with one another, suggesting more career readiness training at the high school level, including career technical education. Survey respondents reported a more concentrated focus on mathematics, physics, and engineering while aligning those courses with apprenticeship programs such as the one at Charlottesville Albemarle Technical Education Center (CATEC), but with more flexible evening hours. One survey respondent reported a need for more career/life planning programs that can prepare the young workforce with financial planning and knowledge.

Innovation and Entrepreneurship Asset Inventory

Prepared by:

Innovation and Entrepreneurship Asset Inventory

Starting in the post-World War II era, economists started undertaking research about how knowledge affected economic growth.[4] By the 1980s, many recognized that new knowledge was as important to economic growth as labor and capital,[5] leading countries and states to consider science- and technology-based strategies to promote further economic development. These strategies have evolved over the years, but generally include a focus on five elements of an innovation-based economy:

- **Sources of innovation**, such as universities, federal labs and non-profit research entities;
- **Companies**—entrepreneurial, small and large—that can bring new ideas to the market;
- **Skilled knowledge workers** with expertise in science, technology, engineering and math disciplines;
- **Infrastructure** that supports these entities, such as high-speed broadband connections, intellectual property protection, and equity capital markets; and
- **Community**, the connective tissue that links these elements into an ecosystem.

This inventory looks at innovation and entrepreneurship assets in Region 9 because these are drivers of economic growth. A region with strong innovation will be more competitive and grow faster than those without. And regions with entrepreneurial cultures and tightly integrated ecosystems will be more diverse economically, and less susceptible to economic changes.

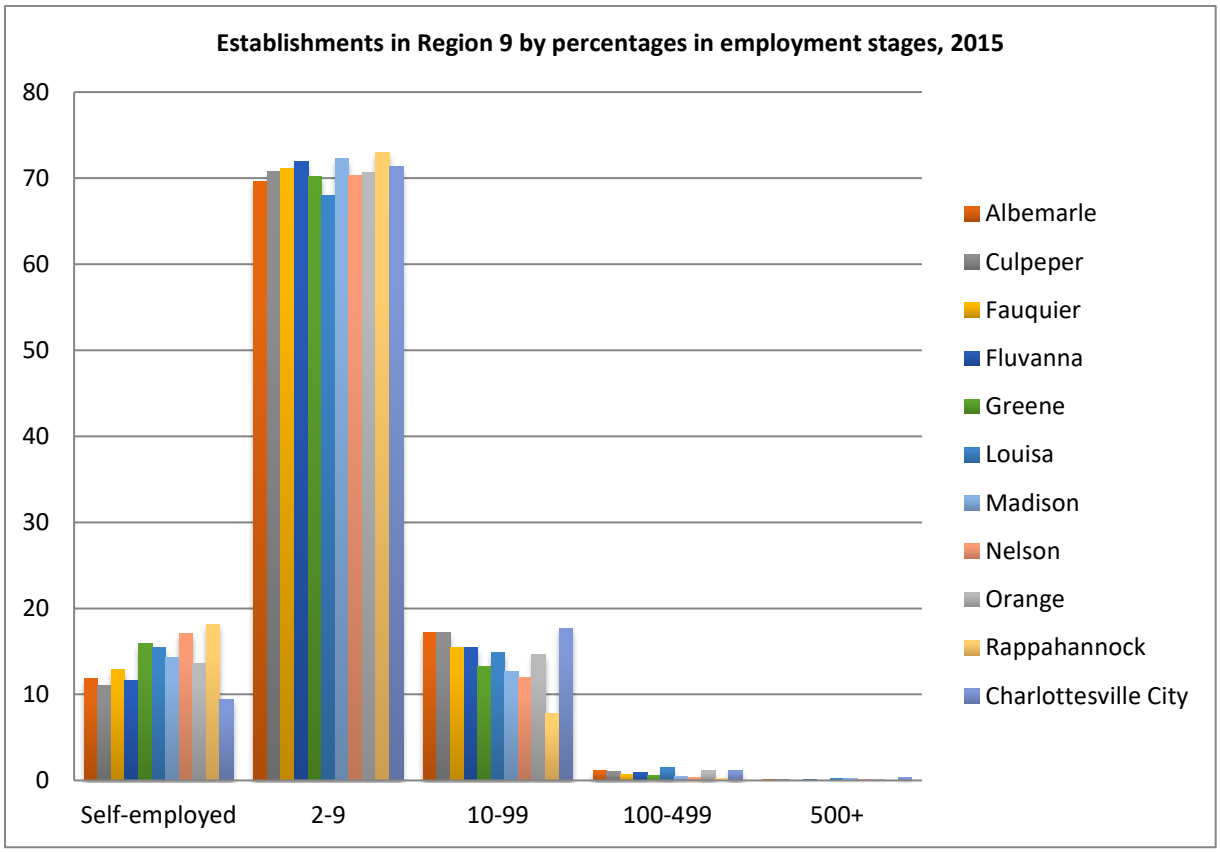
Region 9 is blessed with the location of the University of Virginia, one of the top universities in the world, and this, along with the advanced manufacturing and technology-based firms in the US 29 corridor, form the backbone of the area's innovation assets. These assets support biomedical and information technology, generally, as target markets.

Small Business and Entrepreneurship

Job creation comes primarily from young companies and those in scale-up stages which are expanding from startup mode to revenue creation and production. This is in contrast to older firms whose employment trends have been negative for some time. A major reason for this phenomenon is that it is easier to younger firms to innovate and stay relevant in their markets. This section of the report looks at both small and young firms in Region 9.

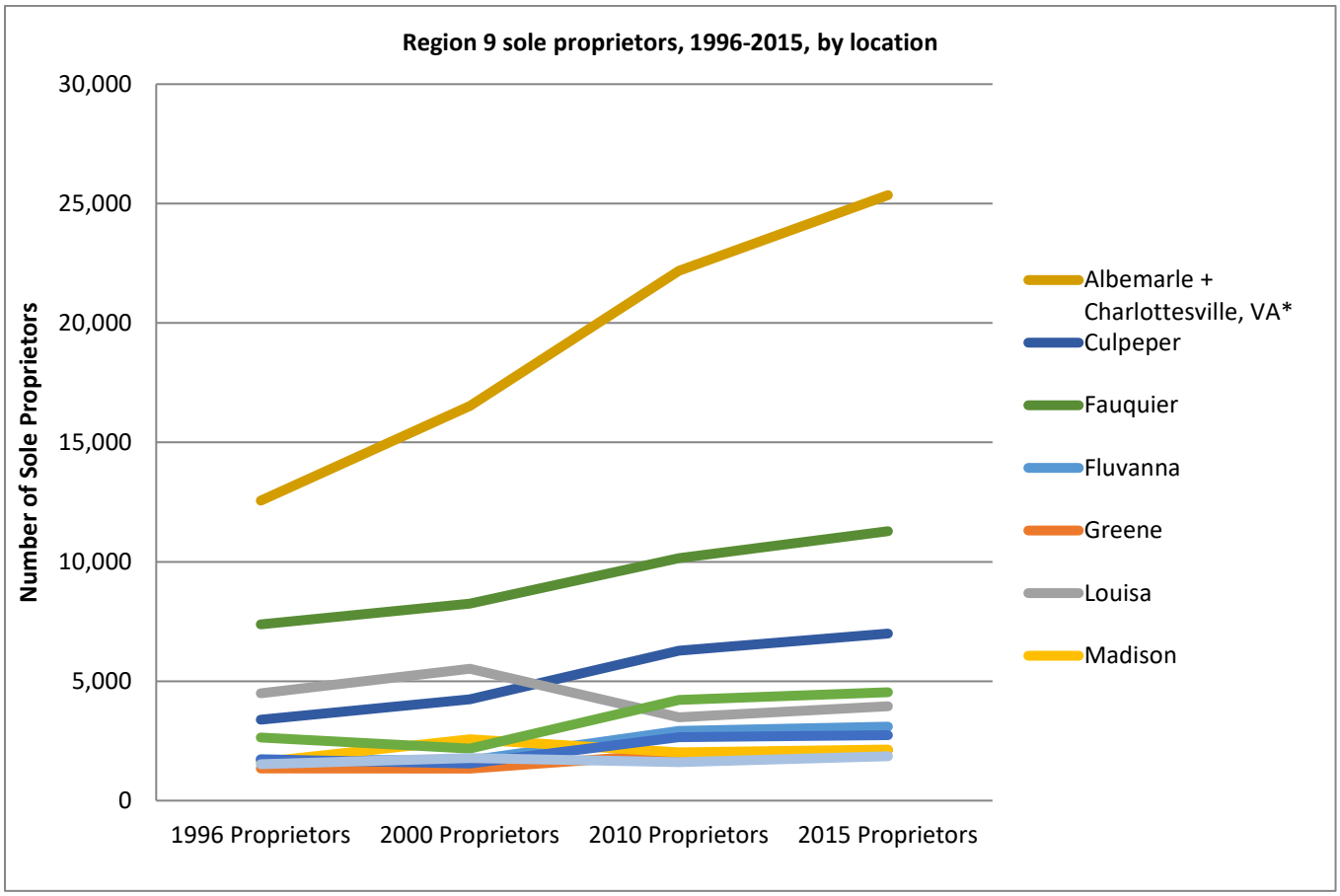
Like many other places in Virginia, Region 9 is dominated by small businesses. Of the 20,921 establishments in Region 9 in 2015, 12.1% represent self-employed persons and 70.6% have 2-9 employees. Among the different counties in the region, these percentages are remarkably stable.

[4] Solow, Robert W. 1956. "A Contribution to the Theory of Growth." *The Quarterly Journal of Economics*.70 (1): 65-94.
[5] Romer, Paul. 1986. "Increasing Returns and Long-Run Growth."94 (5): 1001-1037.

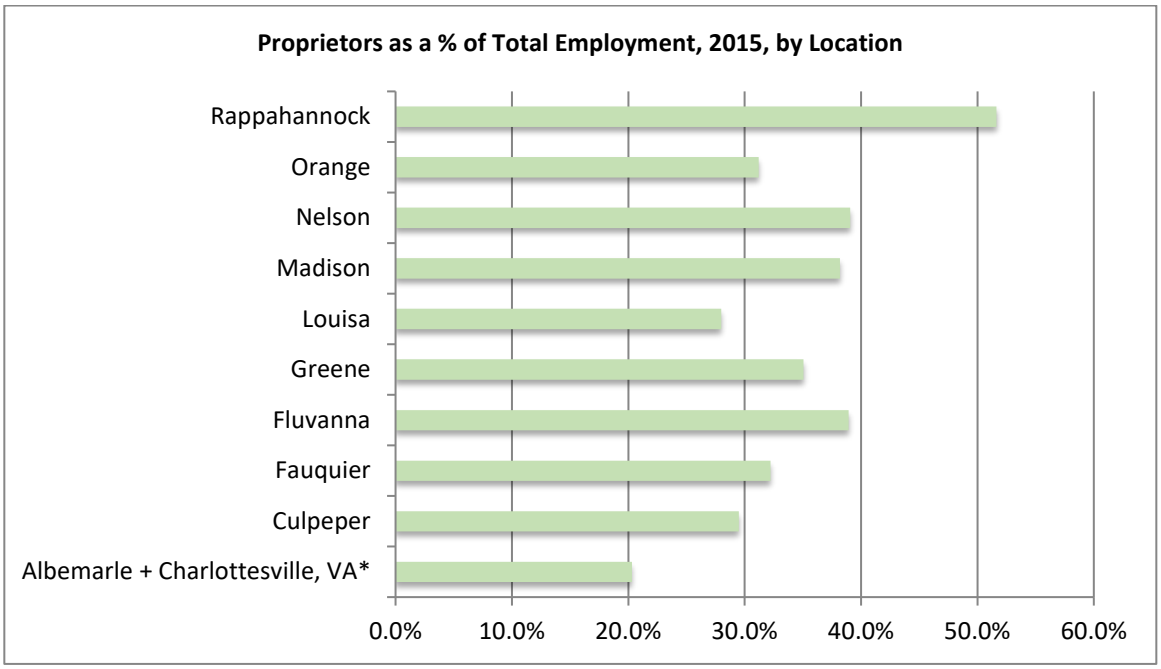


Source: Youreconomy.org

Rappahannock County has the highest percentage of self-employed persons, while Albemarle/Charlottesville has seen the fastest growth in sole proprietorships.

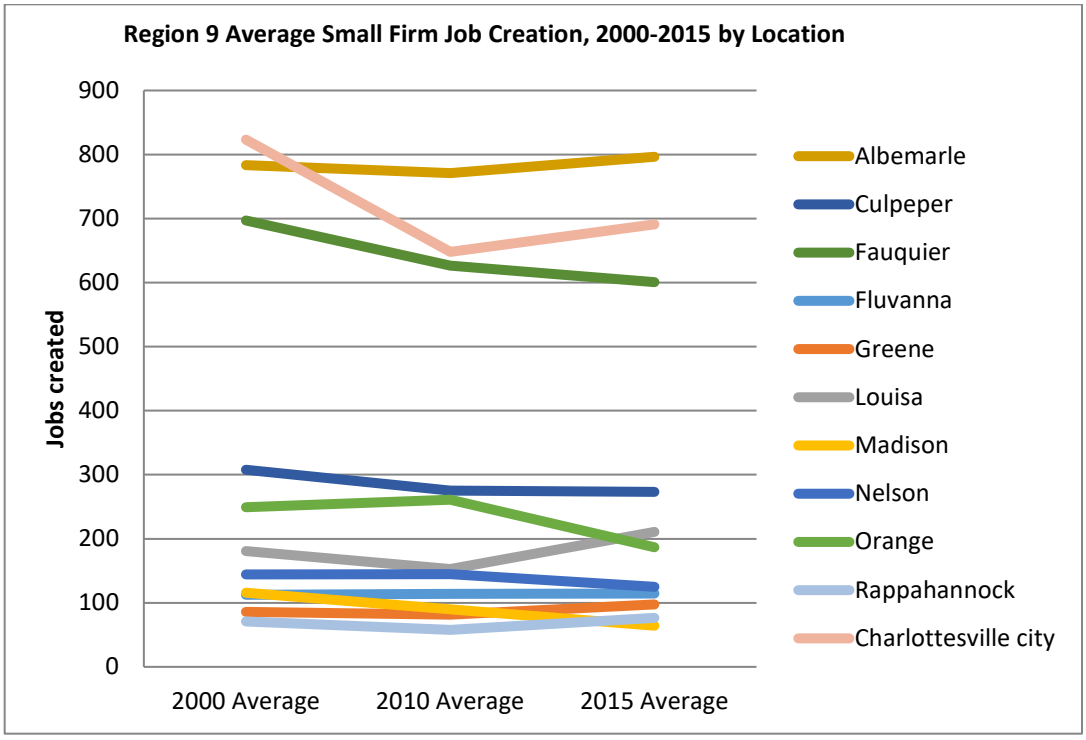


Source: US Census Bureau, LEHD, QWI



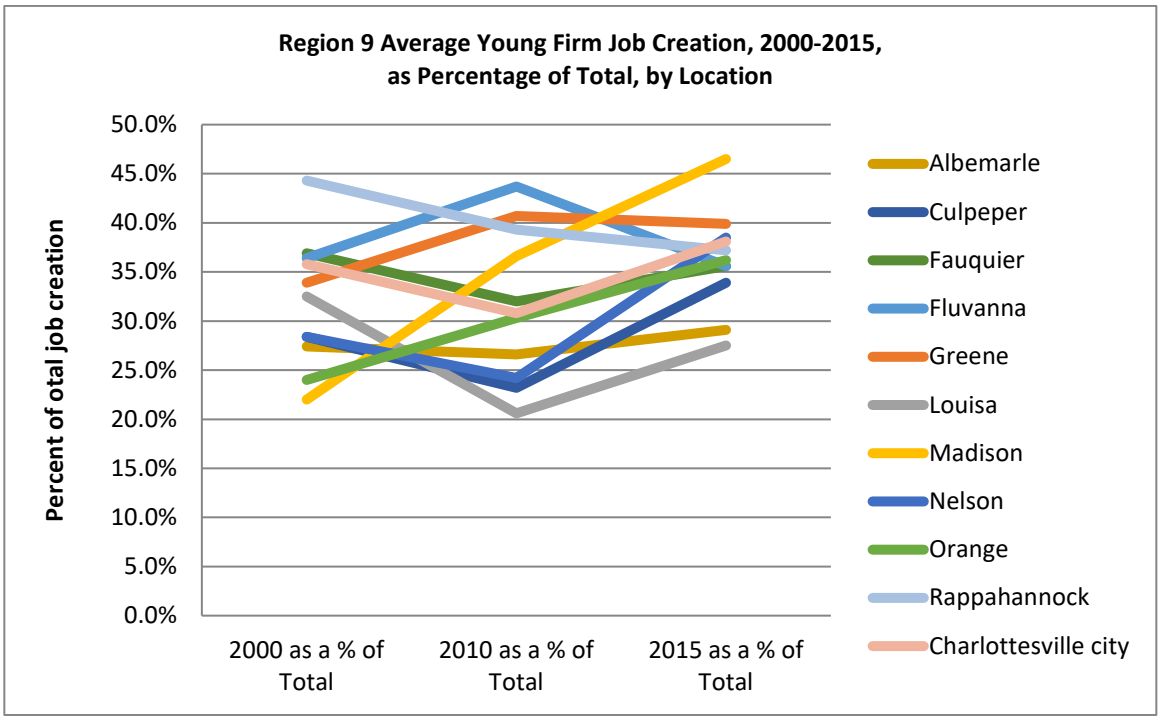
Source: US Census Bureau, LEHD, QWI

Job creation by small firms in Region 9 has been steady since 2000 except in Charlottesville and Fauquier County, where there was a substantial drop in between 2000 and 2010 (likely a result of the Great Recession). Average small firm job creation in Charlottesville had recovered somewhat by 2015.



Source: US Census Bureau, LEHD, QWI

Since economic growth is often associated with young firms (less than five years old), rather than small firms per se, we looked at job growth by young firms as a percentage of total growth in each county. Madison County shows the greatest percentage growth in 2015 at 46.5%, and the greatest increase since 2000. All of the counties show job creation from young firms exceeding 25% of total employment growth.



Source: US Census Bureau, LEHD, QWI

Sources of Innovation

This section of the report looks at sources of innovation – where do new ideas come from in the region? This is important because most innovation stays localized; it is commercialized within 50 miles of where it was created, and often even closer than that.

The Importance of Knowledge to Economic Growth

In the past fifty years, economists have identified the role of new knowledge in economic growth. Two Nobel Prize-winning economists are credited with first identifying the role of knowledge. Nobel Prize in Economics winner Robert Solow observed that there was a variable other than capital, labor and land involved in economic growth, and Kenneth Arrow, another Nobel Prize winner, articulated that the variable was new knowledge.

New knowledge spills over from its source (such as a university or corporate research laboratory) to regional firms, and by extension, to the regional economy. University research, in particular, is important to stimulating innovation and economic growth in its host community. And, the extent to which knowledge is important to an industry will impact its location decisions with respect to sources of innovation including university R&D.

Why Universities Matter

Empirically, regions with universities grow faster than those without, and in smaller places where the agglomeration effects are not as strong, the university's role is even more important. Universities "heavily influence the ability of regions to attract and retain technology-intensive firms, to provide the regional labor force with modern knowledge skills, and to respond flexibly to.... economic circumstances."[6]

[6] Drucker, J. and H.A. Goldstein. 2007. "Assessing the regional economic development impacts of universities: a review of current approaches." *International Regional Science Review*. 30(1): 20-46.

What is Innovation?

Innovation is when new or improved ideas, products, services, technologies, or processes create more market demand or cutting-edge solutions to economic, social, and environmental challenges.

As there are many types of innovations—market, social, civic, and place innovations—this definition focuses on innovations derived from a subset of industries that benefit from co-location and proximity and where firms and workers interact and collaborate. These industries include:

High-value, research-oriented sectors such as applied sciences—from life and material sciences to energy technology to nanotechnology

The burgeoning "app economy" and tech start-up community

Highly creative fields such as industrial design, graphic arts, media, architecture, and a growing hybrid of industries that merge tech with creative and applied design fields

Highly specialized, small batch manufacturing in advanced manufacturing industries, advanced textile production, and small artisan-oriented manufacturing

Other industries organically locating in these areas and are benefiting from interaction and collaboration. Each city should look for other industries during their own analysis—cities could be ahead of the research.

Source: Brookings Institute

University research spurs the creation of new firms and thus affects regional employment. Research partnerships with universities expand and complement the absorptive capacity of the firms, increasing their innovation and competitiveness.

For regions to be competitive,

"The key event is the creation of an entrepreneurial university, whether from an existing academic base or a new foundation, which takes initiatives together with government and industry to create a support structure for firm formation and regional growth."[7]

The entrepreneurial university is characterized by a focus on industry-partnerships, technology transfer of research discoveries to interested and capable industry partners, including startups, support for entrepreneurs, whether students, faculty, or community-based, and support for the ecosystem, often in the form of research parks, incubators, and other capital-intensive infrastructure.

University spin-offs are an important part of the picture since they provide innovative products, new jobs, induce corporate investment in university R&D and have highly localized impacts. Eighty percent of spin-offs operate in the same state as their host institution. However, technology transfer efforts such as these are most effective if they are located within a strong innovation ecosystem and when university reward systems are aligned with desired outcomes.

There is also rising interest in entrepreneurship among students. Increasingly, campuses are involved with supporting entrepreneurs, including student-led companies as well as those from the community. Universities that support entrepreneurs and new businesses, including those generated both on and off campus, also support a flexible and creative workforce, and can significantly leverage economic revitalization. Indeed, students with entrepreneurial skills and knowledge are themselves a valuable output of any university.

The role of a university in its community seems to have changed along with many other institutions in our society. The ivory tower image of a university with a sole focus on teaching and research has given way to an understanding that universities are important place-based assets that can help a region be competitive in a knowledge-based economy. The linear science-push model has given way to a more nuanced and complex understanding of entwined interests among universities, industry and government, and a new contract has arisen, one that suggests than in return for public funds, universities must address their "users" – society and the economy – and be more accountable.

[7] Etzkowitz, H. and M. Klofsten. 2005. "The innovating region: towards a theory of knowledge-based regional development." *R&D Management*. 35(3): 243-255.

University Roles in Economic Development

It is helpful to place this discussion in a larger context, that is, what is the function of the university? Goldstein, Maier and Luger's[8] construct of eight different functions is useful as it lays out all the possible ways that universities can impact their surrounding communities and regions. The eight functions are:

1. Creation of knowledge
2. Human-capital creation
3. Transfer of existing know-how
4. Technological innovation
5. Capital investment
6. Regional leadership
7. Knowledge infrastructure production
8. Influence on regional milieu[9]

University of Virginia

As the major university in Region 9, it is appropriate to look at the University of Virginia (UVA) and its production of new knowledge. The University is an elite research university, ranked #2 best public university by US News and World Report in 2017 and 24th overall. UVA's graduate programs include the highly ranked Darden Graduate School of Business Administration, Curry School of Education, School of Engineering and Applied Science, School of Law and School of Medicine, in addition to the College of Arts and Sciences. Almost 22,000 students attend UVA, taught by 12,000 faculty and staff. With a $5.3 billion endowment, 1.5 million feet of research laboratories and studios, and over 100 research centers, UVA is well positioned to support economic development in Region 9.

In 2016, UVA conducted $338 million of research and development, $260 million funded by the federal government, $72.9 million by foundations, industry and subcontracts, and $5 million by governments. Federal funding was largely from the U.S. Department of Health and Human Services ($176.7 million), with $23.4 million from the U.S. Department of Defense. [10]

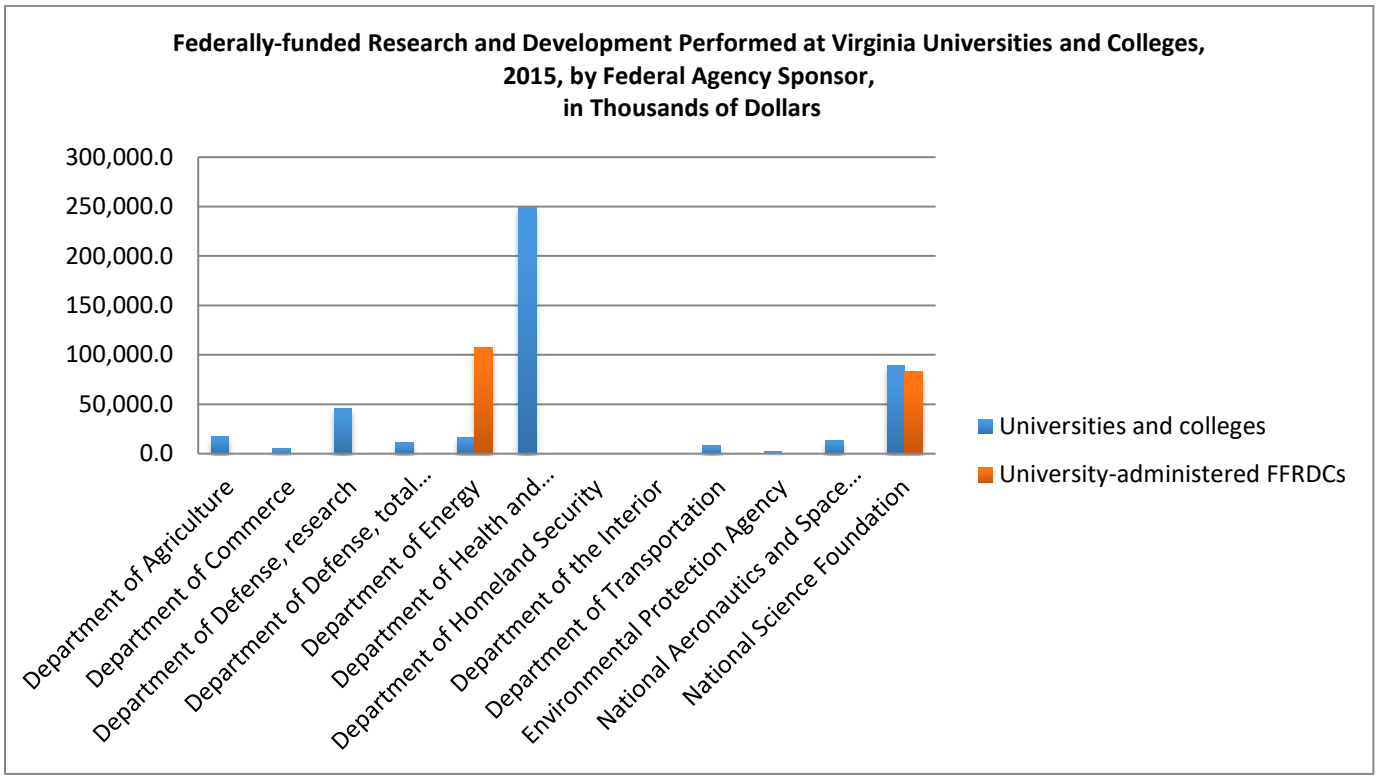
This distribution of federal funding is consistent with the rest of Virginia, where HHS is also the predominant funder.

---

[8] Goldstein, H.A., G. Maier and M.I. Luger. 1995. "The university as an instrument for economic and business development: U.S. and European comparison," in D.D. Dill and B. Sporn (eds), *Emerging Patterns of Social Demand on University Reform: Through a Glass Darkly.* Elmsford, NY: Pergamon.

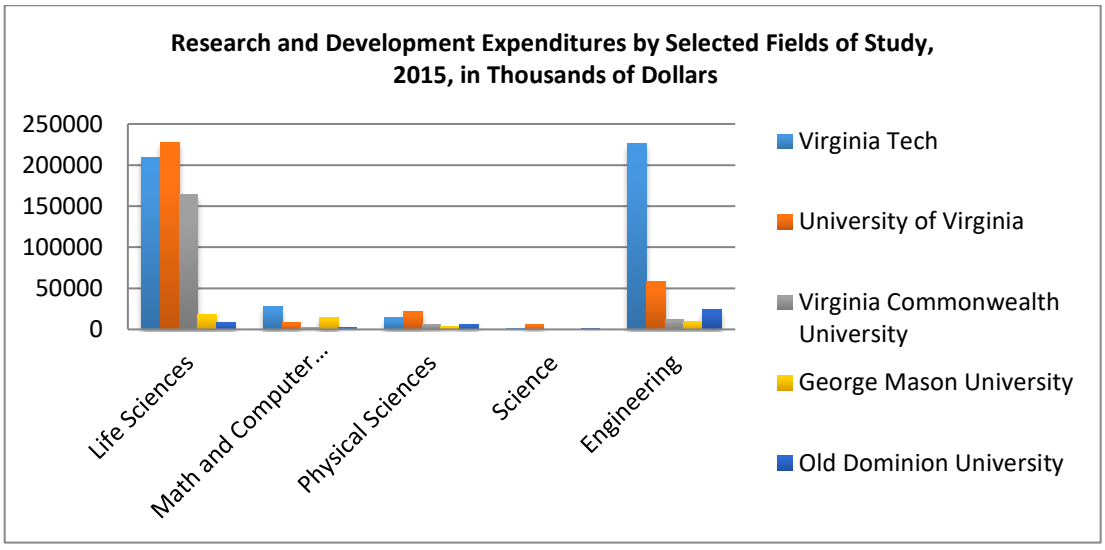
[9] The *creation of knowledge* and the *creation of human capital* (that is, the teaching of students and training of scholars) refer to the traditional roles of teaching and research that characterized the US university in the early 20th century. The *transfer of existing know-how* refers to the cooperative extension model where universities take on the role of training and educating local and regional businesses and entities. *Technological innovation*, on the other hand, refers to the protection and dissemination of new knowledge into the market so that it becomes an innovation, usually embodied in intellectual property policies and technology transfer offices at universities. *Capital investment* refers to the impact of new construction and other long-term investment on the local community. *Regional leadership* refers to the role that university officials and faculty can play in providing direction and resources to the community, while *knowledge infrastructure production* specifically refers to the idea that knowledge "spills over" into the local community. Lastly, *influence on regional milieu* refers to the ability of universities to contribute to the cultural amenities of an area through its arts, sports, and entertainment activities, as well as the agglomeration of highly educated people in one place.

[10] University of Virginia website.

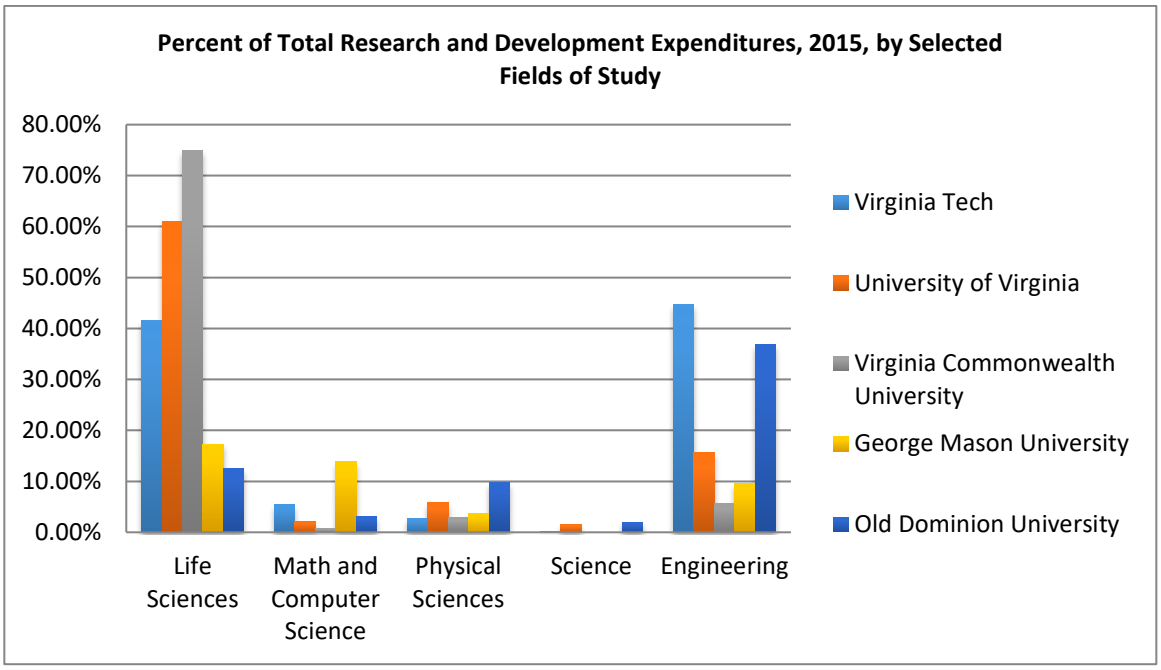


Source: National Science Foundation, http://www.ncsesdata.nsf.gov

UVA's research strengths lie in the life sciences primarily, but with a strong engineering research program as well. (In comparison, Virginia Tech has more research and development in engineering, and Virginia Commonwealth has more life sciences as a percentage of its total.)



Source: National Science Foundation, http://www.ncsesdata.nsf.gov



Source: National Science Foundation, http://www.ncsesdata.nsf.gov

Research Centers and Institutes

The number of centers and institutes continues to be high at UVA, and support largely biomedical and engineering research programs. A significant new development is the addition of five new institutes as a major university-funded investment under the "Cornerstone Plan" adopted in 2013,[11] each to tackle major 21st century issues. Each will be started with a 3-year, $2 million grant from the university, to be augmented with grants and contracts earned by the institutes. Four of the institutes have been established so far:

- Data Science Institute (2014)
- Brain Institute (2016)
- Environmental Resilience Institute (2017)
- Global Infectious Diseases Institute (2017).

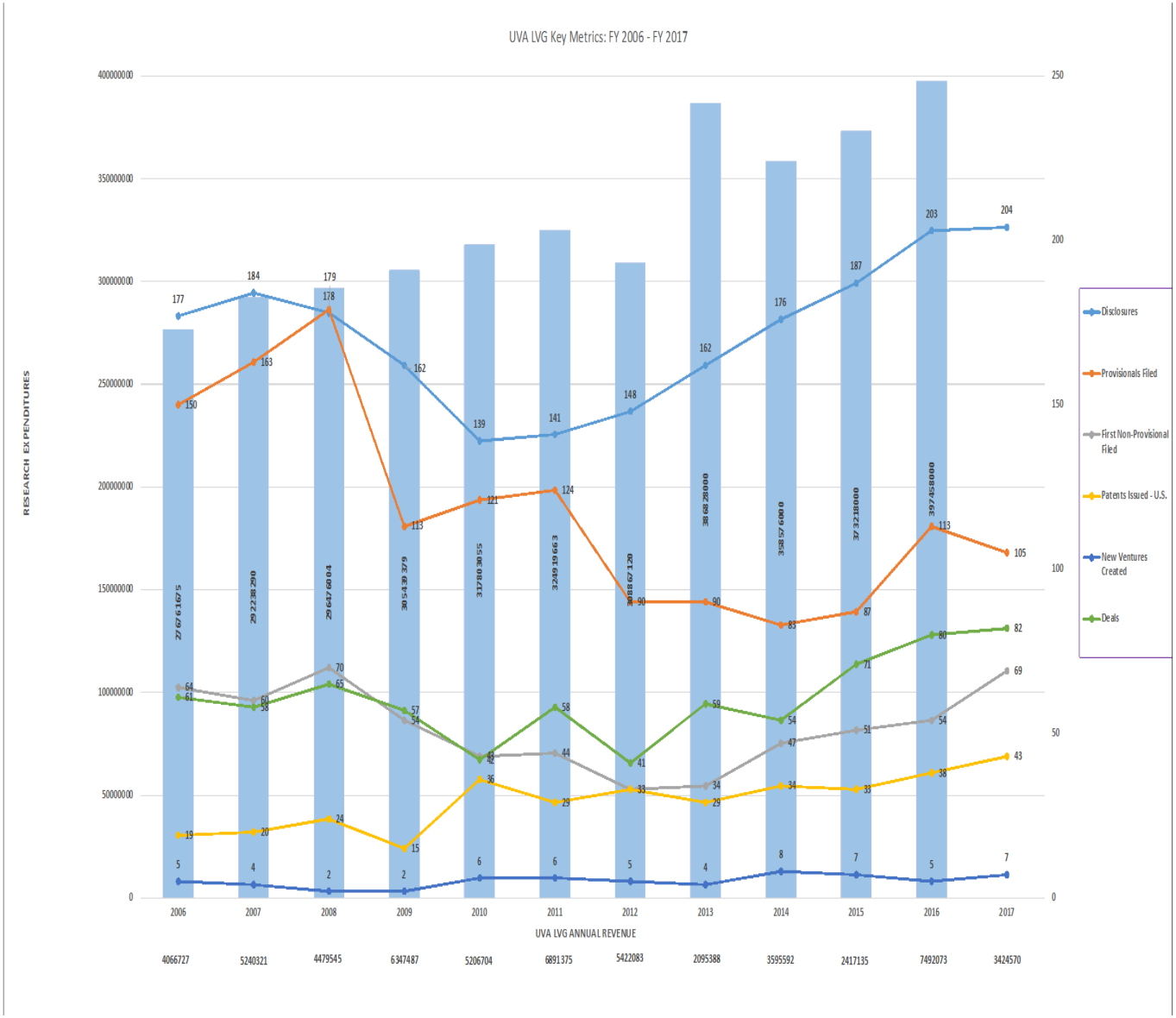
Another significant new research center is the Max Plank Partnership. UVA was selected to join MAXNET Energy, an initiative of the Max Plank Society of Germany. UVA joins Cardiff University as the only external members. The partnership will enable UVA faculty and students to conduct research on new energy processes such as solar process heat, photo-electro catalysis and natural gas to liquid fuels.

Technology Transfer at UVA

The UVA Licensing and Venture Group (LVG) is a critical element of the innovation ecosystem in the region. This is the organization that identifies and protects intellectual property developed at the university by faculty, staff and students, and subsequently licenses the technology to outside entities or to startup companies. This is the key mechanism to legally move discoveries made at the university into the broader economy, ensuring that the licensees receive defendable and competitive intellectual property, while rewarding the university and the inventors appropriately for their prior investments and work.

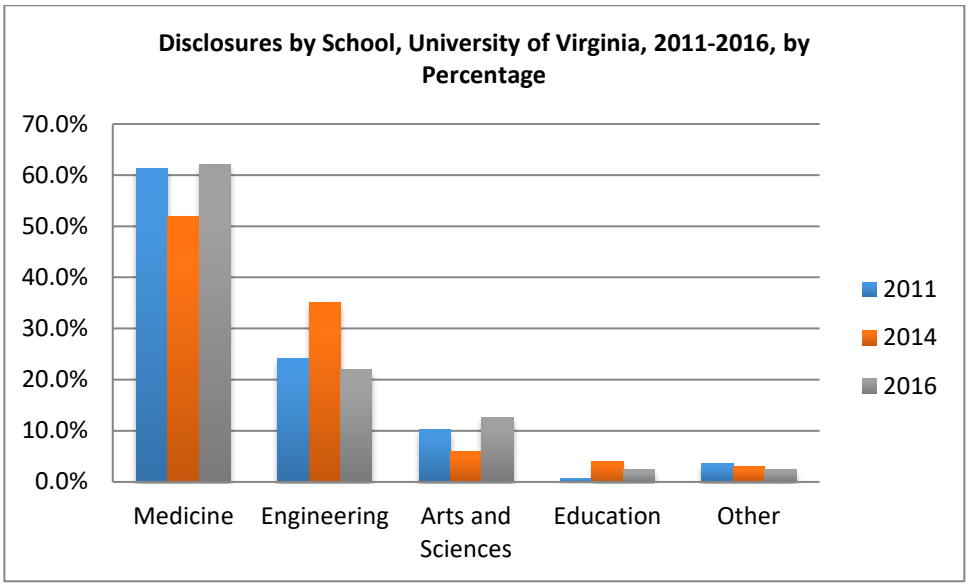
[11] http://planning.virginia.edu/current-strategic-plan

Since 2011, LVG has dramatically accelerated what were already high levels of performance. In 2016, the group processed 203 disclosures, applied for 251 patents, received 71 patents, completed 80 transactions (licenses, options, etc.) and spun out five companies. These metrics reflect an acceleration of past trends.



Source: UVA Licensing and Venture Group

Consistent with federal funding, disclosures are coming largely from the School of Medicine and the School of Engineering and Applied Science. There is no appreciable change in this distribution since 2011. However, it should be noted that the number of spin-off companies based on engineering technology continues to outpace those based on medical technology, reflecting the significant investment in capital and time needed to bring medical technologies to the market.



Source: UVA Licensing and Venture Group Annual Reports

Significantly, LVG has also increased its focus on supporting the startup companies born from UVA technologies. In 2015, the University invested $10 million into a Seed Fund to support translational work by its licensees. The fund is designed to be evergreen, that is returns from the fund will be recycled to invest in firms in the future, and expended at a rate of around $1 million/year for ten years. To date, three investments have been made of between $250,000 and $300,000. The Fund is being run by a seasoned venture capitalist with expertise in healthcare and medical technologies.

In addition to the Seed Fund, LVG is also supporting its startup companies by offering incubator space adjacent to its offices in the Coca-Cola building. No programming is offered, per se, but the Darden Venture Fellows and other students are available to assist the companies. This is distinct from i.Lab, the incubator for student companies, run by the Darden School.

SBIR/STTR

The Small Business Innovation Research (SBIR) program and its companion, the Small Business Technology Transfer Program (STTR), are two federal set-aside programs by which agencies that perform intermural research are required to award a small portion of their research awards to small businesses (generally less than 500 employees). With the STTR, the small business must be teamed with a university. Companies that win SBIRs and STTRs are generally research organizations or start-ups, since there is no matching requirement, and the awards are grants that do not have to be paid back. They are awarded competitively based on the quality of the science and on the potential for the technology to be commercialized and support the agency's mission.

These grants and contracts are awarded on a competitive basis for applied research, and are a way for early stage businesses to gain funding for science and technology-based research and development that may lead to commercialization. The grants and contracts have no equity implications, so they are widely considered as an

excellent source of early stage funding. Sources of equity, such as venture capitalists, look for SBIR/STTR funded companies to invest in because their technology has been vetted competitively.

In 2016, Virginia companies were awarded 245 grants and contracts under the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. The SBIR/STTR program is highly competitive, and companies whose researchers are skilled in writing grant applications are often at an advantage. Therefore, it is not surprising that 26 of the Region 9 SBIR/STTR winners in 2016 were in Albemarle County and Charlottesville, and that many are either prior winners and/or connected to UVA. There was one winner in Fauquier County.

The 2016 winners are listed below. Those with an asterisk were also winners in 2004-2011:

Companies	Number of Awards, 2016	Location	Also on 2004-2011 list
VLN Comm LLC	1	Charlottesville	
Barron Associates	10	Albemarle	*
BrightSpec	1	Charlottesville	
Directed Vapor Technologies	1	Albemarle	*
Hemoshear	2	Charlottesville	*
iHealthScreen	1	Charlottesville	
JKM Technology	1	Charlottesville	
Mikro System	1	Albemarle	*
PSIKick	1	Charlottesville	
Rivanna Medical	1	Charlottesville	
Soundpipe	1	Charlottesville	
Spire Innovations	1	Charlottesville	
SpringBok	1	Charlottesville	
Virginia Diodes	1	Charlottesville	*
Commonwealth Computer	1	Albemarle	*
Mission Secure	1	Charlottesville	
Forever Oceans	1	Warrenton	

Source: http://www.sbir.gov

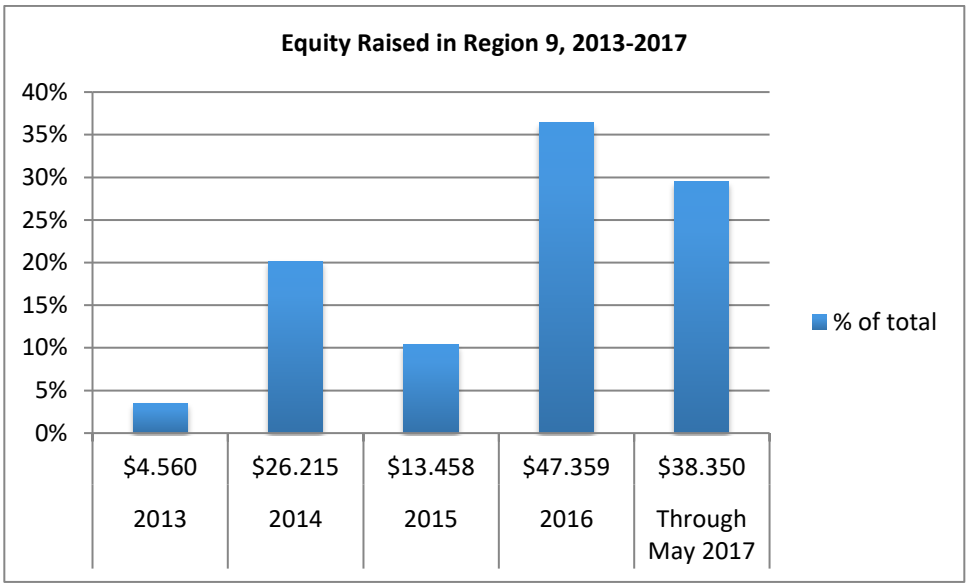
Equity Raised

Venture capital, including in this case seed funding and angel investors, is a source of equity financing used by rapidly growing companies to accelerate their growth. While not all innovative companies succeed in getting venture capital, or want to dilute their ownership by obtaining outside capital, the presence of venture capital denotes a company that outside investors find to be attractive, usually because of its technology, potential markets and management team.

Region 9 companies raised at least $129,942,000 through 53 funding events since 2011 (full list provided on following page), and have a total of $233,745,000 in equity to date. This likely understates the amount of equity raised, since numerous transaction details are not disclosed, nor are all angel deals included. 2016 was a very strong year with $47,359 million of financing announced, but $38,350 million has been announced through June 2017, promising to push over 2016 levels.

Company	Location	Sector	This Transaction (millions)	Type	Year	Total Raised (millions)
Xdynia	Charlottesville	Bio/Health	$ 0.213	Series A	2013	$ 0.265
Direct Spinal Technologies	Charlottesville	Bio/Health	$ 1.000	Seed	2013	$ 1.000
Phthisis Diagnostics	Charlottesville	Bio/Health		Acquired	2013	$ 1.170
WellAware Systems	Charlottesville	Bio/Health		Acquired	2013	$ 10.810
Lewis and Clark Pharma	Charlottesville	Bio/Health	$ 0.375	Venture	2013	$ 0.475
Adia Pharma	Charlottesville	Bio/Health	$ 2.630	Venture	2013	$ 6.730
LoveThatFit	Charlottesville	ICT	$ 0.067	Seed	2013	$ 1.050
LendPro	Charlottesville	ICT		Seed	2013	
NexGrid	Locust Grove	Other	$ 0.275	Venture	2013	$ 1.980
LumaCyte	Keswick	Bio/Health	$ 0.512	Seed	2014	$ 1.360
PluroGen Therapeutics	Charlottesville	Bio/Health	$ 0.153	Venture	2014	$ 3.650
Tau Therapeutics	Charlottesville	Bio/Health	$ 12.840	Venture	2014	$ 12.840
The Bully Tracker	Gainesville	ICT	$ 0.010	Crowdfunded	2014	$ 0.010
nPulse Technologies	Charlottesville	ICT		Acquired	2014	$ 2.950
Apex Clean Energy	Charlottesville	Other	$ 12.700	Debt	2014	$ 10.020
Neoantigenics	Charlottesville	Bio/Health	$ 2.540	Venture	2015	$ 2.540
Gene Solutions	Charlottesville	Bio/Health	$ 0.640		2015	$ 0.647
Provazo	Charlottesville	Bio/Health	$ 0.090	Seed	2015	
iTi Health	Crozet	Bio/Health	$ 0.450	Seed	2015	$ 0.450
TearSolutions	Charlottesville	Bio/Health	$ 3.000	Series A	2015	$ 3.390
SpotTrot	Charlottesville	ICT	$ 0.500	Seed	2015	$ 0.500
Borrowing Magnolia	Charlottesville	ICT	$ 0.118	Convertible Note	2015	$ 0.118
Tap Tap LLC	Charlottesville	ICT	$ 0.295	Seed	2015	$ 0.295
TypeZero Technologies	Charlottesville	ICT	$ 0.415	Debt	2015	
Private Practice	Charlottesville	ICT		Seed	2015	$ 0.415
Social Safeguard	Charlottesville	ICT	$ 3.860	Venture	2015	$ 3.860
Privaris	Charlottesville	ICT		Acquired by Apple	2015	
BrightSpec	Charlottesville	Other	$ 1.550	Venture	2015	$ 1.550
LocusHealth	Charlottesville	Bio/Health	$ 4.000	Series B	2016	$ 7.150
Hemoshear Therapeutics	Charlottesville	Bio/Health		Venture	2016	$ 11.750
Rivanna Medical	Charlottesville	Bio/Health	$ 3.000	Venture	2016	$ 3.250
Mission Sense	Charlottesville	ICT	$ 2.070	Venture	2016	$ 2.070
Relay Foods	Charlottesville	ICT		Acquired	2016	$ 13.350
Moonlighting	Charlottesville	ICT	$ 2.300	Venture	2016	$ 4.200
Regatta Travel Solutions	Charlottesville	ICT		Acquired	2016	$ 0.345
Borrowed & Blue	Charlottesville	ICT	$ 7.000	Series A	2016	$ 10.100
Center for Open Science	Charlottesville	ICT	$ 7.500	Grant	2016	n/a
Intensity Analytics	Warrenton	ICT	$ 5.000	Venture	2016	$ 8.500
Be Healthy Solutions	Charlottesville	ICT	$ 1.900	Venture	2016	$ 1.900
VividCortex	Charlottesville	ICT	$ 4.500	Series A	2016	$ 7.170
Perrone Robotics	Charlottesville	ICT		Seed	2016	
ChartIQ	Charlottesville	ICT	$ 4.000	Series A	2016	$ 4.850
Foodio	Charlottesville	Other	$ 0.589	Seed	2016	$ 0.585
Columbia Power Technologies	Charlottesville	Other	$ 5.000	Convertible Note	2016	$ 5.000
MadiDrop	Charlottesville	Other	$ 0.500	Debt	2016	$ 0.500
Hemosonics	Charlottesville	Bio/Health		Acquired	2017	$ 17.290
Stay AtHome Personal Care	Charlottesville	Bio/Health		Acquired	2017	
Cavion	Charlottesville	Bio/Health	$ 26.100	Series A	2017	$ 26.100
Contraline	Charlottesville	Bio/Health	$ 2.250	Seed	2017	$ 2.930
Travel Triangle	Charlottesville	ICT	$ 10.000	Series B	2017	$ 19.900
OpenQ	Charlottesville	ICT		Acquired	2017	$ 8.000
Gencia, LLC	Charlottesville	Bio/Health		Closed		$ 5.730
Hotelicopter	Charlottesville	ICT		Acquired and closed		$ 5.000

Source: crunchbase.com.

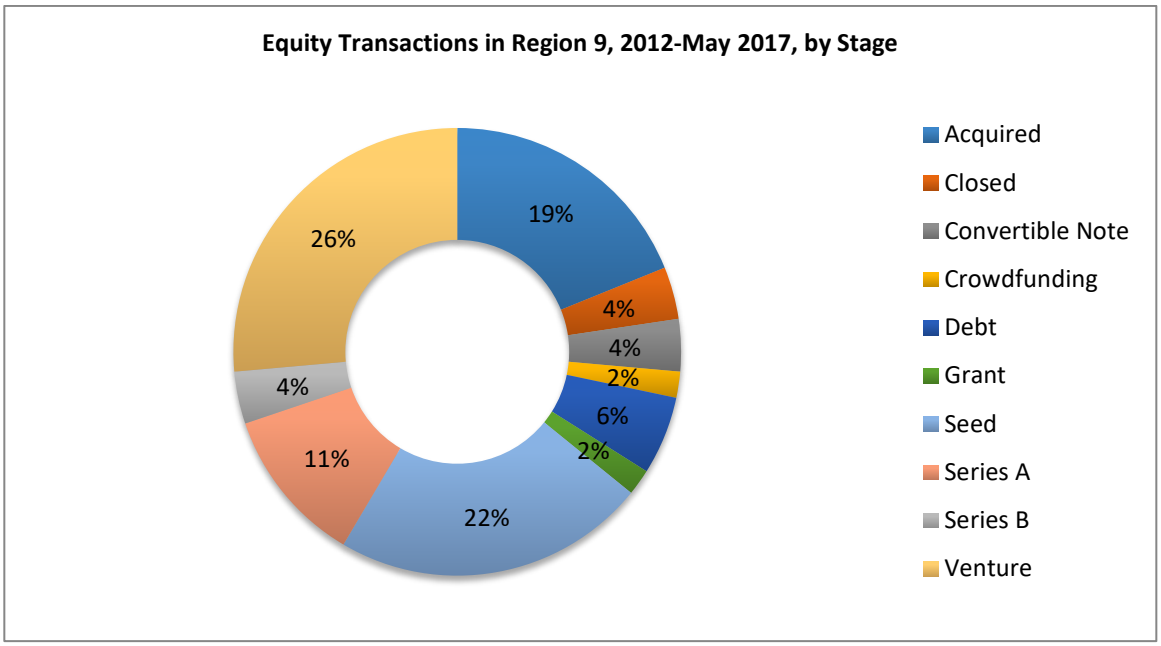


Source: crunchbase.com.

Of these equity infusions, 46% were in the biomedical/life sciences, and 38% in information and communications technology. Biomedical/life sciences included: healthcare, biotechnology, medical devices and pharmaceuticals. Information and communications technology included: E-commerce, Internet and social media, network security and applications in healthcare, analytics, and financial analytics (FinTech).

Many of the companies that received financing were in their later stages of development, a sign of the maturation of the Region 9 equity and entrepreneurial markets. Nineteen percent of the deals were acquisitions, and 15 percent were Series A or B rounds. Twenty-six were venture, compared to 22% for seed rounds.

All but two of the 53 companies receiving equity were in the Greater Charlottesville MSA, reflecting the concentration of venture-funded companies throughout the county. A complete list of the transactions is shown below.



Source: crunchbase.com.

Source: crunchbase.com.

Patents Awarded

The U.S. Patent and Trade Office (USPTO) lists inventors by their home addresses and requires patent applications to list the individual inventors. If, as a result of their employment relationship, a patent is actually owned by an inventor's employer, the usual practice is to assign the patent to the employer. This is most often a company or university, or several entities, if the patent lists several inventors.

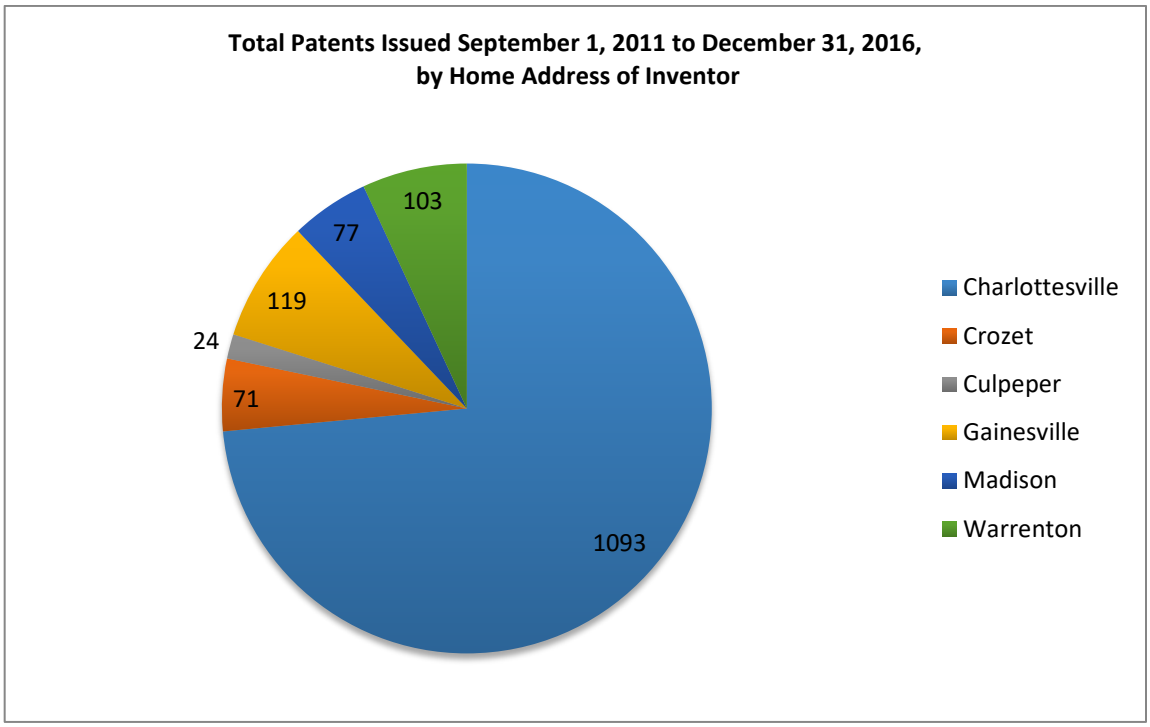
It is important to note that patent analysis is only one indicator of knowledge production, as some new knowledge is protected by trade secrets, trademarks, or not at all. We also note that not all patents are innovations, because they are not brought to market. However, patents are commonly used as a proxy for the invention of new knowledge, as any patent must be unique, non-obvious and new.

Patent intensity in Region 9, measured by patents awarded in 2016 per 1000 population in 2016 is 1.55, compared to 0.397 for Virginia and 1.038 for the US as a whole.

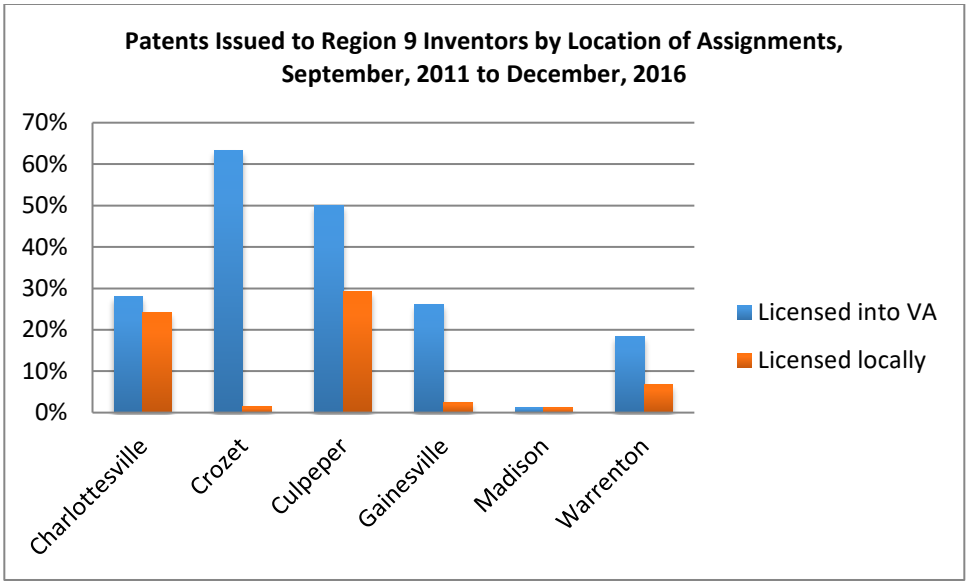
Between September 1, 2011 and December 31, 2016, 1487 patents were issued[12] to inventors residing in Region 9. Of these, 1093 included inventors who resided at a Charlottesville address and 71 at a Crozet address. The rest were spread among the other larger towns in the region.

Nearly 28 percent of the patents were assigned to companies with headquarters in Virginia, and 18.9% were assigned to companies in the same place as the inventor. The latter is often an artifact of an employment relationship; 165 of the patents in Charlottesville and Crozet, for instance, are assigned to the University of Virginia. Some companies with locations in Region 9 are headquartered elsewhere, and this likely accounts for the larger percent assigned out of state.

[12] This was a limited review of patents in Region 9. For a more complete analysis, refer to the 2012 Target Markets Study.



Source: US Patent and Trademark Office, www.uspto.gov.



Source: US Patent and Trademark Office, www.uspto.gov.

In 2011, a similar analysis showed that patents had been assigned to twenty-one companies or organizations in the region. We reviewed the list to see which had also patented in the 2012-2016 timeframe. Those still active are listed here. (Some of these companies may have subsequently moved or closed.) The intent of this list is to show the patent activity only.

Location	Organization	Number of Patents Assigned September 1, 2011-December 31, 2016	Sector
Charlottesville City	Adenosine Therapeutics	1	Pharmaceuticals
	Hemoshear	2	Pharmaceuticals
	Hemosonics	5	Biomedical
	INOVA Solutions	1	IT
	National Optronics	5	Biomedical device
Albemarle County	Barron Associates	2	R&D, IT, Complex systems
	Biotage USA	1	Analytic Chemistry
	Diffusion Pharmaceuticals	7	Pharmaceuticals
	GE Intelligent Platforms (now GE Automation and Controls)	15	IT
	Lighthouse Instruments	1	Instruments for biomedical and pharmaceutical manufacturing
	MicroAire Surgical Instruments	3	Biomedical devices
	Mikro Systems	24	IT, sensors, data analytics
	Privaris (subsequently licensed to Apple)	10	Biometrics, IT
	University of Virginia	165	Various
Greene County	Aker Wade Power Technologies	1	Power conversion
	Ashbury International Group	15	Firearms

To better understand the technologies in Fauquier County, we looked deeper into patents assigned to Warrenton inventors. Of the 103 patents issued between September 2011 and December 2016, 7 stayed in Warrenton and 12 were in Northern Virginia. Most were technologies related to aerospace or information technology. Notable assignees (likely resulting from employment relationships and reflecting commuting patterns) are:

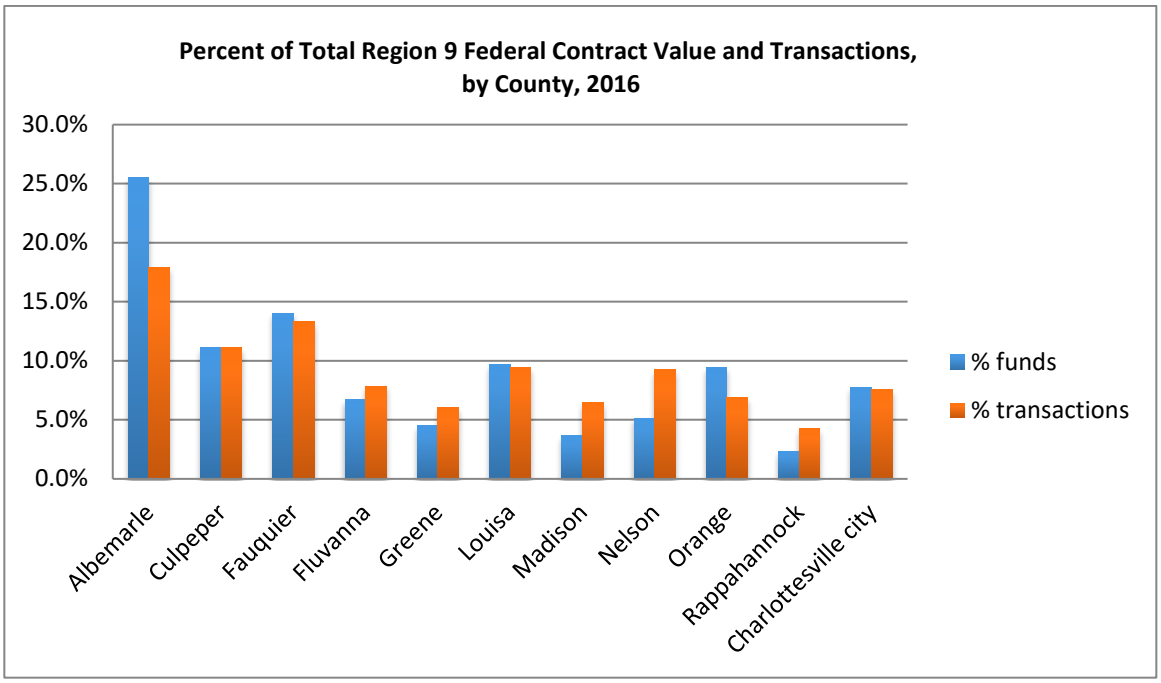
- ExxonMobil, 23 patents assigned (there was a Fairfax County R&D location until 2014)
- DEKA, 13 patents assigned
- BAE systems, 10 patents assigned (Northern Virginia locations in McLean and Arlington)
- Raytheon, 5 patents assigned. (Northern Virginia locations in Sterling and Arlington).

Federal Locations and Contracts

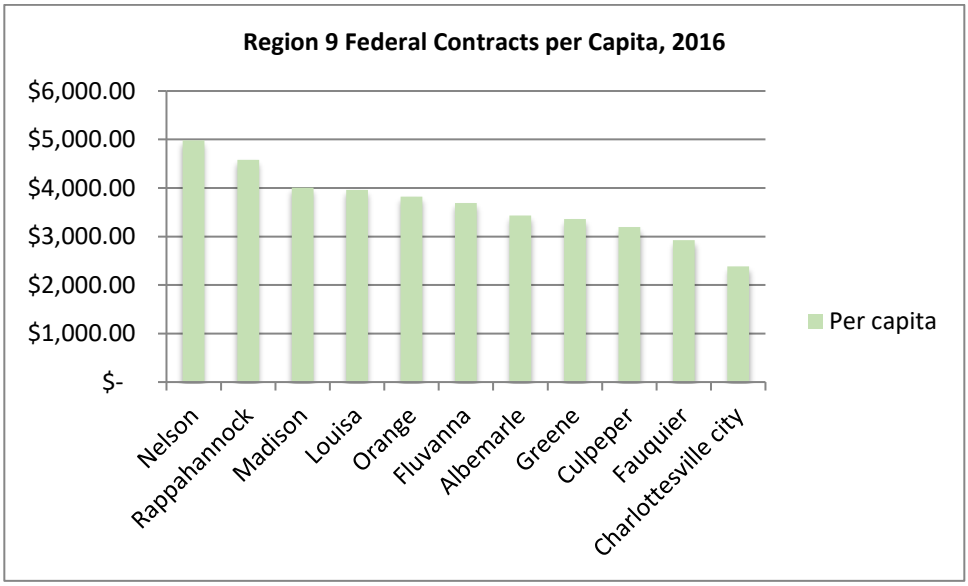
As noted in the 2011-12 Thomas Jefferson Partnership for Economic Development *Regional Existing and Target Industry Analysis*, there are several federal facilities in Region 9 including the Federal Executive Institute, National Ground Intelligence Center and Defense Intelligence Agency in Charlottesville and the Library of Congress National Audio-Visual Center in Culpeper. While these facilities contribute to the highly educated workforce, they are not sources of innovation because of their missions.

Due to the proximity to Washington, DC and the federal government, Virginia and Region 9 are home to many firms that have federal contracts. This is significant for innovation when those contracts are for research and development, product development, or help a firm become established and grow.

In 2016, firms in Region 9 were awarded $1,438,754,672 in federal contracts, or $3,388 per capita. Albemarle County led the region both in percentage of the total value of the contracts and in the number of transactions, followed by Fauquier County and Culpeper County. On a per capita basis, Nelson County and Rappahannock County had the largest total contract value in 2016.



Source: usaspending.gov.



Source: usaspending.gov.

The National Institutes of Health (NIH) is a significant source of research and development funding for life sciences, often leading to innovations in biotechnology and medical devices. The University of Virginia and its spin-off companies received over $100,000,000 in NIH funding in FY2017, far exceeding the amounts received in any other region of the Commonwealth. The recipients were:

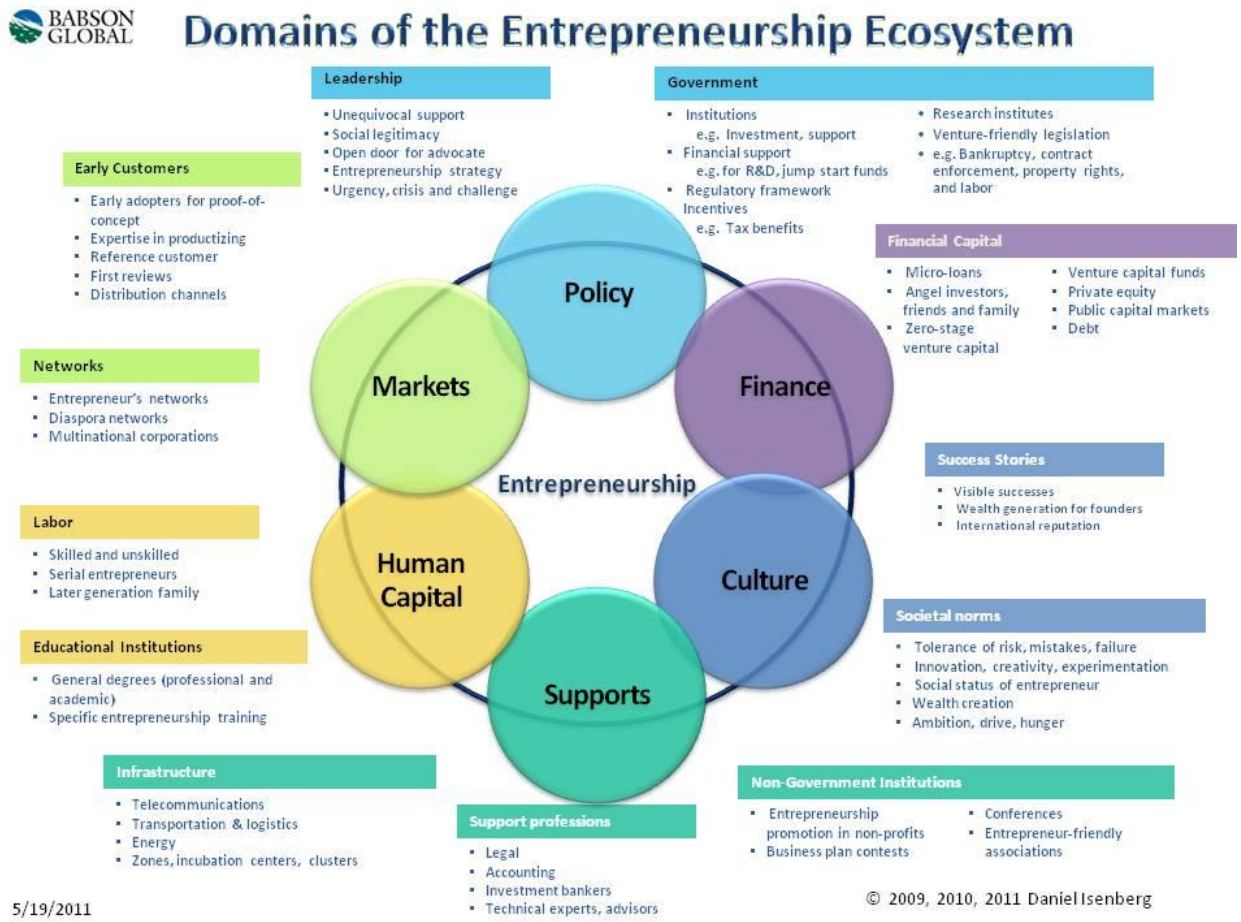
Organization	Awards	Funding	Location
Barron Assocaites	3	$1,077,489	Charlottesville, VA
Hemoshear Associates	1	$781,186	Charlottesville, VA
Indoor Biotechnologies	1	$776,237	Charlottesville, VA
Rivanna Medical	1	$704,777	Charlottesville, VA
University of Virginia	244	$98,254,017	Charlottesville, VA

Source: NIH

Entrepreneurial Ecosystem

An entrepreneurial ecosystem is the set of activities, linkages and interactions that support entrepreneurs in a region, and helps grow new companies. The density and completeness of the ecosystem are related to increased success among its entrepreneurs; missing pieces of the ecosystem can slow or derail entrepreneurial activities. This is particularly difficult in more rural regions where the lack of critical mass can make it even more difficult to start and grow companies than it is in regions with more resources.

This image, created by Daniel Isenberg, founder of the Babson College Entrepreneurial Ecosystem Project, shows the elements of an entrepreneurial ecosystem.



This illustrates why rural regions are at a disadvantage. Because of lower populations and density, local markets (for early adoption of new products and services), networks and labor can be less available in a rural area than in a larger metropolitan setting. Some infrastructure and other support services may be less available, and the culture may be less tolerant of risks. Capital may be less available, and local policy structures may not be supportive.

Region 9 has made steps to counteract these challenges, however progress is uneven. In the Charlottesville/Albemarle County part of the region, many parts of the ecosystem are robust, while the ecosystem is less developed in Fauquier County and sparse in the other Region 9 counties.

For instance, the Charlottesville/Albemarle County part of the region has a denser population, and so there is more of a local market for entrepreneurial products and services, as well as a larger pool of talent to pull from for employees.

The University of Virginia is contributing by training undergraduates and graduate students in entrepreneurship not only through the McIntire School of Commerce (undergraduate entrepreneurship minor) and the Darden School of Business, but also through programs in the School of Engineering (Technology Entrepreneurship Program). The McIntire entrepreneurship minor is now open to students in all of the schools.

Darden's programming is quite significant, including:

- #1 ranked faculty by Entrepreneur Magazine and the Princeton Review (2008, 2009, 2011).
- #5 entrepreneurship program in the U.S. by the Princeton Review (2013).
- Over $1 million in entrepreneurship scholarships awarded annually
- i.Lab Incubator and makerspace
- More than 35 academic courses (electives) in entrepreneurship and innovation.
- Large portfolio of co-curricular entrepreneurial activities, all funded by the Batten Endowment.
- Four major entrepreneurial competitions (including concept and business plan competitions) awarding more than $370,000 annually.
- Venture Capital bootcamp.
- Student clubs include: Entrepreneurship and Venture Capital Club, Net Impact, Energy Club, Private Equity Club, Design and Innovation Club, Entrepreneurship and Innovations Committee and Technology Club.

The infrastructure in Charlottesville/Albemarle County is somewhat more supportive than the rest of the region. While very high speed broadband service is available, it is still considered expensive. And support structures, such as lawyers, accountants, and mentors, are more available in the southern part of the region, in part due to the existence of UVA and the talent that it attracts.

Infrastructure specific to entrepreneurs, on the other hand, is fragmented. While i.Labs is available for students and some community companies through a summer accelerator program, and some co-working spaces are available and three projects planned near the downtown mall, the existing Charlottesville Technology Incubator appears to be supporting only a small number of companies.

Non-governmental institutions, such as Charlottesville Business Innovation Council, exist, and are focused on startups, but sector organizations are small, or fledgling. Sources of capital are relatively strong for a region of this size. The Charlottesville Angel Network has invested over $3 million in the past two years, and CAV Angels, a group made up of UVA alumni, has made four investments to date.

As documented elsewhere in this report, UVA itself is a strong piece of the local ecosystem as a major source of ideas and innovations. And, the success of many of the UVA spin-off companies over the past decade by itself supports and encourages future entrepreneurs to try to do the same. Similarly, the diversity and creativity supported by a "college town" is also part of the supportive culture of this area.

In contrast, the rest of Region 9 has a thinner ecosystem. Markets and labor are less available, except in Fauquier County where the densely populated Northern Virginia suburbs are within reach. There are no major educational institutions teaching entrepreneurship in this part of Region 9, although George Mason University offers programs in nearby Fairfax County and has its biomedical campus in Prince William County. In Culpeper, the E-squared program supports business training for local high school students.

In this part of Region 9, the support organizations are few, and entrepreneurs and small business owners are likely using lawyers, accountants and other professional service providers either from Northern Virginia, Richmond or Charlottesville.

Fauquier County supports three small business centers, including the Mason Enterprise Center on Main Street in Warrenton and two small operations, one in Vint Hill and one in Marshall, that are essentially co-working spaces. The latter two are lightly used, while the Mason Enterprise Center is full and probably could grow. The Mason Enterprise Center exhibits the characteristics of an incubator, and also supports a small co-working space.

Throughout the Region, there are also Small Business Development Centers (SBDCs), although they are part of several distinct organizations because of the way SBDCs are run in Virginia. Each is staffed differently, and supports a large geographic area. The SBDCs provide much of the technical assistance available to entrepreneurs and small business owners that use the spaces in Fauquier County, and to others in the rest of the region.

Definitions:

Incubator: a facility that offers startup companies office/laboratory/manufacturing space, as well as technical assistance, access to capital, training, and events. Typically has screening for admission, regular progress milestones and graduation criteria.

Accelerator: a time-limited program, e.g. 12 weeks or 3 months, often provided for cohorts of companies, that provides technical assistance, mentors, advisors, coaches, training, with an event at the conclusion. Most accelerators offer grants or equity, either throughout the program, or as a prize at the end.

Co-working Space: a place where multiple individuals and companies share office space, often with broadband access, kitchens, conference rooms and other shared facilities. Most successful co-working spaces also provide space for community events and training programs to increase crosstalk and collaboration.

Makerspace: a place equipped with a variety of machines used to make things, often including machining, wood working, 3D printing, and the like, shared by members of the community for a fee.

Small Business: a company with a small number of employees. For the Small Business Administration, this can be less than 500 employees. In most communities, this means less than 50 employees, and often less than 10.

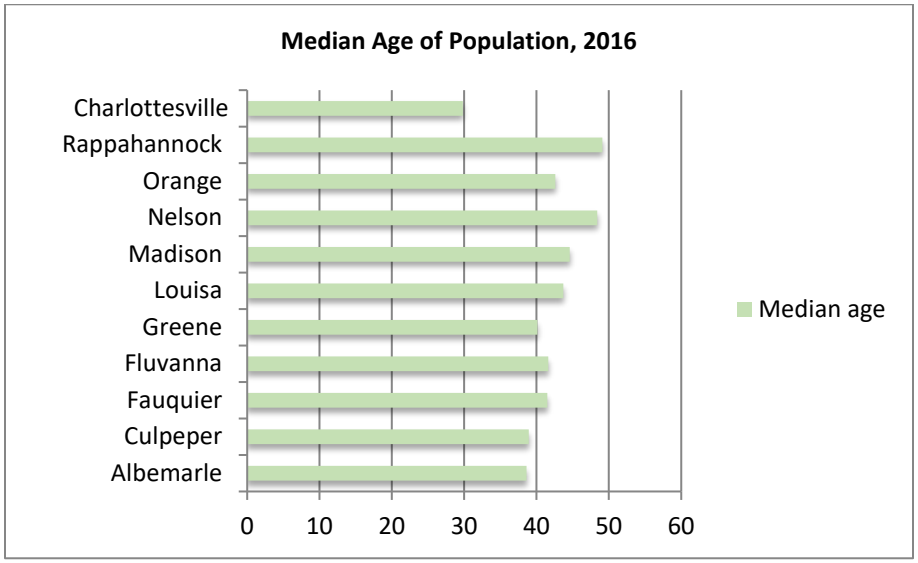
Entrepreneur: a founder of a company with a novel idea that intends to grow the company.

Innovation Culture

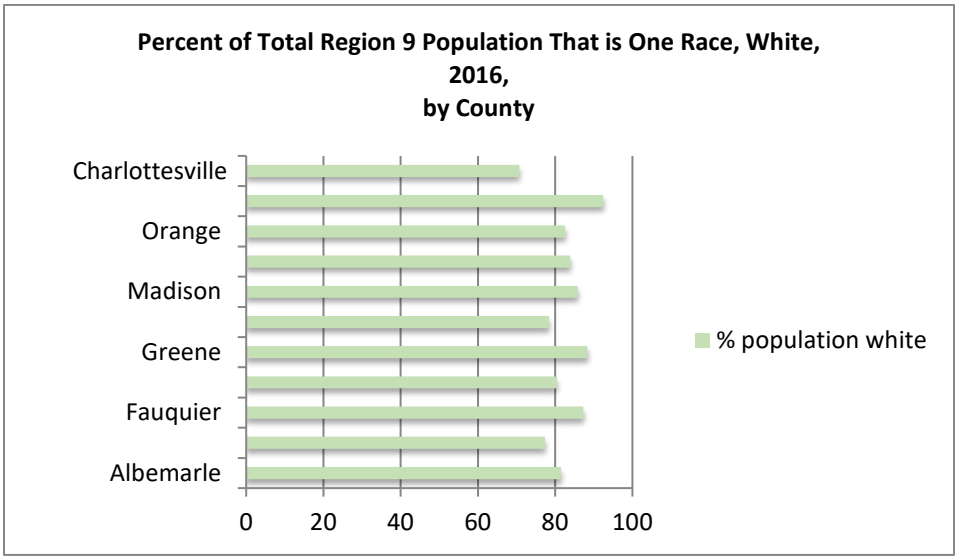
The culture of a place (or an organization) has been shown to directly impact the likelihood that creative and innovative ideas will emerge. Two measures that are often correlated with a supportive innovation culture in a place are diversity and creativity.

Here we measure diversity by looking at age, race and origin. The City of Charlottesville and Albemarle County exhibit more diversity, consistent with their higher innovation, creative occupations, educational attainment and high-tech employment.

With the exception of the City of Charlottesville, the counties in Region 9 have median ages between 38 and 49 years old. Also, with the exception of Charlottesville, Region 9 is between 77 and 92% white, demonstrating little diversity. Both Charlottesville and Albemarle County have relatively high populations of foreign-born residents, at 12.4% and 10.6% respectively, while the other counties range from 1.9% to 7.1%.

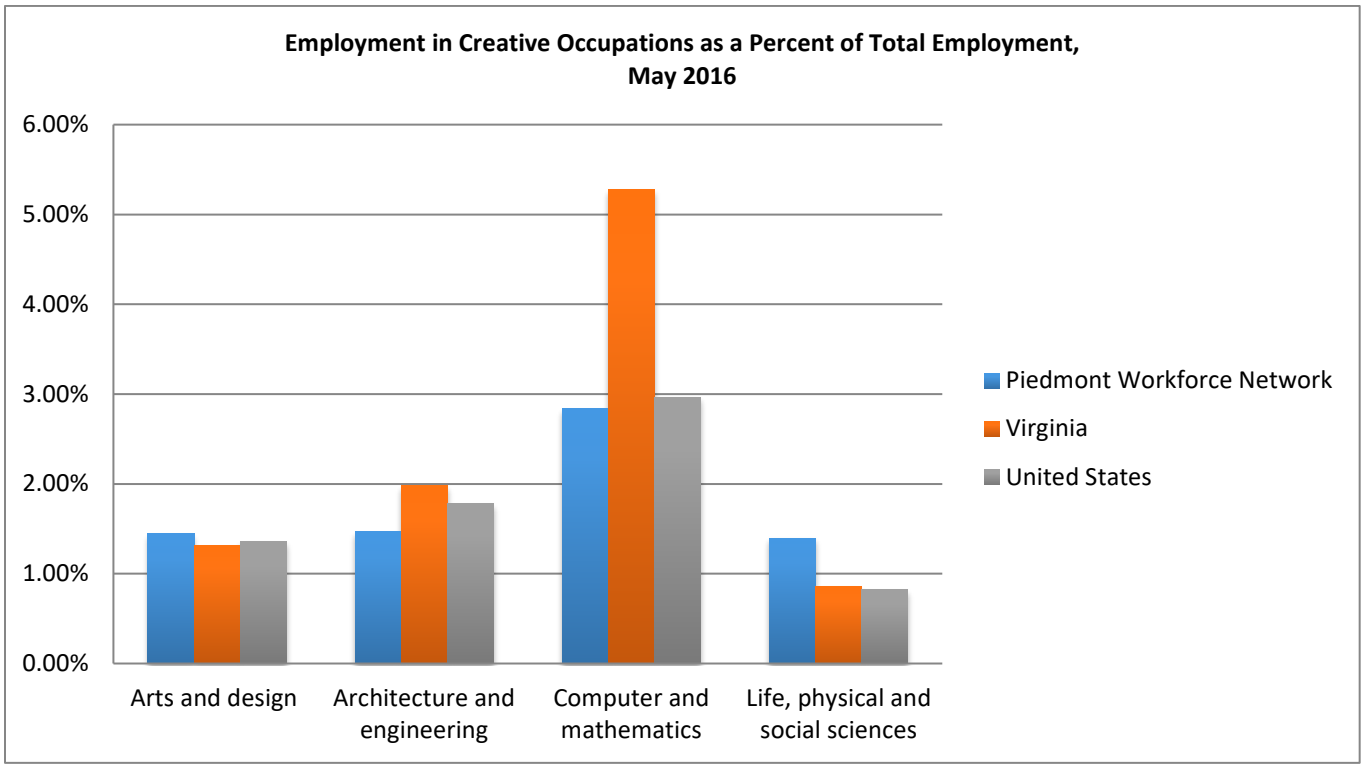


Source: US Census, American Factfinder, 2015 American Community Survey



Source: US Census, American Factfinder, 2015 American Community Survey

On the other hand, employment in creative occupations is relatively high in the area served by the Piedmont Workforce Network. Employment in this area for "Arts and design" and "Life, physical and social sciences" occupations is higher than both Virginia and the US, and "Computer and mathematics" occupations are close to the US level.



Source: Occupational Employment and Wage Rates (OES), May 2016, http://data.virginialmi.com

Best Practice

Introduction

One part of our analysis of the innovation and entrepreneurial characteristics of Region 9 is a comparison with five peer regions. Through this analysis, we learned more about how other high performing regions organize themselves to support innovation and entrepreneurship, especially the interactions between the anchor innovation assets and the surrounding business community.

To identify appropriate peer regions to study, we first looked at the characteristics of Region 9. The objective is to match the peer regions with Region 9 as closely as possible by relevant demographic, geographic and educational data points so that difference we can observe are likely to be from differences in their innovation and entrepreneurial policies and activities, rather than other characteristics.

Region 9 is made up of ten Counties: Albemarle, Culpeper, Fauquier, Fluvanna, Greene, Louisa, Madison, Nelson, and Orange, Rappahannock, and the City of Charlottesville. As of 2016, the total population is estimated at 417,300, with the largest population center in the south (Albemarle County and Charlottesville) with service center communities in Culpeper and Fauquier Counties. These two northern counties are also very close to the Washington, DC metropolitan area, and are within the commuting shed of the DC region. A major state route, US 29, is the thread that connects the region, running around 100 miles between DC and Charlottesville. In general, the region is largely rural, except in the northern counties.

The data for Region 9 used to compare the peer regions is shown below.

County	Population (2016 Estimate)	Percent of Population 25 or older with B.A. or higher	Percent Change in Employment, Dec 2015-Dec 2016
Albemarle	106,878	51.7	2.3
Charlottesville (City)	46,912	49.8	-1.3
Culpeper	50,083	21.9	-1.3
Fauquier	69,069	33.5	-0.4
Fluvanna	26,271	31.5	-4.7
Greene	19,371	23.7	1.9
Louisa	35,236	20.9	-6.4
Madison	13,078	23.2	-1.9
Nelson	14,869	28.2	-7.8
Orange	35,533	25.1	0.9
Rappahannock	7,388	35.1	2
Total	424,688		

Sources: Population: US Census, 2016 Estimates; Percent with BA: American Fact Finder, 2010-2015 American Community Survey, US Census. Change in employment: bls.gov.cew

From an innovation and entrepreneurship point of view, the key asset in Region 9 is the University of Virginia campus in Charlottesville, a public, research-intensive university that includes a medical school. In the Northern part of the region, there are several federal research assets. However, no other region will match the Washington, DC area for federal government presence.

We began by identifying other public, research-intensive universities that are located in rural areas within a two hour-drive of a major metropolitan area. We then noted those universities that also had a medical school, as this is significant for innovation.

Finally, we looked at the regions around these innovation assets for areas defined by the state or localities as an economic development region, to reflect local knowledge of economic activity. For these regions, we collected population and educational attainment data, to ensure that the regions had the same type of diversity as Region 9.

The resulting regions proposed as peers are:

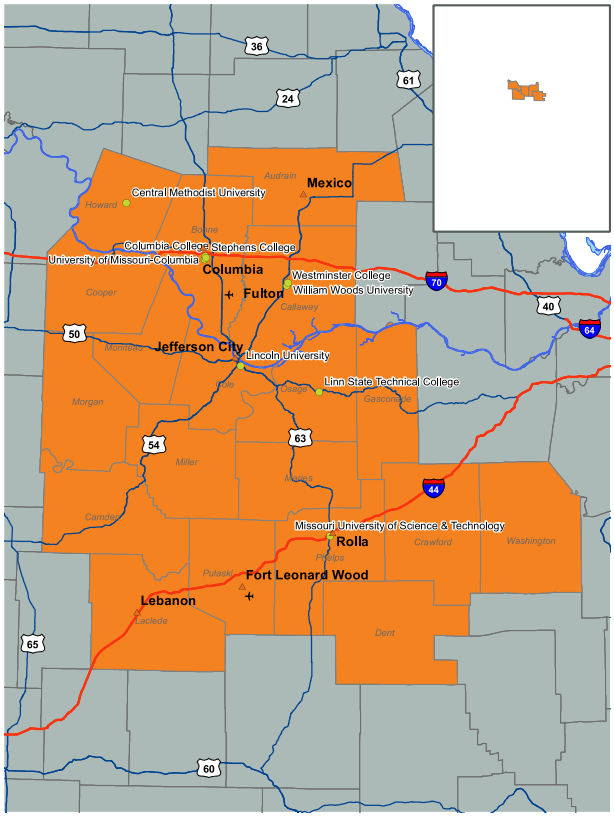
- Columbia/Jefferson City, Missouri
- Willamette Valley, Oregon
- East Central Region, Illinois
- Northeast Georgia
- West Alabama

All five are rural areas within 100 miles of a major metropolitan area (St. Louis, MO; Portland, OR, Indianapolis, IN, Atlanta, GA and Birmingham, AL, respectively) along a major transportation corridor. Each includes the home of a major state-funded, research university.

A brief profile of each peer is provided below.

Columbia/Jefferson City, Missouri

This region is located in the center of Missouri, astride I-70 between St. Louis and Kansas City. Columbia is the home of the University of Missouri, while Jefferson City is the state capital. Rolla, also in the region, is the home of the Missouri University of Science and Technology. This region is a little larger than Region 9 with a similar distribution of population and educational attainment. Key employment sectors include health innovation, information technology, financial and professional services, advanced manufacturing and ag-tech. (http://www.missouripartnership.com/regions-sites-incentives/regions/the-columbia-jefferson-city-region/)



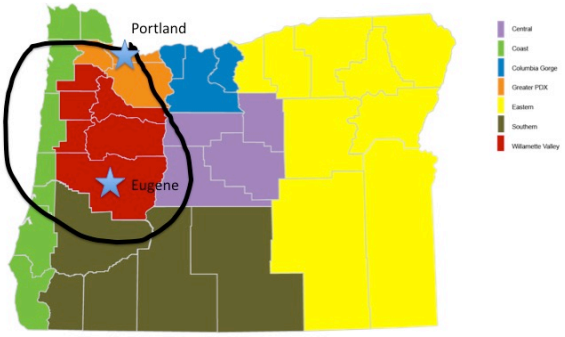
County	Population (2016 Estimate)	Percent of Population 25 or older with B.A. or higher	Percent Change in Employment, Dec 2015-Dec 2016
Boone	176,594	47.3	0.1
Calloway	45,078	20.4	0.5
Cole	76,631	31.6	2.4
Cooper	17,712	19.5	-1.9
Howard	10,058	24.2	0.5
Lincoln	55,267	14.8	1.8
Moniteau	16,018	18.1	-3.7
Montgomery	11,620	12.5	0.6
Warren	33,802	15.8	1.8
Total	692,638		

Sources: Population: US Census, 2016 Estimates; Percent with BA: American Fact Finder, 2010-2015 American Community Survey, US Census. Change in employment: bls.gov.cew

Willamette Valley, Oregon

Willamette Valley is a region in Oregon with Portland, OR just to the north, and Eugene, a population center and home to the University of Oregon, to the South. Located along the I-5 corridor, the region also has Corvallis and Salem in the center. A largely rural area, the Valley is in the west-central part of the state. The region is known for its rich agricultural heritage, including its wineries. The Willamette River runs the length of the Valley, with mountains on the east.

Willamette Valley, Oregon



County	Population (2016 Estimate)	Percent of Population 25 or older with B.A. or higher	Percent Change in Employment, Dec 2015-Dec 2016
Benton	89,385	29	0.9
Lane	369,519	17.2	2.2
Linn	122,849	12	2.9
Marion	336,316	14.5	2.7
Polk	81,823	18.1	0.6
Yamhill	105,035	14.9	0.3
Total	1,104,927		

Sources: Population: US Census, 2016 Estimates; Percent with BA: American Fact Finder, 2010-2015 American Community Survey, US Census. Change in employment: bls.gov.cew

East Central Region, Illinois

The East Central Region of Illinois is anchored by Champaign County and the City of Urbana, the home of the flagship campus of the University of Illinois. Located 124 miles west of Indianapolis, IN, along I-74, this is otherwise a largely rural region. It is also located about 90 minutes east of Springfield, IL, the state capital. The University has been selected by the Association of Public Land Grant Universities (APLU) to receive an Innovation and Entrepreneurship Designation, making this an interesting peer to study. The region is a designated Economic Development District (EDD) by US EDA, although other subsets of this region also perform economic development tasks. The region also is home to Fortune 500 companies such as Abbott, Archer Daniels Midland (ADM), Caterpillar, Deere & Company, Dow Chemical Company, IBM, State Farm, and Intel.

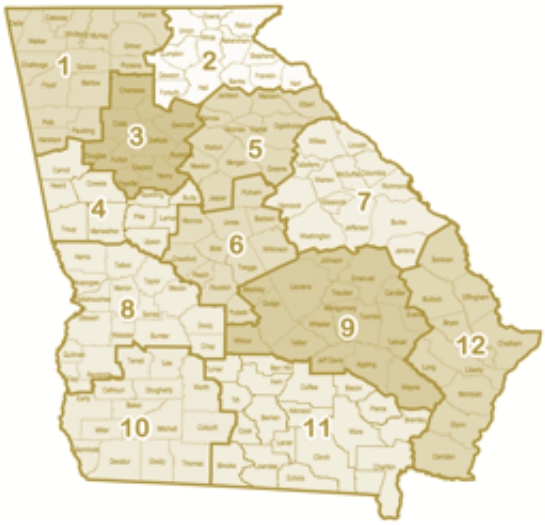
East Central Illinois

County	Population (2016 Estimate)	Percent of Population 25 or older with B.A. or higher	Percent Change in Employment, Dec 2015-Dec 2016
Champaign	208,419	43.4	0.8
Douglas	19,630	17.8	3.5
Ford	13,575	16.6	-0.2
Iroquois	28,334	15.3	-3.7
Piatt	16,560	27.6	1
Vermilion	78,111	13.8	-0.7
Total	364,629		

Sources: Population: US Census, 2016 Estimates; Percent with BA: American Fact Finder, 2010-2015 American Community Survey, US Census. Change in employment: bls.gov.cew

Northeast Georgia

The Northeast Georgia Region (Region 5 on the map below) runs from the edge of Metro Atlanta to the border of South Carolina. The region contains a unique mixture of urban, small town, industrial, and pastoral spaces. Athens-Clarke County, located toward the center of Northeast Georgia, is home to the University of Georgia, and makes up the region's central metropolitan core. Barrow, Jackson, Walton, and Newton counties have urbanized areas of their own as a result of their proximity to Atlanta and the major I-85 and I-20 interstate corridors. Elbert, Greene, Jasper, Madison, and Morgan counties contain small municipalities but remain considerably rural in character. According to their most recent CEDS (http://www.negrc.org), the region's industries are: "Education Services, Manufacturing, Health Care and Social Assistance, Construction, and sectors related to retail and services, such as Wholesale Trade and Transportation and Warehousing."

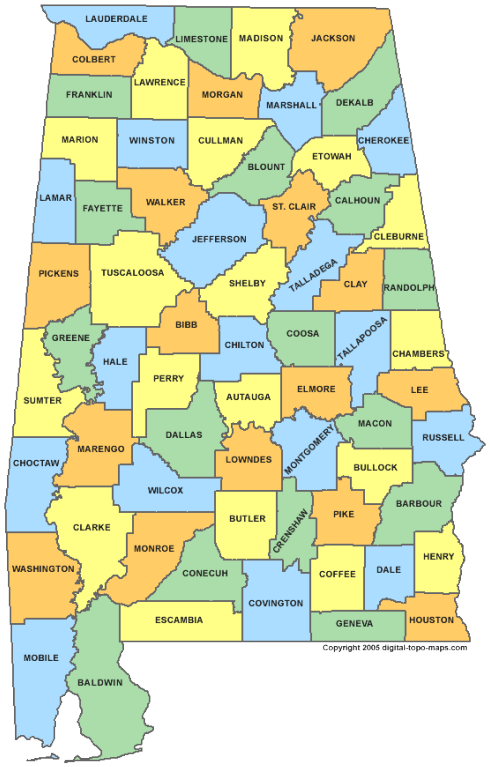


County	Population (2016 Estimate)	Percent of Population 25 or older with B.A. or higher	Percent Change in Employment, Dec 2015-Dec 2016
Barrow	77,126	16.5	-1
Clarke	124,707	40.2	2.2
Elbert	19,143	10.6	2.1
Greene	17,003	24.7	2
Jackson	64,615	19.2	8.8
Jasper	13,654	11.9	-0.3
Madison	28,824	15.6	2.9
Morgan	18,170	22.1	-1
Newton	106,999	20.2	1.9
Oconee	36,838	44.9	10.9
Oglethorpe	14,921	17.2	6.9
Walton	90,184	17.9	7.2
Total	612,184		

Sources: Population: US Census, 2016 Estimates; Percent with BA: American Fact Finder, 2010-2015 American Community Survey, US Census. Change in employment: bls.gov.cew

West Alabama

The West Alabama area is 50 miles southwest of Birmingham and 95 miles northwest of Montgomery, the state capital. Tuscaloosa is the largest city in the West Alabama area, and is home to the University of Alabama. The Medical School is located at the Birmingham campus. Downtown Tuscaloosa is in the midst of unprecedented amounts of growth in both the private and public sectors through multi-million dollar reinvestments, especially Tuscaloosa's Riverfront, which is experiencing a renewal with recreation trails, businesses, restaurants and the addition of the Tuscaloosa River Market. However, the region has been in a continuous process of recovery and rebuilding since an EF-4 tornado struck on April 27, 2011.



County	Population (2016 Estimate)	Percent of Population 25 or older with B.A. or higher	Percent Change in Employment, Dec 2015-Dec 2016
Bibb	22,643	10.6	-1.7
Fayette	16,546	14.1	2.6
Greene	8,422	10.9	-3.2
Hale	14,952	13.9	-2.8
Lamar	13,918	11.5	2.8
Pickens	20,324	9.9	0.4
Tuscaloosa	206,102	28.5	-0.1
Tuscaloosa City	99,543	34.6	n/a
Total	402,450		

Sources: Population: US Census, 2016 Estimates; Percent with BA: American Fact Finder, 2010-2015 American Community Survey, US Census. Change in employment: bls.gov.cew

Innovation and Entrepreneurship in Peer Regions

For each region, we describe how innovation and entrepreneurship are intertwined with broader economic development activities. We also identify any programs or initiatives that are unique and noteworthy.

Themes arising from this comparison include:

- For many universities, moving from a model of teaching, research and service to one that more explicitly includes economic development is a long-term evolution. Each of the universities highlighted here is in some stage of this evolution, with most having significant research, technology transfer, entrepreneurial support, and research commercialization activities.
- The places studied vary in the tightness of the connection between the university and local/regional economic development, with most having a greater relationship in the university's home community and diminishing impact in rural communities farther away.
- The areas vary considerably in their attention to the issue of inclusion, with two explicitly and prominently seeking to extend economic prosperity to all of its citizens, regardless of their location (urban and rural), and actively seeking ways to connect the poorest to better jobs, higher skills and more supportive neighborhoods. The issue of inclusion is one that is just coming to prominence in the technology community and for universities as well.
- The places studied that are doing better seem to have accomplished an integrated approach to economic development that embraces traditional business attraction as well as innovation and entrepreneurship support, workforce development, and place-making. Transportation, excellence in K-12, arts and culture all play a part in the approach.
- Two of the places have made significant investments in broadband, and two have focused on air service, both essential infrastructure for a knowledge-based or creative economy.

Columbia/Jefferson City, Missouri

The area identified as a peer to Region 9 is served by two distinct economic development entities. Regional Economic Development, Inc. (REDI) serves Columbia and Boone Counties. This part of the area has a strong economy rooted in education, research, healthcare, life sciences and high-tech industry. In 2016, Entrepreneurship Magazine called Columbia, MO one of the 15 best cities for entrepreneurs to live and launch.[13]

REDI's strategy includes significant support for entrepreneurship with its own REDI Innovation Hub, a co-working space with business counseling, mentorship and events. Other local entrepreneurship activities include:

- 1 Million Cups (a Kauffman Foundation program)
- Small Business Development Center, SCORE, and Women's Business Center, all funded by the US Small Business Administration with local match
- Missouri Innovation Center, a state-funded initiative, which is a 501c3 that supports a number of entrepreneurial activities including running the University of Missouri (MU) Life Sciences Incubator.
- Centennial Investors, a "mid-MO" angel network
- Mid-MO Accelerator Fund

[13] The other cities identified in the August 2016 list are: Boulder, CO; Austin, TX; Provo City, UT; Charlottesville, VA; Chapel Hill, NC; Ann Arbor, MI; Fargo City, ND; Columbia, MO; Fredericksburg, VA; State College, PA; Decatur, GA; Salt Lake City, UT; Minneapolis, MN; Alexandria, VA; and Orlando, FL.

- Mid-MO Technology Incubator
- Steven and Barbara Fishman Center for Entrepreneurship at Columbia College.

At the University of Missouri itself, entrepreneurship is overseen by the MU Office of Economic Development, and includes the Life Sciences Incubator, the MU Coulter Translational Partnership for Biomedical Innovation, the Mizzou Venture Mentoring Service, the Entrepreneurship Alliance and the Allen Angel Capital Educational Program for student investors.

The other part of the area is served by Missouri CORE, which describes the region as having "growth, innovation and cooperation." They support very diverse industries, but have targeted plant and animal sciences and data centers.

Unique among the peer regions, the 2016-19 Strategic Plan for Columbia, MO calls out inclusion as a critical issue. The plan notes that poverty is increasing in the region, but "profoundly in the Black community." As a result, the plan commits to:

- Attracting new businesses and expanding existing ones that pay a living wage;
- Creating a work-ready community to address skill gaps;
- Expanding air access and building a new terminal;
- Community-specific neighborhood enhancement strategies;
- Lower crime rates and increased satisfaction with policing;
- Expand infrastructure and transit with focus on walkable and bikeable areas.

Willamette Valley, Oregon

Like Region 9, this area is comprised of two distinct areas. The northern part of the Valley is served by Strategic Economic Development Corporation (SEDCOR) and is a manufacturing and logistics center focused on Salem, OR. It is a low-cost location for businesses with a significant tourism and agricultural economy. Innovation and entrepreneurship are not part of their vision for their area.

In contrast, the southern part of the area encompasses Corvallis-Benton County and Eugene-Lane County. In Benton County, innovation is a key attribute, with a focus on sectors such as clean technology, advanced materials, food, water and environment, creative industries, healthcare, biomedical development and pharmaceuticals. Corvallis is the home to Oregon State University, but also has emerging interests in tree and nut farming and food manufacturing.

Lane County itself is focused on rural prosperity, and supports "smart growth in small towns and rural communities," rather than innovation and entrepreneurship per se. On the other hand, Eugene, as the largest city in Lane County, is touting its EUGNet, a municipally owned high-speed fiber network scheduled to be implemented in 2018, and a Vertical Housing Development Zone, a 10 year property tax exemption for mixed use development.

Lane County, Eugene and Springfield, another municipality in the County, worked together on a 2010 Regional Prosperity Economic Development Plan, and a recent update highlights some activities of interest:

- Working with University of Oregon (UO) on workforce development
- Attracting the Technology Association of Oregon to open an office in Eugene
- New service to airport from San Jose, CA
- Working on key facilities for Food and Beverage industry
- Broadband deployment

- Downtown redevelopment and urban renewal
- Creative economy

The creative economy work is managed by a coalition of organizations that includes UO, through the Regional Accelerator and Innovation Network (RAIN). RAIN includes an entrepreneurial hub (space), the Eugene Library Makerspace, Smartups, Williamette Angel Conference, Startup Weekend, FertiLab (incubator) and RAIN@UO for students. UO's work is centralized through the VP for Research and Innovation and includes undergraduate research programs, partnerships with industry and other strategic initiatives.

East Central Region, Illinois

This region of Illinois, especially the area around Urbana and Champaign County, is very focused on its place as one of the top startup cities in the Midwest[14]. The region touts its urban living lifestyle, affordability, educational quality (including its K-12 schools), farmer's markets and entertainment options. It also is proud of its diversity, and notes that the University of Illinois, Urbana-Champaign has the highest number of international students of all public US universities. Significantly, the region has gigabit broadband throughout and public Wi-Fi available in the downtown core.

In the broader region, the quality of life including outdoor recreational activities, historical sites, museums and food-related assets such as wineries are touted, alongside the technology assets at the University. The region supports a FabLab and MakerLab, in addition to the University-related entrepreneurial assets.

A big part of the employment base for the region is the University and especially its Research Park, which has both startups and Fortune 500 and Fortune 100 companies located there. The Association of University Research Parks named the Research Park@UI, Research Park of the Year in 2011. The Park has 15 buildings, housing 100 companies with 1711 employees. Its annual economic output is valued at $319 million (July 2015).

The University's EnterpriseWorks incubator, opened in 2003, is located in the Park, and is a "significant bridge" between the university and university-related startups. Inc. Magazine named it one of the Top 3 College Town Incubators. An important statistic is that 62% of the startups stay in Champaign County and 77% remain in the state.

The University of Illinois, Urbana-Champaign sees its core mission as incorporating economic development and innovation, specifically the commercialization of technology. This is likely why it has been awarded the Innovation and Economic Prosperity University designation by the Association of Land-Grant Universities.

The Vice President of Economic Development and Innovation (VPEDI) has as his responsibilities to "protect, fund, support and launch ideas," and actively supports innovation clusters in the region. Under the VPEDI are a number of activities including technology transfer, corporate development, and Illinois Ventures, a seed and early-stage investment firm that invests in companies that are based on innovations licensed from the University. The VPEDI also oversees the Technology Entrepreneurship Center for students, providing course, venture funding, product competitions, etc.

Northeast Georgia

This region stretches from the Atlanta suburbs to Clark County, the home of the University of Georgia (UGA). The local economic development group describes the area as a "center for arts, learning and cuisine, music capital, and

[14] Popularmechanics.com, 2015 listing. Other cities, in order, are: St Louis, MO; Asheville, NC; Oakland, CA; Portland, ME; Baltimore, MD; Holyoke, MA; Boulder, CO; Reno, NV; Des Moines, IO; Cleveland, OH; Urbana, IL; Queens, NY; Detroit, MI; and Austin, TX.

home to the University of Georgia and Athens Tech." The area has a diversified employment base with manufacturing companies, including major Fortune 500 firms, as well as startups.

The arts are a big focus, with an Arts Council and Film Athens, a new organization to attract filmmakers to the region. The area is highly ranked for music outside of LA, NY and Nashville.

Bio and health sciences are another focus, building on the strength of UGA and the local hospitals. The area is mentioned as the northern anchor of the "GA Innovation Crescent," and has been the recipient of significant investment by the state-funded Georgia Research Alliance that supports endowments for eminent scholars at UGA and other state institutions.

UGA's support for innovation and entrepreneurship is embodied in the Innovation Gateway, (formerly the Georgia Bioscience Commercialization Center), a program for university-related startups. Entrepreneurs in the region not in bioscience are supported through the SBDC and SBA.

West Alabama

The Chamber of Commerce of West Alabama supports local entrepreneurs and innovators as part of its economic development portfolio. They operate the EDGE business incubator and co-working center. In addition, with the University of Alabama College of Commerce and the City of Tuscaloosa, they operate the Center for Entrepreneurship and Innovation.

A significant activity is the Alabama Entrepreneurial and Research Network (AERN) that provides equipment, training, etc. to support small business and economic development in twenty rural, low-income counties, including all of West Alabama. AERN provides places with business resources, computers, software, libraries of business books, workshops, and seminars for potential business owners.

The University of Alabama sees its role as providing teaching, research and service, the traditional missions of land grant universities. However, the University also notes that it "promotes innovation, assists in business creation and growth and facilitates economic development by making the region and state attractive for business and industry location and expansion."

In addition to the programs mentioned above, the University supports the Alabama Innovation and Mentoring of Entrepreneurs (AIME) which helps faculty, staff and students create ideas and commercialize them, providing support on idea development, prototypes and business plans. The BAMA Tech Incubator houses four companies on campus and SMART groups provide a vehicle for university-based resources to engage with communities, individuals and companies by providing expert advice and technical assistance.

Site Location Analysis

Prepared by:

GLS Final Report: Appendix

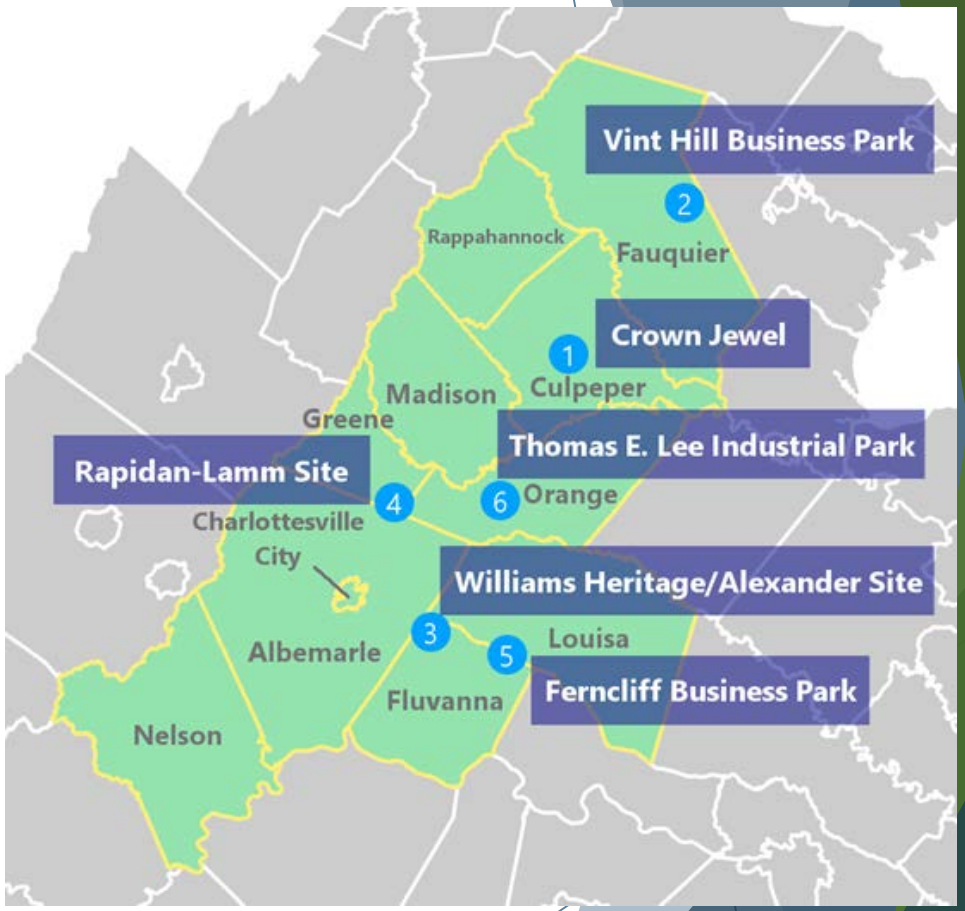
GO Virginia Region 9

Prepared for: GO Virginia Region 9 Council
Date: August 15, 2017

Sites Considered

- Culpeper County: McDevitt/Crown Jewel Site
- Greene County: Rapidan-Lamm Site
- Fauquier County: Vint Hill Business Park
- Fluvanna County: Williams Heritage / Alexander Site
- Louisa County: Ferncliff Business Park
- Orange County: Thomas E. Lee Industrial Park

Region 9 Site Locations Identified from Preliminary Screening



camoin associates

Site Overviews

	McDevitt/Crown Jewel	Vint Hill	Williams Heritage/ Alexander	Rapidan-Lamm Center	Ferncliff Business Park	T. E. Lee Industrial Park
County	Culpeper	Fauquier	Fluvanna	Greene	Louisa	Orange
City	Culpeper	Vint Hill	Troy	Ruckersville	Louisa	Orange
Ownership	Four owners	Single owner, Vint Hill Village LLC	Two owners, Williams Heritage LLC and Charles Alexander IV et al	Single owner, Lamm Properties LLC	Single owner, Ferncliff LLC	Lot 5A – Single owner, Orange EDA Lot 10 – Pierce Hardy LP
Site Size	155 acres	4 parcels of approx. 80+ acres	157 acres	65 acres, VDOT ROW splits site	125 acres	Lot 10: 24.8 acres Lot 5A: 8 acres
Topography	Moderately sloping	Relatively flat/slightly rolling	Moderately sloping	Relatively flat	Relatively flat/slightly rolling	Relatively flat/slightly sloping
Zoning	Industrial and Rural	Planned Commercial Industrial District	Agricultural	Business (General, B-2)	Industrial & Commercial	Industrial (I-2)
Phase I	Not completed	Completed	Not completed	Not completed	Completed, no RECs	Completed for Lot 5A, not completed Lot 10
Wetlands	Delineation not completed. Likely stream in center/southern portion of site.	Delineation not completed. Stream in middle of Lot A and in between K2 and A	Delineation not completed. Wetlands likely located on eastern and western boundaries, center of site.	Delineation not completed	Delineation completed (TBD)	Delineation not completed
Electricity Supply	Served by Rappahannock Electric Coop, adjacent substation has 50MW excess capacity	Served by Northern Virginia Electric Coop	Served by Central Virginia Electric Coop, existing line intersects site.	Served by Rappahannock Electric Coop with 34.5 kV and 12.5 kV onsite.	Served by Central Virginia Electric Coop, with three-phase and 110 kV onsite.	Served by Dominion Power
Natural Gas Supply	Distribution line onsite	Distribution line onsite	Four miles to Transco/Williams pipeline.	One mile to Columbia Gas transmission line	3-4 miles to Columbia Gas transmission line	2-3 miles to Columbia Gas interstate pipeline
Water Service	Service onsite, 1 MGD available	Service onsite	Onsite by 2019	Service onsite, 200k gpd excess system capacity	Service onsite, 1.25 MGD excess system capacity	10” main on site. 200,000 GPD available
Wastewater Service	Adjacent to treatment facility, 1-2 MGD available	Service onsite	Onsite by 2019	Service onsite	Service onsite	Service onsite
Telecommunications	Service onsite	Service onsite	Service onsite	Service onsite	Service onsite	Service onsite
Surrounding Uses	Wastewater treatment center, community college	Residential, FAA	Female correctional facility, mobile home park	Residential	Light industry	Light industry, sparse residential

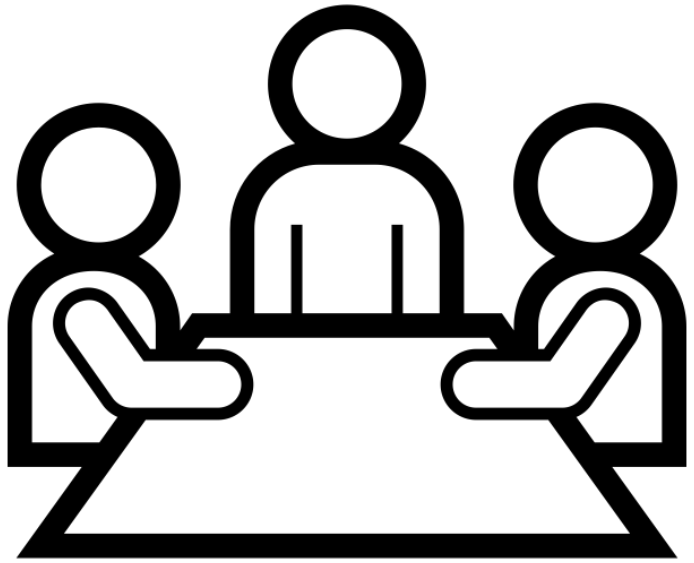
camoin associates

Must / Asset Analysis

- *Site characteristics meet general must requirements.*
- *Site characteristics are marginal (or need more due diligence) for general project must requirements.*
- *Site characteristics do not meet general must requirements.*

	McDevitt/Crown Jewel	Vint Hill	Williams Heritage/ Alexander	Rapidan-Lamm	Ferncliff	T. E. Lee
Ownership	Four owners	Single owner, Vint Hill Village LLC	Two owners, Williams Heritage LLC and Charles Alexander IV et al	Single owner, Lamm Properties LLC	Single owner, Ferncliff LLC	Lot 5A – Single owner, Orange EDA Lot 10 – Pierce Hardy LP
Adequate Zoning	Industrial and Rural	Planned Commercial Industrial District	Agricultural	Business (General, B-2)	Industrial & Commercial	Industrial (I-2)
Environmental Conditions	Phase I not completed	Phase I completed	Phase I not completed	Phase I not completed.	Phase I completed	Phase I completed on Lot 5A, not completed for Lot 10.
Wetlands	Delineation not completed	Delineation completed- all anticipated impacts permitted	Delineation not completed	Delineation not completed	TBD	Delineation not completed but minimal to no wetlands expected
Electricity Supply	Rappahannock Electric Cooperative: 50MW	Northern Virginia Electric Cooperative: Capacity Sufficient according to EDO (supporting documentation not provided to GLS)	Not On-site. Central Virginia Electric Cooperative substation less than 0.5 miles away	Rappahannock Electric Cooperative: 34.5 KV. Unknown capacity.	Central Virginia Electric Cooperative (CVEC): 110 KV. Unknown Capacity	Dominion Virginia Power is provider, capacity available is TBD
Natural Gas Supply	Distribution line onsite	Distribution line onsite	Williams Gas transmission line 2.2 miles away, no infrastructure onsite	Columbia Gas' interstate pipeline is within 1 mile. Approved for tap.	Columbia Gas transmission line 4 miles away, no infrastructure onsite	Columbia Gas transmission line 2-3 miles away, no infrastructure onsite
Water Service	Town of Culpeper: 1MGD available	Buckland WSA: Capacity Sufficient according to EDO (supporting documentation not provided to GLS)	Not On-site. Fluvanna County: 250,000-500,000 available by 2019	Rapidan Service Authority: 200,000 GPD 1 million gallon tank on-site.	Louisa County Water Authority: 20" line, 1.25 MGD in excess capacity.	Infrastructure onsite, 200,000 GPD excess capacity
Wastewater Service	Town of Culpeper: 1-2 MGD Available	Vint Hill Wastewater Treatment Plant and Fauquier County Water and Sanitation Authority: Capacity Sufficient according to EDO (supporting documentation not provided to GLS)	Fluvanna County: 10" line, unknown capacity	Rapidan Service Authority: 14" line. 400,000 GPD	Louisa County Water Authority: Force main, 400,000 GPD in excess capacity.	Rapidan Service Authority.: Unknown Capacity

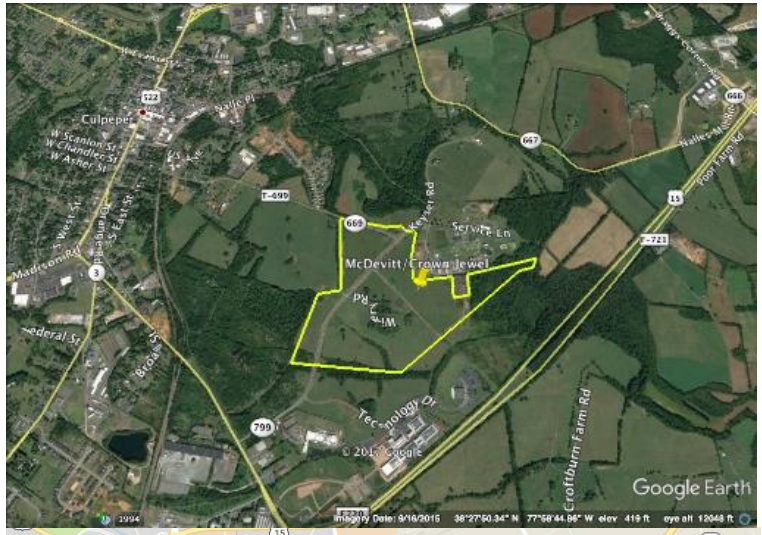
camoin associates

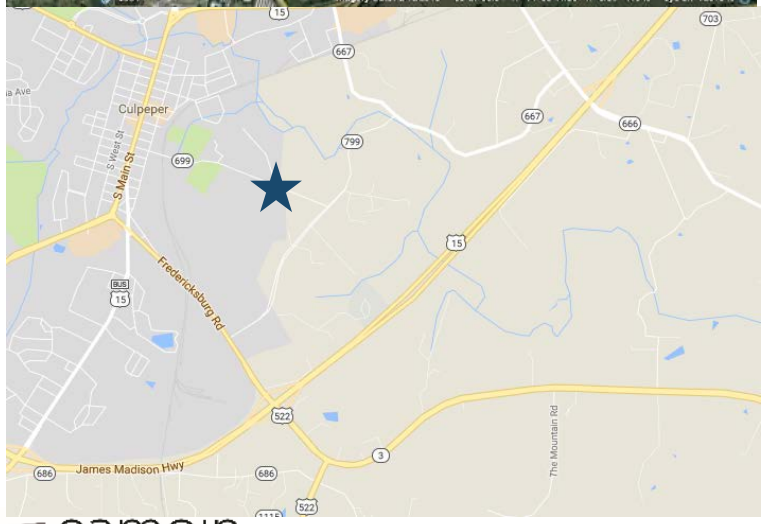


Culpeper County

camoin associates

Site Profile
McDevitt/Crown Jewel





Criteria	Description
General Information	• **Site Name**: McDevitt/Crown Jewel • **City:** Culpeper • **County**: Culpeper
Site	• **Total Size**: 155.4 acres • **Ownership**: Four individual owners • **Floodplain:** Outside 100-year floodplain • **Surrounding Uses**: Agricultural, wastewater treatment center, Germanna Community College • **Nearby Companies:** Equinix (data center), SWIFT (encrypted messaging service) • **Other Site Development Concerns:** Planned road to provide additional access to Germanna Community College would effectively split the site.
Environmental / Zoning	• **Air Permitting**: Site is in attainment for all pollutants. • **Zoning:** 24 acres zoned industrial, remainder of site zoned rural • **Wetlands:** Delineation has not been completed. Apparent wetlands on site located near southwestern portion of property. • **Phase I ESA:** Not completed
Utilities & Services	• **Industrial Water:** On-site through Town of Culpeper. 1 MGD available through a 12” line. • **Industrial Wastewater:** Adjacent to Town of Culpeper Water Pollution Control Facility (WPCF). 1-2 MGD Available. • **Electric**: Served by Rappahannock Electric Cooperative with sub-station adjacent to site. Approximately 40 MW available. • **Natural Gas**: Columbia Gas, distribution line on-site.
Logistics	• **Interstate/Highway:** 1-95, 31 miles away and approximately 40 minutes • **Rail**: No rail onsite • **Deep Water:** Port of Virginia, Newport News 169 miles away • **Distance to Commercial Airport:** CHO: 39 miles, 45 minutes from site. IAD: 57 miles, 80 minutes from site. • **Access to Site:** Site is accessed by McDevitt Drive, located less than a half mile off of US 29.

camoin associates

SWOT McDevitt/Crown Jewel

Strengths

- ✓ Gas, electric, water, and wastewater are already on-site or adjacent to the site.
- ✓ Located close to population center, Town of Culpeper.
- ✓ Established road access.

Weaknesses

- ✓ No due diligence studies (Phase I ESA, etc.) completed.
- ✓ 30+ minutes to interstate (I-95).

Opportunities

- ✓ Current excess electrical capacity is over 40+ MW in adjacent substation.
- ✓ High likelihood that site will be rezoned.

Threats

- ✓ Portion of the site has to be rezoned from its Rural designation. Rezoning can draw contention from local residents
- ✓ Depending on user, close proximity to waste water treatment facility may be an impediment due to look and/or smells.
- ✓ Future planned access road to Germanna Community College needs to be further addressed, as it could impede potential development plans.
- ✓ Apparent wetlands onsite. Proper delineation needed to determine site developability.

camoin associates

Site Industry Profile Competiveness Assessment
McDevitt/Crown Jewel

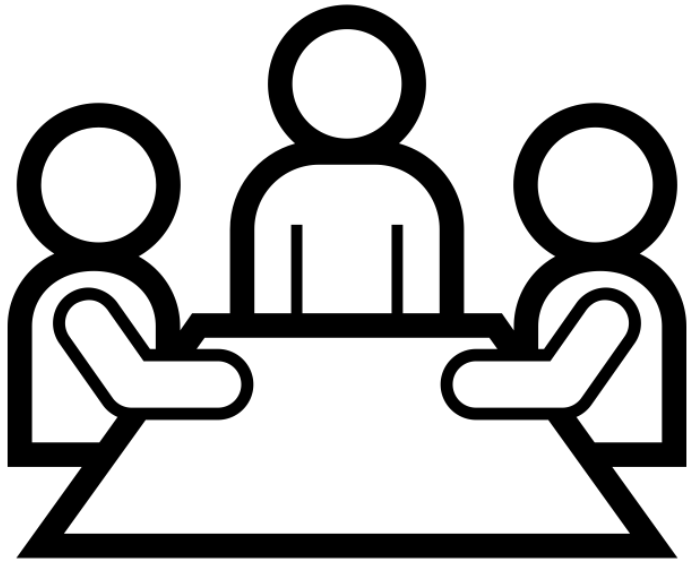
Industry Sector	Competitiveness	Comments
IT/ Communications	High	Site is well suited for a data center or similar type operation. Proximity to fiber, extensive electric capacity, available water capacity, and location of site all contribute to making this area an optimal spot for facility in this industry.
Biomedical/ Biotechnology	Low	Industry would not be a good fit due to lack of synergies with surrounding neighbors.
Finance/ Business Services	Low	Industry would not be a good fit due to lack of synergies with surrounding neighbors. Additionally this sector would not be the best use considering available infrastructure.
Food and Beverage Manufacturing	Moderate	Existing infrastructure, size of site, and access to Hwy 15 would generally allow for this type of industry, but the surrounding users in the park, along with nearby neighbors, do not promote this type of use.
Light Manufacturing	High	Of the sites considered, this is one of the few sites that has all utilities (water, wastewater, natural gas, and electricity) onsite, making it well positioned for a variety of industries. Additionally, the layout and topography of the site would suggest that multiple users with a small footprint would be a better fit than one user with a large footprint need.

camoin associates

Site Improvement Action Items
McDevitt/Crown Jewel

Task Item	Priority	Anticipated Cost	Comments
Rezoning	High	TBD	Rezoning the site prior to a company selecting this location will alleviate any perceived risks. By proactively changing the zoning designation it communicates to potential users the community's desire to attract a specific industry to this site. Since land owners are rightfully concerned with tax increase, perhaps some creative incentive can be established to offset increase in costs.
Phase I	High	$10-20k	A completed Phase I will eliminate any risk associated with unknown environmental issues.
Wetlands Delineation	Moderate	$10-15k	There is a high likelihood that wetlands exist onsite. A wetlands delineation will confirm the presence of wetlands and a plan can be established to remediate them if necessary. A delineation helps to alleviate any perceived risks with possible wetlands.
Preliminary Geotechnical Study	Moderate	$5-15k	Though geotechnical information is generally known for the area, soil conditions can change dramatically over a few hundred feet. A preliminary geotechnical report will help define soils of the area and help eliminate any perceived risk.
Option Sites	Moderate	TBD	Control of sites will allow for economic developers to communicate to prospects their ability to transact the property at an established price.

camoin associates



Fauquier County

camoin associates

Site Profile
Vint Hill

Criteria	Description
General Information	• **Site Name**: Vint Hill • **City:** Vint Hill • **County**: Fauquier
Site	• **Total Size**: Land bays A, J, K2 and K1 total 80+/- acres. Land bay A is 45 acres, J is 12 acres, K2 is 17 acres, and K1 is 6 acres. • **Ownership:** Vint Hill Village, LLC • **Floodplain:** Outside 100-year flood plain • **Surrounding Uses**: Commercial, Industrial, Government • **Nearby Companies:** OVH (cloud computing), Potomac TRACON (FAA), Old Bust Head Brewery • **Other Site Development Concerns:** Depth of water table.
Environmental / Zoning	• **Air Permitting**: Attainment • **Zoning:** Planned Commercial Industrial Development (PCID) • **Wetlands:** Potential wetlands on Parcel A, delineation complete, all anticipated impacts permitted • **Phase I ESA:** Completed
Utilities & Services	• **Industrial Water:** Water on site. Buckland WSA. • **Industrial Wastewater:** Sanitary sewer through Vint Hill Wastewater Treatment Plant and Fauquier County Water and Sanitation Authority • **Electric**: Northern Virginia Electric Cooperative (NoVEC) • **Natural Gas**: Columbia Gas, exists in park.
Logistics	• **Interstate/Highway:** I-66 is 8 miles away, I-95 is 35 miles away, I-495 is 30 miles away • **Rail**: Not available • **Deep Water:** Port of Virginia, Newport News Marine Terminal. 156 miles, 2 hours and 45 minutes., Inland Port of Virginia is 20 miles away • **Distance to Commercial Airport:** IAD: 28 miles, 32 minutes. • **Access to Site:** Sites accessible via a number of roads off of Highway 215, approximately 1.5 miles from US 15.

SWOT Vint Hill

Strengths

- ✓ Attractive location and community with easy access to D.C. market.
- ✓ Existing water, sewer, electric, and natural gas infrastructure within the park.
- ✓ Multiple access points into site with existing road infrastructure.
- ✓ Easy access to Interstate 66.
- ✓ Phase I competed.

Weaknesses

- ✓ High wage area may prevent certain industries from considering community.
- ✓ Preference for 'smart industry' will limit flexibility of industries that will fit within the site.
- ✓ Stream exists through Lot K2 and Lot A.

Opportunities

- ✓ The "missing link" road section, will make road access easier for all sites within the park.
- ✓ Other industries in park have expressed interest in pursuing greywater as an option for industrial processes.
- ✓ Dark fiber to be brought into community by 2018.

Threats

- ✓ Large, neighboring residences may be oppositional to new development or specific types of industries.
- ✓ Likely wetlands on Lot A.
- ✓ Depth of water table may impact construction costs and timeline.

camoin associates

Site Industry Profile
Competitiveness Assessment
Vint Hill

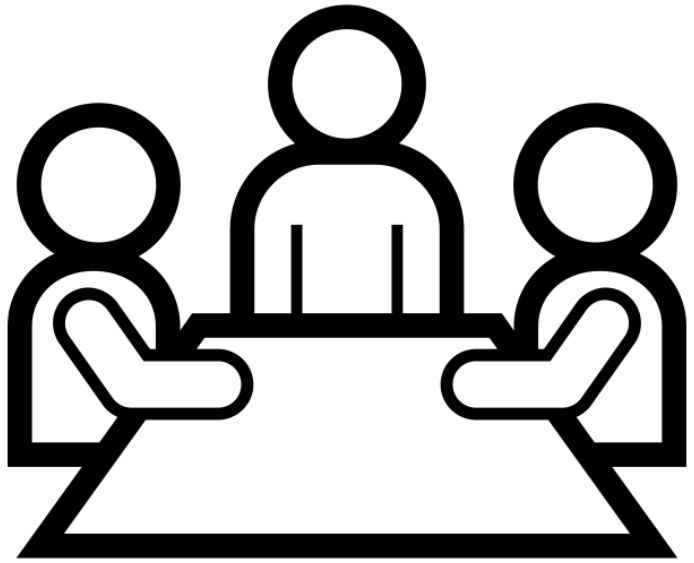
Industry Sector	Competitiveness	Comments
IT/ Communications	High	Dark fiber will be accessible from the site within six months to a year. Site is currently home to OVH data center and FAA TRACON facility as well as Northrop Grumman. Existing capacity to serve 20+ MW of electrical needs to be better understood.
Biomedical/ Biotechnology	Moderate	Though the site and the industrial park generally have the infrastructure and surrounding uses that could support a biomedical type of facility, this type of operation should not be a primary target for the park. The general area of Vint Hill lacks the synergies and resources generally needed to support a biomedical project.
Finance/ Business Services	High	Proximity to DC, existing industry in the park, available infrastructure, and the community of Vint Hil position these sites as being primary targets for companies within this sector.
Food and Beverage Manufacturing	Low	Even though there is a brewery within the park, general food processing or manufacturing would not be a good fit for the industrial park due to proximity to residential and other uses within the park.
Light Manufacturing	Moderate	Infrastructure and site size are adequate for general light manufacturing operations, but the surrounding residential neighbors, along with the current occupants in the park, do not make this industry a good fit for the site.

camoin associates

Site Improvement Action Items
Vint Hill

Task Item	Priority	Anticipated Cost	Comments
Preliminary Geotechnical Study	Moderate	$5-15k	Though geotechnical information is generally known for the area, soil conditions can change dramatically over a few hundred feet. A preliminary geotechnical report will help define soils of the area and help eliminate any perceived risk. A Preliminary geotechnical report will also establish the water table, which is a perceived risk of the site.
Establishment of a Site Readiness Fund	Moderate	TBD	Develop a site readiness fund for future development and preparation of the sites to include items such as site clearing, site grading, utility extensions, access roads, signage, signaling, etc.

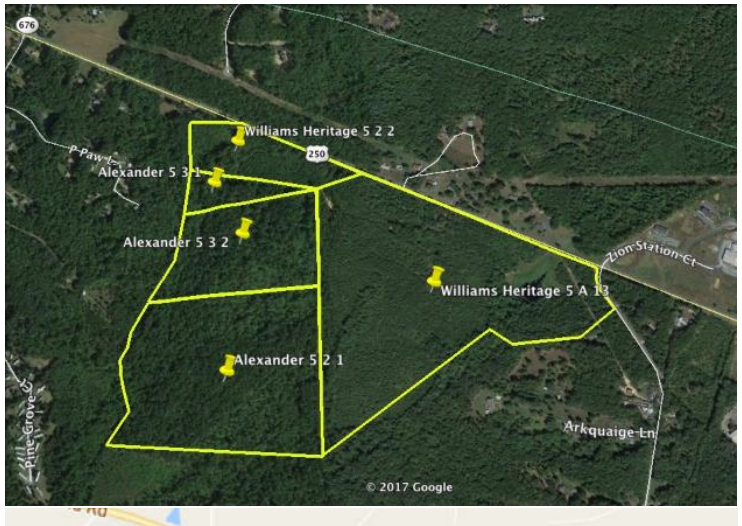
camoin associates

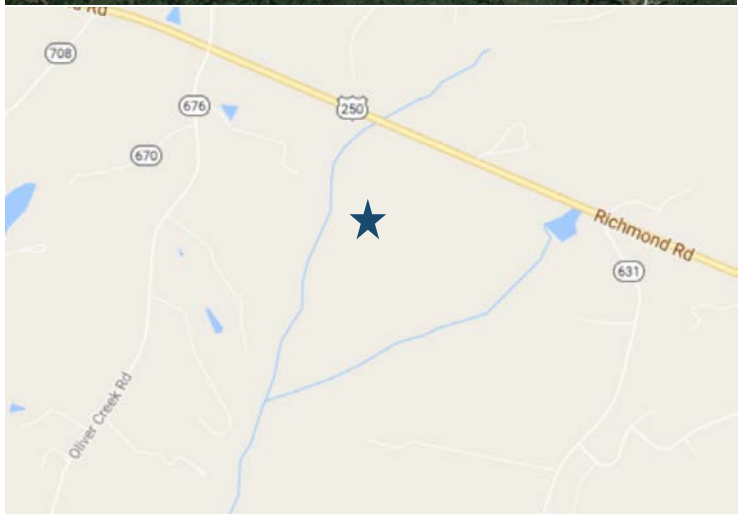


Fluvanna County

camoin associates

Site Profile
Williams Heritage/ Alexander





Criteria	Description
General Information	• **Site Name**: Williams Heritage / Alexander • **City:** Troy • **County:** Fluvanna
Site	• **Total Size**: 156.8 acres • **Ownership:** Two owners for five parcels • **Floodplain:** Unknown • **Topography:** Over 100 feet of elevation change over entire site. • **Surrounding Uses**: Commercial, Industrial, Residential • **Nearby Companies:** NA • **Other Site Development Concerns:** Property is heavily wooded with minimal clearing.
Environmental / Zoning	• **Air Permitting**: Attainment • **Zoning:** A-1: Agricultural. Property is located within Fluvanna's Urban Development Area for high growth rate. • **Wetlands:** Apparent wetlands on-site, no assessment completed. Likely wetlands located along eastern and western borders of site, as well as center of property. • **Phase I ESA:** Not Completed
Utilities & Services	• **Industrial Water:** Not on-site. Fluvanna County is working with Louisa County. Site will have 500,000 GPD by 2019. • **Industrial Wastewater:** A 10" Fluvanna County wastewater line is located 2500' away. • **Electric**: Central Virginia Electric Cooperative substation less than 0.5 miles away. • **Natural Gas**: No infrastructure onsite. 2.2 miles to Williams transmission line.
Logistics	• **Interstate/Highway:** I-64, 2 miles away • **Rail**: Not feasible • **Deep Water**: Norfolk International Terminals (NIT), 145 miles, 150 minutes. • **Distance to Commercial Airport:** CHO: 25 miles, 40 minutes. IAD: 98 miles, 2 hours • **Access to Site:** Site has access available from Highway 250, Two miles from I-64

camoin associates

SWOT Williams Heritage/ Alexander Site

Strengths

- ✓ Highway frontage on Hwy 250 and easy access to I-64 and Charlottesville area.

Weaknesses

- ✓ No site clearance has been completed.
- ✓ Lack of water, wastewater, and natural gas infrastructure onsite to service potential industry.
- ✓ No due diligence studies completed.
- ✓ Multiple owners of property.
- ✓ Significant elevation change across site.

Opportunities

- ✓ Raw nature of the site allows for flexibility in terms of site shape and design. Access to interstate, size of site, and surrounding neighbors allow this location to be a potential site for heavy industry.
- ✓ Upgrade of prison water treatment facility to supply potential 75k gpd additional capacity to system. Additional capacity to be added via Louisa County water project (via St. James River), current timeframe is that this capacity will be available in five years.
- ✓ Short term potential to borrow sewer capacity from Louisa county. Additional opportunity to upgrade prison wastewater treatment facility.

Threats

- ✓ Site flaws may exist that are not apparent due to the sites raw nature
- ✓ The site has to be rezoned from its “Agricultural” designation. Rezoning can draw contention from local residents.
- ✓ Route and cost to bring natural gas to site is unknown. Further due diligence required to understand this item as it will influence the decision to target heavy industry.
- ✓ Potential wetlands located on borders of property

camoin associates

Site Industry Profile
Competitiveness Assessment
Williams Heritage/Alexander

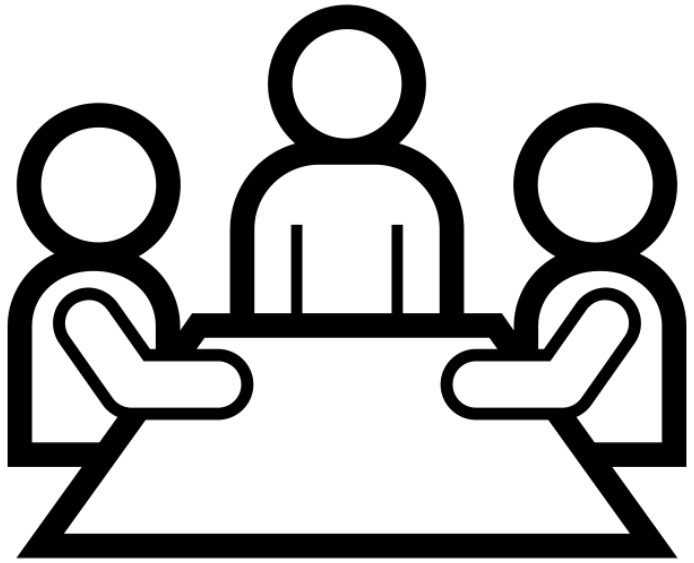
Industry Sector	Competitiveness	Comments
IT/ Communications	Low	Lack of onsite utilities and due diligence completed on the site make this a difficult location to attract a company in this industry. Additionally, the community and surrounding neighbors lack any synergy.
Biomedical/ Biotechnology	Low	Though proximity to Charlottesville is decent, the current characteristics of the site and the community do not make this a competitive location for the biomed industry.
Finance/ Business Services	Low	Community and surrounding industry, along with poor site characterization, make this a poor location for any company in this industry sector.
Food and Beverage Manufacturing	Moderate	Site's lack of readiness and characterization lead to the *Marginal* classification. However, further due diligence and extension (or plans for extension) of utilities will make this a more attractive location for this industry.
Light Manufacturing	Moderate	Site's lack of readiness and characterization lead to the *Marginal* classification. However, further due diligence and extension (or plans for extension) of utilities will make this a more attractive location for light manufacturing or even heavy industry.

camoin associates

Site Improvement Action Items
Williams Heritage

Task Item	Priority	Anticipated Cost	Comments
Engineering Studies	High	TBD	A clearer understanding is required to determine the actual cost and timelines associated with bringing adequate infrastructure to site. Coordination with all utilities can help to obtain cost savings and proper feedback on site being adequate for industry.
Tree Clearance	Moderate	TBD	Heavily wooded lots make it difficult for prospective clients to imagine their facility on that particular site. Even clearing off a portion of the site can prove beneficial in showcasing a piece of property. Prior to tree clearance it is important to determine if this site is actually the best parcel to develop for industry.
Phase I	Moderate	$15-20k	A completed Phase I will eliminate any risk associated with unknown environmental issues. Prior to Phase I being completed it is important to determine if this site is actually the best parcel to develop for industry.
Wetlands Delineation	Moderate	$10-15k	There is a high likelihood that wetlands exist onsite. A wetlands delineation will confirm the presence of wetlands and a plan can be established to remediate them if necessary. A delineation helps to alleviate any perceived risks with possible wetlands. Prior to delineation being completed it is important to determine if this site is actually the best parcel to develop for industry.
Preliminary Geotechnical Study	Low	$5-15k	Of all tasks being recommended, this would be the lowest priority

camoin associates

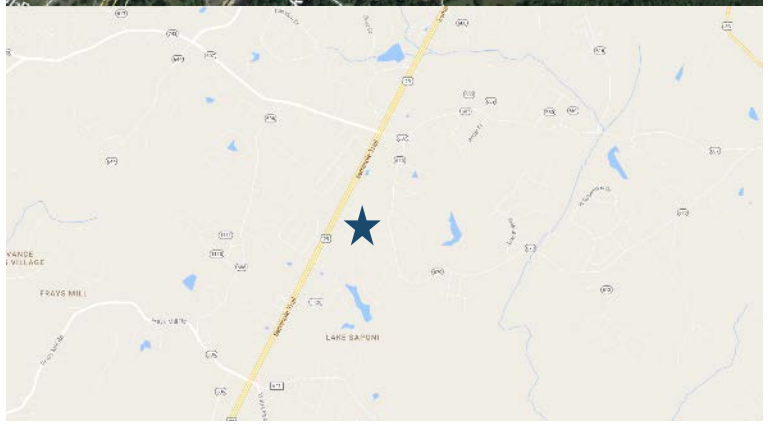


Greene County

camoin associates

Site Profile

Rapidan-Lamm Center



Criteria	Description
General Information	• **Site Name**: Rapidan-Lamm Center • **City:** Ruckersville • **County**: Greene
Site	• **Total Size**: 65 acres. Planned VDOT connector road would effectively split site into plots of 30 and 32 contiguous acres. • **Ownership:** Single owner, Lamm Properties LLC • **Floodplain:** Site is outside of 100 year floodplain. • **Surrounding Uses**: Apartment, Single Family Residential, and Retail • **Nearby Companies:** Sheetz (gas station), Food Lion, Holiday Inn
Environmental / Zoning	• **Air Permitting**: Located in attainment area for all pollutants • **Zoning:** B-2, business general • **Wetlands:** Delineation not completed, minimal to no wetlands anticipated. • **Phase I ESA:** Not completed
Utilities & Services	• **Industrial Water:** Municipal water is available on-site via Rapidan Service Authority. 12” line with 200,000 GPD available. There is a one million gallon tower on the property. • **Industrial Wastewater:** 14” Rapidan Service Authority wastewater line on-site with 400,000 GPD in capacity. • **Electric**: Onsite through Rappahannock Electric Cooperative. 34.5 KV lines with unknown capacity. • **Natural Gas**: Columbia Gas’s interstate pipeline is within a mile, with an approved decompression tap
Logistics	• **Interstate/Highway:** I-64 is 16 miles away. US 29 is adjacent to site. • **Rail**: No rail onsite • **Deep Water:** Norfolk International Terminals (NIT) is 169 miles, 2 hours and 40 minutes from site. • **Distance to Commercial Airport:** CHO: 6 miles, 9 minutes from site. IAD: 89 miles, 1 hour and 45 minutes from site. • **Access to Site:** Site has access available from US 29.

camoin associates

SWOT Rapidan-Lamm Center

Strengths

- ✓ Significant highway frontage and access to US 29.
- ✓ Site clearing has been completed.
- ✓ Sewer, water, and electrical infrastructure onsite.
- ✓ Approximately 30 minute drive time to Charlottesville.

Weaknesses

- ✓ Natural gas located one mile away.
- ✓ Site is zoned B-2 for retail zoning and general business. Rezoning will likely be required for target industry sectors.
- ✓ Recent Phase I not completed.

Opportunities

- ✓ Landing a project soon could convince the VDOT to not construct the road that is currently planned.
- ✓ Rapidan Service Authority has purchased land to build a two million GPD reservoir.
- ✓ Potential to move site into a function based zoning.
- ✓ Old due diligence studies might be available to give insight into any existing conditions onsite.

Threats

- ✓ Large, neighboring residences might prove oppositional to certain industry.
- ✓ Once the planned connector road is built it will completely change the size of development possible onsite.
- ✓ Council does not want a heavy truck user.

camoin associates

Site Industry Profile
Competitiveness Assessment
Rapidan-Lamm Center

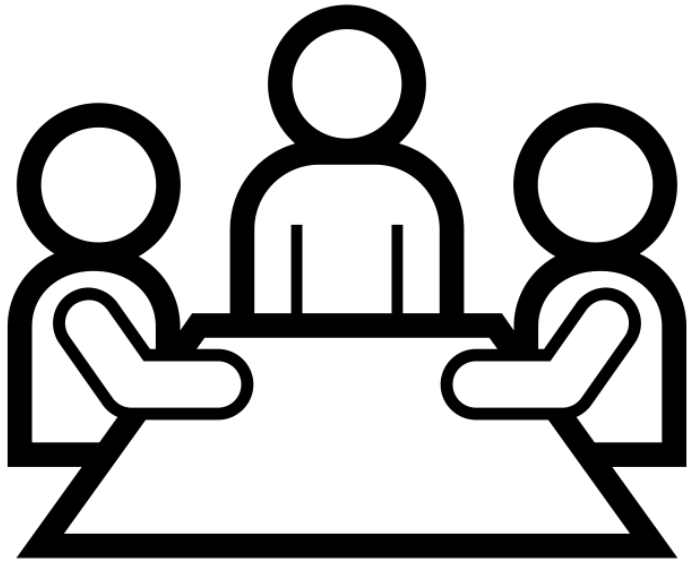
Industry Sector	Competitiveness	Comments
IT/ Communications	Moderate	Data center or other related industry might practically work given the site and infrastructure characteristics, but it would not be the best use for the site or the community.
Biomedical/ Biotechnology	Moderate	Companies related to this industry are located in Charlottesville area, so there is the potential to attract a user in this field. However, the surrounding neighbors and general site characteristics do not make this a very attractive location for this industry.
Finance/ Business Services	High	Due to proximity to Charlottesville, road access, and general site characteristics, this location is well positioned for office space that could accommodate this industry.
Food and Beverage Manufacturing	Low	Surrounding residential area will likely be a deterrent for this industry, especially those that have significant traffic in and out of facility.
Light Manufacturing	Low	Surrounding residential area will likely be a deterrent for any manufacturing activity onsite.

camoin associates

Site Improvement Action Items
Rapidan-Lamm Center

Task Item	Priority	Anticipated Cost	Comments
Phase I	High	$15-20k	A completed Phase I will eliminate any risk associated with unknown environmental issues. Local economic development group to try and track down previous studies conducted prior to site clearing. If report is found, then the old study may only need to be updated rather than created.
Wetlands Delineation	Moderate	$10-15k	There is a high likelihood that wetlands exist onsite. A wetlands delineation will confirm the presence of wetlands and a plan can be established to remediate them if necessary. A delineation helps to alleviate any perceived risks with possible wetlands.

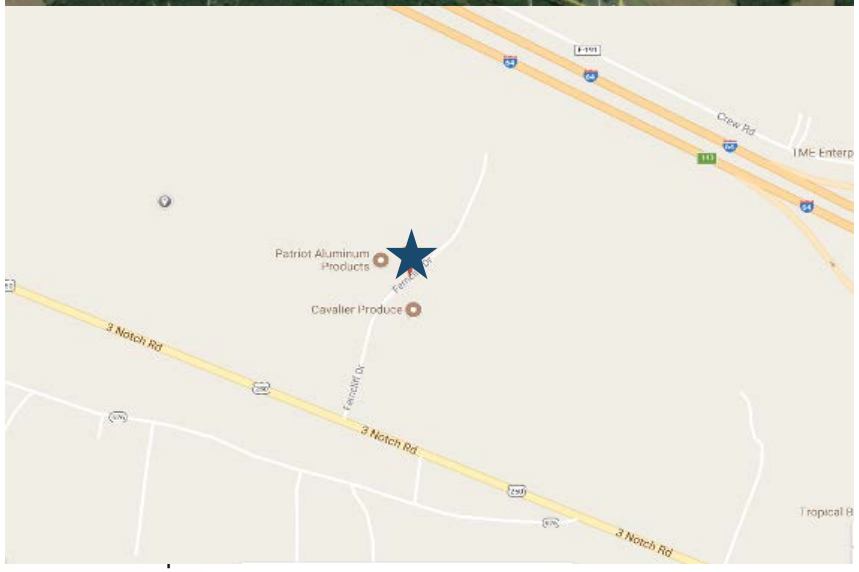
camoin associates



Louisa County

camoin associates

Site Profile
Ferncliff Business Park



Criteria	Description
General Information	• **Site Name**: Ferncliff Business Park • **City:** Louisa • **County**: Louisa
Site	• **Total Size**: 125 • **Ownership:** Single owner, Ferncliff LLC • **Floodplain:** Outside the 100-year Floodplain • **Surrounding Uses**: mixed- residential; commercial and Industrial • **Nearby Companies:** Patriot Aluminum (conduit), Cavalier Produce (produce distributor) • **Other Site Development Concerns:** NA
Environmental / Zoning	• **Air Permitting**: Located in attainment area for all pollutants. • **Zoning:** Industrial and Commercial • **Wetlands:** Minor wetlands onsite, should not interfere with development • **Phase I ESA:** Completed
Utilities & Services	• **Industrial Water:** Louisa County Water Authority operates a 20” line at 65+ psi on-site, with 1.25 MGD in excess capacity. • **Industrial Wastewater:** Louisa County Water Authority has a wastewater force main onsite with approximately 400,000 GPD in excess capacity. • **Electric**: Central Virginia Electric Cooperative (CVEC) operates 110 KV lines on-site • **Natural Gas**: Columbia Gas transmission line 4 miles away.
Logistics	• **Interstate/Highway:** 1-64, 0.5 miles away • **Rail**: No rail onsite • **Deep Water:** Virginia International Gateway (VIG). 100 miles, 1.5 hours. • **Distance to Commercial Airport:** CHO: 30 miles and 40 minutes IAD: 103 miles, 2 hours. • **Access to Site:** Site is accessed via Highway 250, a two lane highway. Entrance is approximately one mile from I-64.

camoin associates

SWOT Ferncliff Business Park

Strengths

- ✓ Exceptional highway and interstate access.
- ✓ Available water, sewer, and electric infrastructure.
- ✓ Zoning allows for light to medium industrial uses.
- ✓ Proven success of existing park users (both recently completed expansions).

Weaknesses

- ✓ Natural gas line is four miles away.
- ✓ Cemetery located in top left corner of the site but has already been set aside.

Opportunities

- ✓ The business park has recently acquired 40 acres on the southeast of the property.
- ✓ The business park is in the process of purchasing more land to the west of the property.
- ✓ Interstate access allows for more options regarding industry targets i.e. distribution.
- ✓ Large site size allows for flexibility when creating a development plan.
- ✓ 1.25 MGD of excess water capacity.
- ✓ Columbia Gas has already expressed interest in bringing infrastructure to site.

Threats

- ✓ Ability to attract employer with 100+ employees.

camoin associates

Site Industry Profile
Competitiveness Assessment
Ferncliff Business Park

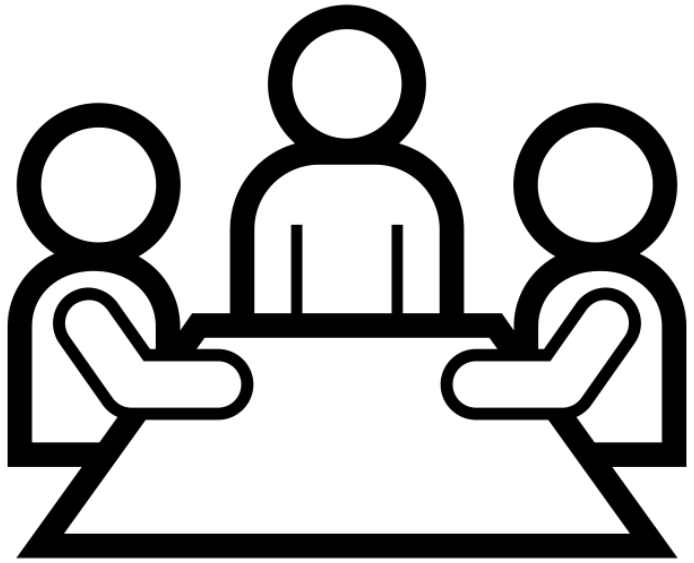
Industry Sector	Competitiveness	Comments
IT/ Communications	Low	Current users of park and site characteristics do not promote this location as being an attractive option for this industry. Total available capacity in electrical system is currently unknown. Approximately 40-50 MW would be needed for small data center operation
Biomedical/ Biotechnology	Low	Distance from existing biomedical industry and research centers, along with current users within the park, would not make this industry sector a good fit for this location.
Finance/ Business Services	Low	Distance from existing finance/business service operations, along with current users within the park, would not make this industry sector a good fit for this location.
Food and Beverage Manufacturing	High	Proven ability to serve this industry sector as Cavalier Produce is already located in the park. Park and local road infrastructure (3 Notch Road is two lanes) may prevent project with significant amount of truck traffic from locating at this site.
Light Manufacturing	High	Proven ability to serve this industry sector as Patriot Aluminum is already located in the park. Future users should not need to have natural gas, as cost to bring infrastructure to site may be cost prohibitive.

camoin associates

Site Improvement Action Items
Ferncliff Business Park

Task Item	Priority	Anticipated Cost	Comments
Natural Gas Engineering Study	Moderate	$2-4 MM	Though it has proven to not be a need for current users, having natural gas onsite could prove beneficial to attracting future users and increasing the variability of industries that could fit within the growing park. Bringing infrastructure to site is likely prohibitive at the current time, but a preliminary engineering study to determine approximate costs should be completed.to determine viability.
Transportation Needs	Low	TBD	Due to anticipated growth of the park, there is a high likelihood that various transportation infrastructure will be needed. Options may include signalized entrance or a turn lane. It is would be best to coordinate with the economic development agency on best use of funding. Proactively upgrading transportation infrastructure will make this site more attractive for company with large truck usage.

camoin associates

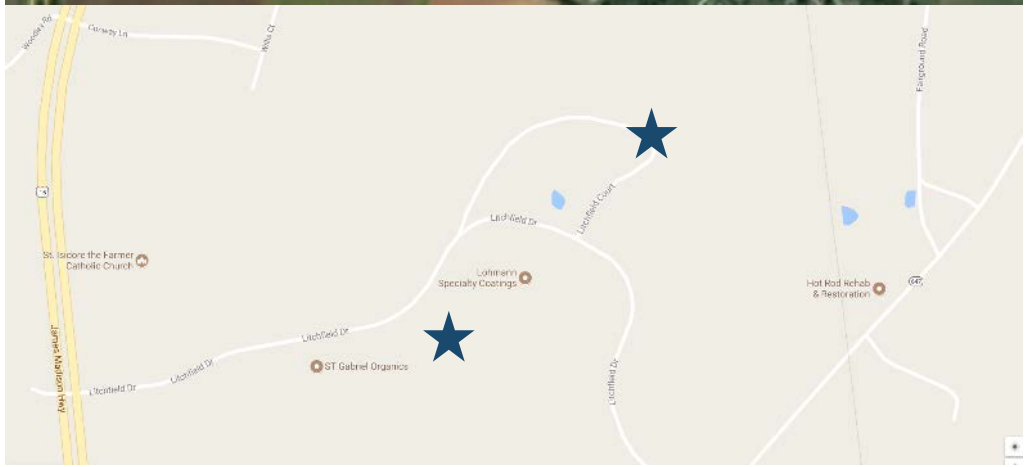


Orange County

camoin associates

Site Profile

Thomas E. Lee Industrial Park



Criteria	Description
General Information	• **Site Name**: Thomas E. Lee Industrial Park • **City:** Orange • **County:** Orange
Site	• **Total Size**: Lot 10 is 16.8 acres and Lot 5A is 8 acres. • **Ownership:** Lot 10 owned by single entity, Pierce Hardy LP. Lot 5A owned by Orange EDA. • **Floodplain:** Outside the 100-year floodplain • **Surrounding Uses:** Manufacturing and Agricultural • **Nearby Companies:** Zamma (cabinets), Lohmann (adhesives), St. Gabriel Organics (pet products) • **Other Site Development Concerns:** NA
Environmental / Zoning	• **Air Permitting**: Located in attainment for all pollutants. • **Zoning:** I-2, General Industrial • **Wetlands:** Delineation not completed, minimal to no wetlands anticipated to be found onsite. • **Phase I ESA:** Completed for Lot 5A, not completed for Lot 10.
Utilities & Services	• **Industrial Water:** Rapidan Service Authority operates a 10” main on site. 200,000 GPD available • **Industrial Wastewater:** Available on-site through Rapidan Service Authority. • **Electric**: Dominion Virginia Power. Unknown distance and capacity. • **Natural Gas**: Columbia Gas’s interstate pipeline is 2-3 miles away.
Logistics	• **Interstate/Highway:** I-64, 18 miles away • **Rail**: Rail adjacent to lot 10 • **Deep Water:** Port of Richmond, 80 miles, 90 minutes. • **Distance to Commercial Airport:** CHO: 26 miles, 28 minutes. IAD: 80 miles, 90 minutes. • **Access to Site:** The site is accessible via Litchfield Drive, which intersects US 15, a 4 lane highway.

camoin associates

SWOT Thomas E. Lee Industrial Park

Strengths

- ✓ Pad ready sites, majority of land owned by economic development authority.
- ✓ Established light industrial neighbors.
- ✓ Phase I completed on Lot 5A and Lot A and no issues identified.
- ✓ Geotechnical study completed onsite.
- ✓ Lot 5A and A controlled by county.

Weaknesses

- ✓ Natural gas line not onsite, cost of $1.5 MM to bring to site.
- ✓ Significant elevation change across Lot 10, sloping to the northeast to the rail.
- ✓ The nearest interstate is located 18 miles from the site.

Opportunities

- ✓ Dark fiber being brought into the county.

Threats

- ✓ Control of Site 10 by private owner. Perceived difficulty in acquisition of site due to ownership.
- ✓ Bringing rail to site may be difficult and cost prohibitive due to slope of site.

camoin associates

Site Industry Profile
Competitiveness Assessment
Thomas E. Lee Industrial Park

Industry Sector	Competitiveness	Comments
IT/ Communications	Low	Though fiber is being brought into the county, this type of industry would not be a good fit considering other users in the park are primarily light manufacturing and distribution. Additionally, it is unknown if appropriate electrical capacity could be provided to serve an operation like a data center.
Biomedical/ Biotechnology	Low	Distance from existing biomedical industry and research centers, along with current users within the park, would not make this industry sector a good fit for this location.
Finance/ Business Services	Low	Distance from other finance/business services, along with current users within the park, would not make this industry sector a good fit for this location.
Food and Beverage Manufacturing	Moderate	Depending on the exact operation, this location may not prove favorable when it comes to logistics and transportation access.
Light Manufacturing	High	This industry sector has already proven to be a good fit for this park. All utilities, except natural gas, are available onsite. Users with significant truck requirements may not seriously consider this site due to distance to major highways and interstates.

camoin associates

Site Improvement Action Items
Thomas E. Lee Industrial Park

Task Item	Priority	Anticipated Cost	Comments
Option Lot 10	Moderate	TBD	Control of site by economic development agency will remove risk of land acquisition and establish cost.
Engineering Study for Natural Gas	Moderate	TBD	Conduct study on exact plan, timeline, and cost required to bring natural gas service into the park. Though it may not make sense to bring infrastructure to site, a thorough understanding of all details required to bring natural gas to site will help in attracting a project with large natural gas demands.
Phase I on Lot 10	Low	$10-15k	If Lot 10 is actively being marketed for this property, it would greatly benefit from having a completed Phase I available. Coordination required with landowner to determine who would cover cost of study.

camoin associates

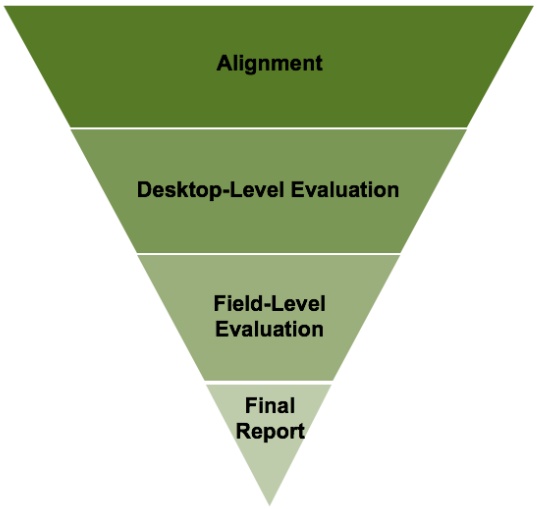
Appendix II: Site Evaluation and Conclusions

Process and Methodology

Project Scope

As part of the GO Virginia Region 9 initiative, Global Location Strategies (GLS) evaluated an identified set of existing sites throughout the region to assess their readiness for recruitment of commercial/industrial capital investment projects. Using a variety of data collection sources and subsequent analyses, this report details the sites evaluated, competitiveness of sites on recommended target industries, and action items that can be pursued to make the sites more competitive.

Figure 1: GLS Methodology

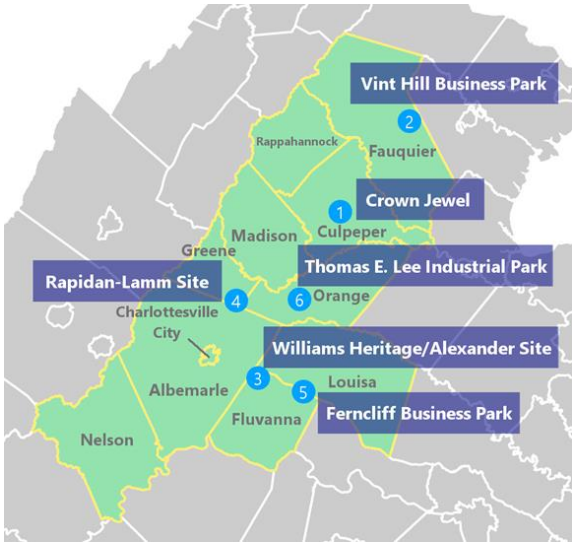


Project Alignment

The beginning of the site evaluation scope started with an alignment meeting to ensure that the project's process and outcomes align with the client's wants and expectations. As a result of the alignment call with the Central Virginia Partnership, site criteria were prioritized. It was decided that existing, established sites would be the primary focus of the site evaluation. It was agreed that the sites should be distributed throughout the whole of the region. The sites prioritized were sites that were further along in the development process (clearing, grading, etc.) and had more due diligence information available (geotechnical, wetlands, ESA). After soliciting site information from local economic developers, GLS worked with the Central Virginia Partnership to rank and eliminate sites for further analysis. The result of the first, high level screening yielded six sites from six counties:

- Culpeper County: McDevitt/Crown Jewel Site
- Greene County: Rapidan - Lamm Site
- Fauquier County: Vint Hill Business Park
- Fluvanna County: Williams Heritage / Alexander Site
- Louisa County: Ferncliff Business Park
- Orange County: Thomas E. Lee Industrial Park

Figure 2: Region 9 Sites



Data Collection

"Request for Information" (RFI) questionnaires were distributed to local economic developers for each of the six sites. All questionnaires were completed and submitted to GLS by the week of July 3rd, 2017.

All six sites which completed a questionnaire received a virtual site tour. A virtual site tour takes the form of a web conference with local economic developers and utility representatives. The "tour" is done by screen-sharing Google Earth and "touring" the site and surrounding area. The virtual site tour is an opportunity to fill in gaps in the RFI questionnaire and gain greater insight from the community about their knowledge and intentions for the site. All virtual site tours were completed on July 5th and July 6th.

From the desktop-level data gathering, a preliminary evaluation was conducted on each of the six sites. Both a preliminary "Must" screening, which filters sites based on necessary features, and a SWOT Analysis were performed to evaluate the characteristics of the site.

Site Visits

During the week of July 17th, 2017, GLS representatives visited all six sites. Each visit lasted approximately half a day, and included a tour of the site and community, as well as meetings with economic developers and other community representatives. Data gathered on the site visits helped to further facilitate understanding of the sites, the community, and available infrastructure.

Site Evaluation Summaries

**Detailed site profiles, SWOT analysis, explanation of target industry competitiveness, and list of site improvement action items can all be found in provided appendix.*

Culpeper County: McDevitt/Crown Jewel Site

Culpeper County's McDevitt/Crown Jewel site is located less than a mile east of the Town of Culpeper. The land is gently sloping from northeast to southwest, and 122 of its 155 acres can be considered contiguous and developable. Neighbors include a wastewater treatment plant, two data centers, and a community college campus. The site is primarily accessed via McDevitt Drive, and is located less than a half mile from US 29. The targeted property is made up of four owners, and the zoning is split between Industrial and Rural.

Due to the site's existing neighbors, the McDevitt/Crown Jewel site has access to many existing utility supply lines, including electricity, gas, water, and wastewater with a large, expandable electrical substation located on site that could support up to a 40 MW load without requiring significant upgrades. Dark fiber communication lines are also in proximity, making the site a good fit for IT operations. Neighboring operations have proven that data centers can work in the area. The site could also support small, light manufacturing facilities, but due to the sloping topography of the site, potential operations will likely have to be limited in footprint to minimize extensive earthwork. Rezoning all parcels to Industrial would assist in the marketability of the site and decrease perceived risk associated with changing zoning classifications.

Strengths

- Gas, electric, water, and wastewater are already on-site or adjacent to the site.
- Over 1 MGD excess water capacity available.
- Extensive electrical capacity, 50 MW, can be made available today.
- Established road access to site.

Weaknesses

- Apparent wetlands onsite. Proper delineation needed to determine site developability.
- Future planned access road to Germanna Community College needs to be further addressed, as it could impede potential development plans.
- No Phase I ESA completed.
- Rezoning is required for target industries.

Competitive for Following Industries

- IT/Communications
- Light Manufacturing

Recommended Site Improvement Action Items

- Completion of Phase I ESA
- Rezoning
- Preliminary Geotechnical Study
- Wetlands Delineation
- Secure Option on all Parcels

Fauquier County: Vint Hill Business Park

The Vint Hill Business Park is currently home to a server assembly and data center, OVH, and an FAA terminal radar approach control (TRACON) facility as well as Northrop Grumman an aerospace and defense company. They have plots currently available ranging from 3 to 45 acres of developable area. The park has multiple on-site access roads, and can be reached from Highway 215, approximately 1.5 miles off US 29. The business park is in a well-populated area including residents with high educational attainment, and has access to all major utility services except for industrial wastewater. A new, large veteran's center is planned for acreage adjacent to the business park. The proposed parcels are zoned as Planned Commercial Industrial District.

The Vint Hill sites reap a number of benefits from their location. With established neighboring business operations, the sites have access to all necessary utilities. The business park is also located in a high-income community with good schools, which is very attractive for those looking to locate outside of the D.C. area. The Vint Hill site is particularly well suited for IT operations, business and financial services, or high value-add light assembly (e.g. medical devices, aerospace, electronics) with the community capable of providing an educated, currently out-commuting, workforce.; however, the surrounding uses would generally be prohibitive for any kind of heavier industrial operation.

Strengths

- Attractive location and community with easy access to D.C. market.
- Exiting utility infrastructure (electric, natural gas, water, and wastewater) within the park. Dark fiber being brought into community.
- Highway frontage and plentiful road access.
- Highly educated workforce that is primarily commuting out of the county for work.

Weaknesses

- High wage area may prevent certain industries from considering community.
- Preference for 'smart industry' will limit flexibility of industries that will fit within the site.

Competitive for Following Industries

- IT/Communications
- Finance/Business Services

Recommended Site Improvement Action Items

- Preliminary Geotechnical Study
- Site readiness fund for future development and preparation of sites

Fluvanna County: Williams Heritage / Alexander Site

The Williams Heritage/Alexander site in Fluvanna County is the least characterized of the sites evaluated. The site was only recently identified as a potential industrial opportunity, and therefore no site preparation or characterization has been done. The 156-acre site is located adjacent to Highway 250, just 2 miles from I-64. The property is heavily wooded, has notable elevation changes, minimal utilities onsite, and is bordered on the west by a residential neighborhood. Zoning is currently Agriculture and would have to be changed in order to utilize site as an industrial property.

In its raw state, the Williams Heritage/Alexander site has flexibility in regards to how it can be developed. It will likely have access to water and sewer by 2019, with possible access to gas and sufficient access to electric. With necessary utilities, the site could support light manufacturing or food and beverage manufacturing activities. However, the cost of bringing natural gas to site may be prohibitive. Due diligence activities should take priority moving forward, as more accurate site information will aid in more precise industry targeting. By doing some preliminary site preparation (clearing of trees, possible grading) and establishing a plan for bringing in infrastructure, this site would be more marketable for future prospects.

Strengths

- Highway frontage on Hwy 250 and easy access to I-64 and Charlottesville area.
- Close to electrical substation.

Weaknesses

- Heavily treed site, making it difficult to see property.
- Lack of water, wastewater, and natural gas infrastructure onsite.
- No due diligence studies completed.
- Multiple owners of property.
- Rezoning required for target industries.

Competitive for Following Industries

- Following further due diligence onsite and extension of utilities, site would likely be good fit for Light Manufacturing and Agricultural Value Added

Recommended Site Improvement Action Items

- Site Clearing
- Engineering Study (for Utilities)
- Phase I ESA

Greene County: Rapidan Center

The Rapidan property is a 65-acre site that is advanced in the development process. The site was cleared, graded, and prepared for a previous retail opportunity that did not materialize. Configuration of the site is roughly rectangular, and could support a single large development, or two or more smaller developments. The site is located directly on US 29, and neighbors a handful of retail and commercial operations to the north, with residential areas to the south and east including a large apartment complex bordering the property. Current zoning of the parcel is listed as B-2 for General Business.

The preparation activities that have already been performed on the Rapidan site put it at an advantage in comparison to other sites, as potential buyers will not have to spend the time or money on these items. While the site itself could possibly support a light manufacturing facility, the surrounding residential areas of the site prevent this location from being a good fit for heavier industrial operations. Due to the significant residential development nearby, the site would likely be limited to commercial, retail, or office space. County Board of Supervisors has also expressed a desire to avoid any operation with large truck activity. Office space could be provided to companies coming out of the UVA Research Park and are looking to commercialize. County and local community could partner with local developer to help build a small business park with available office space.

Strengths

- Significant highway frontage and access to US 29.
- Site clearing has been completed
- Sewer, water, and electrical infrastructure onsite.

Weaknesses

- Currently planned VDOT road splits property and may restrict development of site.
- Natural gas located one mile away.
- Location next to residential areas are deterrent for certain industries.

Competitive for Following Industries

- Best fit is Finance/Business Services. Site is well suited for business park.
- Moderate opportunity exists for attracting IT/Communications or Biomedical/Biotechnology company.

Recommended Site Improvement Action Items

- Completion of Phase I ESA. If previous studies can be found and made available, then an update of these studies would be required.
- Coordination with developers on constructing business park. Office space users are not likely to build their own space.

Louisa County: Ferncliff Business Park

The Ferncliff Business Park is a rural industrial park located in Louisa County. The park is 104 contiguous acres, with approximately 70 developable acres remaining. Forty greenfield acres to its southeast were also recently purchased. Current users in the park include Patriot Aluminum and Cavalier Produce. Two speculative buildings have just been built. Each building is 27,725 square feet, totaling 55,450 square feet in all. The park is located between Highway 250 (3 Notch Road) and I-64, and is accessed via Highway 250, a half mile from I-64's Exit 143. With the exception of the additional 40 acres (zoning of this parcel is to be determined), the entire industrial park is zoned Industrial and Commercial.

Ferncliff is well suited to support several industries that do not require natural gas. The sites could be used for projects that fall within the identified industry targets of light manufacturing and agricultural value add, again with the caveat that they cannot supply natural gas. If Three Notch Road could be expanded from two lanes to four, the location could be a good fit for a distribution center or similar project due to its interstate proximity. It is doubtful that the site could support large footprint requirements due to the topography of the park.

Strengths

- Exceptional highway and interstate access with close proximity to Charlottesville.
- Available water, sewer, and electric infrastructure.
- Over 1 MGD excess water capacity available.
- Zoning allows for light to medium industrial uses.

Weaknesses

- Natural gas line is four miles away.
- Lack of available workforce would make it difficult to attract company of 100+ employees.

Competitive for Following Industries

- Site is most competitive for Food and Beverage and Light Manufacturing.
- Due to existing manufacturing users within the park, along with lack of robust electrical infrastructure and capacity, site is not competitive for a data center or similar operation.

Recommended Site Improvement Action Items

- Market the site for user with large truck counts, design, permitting and funding for the installation of turn lane and/or signaled entrance.
- Attract a wider array of industrial uses, design, permitting and funding for extension of natural gas.
- Complete necessary studies (wetlands delineation, preliminary geotechnical study) on recently purchased 40 acres.

Orange County: Thomas E. Lee Industrial Park

The Thomas E. Lee Industrial Park in Orange County has multiple parcels available for development. There is an 8-acre site with 100,000 square foot building pad in place. The 8-acre parcel adjoins a 16.8-acre parcel that is not currently under the county's control. Though the 16.8-acre is adjacent to a rail line, there is significant concern on any potential for bringing the rail into the site due to significant elevation change. There is also a non-adjacent 5-acre parcel that could support smaller operations. The park is rurally located, over 2.5 miles from the town of Orange. Most major utilities are already within the park, with the notable exception of natural gas, which is located more than two miles away. All sites within the park are adequately zoned I-2, Industrial.

The T. E Lee sites could successfully support light manufacturing operations or potential food processing facility. There is not currently natural gas on site, but access could be extended to the site with an estimated cost of $1.5 million. Most industries will likely face transportation issues, as the closest interstate is approximately 18 miles away. Additional opportunity exists for the area if dark fiber is successfully brought in, but current marketing efforts should not focus on any IT or financial service type industry until this becomes a reality.

Strengths:

- Sites are pad-ready, and the majority of land owned by economic development authority.
- Established light industrial neighbors.
- Phase I completed on Lot 5A and Lot A.
- Geotechnical study completed.

Weaknesses:

- Control of Site 10 by 84 Lumber. Site also has significant topography challenges (rail will be difficult to bring to site) and no Phase I has been completed.
- Natural gas line not onsite, cost of $1.5 MM to bring to site.
- Transportation access to interstate

Competitive for Following Industries

- Light Manufacturing would be primary target.
- Moderate opportunity for Food and Beverage Manufacturing.

Recommended Site Improvement Action Items

- Option Lot 10 to establish control and price of land.
- Detailed engineering study and plan to bring natural gas to site.
- Coordinate with owners of Lot 10 to conduct Phase I ESA.

Final Conclusions

Sites reviewed ranged from undeveloped, raw land to established industrial parks. Based on our observations, some general conclusions can be made regarding target industries:

- None of the sites are a good fit for a heavy industrial operation due to available infrastructure or community preference.
- None of the sites are well positioned nor are currently a great fit for any biomedical operation. This result is generally driven by the community and surrounding synergies, rather than the site characteristics. Best option for biomedical operation would currently be the Rapidan site in Greene County.
- Ferncliff Business Park is best fit for food and beverage manufacturing operations due to existing utilities onsite, access to interstate, and established food operation in the park.
- Half of the sites evaluated (Culpeper, Louisa, and Orange County) would be a good fit for light manufacturing operations that do not require natural gas.
- Due to lack of due diligence to date, the site in Fluvanna County is currently not sufficiently developed to market for the target industries.
- Only the sites in Culpeper County and in Louisa County can handle a large user that would require one million gallons per day of process water.

Figure 3: Site Competitiveness for Target Industries

Industry Sector	Culpeper	Fauquier	Fluvanna	Greene	Louisa	Orange
IT/ Communications	Good	Good	Low	Moderate	Low	Low
Biomedical/ Biotechnology	Low	Moderate	Low	Moderate	Low	Low
Finance/ Business Services	Low	Good	Low	Good	Low	Low
Food and Beverage Manufacturing	Moderate	Low	Moderate	Low	Good	Moderate
Light Manufacturing	Good	Moderate	Moderate	Low	Good	Good

**Further details on target industry recommendations can be found in the attached appendix.*

Based on information obtained from all locations reviewed, each site has a unique list of **recommended site improvement items** that would increase its marketability and readiness:

- Three of the six sites do not have a Phase I ESA completed. By commissioning and completing a Phase I study for a site, risks associated with previous uses or environmental concerns can be alleviated. Sites that are heavily marketed generally have Phase I studies already completed.
- Natural gas is only located on the Culpeper and Fauquier County sites. Neither of these sites are well positioned to attract a company or industry that requires natural gas for its operation. Three sites that are more likely to attract a natural gas user include sites in Fluvanna, Louisa, and Orange counties. However, none of these sites have natural gas onsite, with nearest lines being 2-4 miles away.
- The Williams Heritage/Alexander site in Fluvanna County is the least understood and developed site among all sites considered. Prior to any site improvements or due diligence studies, it is recommended that further review be conducted with economic development and utility representatives to determine that this particular site is the location that should be focused on for future investment.
- Wetlands delineation should be completed on sites that have significant concerns of wetlands being located in primary buildable area of site. The primary site for consideration is the Crown Jewel site in Culpeper County.
- Only the Culpeper County site should be proactively rezoned. Though the Williams Heritage/Alexander site is zoned agricultural, further exploration is required to determine if this site should actually be targeted for industrial development. Rezoning should occur much later in the process. While the Rapidan site in Greene County could likely accommodate an industrial user, there is also a high likelihood that retail or some small business park could be located in this site and be within the assigned zoning ordinance.
- The Crown Jewel site is currently controlled by four owners. Though not a high priority, it is recommended that a potential option on these sites be explored so that the county can maintain control (rather than having the risk of the separate owners).
- The Ferncliff Business Park, in addition to having natural gas onsite, would benefit from proactive investment in site access infrastructure (turning lanes, signaled entrance) and onsite roads. The new spec building, remaining acreage, and recently purchased land are positioning this site to grow even more, and the transportation infrastructure will assist in its marketability.

Figure 3: Region 9 Sites and Industry Recommendations

Site	Site Improvement Action Items
Culpeper County	Rezoning, Phase I, Wetlands Delineation, Preliminary Geotechnical Study, Option Sites
Fauquier County	Preliminary Geotechnical Study, Site Readiness Fund
Fluvanna County	Engineering Studies, Phase I, Tree Clearance, Wetlands Delineation, Preliminary Geotechnical Study
Greene County	Phase I, Wetlands Delineation
Louisa County	Natural Gas Infrastructure, Transportation Infrastructure (as needed)
Orange County	Option Lot 10, Phase I on Lot 10, Engineering Study for Gas (or extend infrastructure)

**Further information and details around site improvement action items can be found in the attached appendix.*

The Path Forward

Site improvement action items have been developed based on the experience of GLS and the identified needs of the site to attract targeted industries. However, it should be noted that moving forward on any of these action items is dependent on a variety of parties being involved, including site owners, economic developers, utility representatives, etc. While Global Location Strategies has prioritized certain actions above others, coordination with local economic development agencies will help further refine the priority list.

A lack of sites with natural gas service is a prohibitive factor in recruiting any industry that has a substantial need for natural gas. A regional discussion with natural gas providers is needed to identify specific areas and sites that would be a best fit for large natural gas prospects and work proactively to determine necessary projects and the funds required.

Region 9 has the opportunity to attract more heavy and light industry, but this would require that better and more sites be developed and made shovel ready. Currently the region seems to be lacking adequate number of sites to meet the needs of the targeted industries. A larger, region-wide initiative is recommended to be more proactive on maintaining a proper inventory of sites over the next 3-5 years.

Through proper coordination across all economic development, utility, and county representatives, along with targeted, value-add investment, Region 9 will properly position itself to attract future projects over the next five to fifteen years.

Appendix III – Stakeholder Engagement

The following table lists individuals interviewed by the consultant team in order to provide firsthand information on Region 9's economy and industries. Interviewee names and organizational affiliation are listed, broken down by status or role.

Region 9 Stakeholder Interview List	
Individual	Affiliation
Amanda Moxham	Moxie Consulting, PWN Board
Ann Mallek	Albermarle County Supervisor, Member of Virginia Board of Workforce Development
Brenda Tanner	Orange County Schools
Butch Davies	Davies, Barrell, Will, Lewellyn & Edwards, PLC
Christy Connolly	PATH Foundation
Christy Phillips	WillowTree, PWN Board
Colette Sheehy	UVA
Dave Durr	Culpeper Farmer's Cooperative
David Pettit	Lenhart Pettit
Deborah van Eersel	UVA Research Park
Diantha McKeel	Chair of Albermarle County Board and Member, PWN Council
Ed Dalrymple, Jr.	Cedar Mountain Stone
Ed Scott	EcoSeptix
Elizabeth Smith	Afton Mountain Vineyard
Frank Friedman	Piedmont Virginia Community College
Hollie Lee	City of Charlottesville/Workforce
Jeanian Clark	Lord Fairfax Community College
Jeanne Wesley	Germanna Community College, PWN Board
Jim Cheng	Former Secretary of Commerce and Tech Executive
Joe Martin	Fauquier Chamber
John McCarthy	Rappahannock County
Kathy Galvin	Charlottesville City Council
L.J. Lopez	Milestone Partners
Lee Frame	Orange County Supervisor, PWN Council Member
Leigh Middleditch	McGuire Woods Consulting
Matt Eberhardt	Madison County Schools
Neil Williamson	Free Enterprise Forum
Peter Rice	BoxInBoxOut, PWN Board
Ray Knott	Union Bank
Ridge Schuyler	Piedmont Virginia Community College
Rob Stockhausen	CBRE
Rod Gentry	PWN Board
Rosa Atkins	School Superintendent Charlottesville Public Schools
Sandy Boone	Culpeper Chamber
Stephanie Koren	Lousia County Supervisor
Steve De Jong	Lohmann Corporation
Steve Ray	PWN Board, Chair
Suzanne Brooks	Pepsi-Cola Bottling Co.
Tom Click	Patriot Aluminum
Tony O'Brien	Fluvanna County, PWN Council

Region 9 Stakeholder Interview List	
PD-9 Elected Officials	
Supervisor Gary Deal	Culpeper County
Supervisor Clay Jackson	Madison County
Supervisor Jim Crozier	Orange County
Council Member Meaghan Taylor	Town of Culpeper
Central VA Partnership (CVP) Private Sector Board Members	
Brian Cole	LexisNexis
David Mitchell	Great Eastern Management Company
Anne Gardner	Charlottesville Area Association of Realtors
Ethan Dunstan	UVA Community Credit Union
Mike Wesson	First Citizens Band
PD-10 ED Partners (Local Economic Developers)	
Andy Wade	Louisa County
Chris Engel	Charlottesville
Diana Gamma	Greene County
PD-9 County Administrators	
Bryan David	Orange County
Tracey Gardner	Madison County
Mary Jane Costello	Madison County
PD-9 Economic Developers	
Tracey Gardner	Madison County
Phil Sheridan	Culpeper County
Miles Friedman	Fauquier County
PD-9 PWN Council Members	
Supervisor Alexa Fritz	Culpeper County
Supervisor Ron Frazier	Rappahannock County
UVA Representatives	
Steve Laymon	Interim Dean, UVA School of Continuing & Professional Studies
Kate Mellon	Director, Career Communities, UVA Career Center
Dillon Kuhn	Career Lead for Entrepreneurship & Business Programs, UVA Career Center
Archie Holmes	Associate Provost, UVA
PD-10 Elected Officials	
Mayor Mike Signer	Charlottesville, Mayor
Supervisor Michelle Flynn	Greene County
Supervisor Diantha McKeel	Albemarle County, Chair
One-Stop Center Management Team	
Mary Ann Gilmer	Goodwill of the Valleys (Vice President overseeing One-Stop contract for PWN)
Tom Gillette	Goodwill - One Stop Center Manager - Charlottesville
Marty Bywater-Baldwin	Goodwill - One Stop Center Manager - Culpeper
Dick Sindy	Virginia Employment Commission
Naomi Aitken	VA Dept. of Aging & Rehabilitation Services
Carol Coffey	Adult Education
Valerie Palamountain	Piedmont VA Community College - Workforce Services
PD-10 County Administrators/City Manager	
Maurice Jones	Charlottesville
Doug Walker	Albemarle County
John Barkley	Greene County
Steve Nichols	Fluvanna County

Economic Development Summits

Summit Overview

Thomas P. Miller & Associates hosted two Economic Development Summits within Region 9. The first summit was held at Germanna Community College on July 17 and was well-attended with representation from each of the five counties within the Rappahannock-Rapidan Regional Commission. The second summit was held at UVA Research Park in Charlottesville on July 18 and was well attended with representation from each of the six localities which fall under the Thomas Jefferson District Commission. Both summits included an overview of the GO Virginia initiative and the initial data collected on the region. Both groups were led through facilitated discussions that focused on the region's strengths, weaknesses, opportunities, and threats (SWOT) and their community values. Collectively, these two communities summarized their discussions with a Community Statement, the combined results being the following:

> *As a Region that values the preservation of the quality of life, history, education, and natural surroundings of our community, we are working toward a realistic view of the future that includes purposeful growth through collaboration and adaptability, leveraging our spirit of innovation and entrepreneurialism to create equitable and diverse opportunities.*

The region places collective value on the preservation of history and historic areas, quality of place, natural beauty and the aesthetic appeal, education, innovation and entrepreneurialism, adaptability, and collaboration and partnerships. The table below shows the region's top assets and challenges, expressed under the strengths and weakness categories respectively within the analysis, that were identified by the community (in no particular order).

Top Strengths	Top Weaknesses
■ Ease of transportation	■ Need for a skilled workforce that matches employers' needs
■ Proximity	■ Lack of ready space or sites for investment
■ Educational resources	■ Limiting of opportunities at the local level to promote self-interest
■ Quality of life	■ Lack of infrastructure, especially broadband or adequate internet
■ Natural beauty	

The table below lists the top opportunities as well as external factors that could slow or stop progress, expressed under the opportunities and threats categories respectively within the analysis.

Top Opportunities	Top Threats
■ Regional collaboration and identity	■ Lack of public support
■ Expansion of technology industries	■ Lack of political support
■ Coordination of innovation ecosystems	■ Lack or prioritization of funding or resources
■ Growth through site-readiness, including infrastructure investments, regional parks, and business incubation	■ Changes in human capital
	■ Competition at all levels, including other regions

Regional Strengths

A more detailed analysis of the strengths would show that the region is perceived to have a high quality of life, with a relatively affordable cost of living compared to other regions (although there is some perceived inconsistency within the region). There is ample land available, with a hospitable climate and ample natural beauty and historic sites (e.g. Ashlawn, Monticello, Montpelier) that inspire tourism. The region has a distinct agricultural heritage, with equine and viticulture specializations, that forms a base for strong agribusiness and farm-to-table culture. Generally, there are strong food production and hospitality services in the region.

The general location of the region is also seen as an asset, with proximity to major population centers in the Mid-Atlantic, such as the District of Columbia and Richmond, as well as the established material flow for local producers or distribution and general access to domestic and international markets, including through a deep-water port in nearby Norfolk. This access is also facilitated by strong transportation, which is seen as reliable and multimodal. The rail, airport, an inland port, and regional arteries (i.e. 3, 17, 39, 64, 66, 81, 95, 522, etc.) all being perceived as assets.

Transportation also connects the region to its workforce, which is perceived as being stable and educated, especially within the high-demand information technology sector. The education system as a whole, providing a pipeline for the workforce, is perceived as an asset for the region. There is a strong K-12 system, good trades/vocational training (e.g. K-Tech), and quality higher education through the community colleges and the University of Virginia (UVA, which has a far-reaching impact through its intellectual property, capital, and entrepreneurship programs. The UVA hospital is an example of an existing partnership that benefits the community. Other intellectual resources or anchor institutions that are seen as assets could include Vint Hill and Rivanna Station. There is a stable local government and probusiness leadership, with variations by locality, and a talented and engaged base of business owners. There are financial strengths in access to capital and there are concentrations of private capital that could also be leveraged.

Regional Weaknesses

Continuing the detailed analysis of the weaknesses shows that the region, there is a need for skilled and qualified workforce that matches the needs of employers. This is in spite of the fact that the workforce is generally viewed as being educated. It is perceived that this is part of a disconnect in secondary education regarding the varying benefits between the trades and college. There is a lack in high-level technical and specialized positions, such as those in STEM and the trades. Training needs to be tailored to business needs. There are only a limited number of large employers, and there is a perception that a lot of the existing jobs do not provide career growth opportunities. The average wage is low, especially in tourism. In some areas, such as Charlottesville, the cost of living seems high when compared to wages. There is a general perception that wages need to be more competitive to attract and retain the commuting workforce. The region is experiencing "brain drain," as educated individuals leave for other opportunities elsewhere. There is a perceived lack of entertainment and recreation opportunities.

Infrastructure is viewed as inequitable, being focused primarily in urban areas. It is the perception that the existing power may not have the ability to meet demand, and a cooperation between the four utilities is needed. There is insufficient reliable internet access, especially broadband, and the sewer/water infrastructure is also a concern. Transportation is perceived as having limited accessibility within the region, with a need to expand the road systems and public transport. The airport is in need of more direct flights. The region is geographically very rural with a few denser city centers connected by major roadways. Because of this, the many small businesses throughout the region suffer from logistical difficulties that make them less competitive. There are a few regional industry clusters, such as a small wood processing clusters, but more are needed. The area is lacking in light manufacturing, possibly due to supply chain weaknesses. There is a lack of synergistic business support and cooperation across sectors. General

topography may limit expansion in some areas, and there is a general lack of ready sites and real estate or office space. The region could be seen as unpredictable on land use, creating an unattractive reputation. There is also a perception of general resistance to change and a "no growth" attitude in some of the localities. Some of that is perceived to be fueled by well-funded "anti-growth" groups or general lack of understanding of the benefits of economic development by the general public. Moreover, some local laws and regulations, including zoning, can also be seen as barriers. In a broader sense, Dillon rule can further hinder local government. There is a general lack of cooperation between localities, as there has not been a history of collaboration. The economic development that is happening is inconsistent across the region. There is a lack of regional identity upon which to build. There is no infrastructure for regional collaboration, no regional structure and systems, and a lack of structure for cooperation between governments. There is also a perceived lack of resources and funding.

Regional Opportunities

More detailed analysis of the opportunities identified would indicate that there is a log of room for growth in regional collaboration, thanks to the GO Virginia initiative. The region could work on a regional identity, built out of the GO Virginia initiative, establishing a regional mindset and sub-regional cooperation. More public/private partnerships could be made, along with grassroots efforts.

Invest in infrastructure, including broadband and internet access. Transportation should be expanded, including rail. Invest in site development and site-readiness, producing more sites to meet the demand proactively, perhaps through a regional business park. General support for small businesses would help preserve and promote the region's entrepreneurial spirit. These efforts could include attracting incubators and telecommuting opportunities through partnerships with higher education and possibly the creation of an innovation center, a physical space with advanced incubation services. The CIC model could be replicated within the region, through an enterprise incubator or co-project development. These ideas should also be paired with seed capital opportunities. There is lots of room for growth, primarily by leveraging what is already present in the region. The region has proximity to other Regions with complementary industries and economic interests (e.g. beverage processing, manufacturing, etc.).

Technology, in particular, is seen as a sector worth targeting, given the region's assets in UVA Research, Vint Hill, NAP Cloud, and others. Other sectors that could be targeted include distribution, tourism, security, defense, and renewable energy or climate-related business. The region could look at patents distribution for new businesses, and research and development in higher education could generate new spin-offs. The region must leverage research capabilities with small and growing companies. There are already perceived synergies with local education resources and intellectual capital. However, more must be done to connect education systems with target industries in order to develop strong human capital ecosystems.

Workforce development should be a focus, including more workforce schools, such as those with a regional focus (e.g. New Pathways, CCAM, etc.). The region must be able to identify the gaps in education and workforce and be flexible to the changing demographics, such as Baby Boomers with second careers. The existing overlay in Region 9 of the Workforce Investment Board and Central Virginia Partnership territories is perceived as being a significant opportunity. Overall, there must be a willingness for localities to collaborate on specific projects and programs. There could be an opportunity to lighten regulations (i.e. through multiple levels of government) and to get creative in local government investments. The legislative though around investment is perceived as an opportunity. Rezoning (possibly without increasing taxes) is seen as another opportunity. In general, people want to live in the region and the region has a desire to improve.

Regional Threats

Lastly, detailed analysis of existent regional threats show that the external forces that could slow or stop progress in the region would include negative public opinion and lack of support, or outright resistance to changes. There is a thought that many will continue forward with a "business as usual" mentality. A lack of support could also translate into a lack of funding or cuts to funding. Political will and regulatory changes, especially around land use, could be seen as a threat. Moreover, general changes within the federal government could create uncertainty that might threaten target industries or regional progress. There could also be a disconnect between how state and local governments measure success for economic development. It is perceived that a clear path to regional cooperation is lacking.

General competition can be seen as a threat. Neighboring states might be offering more incentives with less restrictions. Other regions could be more competitive and have the ability to generate strong local matches. There could be a general lack of willingness to compete with others (i.e. provide incentives) or to collaborate together. Territorialism, or parochialism, is an obstacle.

Changing demographics will always be a threat, with younger workers leaving the area and older workers returning, but also a lack of seasonal workers (which may require a statewide approach or program) can threaten progress. Worker training cycles and a lack of vocational education can become threats, as does turnover in education due to uncompetitive compensation.

An economic downturn could also become a threat, especially given the possible costs of development and infrastructure expansion, which in themselves could become a threat. Failure to invest in infrastructure development, including transportation, would slow or stop growth in development, as would inconsistent or unpredictable land use decisions. Because the community values its quality of life, an imbalance between that quality and the economic development occurring could be perceived as a threat.

Summit Notes

Responses organized by category and group

Assets I:

- Major transportation hubs for rail, airports (small – Charlottesville), trucks (distribution center), metro, rail lines/Amtrak
- Proximity
- Intellectual Resources (Workforce Dev, UVA, Comm. College, etc)

Assets II:

- Natural Beauty
- Educational Resources (medical, higher ed, industry within itself)
- Quality of Life (incl. climate, geography, etc.)
- Transportation/Proximity (i.e. to Markets)

Additional Assets I (Notes):

- Quality of Life*
- Location
    - Proximity to DC, Charlottesville, Richmond
    - East Coast logistics hub

    - Access to market
- Work where you live
- Transportation*
    - Reliable, multi-modal
    - Rail, airport**
    - Potential for rail expansion
    - VA Inland Port
    - Regional transportation arteries
        - 95, 17, 66, 522
- Intellectual resources*/stable, educated workforce
    - Workforce development centers (areas covered)
    - UVA*
    - Community colleges
    - Charlottesville Albemarle Technical Education Center (CATEC), vocational training expansion
    - Vint Hill
- Land*
- People
    - Skills/education
- Tourism in Region 9*
    - Hospitality/food service/production
- Cost of living, affordable relative to other areas
- Financial (access to capital in Virginia)
- Agriculture economies
    - Niche/specialized agriculture
    - New opportunities
    - Wineries/breweries
    - Equine (races, etc)
- History
    - Civil war/revolutionary war (Ashlawn, Monticello, Montpelier)
- Outside the fall zone
- Talented, engaged business owners
- Stable, educated workforce
    - Educated IT workforce
    - Workforce (importance of finding right match)*
- Diverse geography (urban/suburban/rural)
    - Selling point for new business?
- Probusiness leadership (locality variations)
- IT infrastructure (locality dependent)
- Existing partnerships (UVA hospital)
- Education (UVA, community colleges)
- Climate

Additional Assets II (Notes):

- Quality of life (workers, owners, current residents, live-work) *******
    - Climate, geography, desirable place to live
        - Natural Beauty/Environment
        - Natural Resources
    - Healthcare (access)* and medical resources*

    - Farm-to-table
    - "reasonable" cost of living
- Concentrations of Private Capital
- Transportation ***
    - Easy access
    - I-64, I-66, I-81, US 29, Rt 3, Rt 17
    - Roadway (Improvements, 64, Proximity to Mid-Atlantic, one-day drive)
    - Rivanna Station
- Infrastructure (deep-water port, air, roads) *
    - Established material flow for local producers/distribution
- Comparably lower cost (RVA or NOVA)
    - Less competition to keep workers, lower churn
- Socioeconomic diversity
- Tourism (scenery, visitors)
    - Historic venues
- Education*** System/Pipeline*/Resources
    - K-12
    - Trades
    - Higher Ed (Comm. College and University)
        - Institutions
        - Leverage UVA & CC system*
        - UVA** far-reaching impact (IP/Capital)
        - Entrepreneurship programs (opportunities)
- Location*
    - Proximity to DC and Richmond*
    - Proximity to large markets, access to markets (domestic/int'l)
- Stable local government
- Park Service* and Tourism* (historical) – Branding
- Agribusiness
- Highly educated workforce
- Steady economic base

Challenges I:

- Need skilled workforce
- Lack of adequate broadband
- Localities limit opportunities when self-interested

Challenges II:

- Lack of Space (ready space, incubators, etc.) and infrastructure (broadband, etc.)
- Lack of workers matching employers' needs (skills-gap, brain drain, middle skills)
- Infrastructure for Regional Collaboration
- Inconsistent cost of living (across region)

Additional Challenges I:

- Need skilled, qualified, pass drug tests*
    - Lack of soft skills
    - Lack career-ladder jobs
- Geographically dispersed – few areas of concentration

- Beauty of Region (doesn't need econ. dev.)
- Infrastructure*
    - Broadband****
    - Sewer, public water***
- Transportation (need to expand road system, public transport)
    - Access to Vint Hill and Airport
- Secondary education (College v Trades)
- Childcare is expensive
- Sequestration
- Local limitation on opportunities
    - Narrow focus or self-interested
    - Zoning*
    - Dillon impact
    - Lack of cooperation between localities
- Reputation (seen as unpredictable on land use)
- Resistance to change
    - Well-funded "anti-growth" groups
    - Lack of understanding of overall benefits of economic development (general public)
- Lack of resources* and funding
- Lack of historic collaboration (regionally)
- Dillon – hinders local government (incentives) but positive for business (regulatory)
- Competitiveness in pay (how to attract commuting workforce)
- Difference in motivations in each county
- Biased economic/business values
- Lack of entertainment/recreation

Additional Challenges II:

- Low high-skilled trade workers
- Equitable infrastructure
    - Power – ability to meet demand
        - How to get four utilities to work together?
    - Broadband Gaps or limitations******
    - Accessibility/Transportation within Region (more E-W)**
    - Infrastructure only found in urban areas
    - Airport – direct flights
- Site Readiness/Lack of ready sites**** and real estate/ office space
- Lower wage jobs in tourism
- Lack of synergistic business support/coop. of sectors
- Small wood processing cluster – need more
- RURAL – spread apart, small businesses are unconnected, see alone in competition
- Brain Drain – losing job opportunities *
- How to leverage assets? Lack awareness of R&D
- Tailor training to business needs
- Skill gap**** – company gap, human capital
    - Lack higher-level tech positions (specialized), STEM/Trades
    - (top skills + bottom, but lacking middle)
    - Workforce development / trade schools

    - Lack of workers to match employer need (trade system)
    - Executive/Management skillsets hard to find
- Regional approach
    - Inconsistency across region
        - Inconsistent economic development
        - Diversity between counties
    - Lack of Regional Identity
        - Not a historic region
    - Lack of Regional collaboration***
        - Lack of infrastructure for regional collaboration
        - Lack of regional structure and systems
        - Lack of structure for cooperation between governments
- Cost of living*, housing, land
    - (esp. around Charlottesville)
    - especially compared to wages
- Low average wage*
- Mind Set of Counties
    - Perception of "no-growth" attitude in some localities
    - Regulation (local)* and barriers from laws/regulations
    - Community will
    - Resistance to change
- Topography – limits expansion in some areas
- Adequate technical resources
- Supply chain weaknesses
- Lack of light manufacturing
- Limited number of large employers/limited opportunities for career growth
- Anchor company?

Opportunities I:

- Technology (UVA Research, Vint Hill, biomedical, fed gov expansion, NAP cloud)
- Regional Collaboration (local/state gov and legislative thought around reinvestment, more business-minded)
- Room for growth through site-readiness, public/private partnership, infrastructure and transportation investments, and business incubation

Opportunities II:

- Innovation Centers or Innovation Ecosystems (human capital development, dev. training capital)
- Mind-Set/Regional Identity
- Sites/Regional Park (Gov. Opp.)

Additional Opportunities I:

- Technology
- Regional collaboration
- Legislative thought around reinvestment
- Room for growth – leverage what is there
- Rezoning
- Improve site readiness*
- Public/private partnership
- Infrastructure investment*

    - Cable, phone, internet
    - Expand rail
- Transportation expansion
- Business incubators*
- Patents distribution (new business) Fauquier + UVA
- Baby boomers and Second Careers
- Tourism (lakes, rivers, vineyards, etc)
- Location
- Ability to be creative in local government investments
- Proximity to regions with complementary industries/economic interests (valley ex: beverage processing, manufacturing, etc.)
- Willingness for localities to collaborate on specific projects/programs
- Opportunity to lighten regulations (multiple levels of gov)
- Identify gaps in education, workforce, credentials (public, private, nonprofit)
- Rezone without increasing tax
- Vint Hill
- Airport
- Workforce development
- Expanding quality of life

Additional Opportunities II:

- Export commuters – where jobs are – keep home
- Desire to improve
- Manufacturing and technical places to grow
    - Offset the costs of growth and commercial
- Job futures for our kids
- Rivanna Station expansion
- Support for small business, develop entrepreneurial spirit
    - Attract incubator or telecommute (workers/owner, econ partnership with higher ed/tech)
        - Innovation center (Physical space with advanced incubation services)
        - Start-up incubation with employment growth opportunities
    - Replicate CIC model within Region (enterprise incubator or co-project development)
    - Seed capital opportunities
- Higher ed R&D effort into spin-offs
    - UVA – commercial of research
    - Outreach – UVA
    - Leverage UVA's research capabilities w/ small/growing companies
    - Synergies/leverage local education resources
    - Intellectual capital
- PPP – kept Patriot Aluminum here (lease purchase 30k)
- Workforce schools – regional (new pathways, c cam – Prince George)
- R&D development
- Grass Roots
- Site development/infrastructure*
    - Produce more sites to meet demand *proactively*
- Human Capital – Ecosystems
- GO Virginia to build regional identity
    - Regional mindset/identity

    - Sub-regional cooperation
- Connect education systems with target industries
- Out of 50-mile radius for government jobs
- Current WIB/CVP overlay, Area 9
- People *want* to live here
- Renewable energy/climate space
- Infrastructure investments
    - Broadband
- Business park (regional)
- Distribution centers
- Increase Tourism
- High-Tech, Security, and Defense
- Distributed workforce

Threats I:
- Public Opinion/lack of public support
- Lack of funding/prioritization of funding
- Competition (between localities, regions, states, globally)

Threats II:
- Mind-Set/Politics*
- Competition (turf wars)
- Resources (capacity and financing)
- Transportation/Airport
- Workforce/Human Capital (efficiencies, demographics, etc.)

Additional Threats I:
- Public opinion/lack of public support/buy-in*
    - "Business as usual"
    - Lack of buy-in/effort from any site (public or private)
- Lack of funding**/cuts
    - Prioritization of funding/investment
- Turnover in public education (not adequately compensated)
- Regulation/laws
    - Around land use
    - Change in political will
- Competition (localities, regions, states, globally)
    - Neighboring states offering more incentives with less restrictions
    - Lack of desire/effort to compete
    - Competitiveness with other regions
    - Ability to generate local match
    - Inter-municipal relationships
- No clear path to regional cooperation or VISION*
- Demographics (age distribution)
- Bleeding growth from the region
- Lack of vocational education
- Failure to invest in infrastructure (be pro-active)
- Territorial obstacles to collaboration
- Lack of seasonal workers (state-wide program)

- Millennials leaving/Age distribution
- Cost of infrastructure expansion (water/sewer)
- Unpredictable/inconsistent land use decisions
- Balancing economic development with quality of life

Additional Threats II:
- High site costs
- Lack of incentives (symptom of other problems)
- Competition** (Inter-state)
- County "turf" issues* and parochialism
- Worker training cycles
- Resources*** and Funding (incl. willingness to partner)
    - Organizational pathway for resources is limited
    - Lack of capital
- Political will**
    - Lack of participation in politics
- Lack of will and resistance to change***
    - Intergenerational conflict
- Development costs/site (intentionally small)
- Federal government changes (uncertainty)
- Disconnect between state/local measure of success for economic development
- Large area with varying interests
- Economic downturn
- Airport access (distance to Dulles)*
    - No discounted carriers
- Limit more in ready space
- Logistics of operationalizing
- Inertia
- Taxes

VALUES:
- Quality of Place**/Location (preservation of natural beauty)
    - Environment/Geography
    - Preservation of the community aesthetic
    - Preservation of environment and historic areas
    - Growth vs. No-Growth
- Quality of Life
- Education** (quality)
- History
- History of innovation** (try new things while preserving)
    - Enabling entrepreneurial spirit (incubators, bus. dev.)
- Equality of preparedness for opportunity/work, individually and municipally
- Enable entrepreneurial spirit (incubation, new business ideas, government, shared resources within region)
    - Build supports for business growth, entrepreneurial
    - Increase resources in areas where they are limited (CIC strong in Charlottesville)
- Adaptable, collaborative, receptive, partnership (gov/business)

Actions:

Improve willingness to change, infrastructure investment, holistic view of economic development

STATEMENT:
As a region that values… quality of life, community aesthetic (historically), enriching our economy… education…
As a region that values… Preservation of history, education, natural resources, coupled with innovation…

We are working toward… realistic view of the future… through adaptable, collaborative, receptive, openminded, business and government with citizens…
We are working toward… purposeful growth that creates equitable and diverse opportunities for entrepreneurialism… equitable access…

Attendee List

The following tables list the attendees of the July 17th and 18th economic summits for Region 9, who contributed their thoughts and opinions on economic development within the region for use in the Economic Growth and Diversification Plan.

GO Virginia Economic Development Summit Attendees - July 17, 2017		
First Name	Last Name	Affiliation
Duane	Adams	Candidate for Louisa County Board of Supervisor
Lynn	Bell	Fauquer Chamber of Commerce Board Member
Frank	Berry	Hantzmon Wiebel
Geri	Berry	Madison County resident
Sandy	Boone	Culpeper Chamber of Commerce
Chip	Boyles	Thomas Jefferson Planning District Commission
Gerry	Culver	Culpeper Small Business Advisory Council
Ed	Dalrymple, Jr	Cedar Mountain Stone
Bryan	David	Orange County
The Hon. Gary	Deal	Culpeper County
Miles	Friedman	Fauquier County
Rod	Gentry	Albemarle County EDA
Guy	Hinkler	Citizen
Ray	Knott	Union Bank & Trust
Joe	Martin	Fauquier Chamber of Commerce
Patrick	Mauney	Rappahannock Rapidan Regional Commission
Lisa	Peacock	Culpeper County Human Services
Oliver	Price	Rappahannock Electric Cooperative
Steve	Ray	Piedmont Workforce Network Chair
David	Reardon	Lord Fairfax Small Business Development Center
Ed	Scott	EcoSeptix Alliance
Sheba	Shough	Greater Warrenton Chamber of Commerce
Chris	Snider	Office of Congressman Brat
Renee	Younes	GMU Mason Enterprise Center

GO Virginia Economic Development Summit Attendees - July 18, 2017		
First Name	Last Name	Affiliation
Naomi	Aitken	Department of Aging & Rehabilitation Services
Chip	Boyles	Thomas Jefferson Planning District Commission
Suzanne	Brooks	Pepsi-Cola Bottling Co.
Rebecca	Cardwell	UVA Community Credit Union
Jim	Cheng	CAV Angels
Tom	Click	Patriot Aluminum
Brian	Cole	LexisNexis
The Hon. Norman	Dill	Albemarle County
Ethan	Dunstan	UVA Community Credit Union
Chris	Engel	City of Charlottesville
Alex	Euler	Center for Innovative Technology
Frank	Friedman	Piedmont Virginia Community College
Diana	Gamma	Greene County
Tracey	Gardner	Madison County
Christian	Goodwin	Louisa County
Betty	Hoge	SBDC
Elizabeth	Johnson	Social Enterprise Incubator of Charlottesville
Mary Jo	Kay	UVA Community Credit Union
John	Kluge	Alight Fund
Sharon	Krueger	University of Virginia
Gary	LeFeuvre	NEST Furnished Living Solutions
The Hon. Ann	Mallek	Albemarle County
Leigh	Middleditch	McGuireWoods
Kaye	Monroe	Department of Aging & Rehabilitation Services
Percy	Montague	Montague, Miller & Co.
David	Pettit	Lenhart Pettit
Colette	Sheehy	University of Virginia
Dave	Shreve	Albemarle County EDA
Dick	Sindy	Virginia Employment Commission
Mary Jo	Sisson-Vaughan	VA Small Business Finance Authority
Jason	Smith	Fluvanna County
Elizabeth	Smith	Afton Mountain Vineyards
Mark	Stapleton	Three Pines, LLC
Joel	Stopha	Virginia Economic Development Partnership
Andy	Wade	Louisa County
Doug	Walker	Albemarle County
Sam	Wilson	Rappahannock Electric Cooperative

Appendix IV - Qualitative Information Summary

Table of Contents

Talent Development

- The economy is reaching full employment, not a lot of slack labor, no available skilled labor in particular.
- Job decreases in some industries have caused existing job numbers to be so low those industries may not support future or even present demand:
    - Jobs in manufacturing, wholesale, mining, and forestry decreased, creating possible shortages if/when there is future demand.
    - Construction jobs are down but growth in other industries is creating demand for construction services that can't always be met with resources in the region, particularly for larger projects.
- Giant and super expert workforce is out-commuting each day to NOVA.
    - How do we retain that talent and use it to build businesses in the region?
- Opportunity – 12,000 veterans exit the military in VA each year, how do we connect to local companies.
    - Tie-in with skilled trades and entrepreneurship.
- Highly skilled workforce already employed, established and stable in general.
    - Employment in high-skill areas expected to continue to grow, another 25k+ jobs.
    - Example 1 – Continental, which closed a Mexico plant and integrated into local facility – their production efficiency was top-notch.
    - Example 2 - The University of Virginia attracts a number of highly-skilled workers as well as trailing spouses.
- The geographic location of Region 9 is an asset.
    - The region offers various post-secondary education providers including the University of Virginia (UVA), Piedmont Virginia Community College, Germanna Community College, and Lord Fairfax Community College.
    - The quality of life factor contributes to the boomerang affect: low taxes, scenic wonders, an hour drive from the mountains and a two-hour drive from the beach, and proximity to D.C. In addition, the region attracts millennials with various bike paths, hiking trails, brewpubs, and vineyards.
- K-12 system is strong and well-performing.
    - Charlottesville Public Schools has introduced students to career exploration training in both primary in secondary education.
- Within Region 9, Charlottesville, Albemarle County and the University of Virginia have become a center of economic and workforce development.
    - The University of Virginia is the region's largest employer; however, it is difficult to be hired unless you have a foot in the door.
    - The University of Virginia, while still being a partner within the workforce system, has continued to push forward with their own initiatives rather than collaborating with other initiatives across the region.
- The region's local community colleges act as feeder schools to the University of Virginia but have had challenges with attitudes about 2 vs. 4-year colleges as starting points.
    - Beginning at the K-12 level, community colleges have offered students dual enrollment courses they can transfer to the local community college or a 4-year university.
    - Interviewees noted that there is a mindset amongst students that attending a 4-year college is the only pathway for success.

- Parents have not been as supportive. They want their children to be more successful than they were and push the idea of attending a 4-year university and moving to larger cities for career success.
- Up until the last year and a half, it has been taboo to talk about community colleges in the high schools.
- Community colleges have not been as successful promoting and branding themselves as University of Virginia, however high schools have permitted them to visit and generate a buzz among students.

- Interviewees noted that there is an influx in the number of highly-skilled workers and low-skilled workers but the region has a middle-skills gap.
  - Efforts have been underway in education to bridge that gap (i.e., leadership development programs, soft skill training, and career exposure/mentorship as early as the 6th grade).
    - Programs include: Go Driver; Peer Network; E-Squared; Core Craft.
    - CTE Schools include: Carver School; Charlottesville-Albemarle Technical Education Center.
  - Parents need to be convinced that advanced manufacturing is a good option for non-college bound kids.
  - Apprenticeship programs are needed as well.
  - While retail jobs have been in-demand and require relatively low skill level, many of these positions have been filled by students at the college and trailing spouses.
- While the talent is available in the region, it suffers from disconnects within workforce system that hinder its effectiveness in attracting and retaining jobs.
  - There is a disconnect between economic development and workforce development.
  - Business should drive the demand and the system should respond with the supply to meet those demands.
  - Workforce and economic development partners are not informed about what partners are doing and what is available to them, but are committed to improving that relationship with the help of the Workforce Development Board.
  - Duplication of services occurs because of lack of information about partner activities.
  - Members of the labor force commute out for work due to competitive wages, with the most common commute destination being NOVA or D.C.
  - Technical skills are missing as well as STEM-related skills. These skill sets are critical, especially in the information technology (IT) industry but there is a concern from education that if these individuals are trained and learn all they can about IT, they will graduate and leave the region to places like NOVA or California.
- There are several tourism destinations in the area.
  - Many of these destinations are Civil War-based including Brandy Station Battlefield, Wilderness Battlefield and one German trading post, Ft. Germanna.
  - Although nobody likes to talk about these types of low-skill positions, they can certainly be capitalized upon (i.e., hospitality, food and restaurants, retail trade, etc.) and be the foundation to advanced skill sets.
  - While the tourism industry is beginning to pop up more and more, from an economic development point of view, it is ideal to capitalize on it and leverage the influx of workers available in the region.
- The retail industry is booming at a rate higher than other industries and beginning to offer competitive pay.

- Capitalize on the K-12 systems.
    - As noted, Charlottesville Public Schools has already begun career exploration programs. This should be used as an example for neighboring school districts.
    - School districts in more rural counties noted a lack of career exploration initiatives: for example districts in Culpeper and Madison Counties used to have CTE programs but they have since ended.
- Get workforce board members to do the heavy lifting on workforce strategy.
    - There was a demand from interviewees that the Workforce Development Board needs to develop a vision that all of the partners can get behind, establish stronger goals, and become more innovative in an effort to attract businesses.
- Create sector partnerships to increase the number of seats to fill programs.
    - There is a talent attraction plan that took 18 months, but nobody would fund it. A foundation was willing to match funds, but no private sector funds were proposed, thus no matching funds.
    - The business community **MUST** be involved in this initiative.

Growing Existing Businesses

- Business services are the sweet spot for Fauquier County – don't require a lot of infrastructure, workforce is already present.
- Culpeper, Orange, Nelson, Fluvanna and Louisa Counties are all pro-business, other counties are more adverse and don't want growth in general.
- NOVA drives up the cost of labor because businesses there offer premium salaries.
- There are agricultural value-added opportunities that will be relatively high paying. Food systems is a broader concept than farming and food processing.
    - Example – Ardent Milling significantly expanding flour mill.
    - Greenhouse operations popping up around the region (they use a zoning work-around with one year of temporary operations that gets them the agricultural designation, then they can do what they want). Large commercial greenhouses are producing vegetables.
    - An equine-only feed mill is an opportunity --- like gluten-free production facilities for humans, these specifically exclude ionophore, which give horses heart lesions.
- Data centers would do well in Culpeper - they are pro-growth and have the infrastructure in place, including an existing data center. There is also one in Fauquier County. They could also work in Charlottesville.
- A lack of good sites/buildings is the second biggest constraint after workforce. The region needs to get sites to pad-ready where possible.
- Permitting takes too long.
- Charlottesville has great business formation, but some end up leaving the area due to constraints of land/buildings.
- Opportunities exist in cybersecurity, advanced manufacturing and general information technology.
- Orange County lacks a good solid road network, with no 4-lane roads (except small sections).

Startups/Innovation/Commercialization

- There are several institutes and centers in the region: the National Radio Astronomy Observatory, CFA Institute (grew out of two UVA professors), Insurance Institute for Highway Safety, Federal Executive

Institute (high level federal employee training), National Ground Intelligence Center and Defense Intelligence Agency (NGIC & DIA), JAG Law School, Darden Batten Institute (iLab), Medical/Bio Research, Biomechanics, UVA Applied Research Institute, UVA Environmental Resiliency Institute.

- In the Charlottesville/Albemarle County part of the region, many parts of the ecosystem are robust.
    - UVA does $328m in R&D, mostly funded by the Federal government and is looking to double that over 10 years.
    - UVA is contributing by training undergraduates and graduate students in entrepreneurship not only through the McIntire School of Commerce (undergraduate entrepreneurship minor) and the Darden School of Business, but also through programs in the School of Engineering (Technology Entrepreneurship Program). The McIntire entrepreneurship minor is now open to students in all of the schools.
    - Darden's programming is quite significant, including i.Lab Incubator and makerspace
    - Some co-working spaces are available and three projects are planned near the downtown mall, but the existing Charlottesville Technology Incubator appears to be supporting only a small number of companies.
    - Charlottesville Business Innovation Council is focused on startups, but other sector organizations are small, or fledgling.
    - Charlottesville Angel Network has invested over $3 million in the past two years, and CAV Angels, a group made up of UVA alumni, has made four investments to date.
    - The diversity and creativity supported by a "college town" is part of the supportive culture of this area.
    - Returning alumni are a resource provided by UVA – experience and expertise from other work, other regions.
- Start-ups in Charlottesville do not have access to affordable space, for example old mill or warehouse space that is available cheaply.
- The ecosystem is less developed in Fauquier County and sparse in the other Region 9 counties.
    - There are no major educational institutions teaching entrepreneurship in this part of Region 9, although George Mason University offers programs in nearby Fairfax County and has its biomedical campus in Prince William County. In Culpeper, the E-squared program supports business training for local high school students.
    - Fauquier County supports three small business centers, including the Mason Enterprise Center on Main Street in Warrenton and two small operations, one in Vint Hill and one in Marshall, that are essentially co-working spaces. The latter two are lightly used, while the Mason Enterprise Center is full and probably could grow. The Mason Enterprise Center exhibits the characteristics of an incubator, and also supports a small co-working space.
    - Throughout the region, there are also Small Business Development Centers (SBDCs), although they are part of several distinct organizations because of the way SBDCs are run in Virginia. Each is staffed differently, and supports a large geographic area. The SBDCs provide much of the technical assistance available to entrepreneurs and small business owners that use the spaces in Fauquier County, and to others in the rest of the region.
- Need to double the space available in Charlottesville for biotech cluster from 400,000 today to 800,000. State support so far has been negligible, need someone to pull together support, funds, and build a center that could be the new biotech hub similar to Indoor Biotechnologies. Need manufacturing space and wet lab space. Medical devices and instrumentation would be the focus.

Sites

- Site are in very short supply in general, particularly infrastructure or shovel-ready sites.
    - Lots of land could be industrial (example of Culpeper), but is not zoned, ready or even planned out.
    - Money and vision are the obstacles, political leaders can't see out that far.
    - Need to fit into VA's "site readiness program."
    - Need to actually market the sites as well – support particularly benefits sites with infrastructure and investments that will eventually address supply shortages.
- For the sites reviewed and visited:
    - No sites are well positioned for Biomedical/Life Sciences industry.
    - Majority of sites are lacking due diligence studies. For any sites being marketed for future industrial use, it is fairly standard to have a Phase I ESA completed.
    - Some communities and locations could be well suited for heavy industry, but these types of users are generally not preferred by the community or do not have necessary infrastructure.
    - Orange County and Louisa County are the only local economic development groups or localities that have control over any of the sites being considered.
    - For the sites that seemingly have wetlands located in major portions of the property, particularly on McDevitt Crown Jewel property, a wetlands delineation should be completed.
    - Lack of natural gas onsite at Ferncliff and T.E. Lee limits the types of operations that could locate in the industrial parks.
    - Where applicable, sites should proactively rezone in order to increase marketability of sites for potential projects.
    - Of all sites reviewed and analyzed, the Williams Heritage/Alexander site is the least understood and developed site. It is recommended that further study be conducted to determine if this particular site is even the best positioned property for investment by community.
- In Germanna Wilderness Area, there are 2,000 acres available for mixed use, could be a future housing/mixed use site with business services.
- UVA Research Park could be in play but only if UVA will engage and allow for development on the site.
- There is strong support for a regional industrial park – 526 acres owned by UVA could be a potential site if they can be engaged.
- Can we repurpose excess retail space into ready development sites, particularly in Albemarle and Charlottesville?
    - Example of substandard space, such as the metal recycling plant in Charlottesville that could be acquired and used.
    - Need Class A in Charlottesville, there is zero right now.

Other Opportunities

- The region is fast becoming a high-skill, intellectual-property focused economy. That has been good on some accounts but other businesses are leaving because of space, cost, political considerations around regulations, permitting, and site constraints.
    - Opportunity to pull in office development into the northern portion of the region if a site is available.
    - Biotech cluster significant in the south.

    - Data center and light industry centered around Culpeper.
    - Everywhere else seems to have industry, agriculture and tourism.
- PATH Foundation has $200mm +/- that is available for matching funds for various projects and can be used very broadly. Plans to invest around $8mm per year depending on fund performance. More interested in capital projects, don't want to fund operations.
- Healthcare challenges include lack of certain services, having to transport patients out of county.
- Broadband is a huge issue across the region, needs to be solved both for businesses and for talent attraction/retention, and to facilitate remote working.
    - Orange County example can be replicated across the region – they are building the fiber backbone to connect schools & county buildings and will extend to a series of towers that will serve for emergency response, wireless internet and cell phone antennae. Awarded $1mm from the state with county contribution of $600,000 for initial phase.
    - Fauquier planning $20mm over 5 years for broadband push.
- Some of the greatest challenges moving forward result from resistance to change on the part of existing residents.
    - The region has a lot of forested areas and conserved land; those who actually own the land prefer to keep things unchanged.
    - Interviewees noted that the region suffers from a lagging tech infrastructure. In certain areas of the region, there is limited broadband and phone service available. For many of the locals, this is a concern but it has been like this for years so why be concerned? This lack of technology is one reason why some millennials commute long distances for work and/or move out of the region all together.
- Restrictions on development in certain key areas are constraining growth.
    - Harmony and Deschutes could not be accommodated; a second brewing company moved to Region 8 when a lack of infrastructure in Nelson County forced them to look outside.
    - Economy is becoming more homogeneous around the knowledge-driven businesses, and restrictions on development, plus increased costs, will further hinder efforts to diversify.
- While the Go Virginia initiative is perceived as having good intentions, it is not gaining a lot of support from business, economic development, and workforce development stakeholders.
    - The state is divided into several regions already: workforce development areas, planning districts, etc.
    - These regions are built upon by layers creating duplicative services. Instead of eliminating roadblocks and barriers that have been identified already, they create new regions without eliminating previous regions. "Slap something else on it without replacing it."

Appendix V - Targeted Industry Profiles

Financial and Business Services

Region 9 Industry Profile

Overview

The Financial and Business Services industry sector is made up of 22 different 4-digit NAICS industries covering a broad range of products and services. Industry industries in this sector include those in Finance, Insurance, and Real Estate (FIRE), as well as accounting, consulting, and data processing services. This industry sector covers a diverse array of services related to finance and business management.

A detailed list of 4-digit NAICS industries within this industry sector is available at the end of this report. Because of the cross-compatibility of many industries within each targeted sector, some industries may belong to multiple sectors.

Major Products and Services:

- Insurance and wealth management
- Accounting and bookkeeping
- Real estate leasing
- Information and data processing
- Legal and consulting services

Significance Within Region 9

This sector was selected as a potential target for further growth and development due to a leakage of skilled professionals who are commuting out of the Region's northern counties and into Northern Virginia and the Washington, DC Metro Area. Only 23% of residents in Fauquier County work in-county, for example, while 77% commute to adjacent areas in Virginia, DC, or Maryland. When compared to other localities in Region 9, like Albemarle County, where 47% of residents work in-county or in Charlottesville, it is evident that Region 9's northern counties have a pool of talented workers that are currently dissuaded from working in-county. As this talent pool already exists in the region, it would be prudent to attract business investment locally with the aim of leveraging existing labor resources to grow this sector into the future. This could reduce commute times for residents and allow the productivity of their work to more closely benefit the Region.

Industry Trends

As of 2016, there were 2,310 establishments within Region 9's Financial and Business Services industry sector. This total amounts to 3% of Virginia establishments in this sector. The number of establishments has grown by 21% in the period between 2006 and 2016, adding nearly 400 net new businesses. This level of growth is below that of the Commonwealth of Virginia, but above that of the United States.

Establishment Trends, Financial and Business Services Industry Sector, 2006-2016

Location	2006 Est.	2016 Est.	# Change (2006 - 2016)	% Change (2006 - 2016)	% of US Est. (2016)
Region 9	1,916	2,310	394	21%	0.1%
Virginia	44,701	55,896	11,195	25%	3%
United States	1,552,748	1,791,724	238,976	15%	-

Source: EMSI 2017 Q2 Dataset

Historical and Projected Job Growth

Region 9 saw job growth in the last 10 years for this sector that outpaced both Virginia and the US, adding 2,155 jobs and increasing in size by 15%, compared to 13% and 9% growth for Virginia and the United States, respectively. This trend is expected to accelerate over the next 10 years.

Historical Change in Jobs, Financial and Business Services Industry Sector, 2006-2016

Location	2006 Jobs	2016 Jobs	# Change (2006 - 2016)	% Change (2006 - 2016)	Competitive Effect (2016)
Region 9	14,088	16,243	2,155	15%	256
Virginia	525,409	592,374	66,965	13%	(19,890)
United States	15,101,034	16,442,603	1,341,569	9%	-

Source: EMSI 2017 Q2 Dataset

Projected Change in Jobs, Financial and Business Services Industry Sector, 2016-2026

Location	2006 Jobs	2016 Jobs	# Change (2016 - 2026)	% Change (2016 - 2026)	Competitive Effect (2026)
Region 9	16,243	19,668	3,425	21%	1,038
Virginia	592,374	662,778	70,404	12%	(23,916)
United States	16,442,603	18,605,215	2,162,612	13%	-

Source: EMSI 2017 Q2 Dataset

Regional Competitive Effect[i]: The examined industry sector showed a positive competitive effect of 256 in the period between 2006 and 2016. This is evidence of some level of unique competitiveness within the region which promoted growth beyond that caused by typical industry-level growth and exogenous macroeconomic factors.

Concentration[ii]: When examining a given industry, a location quotient (LQ) greater than 1 denotes that a given industry is more concentrated in a specified area than across the entire United States. Of the 22 industries included in the Finance and Business Services industry sector, three currently have location quotients (LQs) that are higher than 1.2, which denotes significant concentration of an industry within a region. These industries are **Other Investment Pools and Funds (NAICS 5259** with an LQ of 4.53; **Insurance and Employee Benefit Funds (NAICS 5251)** with an LQ of 3.61; and **Other Professional, Scientific, and Technical Services (NAICS 5419)** with an LQ of 1.34.

Top Occupations Replacement Demand

The data on the following page indicates the top five occupations required to staff companies within the Financial and Business Services industry sector for the Central Virginia region. The data below is for the state of Virginia. While the top five occupations are projected to experience healthy growth, particularly for Management Analysts; Accountants and Auditors; and Software Developers, Applications, most of the openings over the next five years will be due to replacement demand, because of the aging population and upcoming retirements. Management Analysts; Accountants and Auditors; and Lawyers will have particularly high replacement demand.[iii]

Replacement Demand for Top Financial and Business Services Occupations in Virginia

Occupations	Employed in Industry Group (2016)	Change (2016 - 2021)	Openings (2016 - 2021)	Annual Openings	Replacement Jobs (2016 - 2021)	Annual Replacement Jobs	% Replacement Jobs
Management Analysts	52,999	2,470	6,233	1,247	3,762	752	60.4%
Accountants and Auditors	45,191	3,868	10,145	2,029	6,277	1,255	61.9%
Software Developers, Applications	37,116	3,046	5,806	1,161	2,759	552	47.5%
Lawyers	21,051	541	2,311	462	1,556	311	67.3%
Insurance Sales Agents	13,023	901	3,057	611	1,770	354	57.9%

Source: EMSI Q2 2017 Dataset

Job Postings and Required Skills

The following includes job posting data for the Central Virginia region between April and June 2017 for the top occupations required to staff companies within the Financial and Business Services industry sector. The top occupations by job postings include Customer Service Representatives; Secretaries and Administrative Assistants, Except Legal, Medical, and Executive; First-Line Supervisors of Office and Administrative Support Workers; Software Developers, Applications; and Maintenance and Repair Workers, General. Of these, there appears to be challenges in hiring First-Line Supervisors of Office and Administrative Support Workers and Software Developers, Applications. This indicates that there may be more demand than supply for these occupations. On the other hand, there were more Maintenance and Repair Workers, General hired than there were postings, which may indicate that companies are not relying directly on traditional job postings to hire.

Financial and Business Services Job Postings vs. Hires, April 2017 - June 2017

Occupation	Avg Monthly Postings	Avg Monthly Hires
Customer Service Representatives	171	116
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	170	135
First-Line Supervisors of Office and Administrative Support Workers	144	90
Software Developers, Applications	100	40
Maintenance and Repair Workers, General	84	93
General and Operations Managers	73	121
Sales Representatives, Services, All Other	72	53
Managers, All Other	72	23
Computer User Support Specialists	58	32
Personal Financial Advisors	54	17
Insurance Sales Agents	47	17
Computer Systems Analysts	46	32
Accountants and Auditors	42	82
Management Analysts	39	43
Bookkeeping, Accounting, and Auditing Clerks	38	119
Market Research Analysts and Marketing Specialists	35	39
Computer and Information Systems Managers	31	17
Receptionists and Information Clerks	22	66
Office Clerks, General	21	255
Counter and Rental Clerks	14	42
Software Developers, Systems Software	12	38
Property, Real Estate, and Community Association Managers	12	7
Real Estate Sales Agents	7	22
Paralegals and Legal Assistants	7	16
Graphic Designers	7	12
Legal Secretaries	5	7
Lawyers	5	26
Veterinary Assistants and Laboratory Animal Caretakers	4	10
Veterinarians	2	9
Architects, Except Landscape and Naval	1	7

Source: EMSI Q2 2017 Dataset

Financial and Businesses Services Job Postings Hard Skills, April 2017- June 2017

Skill	Relevance Score	Postings with Skill
Typing	0.96	350
Top Secret (Intelligence)	0.71	179
Administration	0.55	893
Marketing Planning	0.40	127
Financial Industry Regulatory Authorities	0.37	129
Long-Term Care Insurance	0.36	115
Software Engineer	0.31	90
Management	0.29	1,663
Brand Awareness	0.26	113
Finance	0.25	829
Analysis	0.21	504
Securities (Finance)	0.21	130
Sales	0.21	1,127
Information Security	0.19	580
Positioning	0.19	114
Operations	0.18	826
Microsoft Office	0.17	285
Marketing Strategies	0.16	124
Accounting	0.15	331
Microsoft Excel	0.15	348
JavaScript (Programming Language)	0.14	138
Customer Service	0.13	949
Plumbing	0.12	93
Financial Services	0.12	219
Accounts Payable	0.12	100

Source: EMSI Q2 2017 Dataset

Financial and Business Services Job Postings Soft Skills, April 2017- June 2017

Skill	Relevance Score	Postings with Skill
Coordinating	0.09	274
Listening	0.04	170
Leadership	0.04	445
Leading	0.02	253

Source: EMSI Q2 2017 Dataset

Based on national job postings for the Financial and Business Services industry sector, the most relevant hard skills include: Finance; Management; Accounting; Analysis; and Communications. National job postings also identify the most relevant soft skills for Finance and Business Service as: Leadership; Coordinating; Listening; and Leading. In addition, the following table lists the top five certifications required for this sector that were identified by national job postings, as well as the number of postings in which they were included: [iv]

Top 5 Certifications in Financial and Business Services Job Postings

Certification	Postings with Certification
Master of Business Administration (MBA)	31,217
Certified Public Accountant	23,293
Series 7 General Securities Representative License (Stockbroker)	17,990
Certified Financial Planner	12,174
Certified Internal Auditor	9,959

Source: EMSI Q2 2017 Dataset

The top three national occupational postings for the Financial and Business Services industry sector from April 2017 through June 2017[v] were identified as: Customer Service Representatives; Software Developers/Applications; and First-Line Supervisors of Office and Administrative Support Workers.
The knowledge, skills, and abilities for Customer Service Representatives were identified as the following:

- **Knowledge:** Customer and Personal Services; English Language; and Knowledge of Administrative and Clerical Procedures and Systems
- **Skills:** Active Listening; Speaking; and Service Orientation
- **Abilities:** Oral Comprehension; Oral Expression; and Speech Clarity

The knowledge, skills, and abilities for Software Developers/Applications were identified as the following:

- **Knowledge:** Computers and Electronics; Engineering and Technology; and English Language
- **Skills:** Programming; Systems Analysis; and Systems Evaluation
- **Abilities:** Deductive Reasoning; Inductive Reasoning; and Problem Sensitivity

The knowledge, skills, and abilities for First-Line Supervisors of Office and Administrative Support Workers were identified as the following:

- **Knowledge:** Administration and Management; Customer and Personal Service; and Knowledge of Administrative and Clerical Procedures and Systems
- **Skills:** Active Listening; Coordination; and Monitoring
- **Abilities:** Oral Comprehension, Oral Expression; and Written Comprehension[1]

[1] *O*NET Online.* Customer Service Representatives; Software Developers/Applications; and First-Line Supervisors of Office and Administrative Support Workers. https://www.onetonline.org/link/summary/43-4051.00; https://www.onetonline.org/link/summary/15-1132.00; https://www.onetonline.org/link/summary/43-1011.00

Supply Chain: Demand, Purchases and Sales

Demand

Demand for a given industry or industry sector is calculated based on the estimated national demand from all industries and consumers. Industry wages, taxes, and other values added payments are indirectly part of the demand through the production of the supplying industry. In 2016, the total demand by consumers and other industries in Region 9 for goods produced by the Financial and Business Services industry sector was $5.3 billion. Forty-one percent of this demand (or $2.2 billion in goods and services) was met within the region, while the other 59% of demand (or $5.3 billion in goods and services) was satisfied by imports from outside.[2]

Demand in Region 9 for Goods Produced by the Financial and Business Services Industry Sector

Location	Demand Met in Region	% Demand Met in Region	Demand Met by Domestic Imports	% Demand met by Domestic Imports	Total Demand in Region
Region 9	$ 2,178,793,697	41%	$ 3,159,134,812	59%	$ 5,337,928,510

Source: EMSI 2017 Q2 Dataset

Purchases

The Financial and Business Services industry sector purchased $2 billion worth of goods and materials from other industries in 2016. Forty-six percent of these purchases were sourced from within the region, while 54% were imported from elsewhere in the state and country. Purchases made within this industry are typically from similar industries within other FIRE industries, and generally favor in-region purchases (in six of the top ten industries, the majority of goods and services are purchased in-region).

The table below shows the industries from which Region 9's Financial and Business Services industry sector purchased the greatest quantity of goods.

Top 10 Industries by Purchases Made by the Financial and Business Services Industry Sector

NAICS	Purchases From	Purchases Made in Region	% Made in Region	Domestic Imported Purchases	% Domestic Imported	Total Purchases
523930	Investment Advice	$83,861,608	77%	$24,955,405	23%	$108,817,014
561320	Temporary Help Services	$30,790,772	34%	$60,742,294	66%	$91,533,066
524210	Insurance Agencies and Brokerages	$71,624,098	79%	$18,869,742	21%	$90,493,840
522110	Commercial Banking	$34,693,096	47%	$39,414,834	53%	$74,107,931
531110	Lessors of Residential Buildings and Dwellings	$48,253,615	74%	$16,627,142	26%	$64,880,757
523920	Portfolio Management	$43,487,199	83%	$9,156,871	17%	$52,644,070
531210	Offices of Real Estate Agents and Brokers	$29,619,608	57%	$22,271,697	43%	$51,891,305
551114	Corporate, Subsidiary, and Regional Managing	$20,847,091	42%	$28,818,232	58%	$49,665,323
523120	Securities Brokerage	$17,402,306	42%	$24,507,932	58%	$41,910,238
531120	Lessors of Nonresidential Buildings (except Miniwarehouses)	$25,579,380	65%	$13,919,163	35%	$39,498,542

Source: EMSI 2017 Q2 Dataset

[2] This data only includes demand with respect to industries and consumers within the United States.

Sales

Industry sales are calculated using the sum of the dollar value for all goods and services that other industries purchased from a given industry or industry sector. Since this calculation a.) uses historical data instead of estimates, and b.) does not include consumer spending, the total in-region sales for an industry or industry sector will often be lower than estimated in-region demand. Region 9 establishments within the Financial and Business Services industry sector primarily sold their products and services to other FIRE and government-related industries in the region. The industry sector's largest buyer was **Trusts, Estates, and Agency Accounts (NAICS 525920)**. Sales within all but three of the top ten purchasing industries increased in the period 2015-2016. The three industries that saw a decline in sales were **State Government, Excluding Education and Hospitals (NAICS 902999, $1 million in year-over-year decline)**, **Insurance Agencies and Brokerages (NAICS 524210, $110,000 decline)**, and **Periodical Publishers (NAICS 511120, $16.7 million decline)**.

Top 10 Industries by Sales Made by the Financial and Business Services Industry Cluster

NAICS	Sales To	Total Sales in Region (2015)	Total Sales in Region (2016)	Change in Sales (2015 - 2016)
525920	Trusts, Estates, and Agency Accounts	$114,172,151	$130,816,837	$16,644,686
902622	Hospitals (State Government)	$55,190,700	$69,894,441	$14,703,741
902999	State Government, Excluding Education and	$56,922,635	$55,828,088	($1,094,547)
621111	Offices of Physicians (except Mental Health	$45,613,146	$51,252,707	$5,639,561
523930	Investment Advice	$48,588,968	$49,076,545	$487,577
551114	Corporate, Subsidiary, and Regional Managing	$46,176,555	$47,806,577	$1,630,021
524210	Insurance Agencies and Brokerages	$36,525,195	$36,415,196	($109,999)
531110	Lessors of Residential Buildings and Dwellings	$32,227,201	$35,741,607	$3,514,406
901199	Federal Government, Civilian, Excluding Postal	$32,073,583	$34,772,880	$2,699,297
511120	Periodical Publishers	$46,085,601	$29,412,673	($16,672,928)

Source: EMSI 2017 Q2 Dataset

Factors Driving Investment and Competitiveness

As the US economy closes in on a full decade since the start of the 2008 Recession, it has made a slow but steady recovery. The Financial and Business Services industry sector, being largely reliant on the continued growth and success of the other industries to which they cater, has seen steady growth in tandem. Virtually all industries within the examined industry sector are reliant on macroeconomic growth, market upswings, and increasing disposable income in order to function.

Data Processing and Hosting

An industry that is shared with the Information Technology/Communication industry sector, data processing and hosting has benefited massively from advancements in information delivery and storage. Smaller, more agile companies like Salesforce have been able to decentralize their operations, allowing them to move to more cost-effective locations with leaner work teams with no loss in effectiveness. As

other industries choose to save money by outsourcing their data processing and hosting needs to more specialized agencies, growth expectations for this industry are optimistic. [3]

Securities Investment and Other Financial Vehicles

In the five years leading up to 2016, the portfolio management industry has seen steady growth as increasing discretionary income opened up additional capital for consumers to invest. Pension funds have bolstered investment amounts as well, as the rate of employees saving their earnings in pensions has grown. This industry in particular is incredibly decentralized—no single firm holds more than 4% market share, and even the three largest firms in the industry hold less than 10% of total market share.

Future outlook for this industry shows increased concentration, as successful companies acquire smaller firms to reinforce their existing returns. Even given these acquisitions, industry concentration will likely remain low. Barriers to entry, though still moderate, are steadily decreasing as the cost of collecting and analyzing market data decreases. Currently, the most difficult obstacle when starting a new investment firm is the time, effort, and sufficient assets under management (AUM) needed to cultivate a strong brand and reputation to survive in such a competitive industry.[4]

Legal Services

Law firms in the US provide research, expertise, and consultation on a range of matters related to criminal, business, tax, or commercial law. Due to of the somewhat expensive nature of these matters, budget-weary individuals and businesses have been more hesitant to seek legal counsel in the past ten years. As the United States moves further and further from the 2008 economic recession (a time when the Legal industry saw a decline in M&A and IPO activity which was offset by an increase in bankruptcy proceedings), additional economic activity will increase demand for legal counsel and is projected to grow revenues by 0.8% annually.

The legal services industry is highly fragmented, with close to 92% of US law firms employing less than 20 people. These firms are typically locally and regionally focused. Virginia's proximity to the DC Metro Area gives it a competitive edge on Federal Government cases, which provide lucrative employment opportunities for skilled workers.[5]

Insurance Agencies and Brokers

Insurance agencies and brokers benefit from increased demand for large material assets like homes and vehicles, as well as other intangible expenses like health care. Vehicle registration and demand for health care insurance are projected to increase as incomes rise and consumer confidence strengthens, while homeownership is expected to decline as rising real estate costs price potential buyers out of the market. Projected revenues are expected to grow by 3.7% per year for the next five years, though changes to the regulatory landscape for health care and real estate means this industry's future performance is not completely certain.

---

[3] Diment, D (2016). "IBISWorld Industry Report 51821: Data Processing & Hosting Services in the US". IBISWorld
[4] Miles, R (2016). "IBISWorld Industry Report 52392: Portfolio Management in the US". IBISWorld
[5] Morea, S (2016). "IBISWorld Industry Report 54111: Law Firms in the US". IBISWorld

A continuing trend of downward pricing pressure is expected going forward, as the proliferation of online insurance sales increases the ability of customers to compare prices. To adapt, insurance agencies and brokers have pushed to add additional value through insurance advisory services. Rather than simply serving as a middleman between insurers and consumers, many agencies and brokers are supplementing their services with risk management and insurance consulting. This push for better quality of service has resulted in more competitive hiring, as firms look for employees with a broad portfolio of skills beyond basic salesmanship.[6]

Key External Drivers

Data Processing and Hosting

- **Demand for services conducted online**- From online publishing to e-commerce, demand for data processing and hosting is driven by internet traffic and the need to accommodate, store, and analyze the transfer of information across online platforms. As individuals become more accustomed to using online and mobile services, Data Processing and Hosting will only gain further traction.
- **Price of computers and other equipment**- Falling storage costs for hosting and rising processing speeds for processing are expected to increase efficiency and lower overall costs within this industry, which should make existing firms more agile and lower barriers to the entry for new competitors.

Securities Investment and Other Financial Vehicles

- **Market movements**- The largest product of the finance (particularly portfolio management and related) industry is return on investments in securities and other investments. Movements in the market and subsequently market indices like the S&P 500 Index, can drastically affect performance within investment-related industries.
- **Per capita discretionary income**- Growing discretionary income is a sign that a higher share of per capita income will be invested in financial instruments. As the demand for wealth management and other investment services increases, this industry should expect stronger growth.

Legal Services

- **The crime rate**- The demand for services in criminal law is dependent on the number of criminals being prosecuted at a given time. Changes in the crime rate, crime reporting methodologies, or criminalized actions can impact demand for legal services.
- **Firm profits and number of firms**- As firms' profits increase, they are more likely to choose to engage in legal actions that warrant paying for legal services. Additionally, an increase in market players will likely increase the aggregate amount of legal action being taken, which will more often than not increase demand for legal services.

[6] Gambardella, A (2017). "IBISWorld Industry Report 52421: Insurance Brokers & Agencies in the US". IBISWorld

Insurance Agencies and Brokers

- **Per capita disposable income**- While certain types of insurance have an inelastic demand, an increase in disposable incomes will typically cause consumers to demand goods like automobiles, boats, motorcycles, and houses, which will drive demand for insurance for these goods.
- **The Natural Disaster Index**- An increase in natural disasters would drive up demand for insurance, but could also adversely impact upstream insurance underwriters if there is an abnormal number of payouts.

Success Factors

For all establishments within the Financial and Business industry sector to continue to operate successfully in the industry, they will need to:

- Establish a reputation for strong and in-depth knowledge of the product or service being offered,
- Understand local regulations and strategically negotiate with regulators,
- Observe and comply with all relevant government legislation,
- Recruit and maintain a highly-skilled and well-trained workforce, and
- Develop a strong network of contacts, referrals, and other industry players.

Factors Driving Location

Industries in the Financial and Business Services industry sector, being driven mostly by the presence of office space and broadband internet connection, have the benefit of increasing decentralization. The Northern Virginia office market is substantially overbuilt resulting in affordable lease rates and a 16.2% vacancy rate in that area.[7] Therefore, Region 9 must offer more to firms than just affordable office space to be competitive at growing existing businesses and capturing business expanding out of other locations as well.

While proximity to clientele is an important aspect for industries in this sector, the rise of high-speed internet has made obstacles to communication between establishments and their customers less of a concern. In the insurance industry, mobile shopping has resulted in quicker transactions and more competitive pricing for early adopters, while faster speeds have allowed data processing firms to diffuse into smaller spaces in more affordable geographies to maintain maneuverability against their competition.

In general, the prominence of industries related to the examined industry sector is proportionate to population. Major firms in every industry congregate around larger metropolitan areas like New York; Washington, DC; San Francisco, with smaller establishments setting up close to more regional centers in order to remain close to their customer base.

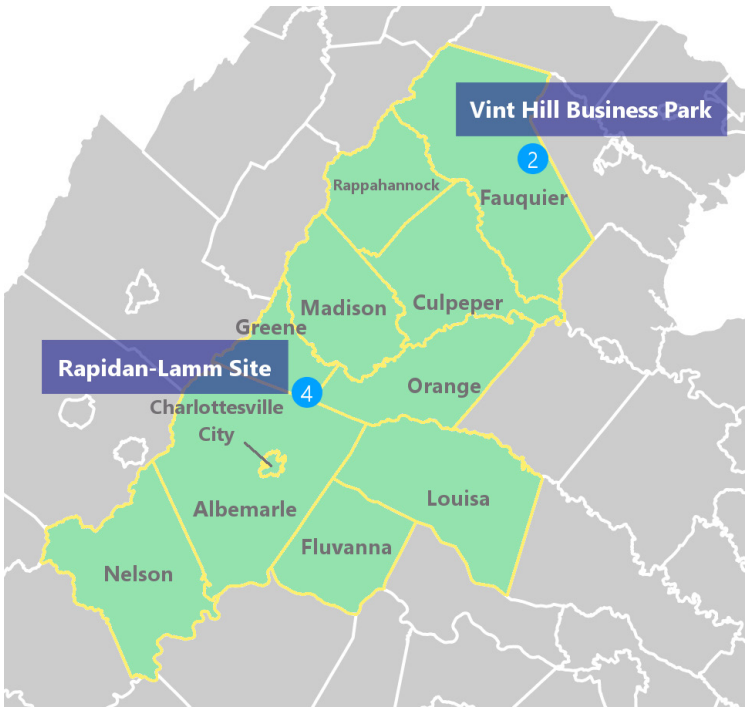
The Southeast region of the United States is an understated player in Financial and Business services. Virginia alone is home to 3.5% of all US data processing and hosting establishments, 2.3% of all portfolio management establishments, and 2.2% of all insurance brokering establishments. The ability to quickly

[7] Transwestern, "Northern Virginia Office Market, Fourth Quarter 2016" Real Estate Outlook.

reach and interact with a variety of Federal Government agencies gives the northern Virginia area a leg up on many government contracts, which has resulted in many major legal, consulting, auditing, and other business service firms choosing to headquarter close by.

Region 9 Sites Suitable for Financial and Business Services

The following sites have been deemed favorable for attracting firms within the Financial and Business Services industry sector, as they provide the necessary infrastructure, location, and capacity to support potential new businesses in this industry sector. Of the six sites visited and analyzed for potential development, two sites were determined to be strong options for future development.



Site #2: Fauquier County - Vint Hill Business Park

The Vint Hill Business Park is currently home to a server assembly and data center, OVH, and an FAA terminal radar approach control (TRACON) facility. They have plots currently available ranging from 3 to 45 acres of developable area. The park has multiple on-site access roads, and can be reached from Highway 215, approximately 1.5 miles off US 29. The business park is in a well populated and well educated area, and the has access to all major utility services except for industrial wastewater. A new, large veteran's center is planned for acreage adjacent to the business park. The proposed parcels are properly zoned as Planned Commercial Industrial District.

The Vint Hill sites reap a number of benefits from their location. With established neighboring business operations, the sites have access to all necessary utilities. The business park is also located in a well-educated community that is very attractive for those looking to locate outside of the D.C. area. The Vint Hill site is particularly well suited for IT operations, business and financial services, or high value-add light assembly (e.g. medical devices, aerospace, electronics) with the community capable of providing an educated, currently out-commuting, workforce.; however, the surrounding uses would generally be prohibitive for any kind of heavier industrial operation.

Site #4: Greene County - Rapidan-Lamm Site

The Rapidan-Lamm property is a 65-acre site that is far along in the development process. The site was cleared, graded, and prepared for a previous retail opportunity that did not materialize. Configuration of the site is roughly rectangular, and could support a single large development, or two or more smaller developments requiring approximately 30 acres apiece. The site is located directly on US 29, and neighbors a handful of retail and commercial operations to the north, with residential areas to the south

and east (including a large apartment complex bordering the property). Current zoning of the parcel is listed as B-2 for General Business.

The preparation activities that have already been performed on the Rapidan-Lamm site put it at an advantage in comparison to other sites, as potential buyers will not have to spend the time or money on these items. While the site itself could possibly support a light manufacturing facility, the surrounding residential areas of the site prevent this location from being a good fit for heavier industrial operations. Due to the significant residential development nearby, the site would likely be limited to commercial, retail, or office space. County Board of Supervisors has also expressed a desire to avoid any operation with large truck activity. Due to proximity to UVA and other biomedical/pharmaceutical research operations, there exists the opportunity to attract a similar facility to this site, but there is perceived to be a very small likelihood of that occurring.

Top Financial and Business Services Companies in Region 9

Region 9 Top Financial and Business Services Firms

Company Size	Company Name	Locality
500+ Employees	S&P Global Market Intelligence	Charlottesville
	State Farm Operations Center	Albemarle
200 to 499 Employees	CFA Institute	Charlottesville
	Communications Corp Of America	Culpeper
	LexisNexis	Charlottesville
	Merkle	Charlottesville
	Qbase	Louisa
	SWIFT	Culpeper
	Union Wealth Management	Culpeper

Industry Sector Definitions

List of 4-Digit NAICS Industries in Financial and Business Services Industry Sector for Region 9

NAICS	Description	Total Jobs (2016)	Total Est. (2016)	Location Quotient
3231	Printing and Related Support Activities	353	32	0.61
5182	Data Processing, Hosting, and Related Services	357	20	0.95
5191	Other Information Services	123	40	0.38
5222	Nondepository Credit Intermediation	239	42	0.32
5223	Activities Related to Credit Intermediation	90	19	0.24
5231	Securities and Commodity Contracts Intermediation and Brokerage	194	36	0.34
5239	Other Financial Investment Activities	565	110	0.87
5241	Insurance Carriers	525	64	0.36
5242	Agencies, Brokerages, and Other Insurance Related Activities	960	152	0.60
5251	Insurance and Employee Benefit Funds	18	2	3.61
5259	Other Investment Pools and Funds	28	9	4.53
5311	Lessors of Real Estate	930	118	0.96
5313	Activities Related to Real Estate	1,009	156	1.04
5331	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	26	5	0.88
5411	Legal Services	1,344	190	0.82
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	1,282	179	0.90
5413	Architectural, Engineering, and Related Services	1,248	199	0.68
5414	Specialized Design Services	322	42	0.94
5415	Computer Systems Design and Related Services	2,813	363	1.09
5416	Management, Scientific, and Technical Consulting Services	1,985	298	0.98
5418	Advertising, Public Relations, and Related Services	472	49	0.71
5419	Other Professional, Scientific, and Technical Services	1,359	187	1.34
Total		16,243	2,310	-

Source: EMSI 2017 Q2 Dataset

[i] The Regional Competitive Effect is part of a Shift Share Analysis. Shift Share Analysis distinguishes an industry's employment growth in a specific area that is attributable to local competitive advantages from growth that can be attributed to national employment trends or overall industry trends. Shift Share indicators help to answer the question "Why is employment growing or declining in this industry?" The **regional competitive effect** explains how much of the change in a given industry is due to some unique competitive advantage that the region possesses, because the growth cannot be explained by national trends in that industry or the economy as whole. This effect is calculated by taking the total regional growth of the given industry and subtracting the national growth for that same industry.

[ii] Location Quotient (LQ) analysis determines how concentrated a particular industry, demographic group, or other variable is compared to a larger geography. Concentration is a measure of local and regional strength when assessing economic growth potential. LQ is calculated by comparing the variable at a regional and national level. For example, if breweries account for 0.16% of all jobs in the Region but only 0.015% of all national jobs, then the LQ for breweries in that region would be 10.67 (0.16/0.015), demonstrating that breweries are 10 times more concentrated in that region than the national average.

[iii] The replacement demand looks at the number of jobs that are expected to be added to the regional economy between 2016 and 2021 and the number of jobs that will have openings due to normal turnover in the workforce such as retirement, death and changing careers. Occupations with a high number of replacement jobs compared to expected job growth may indicate an occupation with a low wage. However, it may also indicate a large number of upcoming retirements in the coming years due to an aging workforce.

[iv] Job postings are collected from various sources and processed/enriched by Careerbuilder to provide information such as standardized company name, occupation, skills, and geography. EMSI performs additional filtering and processing to improve compatibility with EMSI data.

[v] EMSI occupation employment data are based on final Emsi industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry.

Food and Beverage Manufacturing

Region 9 Industry Profile

Overview:

The Food and Beverage Manufacturing industry sector is made up of 11 different 4-digit NAICS industries that are all involved in the processed food manufacturing process. Dominant industries within this sector in Region 9 are in beverage manufacturing, particularly the manufacturing of beer, wine, and soft drinks. Additional manufacturing of baked goods and other food items also exists in the region.

A detailed listing of the industries included in the Food and Beverage industry sector is provided at the end of this profile. It should be noted that because of the cross-compatibility of many industries within each targeted sector, some industries may belong to multiple sectors.

Major Products and Services:

- Beer manufacturing
- Wine manufacturing
- Soft drink manufacturing
- Retail bakery manufacturing

Significance Within Region 9

A shift to a more localized Food and Beverage production scale has created an explosion of farm-to-table restaurants and craft breweries across the country. Craft breweries and small wineries have created new destinations in agritourism and provide a diverse set of offerings unique to their location. Consumers have demanded to know more about the environmental impact of the supply chain of their food and how they can contribute to a sense of community connection. In the last two years, Stone Brewing, Deschutes Brewing Company, and Green Flash Brewing opened locations in Virginia. There are multiple beverage trails open across the state, spanning wineries, breweries and cideries. This subsector of Food and Beverage Manufacturing is also linked to revitalizing downtowns and areas like warehousing districts which may have been abandoned by traditional developers. The tasting rooms that are offered by many smaller-scale breweries offer an intimate setting to get to know the producer and the local ingredients that went into the final product.

Industry Trends

In 2016, there were 99 Food and Beverage Manufacturing-related establishments in the region. This is nearly twice that of just ten years ago, which provides evidence of explosive growth in regional entrepreneurship surrounding this sector. The level of growth within the region was nearly twice that of the Commonwealth of Virginia, which grew 47% over the observed period, and nearly four times greater than that of the United States, which grew 26%. Roughly 12.5% of all establishments in the Food and Beverage Manufacturing industry sector in the Commonwealth of Virginia are located within Region 9.

Establishment Trends, Food and Beverage Manufacturing Industry Sector, 2006-2016

Location	2006 Est.	2016 Est.	# Change (2006 - 2016)	% Change (2006 - 2016)	% of US Est. (2016)
Region 9	50	99	49	98%	0.2%
Virginia	531	782	251	47%	2%
United States	33,088	41,812	8,724	26%	-

Source: EMSI 2017 Q2 Dataset

Historical and Projected Job Growth

In 2006 – 2016 the Food and Beverage Manufacturing industry sector tripled, growing from 565 jobs in 2006 to 1,769 jobs in 2016. This level of growth was well above that of the rest of Virginia, which remained relatively unchanged, and the United States, which grew by roughly 7%. Job growth projections into 2026 remain optimistic, with nearly 600 net new jobs estimated to be added in the following 10-year time period.

Historical Change in Jobs, Food and Beverage Manufacturing Industry Sector, 2006-2016

Location	2006 Jobs	2016 Jobs	# Change (2006 - 2016)	% Change (2006 - 2016)	Competitive Effect (2016)
Region 9	565	1,769	1,204	213%	1,067
Virginia	39,699	39,559	(140)	0%	(928)
United States	1,689,288	1,802,854	113,566	7%	-

Source: EMSI 2017 Q2 Dataset

Projected Change in Jobs, Food and Beverage Manufacturing Industry Sector, 2016-2026

Location	2006 Jobs	2016 Jobs	# Change (2016 - 2026)	% Change (2016 - 2026)	Competitive Effect (2026)
Region 9	1,769	2,364	595	34%	381
Virginia	39,559	40,296	737	2%	(1,917)
United States	1,802,854	1,905,750	102,896	6%	-

Source: EMSI 2017 Q2 Dataset

Regional Competitive Effect[i]**:** As shown by a positive competitive effect of 1,067, the Food and Beverage Manufacturing industry sector has performed well above expectations for the past 10 years, given national industry and macroeconomic employment trends. This high competitive effect is evidence of strong intrinsic competitiveness within the region that goes above and beyond the industry environment for the rest of the United States, as well as the Commonwealth of Virginia, which has had an equivalent but negative competitive effect. Future estimates suggest that Region 9 will maintain its competitive advantage into the future, though that advantage may be dulled in the face of exogenous market factors that may arise.

Concentration[ii]**:** When examining a given industry, a location quotient (LQ) greater than 1 denotes that a given industry is more concentrated in a specified area than across the entire United States. In order to be considered significantly denser than across the United states, an industry must have an LQ above 1.2. Of the 11 industries within the Food and Beverage Manufacturing Industry, only **Beverage Manufacturing**

(NAICS 3121) currently has a location quotient above 1.2. This industry's LQ as of 2016 was 5.0, indicating that it was **five** times more concentrated within Region 9 than across the entire US.

Top Occupations Replacement Demand[iii]

The data below indicates the top five occupations required to staff companies within the Food and Beverage Manufacturing industry for Region 9. The data included in the table below is for the state of Virginia. While the top five occupations are projected to experience healthy growth, especially Retail Salespersons and Sales Representatives Wholesale and Manufacturing and Team Assemblers, most of the openings over the next five years will be due to replacement demand. The aging population within the region will likely bring upcoming retirements within these occupations. All of the top occupations have replacement demand greater than 60% over the next five years. The most significant replacement demand is for Retail Salespersons, followed by Packaging and Filing Machine Operators and Tenders. Note that the median wage for Retail Salespersons tends to be lower than average, which may explain the high replacement demand, as workers seek higher pay jobs. Nevertheless, there will likely be high replacement demand for other manufacturing occupations, including Packaging and Filling Machine Operators; Tenders and Separating, Filtering, Clarifying, Precipitating; and Still Machine Setters, Operators and Tenders.

Replacement Demand for Top Food and Beverage Manufacturing Occupations (Virginia)

Occupations	Employed in Industry Group (2016)	Change (2016 - 2021)	Openings (2016 - 2021)	Annual Openings	Replacement Jobs (2016 - 2021)	Annual Replacement Jobs	% Replacement Jobs
Retail Salespersons	130,633	4,992	28,021	5,604	23,029	4,606	82.2%
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	32,106	1,612	4,996	999	3,384	677	67.7%
Packaging and Filling Machine Operators and Tenders	6,975	318	1,594	319	1,275	255	80.0%
Demonstrators and Product Promoters	3,694	218	787	157	565	113	71.7%
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	946	59	214	43	154	31	72.3%

Source: EMSI Q2 2017 Dataset

Job Postings and Required Skills

The table below includes job posting data for Region 9 between April and June 2017 for the top occupations required to staff companies within the Food and Beverage Manufacturing industry sector.[iv] The top occupation, by far, is Heavy and Tractor-Trailer Truck Drivers, with over 3,900 average monthly postings. Other top occupations include Retail Salespersons; Stock Clerks and Order Fillers; and Cashiers. For these top occupations, especially Heavy and Tractor-Trailer Truck Drivers, there is greater demand than supply. In fact, there continues to be significant demand for Heavy and Tractor-Trailer Truck Drivers.

Food and Beverage Manufacturing Job Postings vs. Hires, April 2017 - June 2017

Occupation	Avg Monthly Postings	Avg Monthly Hires
Heavy and Tractor-Trailer Truck Drivers	3,915	88
Retail Salespersons	406	380
Stock Clerks and Order Fillers	236	174
Cashiers	160	352
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	94	51
Maintenance and Repair Workers, General	84	93
Light Truck or Delivery Services Drivers	80	59
General and Operations Managers	73	121
Managers, All Other	72	23
Demonstrators and Product Promoters	59	15
Waiters and Waitresses	52	365
Driver/Sales Workers	36	39
Laborers and Freight, Stock, and Material Movers, Hand	31	144
First-Line Supervisors of Production and Operating Workers	27	18
Office Clerks, General	21	255
Inspectors, Testers, Sorters, Samplers, and Weighers	16	17
Bartenders	12	53
Industrial Truck and Tractor Operators	12	25
Industrial Machinery Mechanics	8	7
Bakers	5	9
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	2	149
Food Batchmakers	1	6
Packaging and Filling Machine Operators and Tenders	1	27
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	0	0
Mixing and Blending Machine Setters, Operators, and Tenders	0	4

Source: EMSI Q2 2017 Dataset

Food & Beverage Manufacturing Job Postings Hard Skills, April 2017- June 2017

Skill	Relevance Score	Postings with Skill
Road Transport	0.60	2,548
Wheels	0.45	1,015
Cargos	0.40	2,878
Driving	0.36	3,289
Cleaning	0.18	2,191
Hazardous Materials	0.13	1,332
Leasing (Contract Law)	0.13	976
Life Insurance	0.12	1,806
Health Insurance	0.11	1,305
Auxiliary Power Unit	0.10	360
Steering	0.07	347
Vision Insurance	0.07	377
Recruitment	0.06	3,066
Purchasing	0.05	845
Disability Insurance	0.05	409
Television	0.04	324
Information Technology	0.03	728
Insurance	0.03	2,349
Distribution (Business)	0.02	679
Merchandising	0.01	1,201
Warehousing	0.01	496

Source: EMSI Q2 2017 Dataset

Food and Beverage Manufacturing Job Postings Soft Skills, April 2017- June 2017

Skill	Postings with Skill
Scheduling (Project Management)	1,306
Leading	472
Leadership	409
Listening	316

Source: EMSI Q2 2017 Dataset

Based on national job postings for Food and Beverage Manufacturing, the most relevant hard skills include: Cold Calling; Repairing; Plumbing; HVAC; and Preventive Maintenance. National job postings also identify the most relevant soft skills for Food and Beverage Manufacturing as: Leadership; Coordinating; Leading; and Creativity. In addition, the top certifications required for this sector that were identified by national job postings, and the number of postings in which they appeared, are shown in the table below:[v]

Top 5 Certifications in Food and Beverage Manufacturing Job Postings

Certification	Postings with Certification
Master of Business Administration (MBA)	5,896
Commercial Driver's License (CDL)	4,881
Certified Global Meeting Planner	3,146
PMI Certified	2,126
Project Management Professional Certification	1,407

Source: EMSI Q2 2017 Dataset

The top three national occupational postings for Food and Beverage Manufacturing from April 2017 through June 2017[vi] were identified as: Sales Representatives, Wholesale and Manufacturing (Except Technical and Scientific Products); Maintenance and Repair Workers (General); and General and Operations Managers. The knowledge, skills, and abilities for Sales Representatives, Wholesale and Manufacturing (Except Technical and Scientific Products) were identified as the following:

- **Knowledge:** Sales and Marketing; Customer and Personal Services; and English Language
- **Skills:** Active Listening; Speaking; and Persuasion
- **Abilities:** Oral Comprehension; Oral Expression; and Speech Clarity

The knowledge, skills, and abilities for Maintenance and Repair Workers (General) were identified as the following:

- **Knowledge:** Mechanical; Building and Construction; and Customer and Personal Service
- **Skills:** Equipment Maintenance; Repairing; and Troubleshooting
- **Abilities:** Arm-Hand Steadiness; Manual Dexterity; and Near Vision

The knowledge, skills, and abilities for General and Operations Managers were identified as the following:

- **Knowledge:** Administration and Management; Customer and Personal Service; and Personnel and Human Resources
- **Skills:** Active Listening; Coordination; and Monitoring
- **Abilities:** Oral Comprehension; Oral Expression; and Problem Sensitivity[1]

[1] *O*Net Online.* Customer Service Representatives; Software Developers/Applications; and Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products. https://www.onetonline.org/link/summary/41-4012.00; hhttps://www.onetonline.org/link/summary/49-9071.00; https://www.onetonline.org/link/summary/11-1021.00

Supply Chain: Demand, Purchases and Sales

Demand

Demand for a given industry or industry sector is calculated based on the estimated national demand from all industries and consumers. Industry wages, taxes, and other values added payments are indirectly part of the demand through the production of the supplying industry. Currently 89% of total demand by consumers and other industries in the region for goods produced by the Food and Beverage Manufacturing industry sector was met by imports from outside the region, this demand amounting to nearly $920 million in goods and services, out of a total demand of over $1 billion. Only 11% of total demand within Region 9 was met by local industries, amounting to nearly $110 million.

Demand in Region 9 for Goods Produced by the Food and Beverage Manufacturing Industry Sector

Location	Demand Met in Region	% Demand Met in Region	Demand Met by Domestic Imports	% Demand met by Domestic Imports	Total Demand in Region
Region 9	$ 109,693,510	11%	$ 917,361,621	89%	$ 1,027,055,131

Source: EMSI 2017 Q2 Dataset

Purchases

A significant portion of the supply chain for this industry sector is purchases from other food manufacturing industries like **Flavoring Syrup and Concentrate Manufacturing (NAICS 311930)** or **Flour Milling (NAICS 311211)**, as well as manufacturers of packaging like **Metal Can Manufacturing (NAICS 332431)** and **Glass Product Manufacturing Made of Purchased Glass (NAICS 327215)**. Additionally, almost every industry in the supply chain that is related to packaging requires complete importation from outside the region. From the top 20 supply chain industries alone, the following packaging-related goods must be 100% imported from elsewhere in the state or country:

- **Packaging Machinery Manufacturing (NAICS 333993)**
- **Metal Can Manufacturing (NAICS 332431)**
- **Plastics Bottle Manufacturing (NAICS 326160)**
- **Corrugated and Solid Fiber Box Manufacturing (NAICS 322211)**
- **Other Metal Container Manufacturing (NAICS 332439)**
- **Glass Container Manufacturing (NAICS 327213)**

Purchases by the Food and Beverage Manufacturing industry sector from these six industries alone totaled $35.6 million in purchases in 2016, and total costs of wholly-imported packaging goods totaled over $48 million. Given the selection of Light Manufacturing as a targeted industry sector for the region, and the current abundance of wood product manufacturing, there may be an opportunity for the region to realize potential industrial synergies by integrating paper product manufacturing into the craft beverage manufacturing supply chain.

The table on the following page shows the industries from which the Food and Beverage Manufacturing industry sector in Region 9 purchased the greatest amounts of goods.

Top 10 Industries by Purchases Made by the Food and Beverage Manufacturing Industry Sector

NAICS	Purchases From	Purchases Made in Region	% Made in Region	Domestic Imported Purchases	% Domestic Imported	Total Purchases
551114	Corporate, Subsidiary, and Regional Managing Offices	$9,507,110	23%	$31,441,290	77%	$40,948,400
111000	Crop Production	$3,246,199	12%	$23,284,828	88%	$26,531,027
333993	Packaging Machinery Manufacturing	$0	0%	$8,635,934	100%	$8,635,934
332431	Metal Can Manufacturing	$0	0%	$8,405,756	100%	$8,405,756
327215	Glass Product Manufacturing Made of Purchased Glass	$652,734	9%	$7,001,816	91%	$7,654,550
533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	$2,642,788	36%	$4,741,520	64%	$7,384,307
311930	Flavoring Syrup and Concentrate Manufacturing	$242,245	3%	$6,795,037	97%	$7,037,282
311211	Flour Milling	$714,328	11%	$5,917,946	89%	$6,632,274
425120	Wholesale Trade Agents and Brokers	$161,122	3%	$6,097,423	97%	$6,258,545
326160	Plastics Bottle Manufacturing	$0	0%	$5,654,891	100%	$5,654,891

Source: EMSI 2017 Q2 Dataset

Sales

Industry sales are calculated using the sum of the dollar value for all goods and services that other industries purchased from a given industry or industry sector. This calculation a) uses historical data instead of estimates, and b) does not include consumer spending; the total in-region sales for an industry or industry sector will often be lower than estimated in-region demand. In 2016, establishments in Region 9's Food and Beverage Manufacturing industry sector primarily saw in-region sales of their goods and services go to other Food and Beverage manufacturers and vendors. The sector's two largest buyers were **Full-Service Restaurants (NAICS 722511)** and **Limited-Service Restaurants (NAICS 722513)**, which in 2016 made purchases of $4.4 million and $3.5 million, respectively. Sales within all but three of the top ten purchasing industries saw year-over-year growth in total sales amounts; the three which saw decline were **Animal Production and Aquaculture (NAICS 112000)** with a decline of $700,000; **State Government, Excluding Education and Hospitals (NAICS 902999)** with a decline of $62,000; and **Breweries (NAICS 312120)** with a decline of $143,000.

Top 10 Industries by Sales Made by the Food and Beverage Manufacturing Industry Sector

NAICS	Sales To	Total Sales in Region (2015)	Total Sales in Region (2016)	Change in Sales (2015 - 2016)
722511	Full-Service Restaurants	$3,543,405	$4,394,010	$850,605
722513	Limited-Service Restaurants	$2,909,231	$3,459,997	$550,765
312130	Wineries	$2,019,255	$2,750,358	$731,103
112000	Animal Production and Aquaculture	$3,102,384	$2,404,242	($698,142)
721110	Hotels (except Casino Hotels) and Motels	$1,296,589	$1,559,940	$263,351
902999	State Government, Excluding Education and Hospitals	$1,459,251	$1,397,646	($61,604)
312111	Soft Drink Manufacturing	$328,214	$1,238,372	$910,158
312140	Distilleries	$1,002,897	$1,147,644	$144,747
902622	Hospitals (State Government)	$825,201	$996,822	$171,621
312120	Breweries	$825,201	$682,683	($142,519)

Source: EMSI 2017 Q2 Dataset

Factors Driving Investment and Competitiveness

Focusing specifically on the Beverage Production industry within the Food and Beverage Manufacturing industry, a depreciating US dollar will provide an environment conducive to exports, creating an opportunity. Expected increases in consumer spending and disposable income have the potential to boost industry revenue, but strong competition between major enterprises threatens to offset some of this growth.

Dynamic perceptions and prioritization of health is changing consumer preferences regarding beverage purchases. As a response, the state and federal regulatory landscape is changing which may have large implications on beverage producers. Craft beverage manufacturing has seen a renaissance within the past few decades, as consumer preferences have shifted towards higher-quality products. This newfound demand has resulted in an explosion of new entrants into the market, who have sought to innovate in order to stand out in an increasingly competitive market. This increased competition can have both a positive and negative effect: while new entrants can threaten to steal business from incumbent players, having a strong enough industry presence can create a "destination" experience that visitors will be willing to travel further to enjoy. This experience is already prominently on display in Virginia, as the state is home to "beverage trails" (transportation corridors connecting multiple breweries in a short distance) like the Brew Ridge Trail and Nelson 151 Trail.[2]

The beer wine, and liquor manufacturing industries are expected to see steady growth over the next five years, as evolving tastes and consumer preferences push firms to develop newer product lines. Across the US, the number of firms within the brewing industry alone is expected to increase by 13.2% annually. However, this growth in firms will not translate entirely to growth in jobs. The number of jobs are projected to grow by 4.6% annually over the same period.

Competition in the Beverage Production industry is intense and market share concentration is high. The industry's key players are well-established and have fine-tuned their marketing strategies. Barriers to entry for the industry include requirement for large capital investments, the need to differentiate products, regulations, and international competition as larger corporation attempt to mimic "craft" styles to capitalize on this market.

Brewing and Winemaking

The brewing and winemaking industries have seen a significant shift in consumer tastes and preferences in recent years. Consumers, especially regarding a younger population, represent strong demand for craft beverages from small establishments versus the typical standard brands. Specifically, Millennials have expanded their tastes for domestic wine and craft beers. The industry has compensated this demand with many new, small entrants such as microbreweries, while the largest operators have seen increased merger/acquisition activity on the international level. The number of establishments in the brewery industry will continue to grow at a rate of 13.3%, causing revenue growth to flatten as the market becomes saturated. Revenue growth for wineries is predicted to grow marginally at an annual rate of 1%

[2] Virginia Beer Trails. Website: https://www.virginia.org/beertrails/

over the next five years. Most of the revenue growth that occurs will be concentrated to small operators versus large manufactures. Smaller wineries and breweries have captured demand by offering tastings and tours, which reduces the need to use retailers as the middleman. These smaller establishments also leverage their facilities as a destination and each offer a unique experience for their visitors. This has caused large players to get creative with their marketing techniques, and to seek out new technology to reduce their reliance on labor for production.[3,4]

Increased awareness of health concerns associated with beer consumption has caused some beer drinkers to transition to wine consumption as a substitute. This has created increased competition between the two industries.

Brand loyalty and development will also continue to be critical to success in the alcoholic beverage industry. Industry health also depends greatly on government intervention, as the alcohol industry is highly regulated. While regulations are expected to loosen in the coming years, excise taxes are predicted to increase. Revenue is expected to grow marginally through 2022.

Other Beverage Production

While craft beverage sales have skyrocketed thanks to the growing beverage culture and industry innovation, the soda production industry has not enjoyed a similar renaissance. Growing public conscience over the detrimental health effects of sugary beverages has driven increased preferences for healthier options like water and tea. Compounding the effects of these perceptions is the resultant "soda tax" legislation that has cropped up in multiple cities in the past decade, which has made carbonated soda drinks less affordable when compared to healthier substitutes. Overall, industry demand for carbonated soft drinks has declined by 2.7% annually for the past 5 years and is expected to continue in coming years with some offset in part by increased demand for energy drinks.[5]

Establishments in the soda production industry are beginning to innovate with new products that have a lower sugar content, fewer calories, and smaller portion sizes in order to accommodate those with health concerns. Larger industry players have begun diversifying their product offerings with a focus towards more in-demand beverages and zero-calorie reformulations. Some smaller players have also responded to stagnating sales by attempting to develop a "craft" brand for their own products as a non-alcoholic craft alternative. A 2015 Report by Mintel, for example, claimed that 57% of US adults agree that carbonated soft drinks made with natural ingredients are healthier than those made with artificial ingredients.[6] Many of these efforts, however, have been thwarted as consumers switch to bottled water and sparkling juice drinks in lieu of soda. In conjunction with growing health concerns, government campaigns for healthier habits also threaten demand as do proposed tax increases on soda.

---

[3] Stivaros, C (2016). "IBISWorld Industry Report 31212: Breweries in the US". IBISWorld
[4] Stivaros, C (2017). "IBISWorld Industry Report 31213: Wineries in the US". IBISWorld
[5] Stivaros, C (2016). "IBISWorld Industry Report 31211a: Soda Production in the US". IBISWorld
[6] Sisel, E (2015). "Carbonated Soft Drinks: Spotlight on Natural/Craft - US - June 2015". Website: http://store.mintel.com/carbonated-soft-drinks-spotlight-on-naturalcraft-us-june-2015

Intense competition in the soda industry will continue and prices of key inputs are expected to rise. This presents an opportunity for large producers that can pass the price increase on to consumers, but will hurt smaller establishments that cannot transfer the burden. Determinants for success in the industry are brand loyalty, disposable income, product innovation, and marketing. High market saturation and declining demand pose challenges to new entrants. There is great opportunity to capture demand where consumers seek healthier substitutes for carbonated beverages such as seltzer water and carbonated juice. Coffee and tea producers may also see increased demand from consumers seeking caffeinated alternatives.

Key External Drivers

Industry advancement due to coming increases in consumer spending may be offset by growth in the Trade Weighted Index (TWI) on national scale. The overall health of the beverage production industry primarily relies on disposable income and international trade trends. However, the beverage industry tends to fare well regardless of the general state of the economy. Additional external drivers for the industry are as follows:

- **Per capita sugar and sweetener consumption** – Heightened health consciousness has the potential to lower sugar consumption in the future, but per capita sugar and sweetener consumption is currently stable.
- **Per capita disposable income** – Increasing disposable income has different effects on each operator depending on brand status. Higher disposable income increases demand for premium brands in particular. Expected increases in disposable income may provide an opportunity.
- **Healthy eating index (HEI)** – This index portrays how closely the average person obeys the USDA's recommended diet guidelines. An increase in the HEI means that health consciousness is increasing, which will have a negative effect on industry sales. The index is expected to continue rising at a slow rate.
- **Price of sugar** – Sugar is a key component of soda, and thus sugar prices have a large effect on industry success. Establishments in the industry must either raise prices or absorb costs in the event of an increase in the price of sugar. Those that have strong brand loyalty will benefit from increased cost of sugar. Sugar prices have declined slightly in recent past.
- **Per capita soft drink consumption** – Soft drink consumption is expected to decline, posing a challenge to the industry.
- **Trade-weighted index** – The trade-weighted index is a measure of the US dollar against currencies of US trading partners. Industry demand has an inverse relationship with the TWI. The TWI is projected to grow over the 2017 year, which has the potential to stunt manufacturing growth.
- **Consumer spending** – Wine, beer, and soda are classified as discretionary goods and thus, sales will increase as consumer spending increases overall. The year 2017 is expected to bring consumer spending growth.

- **Excise taxes on beer and wine** – These are federal and state taxes imposed on the producers, who usually pass the expense on to consumers by raising prices. Excise taxes are projected to decline in 2017, which will allow consumers to purchase better quality beverages for a lower price. This presents an opportunity for the industry.

Success Factors

For Beverage Production operators to continue successfully in the industry, they will need to:

- Cultivate strong brand recognition,
- Establish a strong distribution network including bars, restaurants, and retail,
- Plan for quickly scaling production to accommodate growing demand,
- Differentiate themselves from competitors by creating unique flavors and packaging at a good price,
- Control quality and consistency of products,
- Utilize economies of scope and scale by producing products that satisfy an array of consumers and producing a large volume of output,
- Have an aggressive marketing strategy, especially for soda production given intense competition,
- Reduce costs by outsourcing noncore functions (particularly for soda production),
- Respond to growing health concerns with innovative products,
- Infiltrate export markets, and
- Ensure steady stream of inputs for production by entering supply contracts.

Factors Driving Location

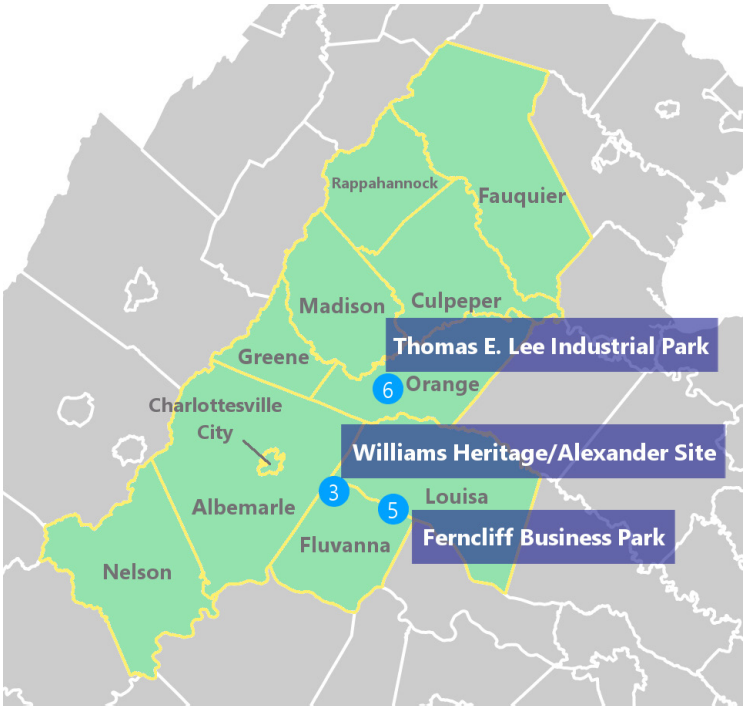
A determining factor in locational decision-making for Beverage Production is their proximity to market and population density, as well as distance from raw materials, access to export markets, and state taxes. Another very important aspect determining location, particularly for wineries, is climate. The brewing, winemaking, and soda producing industries are most concentrated in the Western region of the US, where 26%, 57%, and 22% of establishments are located, respectively. This region provides an ideal environment for beverage producers with high population concentration and abundance of entertainment events, as well as prime climate for production and consumption. The Southeast region of the US provides the second highest percentage of both soda and brewery establishments with 21% and 17%, respectively, due to the hot and dry climate.

The density of Food and Beverage manufacturing establishments in a given location generally correlates with that location's population, due to the ease of meeting demand by transporting goods within a local trade area. The West leads the nation in total brewery locations, possessing 26% of all US industry establishments. Most breweries are concentrated in California, which account for 14% of the country's establishments. California in particular is a popular area for beer drinking due to concentration of live entertainment events, such as awards shows and music festivals, and its growing number of national brands such as Lagunitas and Sierra Nevada.

But while most breweries can succeed with a strong product offering and sufficient demand, wineries are far more beholden to climate and geography. Virginia produces a significant amount of wine, but does not yet compete nationally for wine production. The West Coast, including California, Oregon, Washington, produced 57% of wine in the United States as of 2016. California's wine grape production reached 638.2 million gallons in 2015, according to the most recent production data released by the Wine Institute. While this represents 83% of all US wine production, California's production declined from the 728.9 million gallons generated in 2013. Virginia, despite being home to 3% of both breweries and wineries in the US, is still in the process of establishing and communicating its brand within a national context.

Region 9 Sites Suitable for Food and Beverage Manufacturing

The following sites have been deemed favorable for attracting firms within the Food and Beverage Manufacturing industry sector, as they provide the necessary infrastructure, location, and capacity to support a potential new business in this industry sector. Of the six sites visited and analyzed for potential development, three sites were determined to be strong options for future development.



Site #3: Fluvanna County - Williams Heritage/Alexander Site

The Williams Heritage/Alexander site in Fluvanna County is the least characterized of the sites evaluated. The site was only recently identified as a potential industrial opportunity, and therefore no site preparation has been done. The 156-acre site is located adjacent to Highway 250, just 2 miles from I-64. The property is heavily wooded, has notable elevation changes, minimal utilities onsite, and is bordered on the west by a residential neighborhood. Zoning is currently Agriculture and would have to be changed in order to promote site as an industrial property.

Even though the Williams Heritage/Alexander site has had no development or work, there is flexibility in regards to how it can be developed. It will likely have access to water and sewer by 2019, with possible access to gas and sufficient access to electric. With necessary utilities, the site could support light manufacturing or agricultural value-added activities. However, the cost of bringing natural gas to site may be prohibitive. Due diligence activities should take priority moving forward, as more accurate site information will aid in more precise industry targeting. By doing some preliminary site preparation (clearing of trees, possible grading) and establishing a plan for bringing in infrastructure, this site would be more marketable.

Site #5: Louisa County - Ferncliff Business Park

The Ferncliff Business Park is a rural industrial park located in Louisa County. The park is 104 contiguous acres, with approximately 70 developable acres remaining. 40 greenfield acres to its southeast were also recently purchased. Current users in the park include Patriot Aluminum and Cavalier Produce. Two speculative buildings have just been built and can be joined for a combined floor size of 100,000 square feet. The park is located between Highway 250 (Three Notch'd Road) and I-64, and is accessed via Highway 250, a half mile from I-64's Exit 143. Not counting the additional 40 acres (zoning of this parcel is to be determined), the entire industrial park is zoned Industrial and Commercial.

Ferncliff is well suited to support several industries that do not require natural gas. The sites could be used for projects that fall within the identified industry targets of light manufacturing and agricultural value addition, again with the caveat that they cannot supply natural gas. If Three Notch'd Road could be expanded from two lanes, the location could be a good fit for a distribution center or similar project due to its interstate proximity. It is doubtful that the site could support large footprint requirements due to the topography of the park.

Site #6: Orange County - Thomas E. Lee Industrial Park

The Thomas E. Lee Industrial Park in Orange County has multiple parcels available for development. There is an 8-acre site with 100,000 square foot building pad in place. The 8-acre parcel adjoins a 16.8-acre parcel that is not currently under the county's control. Though the 16.8-acre is adjacent to a rail line, there is significant concern on any potential for bringing the rail into the site due to significant elevation change. There is also a non-adjacent 5-acre parcel that could support smaller operations. The park is rurally located, over 2.5 miles from the Town of Orange. Most major utilities are already within the park, with the notable exception of natural gas, which is located more than two miles away. All sites within the park are adequately zoned I-2, Industrial.

The T. E Lee sites could successfully support light manufacturing operations or potential food processing facility. There is not currently natural gas on site, but access could be extended to the site with an estimated cost of $1.5 million. Most industry will likely face transportation issues, as the closest interstate is approximately 18 miles away. Additional opportunity exists for the area if dark fiber is successfully brought in, but current marketing efforts should not focus on any IT or financial service type industry.

Top Food and Beverage Manufacturing Companies in Region 9

Region 9 Top Food and Beverage Manufacturing Firms

Company Size	Company Name	Locality
100+ Employees	Merchant's Grocery Company	Culpeper
	Pepsi-Cola Bottling Company of Central Virginia	Charlottesville, Albemarle, and Fauquier
	Trump Winery	Albemarle
50 to 99 Employees	Ayrshire Farm	Fauquier
	Blue Mountain Brewery	Nelson
	Devils Backbone Brewing Company	Nelson
	Fitzgerald's Orchard	Nelson
	Prins USA	Culpeper
	Saddleback Farms	Nelson
	Veritas Vineyards & Winery	Nelson
	Whitewood Stable, Inc.	Fauquier
	King Family Vineyards	Albemarle
	Pippin Hill Farm & Vineyards	Albemarle
	Willow Run Greenhouse Corp	Culpeper
15 to 49 Employees	Acorn Community Farm	Louisa
	Afton Mountain Vineyards, Inc.	Nelson
	Ardent Mills	Culpeper
	Barboursville Vineyards	Orange
	Barrel Oak Winery	Fauquier
	Blue Mountain Brewery, Inc.	Nelson
	Bold Rock Hard Cider	Nelson
	Bright Farms	Culpeper
	Early Mountain Vineyards	Madison
	Fitzgerald Orchards	Nelson
	Gordonsdale Farm	Fauquier
	High Acre Farm	Fauquier
	Horton Vineyards	Orange
	Jefferson Vineyards	Albemarle
	Keswick Vineyards	Albemarle
	Misty Mountain Vineyard, Inc.	Madison
	Newstead Farm	Fauquier
	Old Bust Head Brewing Company	Fauquier
	Orchid Station	Orange
	Prince Michel Vineyards	Madison
	Silver Creek & Seamans' Orchards	Nelson
	Splendora's	Charlottesville
	Starr Hill Brewery	Albemarle
	Stonehall Farm	Fauquier
	Castle Hill Cider	Albemarle
	Blenheim Vineyards	Albemarle

Industry Sector Definitions

List of 4-Digit NAICS Industries in Food and Beverage Manufacturing Industry Sector for Region 9

NAICS	Description	Total Jobs (2016)	Total Est. (2016)	Location Quotient
3111	Animal Food Manufacturing	12	4	0.16
3112	Grain and Oilseed Milling	20	1	0.27
3113	Sugar and Confectionery Product Manufacturing	15	4	0.17
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	31	5	0.15
3115	Dairy Product Manufacturing	0	0	0.00
3116	Animal Slaughtering and Processing	16	4	0.03
3117	Seafood Product Preparation and Packaging	<10	0	0.07
3118	Bakeries and Tortilla Manufacturing	142	10	0.36
3119	Other Food Manufacturing	116	11	0.46
3121	Beverage Manufacturing	1,414	61	5.00
3122	Tobacco Manufacturing	0	0	0.00
Total		1,769	99	-

Source: EMSI 2017 Q2 Dataset

[i] The Regional Competitive Effect is part of a Shift Share Analysis. Shift Share Analysis distinguishes an industry's employment growth in a specific area that is attributable to local competitive advantages from growth that can be attributed to national employment trends or overall industry trends. Shift Share indicators help to answer the question "Why is employment growing or declining in this industry?" The **regional competitive effect** explains how much of the change in a given industry is due to some unique competitive advantage that the region possesses, because the growth cannot be explained by national trends in that industry or the economy as whole. This effect is calculated by taking the total regional growth of the given industry and subtracting the national growth for that same industry.

[ii] Location Quotient (LQ) analysis determines how concentrated a particular industry, demographic group, or other variable is compared to a larger geography. Concentration is a measure of local and regional strength when assessing economic growth potential. LQ is calculated by comparing the variable at a regional and national level. For example, if breweries account for 0.16% of all jobs in Maine but only 0.015% of all national jobs then the LQ for breweries in that region would be 10.67 (0.16/0.015), demonstrating that breweries are 10 times more concentrated in that region than the national average.

[iii] Replacement Demand utilizes the difference between the number of jobs that are expected to be added to the regional economy between the period of 2016 and 2021 and the number of jobs that will have openings due to normal turnover in the workforce such as retirement, death, and changing careers. Occupations with high figures for replacement demand compared to expected job growth may point to an occupation with low wages, or it may indicate a large number of upcoming retirements due to an aging workforce.

[iv] The Relevance Score indicates the frequency at which a particular skill appeared on job postings for the selected occupations relative to all job postings within the region. A positive score indicates a greater frequency.

[v] Job postings are collected from various sources and processed/enriched by Careerbuilder to provide information such as standardized company name, occupation, skills, and geography. EMSI performs additional filtering and processing to improve compatibility with EMSI data.

[vi] EMSI occupation employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry.

Information Technology/Communications

Region 9 Industry Profile

Overview

The Information Technology/Communications sector includes 16 different 4-digit NAICS industries involved in the development, deployment, and usage of IT and communications-related products and services. Establishments within this sector are primarily in research and development, electrical component manufacturing, or computer systems design. In addition to fiber optic cable production, manufactured products within this regional industry sector include search, detection, navigation, guidance, aeronautical, and nautical system and instrument manufacturing.[1]

A full list of all 4-digit within this sector can be found at the end of this profile. Because of the cross-compatibility of many industries within each targeted sector, some industries may belong to multiple categories.

Major Products and Services:

- Computer systems design services
- Data centers
- Engineering research and development
- Fiber optic cable manufacturing
- Navigational equipment manufacturing
- Other component manufacturing

Significance Within Region 9

This industry sector was chosen as a target for further growth and development for Region 9 thanks to suitable physical infrastructure and an available skilled workforce to expand its current offerings in these industries using readily-available resources. The region experiences a significant daily out-migration of workers to Northern Virginia counties where they are employed at data centers and related information technology firms. Retaining these skilled workers in the region by both expanding existing businesses, as well as attracting new businesses to the region will help support growth. Furthermore, Region 9 has the benefit of drawing on the technology and entrepreneurial assets of the University of Virginia for growth.

Industry Trends

In 2016, Region 9 was home to 1,184 establishments in the Information Technology/Communications sector, accounting for 0.1% of all businesses in the United States within the selected sector. This number marks an increase in the number of establishments of 128 (or 12%) between 2006 and 2016. This rate of change was lower than those of both the Commonwealth of Virginia and the nation as a whole, which grew by 27% and 23%, respectively.

[1] Miller, M (2017). "IBISWorld Industry Report 33451a: Navigational Instrument Manufacturing in the US". IBISWorld

Establishment Trends, Information Technology/Communications Industry Cluster, 2006-2016

Location	2006 Est.	2016 Est.	# Change (2006 - 2016)	% Change (2006 - 2016)	% of US Est. (2016)
Region 9	1,056	1,184	128	12%	0.1%
Virginia	25,358	32,257	6,899	27%	4%
United States	722,801	891,069	168,268	23%	-

Source: EMSI 2017 Q2 Dataset

Over the last 10 years, employment in the Information Technology/Communications industry sector has decreased by a net 69 jobs (a below 1% decline). This historical decline came despite growth in the sector at both the State and National level (6% and 10% growth, respectively). However, this net loss is expected to reverse to a net gain of over 1,600 jobs in the next 10 years (14% growth).

Historical Change in Jobs, Info. Technology/Communications Industry Cluster, 2006-2016

Location	2006	2016	# Change (2006 - 2016)	% Change (2006 - 2016)	Competitive Effect (2016)
Region 9	11,550	11,481	(69)	-1%	(1,364)
Virginia	385,887	409,392	23,505	6%	(55,942)
United States	9,386,809	10,299,748	912,939	10%	-

Source: EMSI 2017 Q2 Dataset

Projected Change in Jobs, Information Technology/Communications Industry Cluster, 2016-2026

Location	2006 Jobs	2016 Jobs	# Change (2016 - 2026)	% Change (2016 - 2026)	Competitive Effect (2026)
Region 9	11,481	13,089	1,608	14%	(146)
Virginia	409,392	439,352	29,960	7%	(44,401)
United States	10,299,748	11,700,889	1,401,141	14%	-

Source: EMSI 2017 Q2 Dataset

Regional Competitive Effect[i]**:** A regional competitive effect of -1,364 jobs is evidence that regional factors unique to the region contributed heavily to the net loss in jobs over this period, and that losses may have been greater in the absence of solid industry growth at the national level. Future projections are more positive, suggesting that the competitive effect within the region will become more substantial between 2016 and 2026.

Concentration[ii]**:** When examining a given industry, a location quotient (LQ) greater than 1 denotes that a given industry is more concentrated in a specified area than across the entire United States. Of the 16 industries within the Information Technology/Communications sector, three had a location quotient (LQ) above 1.2 (denoting significant concentration within the region). These three industries are **Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (NAICS 3345)** with an LQ of 1.36; **Other Electrical Equipment and Component Manufacturing (NAICS 3359)** with an LQ of 1.36; and **Scientific Research and Development Services (NAICS 5417)** with an LQ of 1.35.

Top Occupations Replacement Demand

The data below indicates the top five occupations required to staff companies within the Information Technology/Communications industry for the Central Virginia region. The data below is for the state of Virginia. While the top five occupations are projected to experience healthy growth, particularly for Management Analysts; Software Developers, Applications; and Software Developers, Systems Software, most of the openings over the next five years will be due to replacement demand. This is likely because of the aging population, which will increase the number of retirements. Trade occupations, such as Electricians and Heating, Air Conditioning and Refrigeration Mechanics and Installers, have a high percentage of replace demand.[iii]

Replacement Demand for Top Information Technology/Communication Occupations Virginia

Occupations	Employed in Industry Group (2016)	Change (2016 - 2021)	Openings (2016 - 2021)	Annual Openings	Replacement Jobs (2016 - 2021)	Annual Replacement Jobs	% Replacement Jobs
Management Analysts	52,999	2,470	6,233	1,247	3,762	752	60.4%
Software Developers, Applications	37,116	3,046	5,806	1,161	2,759	552	47.5%
Software Developers, Systems Software	27,457	1,417	3,428	686	2,011	402	58.7%
Electricians	19,264	223	1,772	354	1,475	295	83.3%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	11,013	106	1,002	200	844	169	84.3%

Source: EMSI Q2 2017 Dataset

Job Postings and Required Skills

The following includes job posting data for the Central Virginia region between April and June 2017 for the top occupations required to staff companies within the Information Technology/Communications industry. The top occupations by job postings include Customer Service Representatives; Secretaries and Administrative Assistants, Except Legal, Medical, and Executive; Network and Computer Systems Administrators; Software Developers, Applications; and Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products. It appears there may be challenges in hiring Network and Computer Systems Administrators; Software Developers, Applications; and Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products. For these occupations, demand exceeds supply.

Information Technology/Communications Job Postings vs. Hires, April 2017 - June 2017

Occupation	Avg Monthly Postings	Avg Monthly Hires
Customer Service Representatives	171	116
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	170	135
Network and Computer Systems Administrators	116	22
Software Developers, Applications	100	40
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	94	51
General and Operations Managers	73	121
Sales Representatives, Services, All Other	72	53
Managers, All Other	72	23
Medical Scientists, Except Epidemiologists	64	13
Computer User Support Specialists	58	32
Computer Systems Analysts	46	32
Accountants and Auditors	42	82
Management Analysts	39	43
Bookkeeping, Accounting, and Auditing Clerks	38	119
Business Operations Specialists, All Other	38	59
Market Research Analysts and Marketing Specialists	35	39
Web Developers	34	11
Computer and Information Systems Managers	31	17
Biological Technicians	29	14
Office Clerks, General	21	255
Electricians	18	43
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	17	28
First-Line Supervisors of Construction Trades and Extraction Workers	13	64
Software Developers, Systems Software	12	38
Plumbers, Pipefitters, and Steamfitters	8	21
Computer Programmers	7	10

Source: EMSI Q2 2017 Dataset

Information Technology/Communications Job Postings
Hard Skills, April 2017- June 2017

Skill	Relevance Score	Postings with Skill
Formal Learning	5.14	146
Top Secret (Intelligence)	1.52	273
Typing	0.79	325
Administration	0.59	941
Computer Science	0.47	101
Research	0.46	652
Analysis	0.42	681
Information Security	0.39	777
Wide Area Networks	0.37	88
Server (Computer Science)	0.36	281
Software Engineer	0.30	90
JavaScript (Programming Language)	0.27	199
Biology	0.26	120
Microsoft Windows	0.24	213
Information Systems	0.24	198
Databases	0.22	191
SQL (Programming Language)	0.22	195
.NET Framework	0.21	124
Systems Engineering	0.20	119
Engineering	0.19	493
Management	0.18	1,499
Java (Programming Language)	0.18	190
C Sharp (Programming Language)	0.18	126
Operations	0.18	839
Testing	0.17	529

Source: EMSI Q2 2017 Dataset

Information Technology/Communications Job Postings Soft Skills,
April 2017- June 2017

Skill	Relevance Score	Postings with Skill
Coordinating	0.07	251
Leadership	0.02	412
Listening	0.01	119
Leading	0.01	226

Source: EMSI Q2 2017 Dataset

Based on national job postings for the Information Technology/Communication sector, the most relevant hard skills include: Analysis; Server (Computer Science); Management; and Programming Language (Java, JavaScript, and SQL). National job postings also identify the most relevant soft skills for Information Technology as: Leadership; Coordinating; Creativity; Leading; and Listening. In addition, the top certifications required for this sector that were identified by national job postings, as well as the number of postings in which they were included, are shown in the table below:[iv]

Top 5 Certifications in Information Technology/Communications Job Postings

Certification	Postings with Certification
Master of Business Administration (MBA)	31,005
Certified Public Accountant	21,789
Cisco Certified Network Associate	13,572
CompTIA A+ Certification	12,091
Cisco Certified Network Professional	10,826

Source: EMSI Q2 2017 Dataset

The top three national occupational postings for Information Technology from April 2017 through June 2017[v] were identified as: Customer Service Representatives; Software Developers/Applications; and Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products). The knowledge, skills, and abilities for Customer Service Representatives were identified as the following:

- **Knowledge:** Customer and Personal Services; English Language; and Knowledge of Administrative and Clerical Procedures and Systems
- **Skills:** Active Listening; Speaking; and Service Orientation
- **Abilities:** Oral Comprehension; Oral Expression; and Speech Clarity

The knowledge, skills, and abilities for Software Developers/Applications were identified as the following:

- **Knowledge:** Computers and Electronics; Engineering and Technology; and English Language
- **Skills:** Programming; Systems Analysis; and Systems Evaluation
- **Abilities:** Deductive Reasoning; Inductive Reasoning; and Problem Sensitivity

The knowledge, skills, and abilities for Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products) were identified as the following:

- **Knowledge:** Sales and Marketing; Customer and Personal Services; and English Language
- **Skills:** Active Listening; Speaking; and Persuasion
- **Abilities:** Oral Comprehension; Oral Expression; and Speech Clarity[2]

[2] *O*Net Online*. Customer Service Representatives; Software Developers/Applications; and Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products. https://www.onetonline.org/link/summary/43-4051.00; https://www.onetonline.org/link/summary/15-1132.00; https://www.onetonline.org/link/summary/41-4012.00

Supply Chain: Demand, Purchases and Sales

Demand

Demand for a given industry or industry sector is calculated based on the estimated national demand from all industries and consumers. Industry wages, taxes, and other values added payments are indirectly part of the demand through the production of the supplying industry. The total demand by consumers and other industries within the region for goods produced by the Information Technology/Communications industry sector was $2.74 billion in 2016. Roughly 33% of this demand was met by the region's industry sector, amounting to $908 million in goods and services. The other 67% of demand was satisfied by imports from the rest of the country.[3]

Demand in Region 9 for Goods Produced by the Information Technology/Communications Industry Cluster

Location	Demand Met in Region	% Demand Met in Region	Demand Met by Domestic Imports	% Demand Met by Domestic	Total Demand in Region
Region 9	$ 908,003,422	33%	$ 1,827,545,505	67%	$ 2,735,548,927

Source: EMSI 2017 Q2 Dataset

Purchases

Region 9's Information Technology/Communications industry sector purchased $1 billion worth of goods and materials from all other industries in 2016. Thirty-two percent of these purchases were sourced from within the region, while another 68% were imported from elsewhere in the country. The industry from which the industry sector purchased the most goods and services was **Wired Telecommunications Carriers (NAICS 517110)** with over $67 million in total purchases.

Within the examined industry sector, a significant portion of the sector's supply chain comes from outside Region 9. In fact, in nine of the top ten industries in the sector's supply chain, the majority of purchases were imported from outside the region. For example, 100% of goods and services purchased from **Cable and Other Subscription Programming (NAICS 515210)** by the examined industry sector (a total of over $18.5 million) were purchased outside of the region. For **Copper Rolling, Drawing, Extruding, and Alloying (NAICS 331420)** as well, 99% of $30 million in purchases was from outside of the region.

The table below shows the industries from which Region 9's Information Technology/Communications industry sector purchased the greatest quantity of goods.

[3] This data only includes demand with respect to industries and consumers within the United States.

Top 10 Industries by Purchases Made by the Information Technology/Communications Industry Cluster

NAICS	Purchases From	Purchases Made in Region	% Made in Region	Domestic Imported Purchases	% Domestic Imported	Total Purchases
517110	Wired Telecommunications Carriers	$42,670,722	64%	$24,483,231	36%	$67,153,953
551114	Corporate, Subsidiary, and Regional Managing Offices	$11,648,180	37%	$20,080,276	63%	$31,728,455
331420	Copper Rolling, Drawing, Extruding, and Alloying	$193,225	1%	$29,810,035	99%	$30,003,259
512110	Motion Picture and Video Production	$1,213,141	5%	$24,506,488	95%	$25,719,628
561320	Temporary Help Services	$6,405,156	26%	$17,851,470	74%	$24,256,626
541110	Offices of Lawyers	$9,451,436	42%	$13,311,574	58%	$22,763,010
533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	$8,829,542	40%	$13,492,933	60%	$22,322,475
541330	Engineering Services	$4,307,639	21%	$16,336,871	79%	$20,644,510
515210	Cable and Other Subscription Programming	$0	0%	$18,544,744	100%	$18,544,744
522110	Commercial Banking	$8,289,331	45%	$10,070,145	55%	$18,359,476

Source: EMSI 2017 Q2 Dataset

Sales

Industry sales are calculated using the sum of the dollar value for all goods and services that other industries purchased from a given industry sector. Because this calculation a) uses historical data instead of estimates, and b) does not include consumer spending, the total in-region sales for an industry or industry sector will often be lower than estimated in-region demand. Regional establishments in the Information Technology/Communications industry sector primarily sold their products and services to government-related industries. The industry's largest buyer was **State Government, Excluding Education and Hospitals (NAICS 902999)**, followed by **Wired Telecommunications Carriers (NAICS 517110)**, with sales of $48.6 million and $40 million, respectively. Both these industries saw year-over-year decline in sales of over $600,000. The highest growth in year-over-year sales was seen in **Hospitals (State Government) (NAICS 902622)**, which grew by nearly $5 million in total sales.

The region's strong sales to various iterations of government indicate that success within the Information Technology/Communications sector is closely tied to the federal government's purchases, federal budget trends and the possibility of sequestration. Private sector firms in this field are highly dependent on federal procurement and any shifts of federal spending could have significant ramifications on the ability of Region 9 firms to grow their revenue or create jobs.

Top 10 Industries by Sales Made by the Information Technology/Communications Industry Cluster

NAICS	Sales To	Total Sales in Region (2015)	Total Sales in Region (2016)	Change in Sales (2015 - 2016)
902999	State Government, Excluding Education and Hospitals	$49,224,547	$48,619,884	($604,663)
517110	Wired Telecommunications Carriers	$40,658,279	$39,968,868	($689,410)
901199	Federal Government, Civilian, Excluding Postal Service	$35,870,418	$39,694,442	$3,824,024
902612	Colleges, Universities, and Professional Schools (State Government)	$32,552,937	$32,018,080	($534,857)
903999	Local Government, Excluding Education and Hospitals	$27,349,008	$31,513,594	$4,164,587
901200	Federal Government, Military	$28,169,818	$30,320,817	$2,150,999
902622	Hospitals (State Government)	$17,651,481	$22,582,576	$4,931,095
551114	Corporate, Subsidiary, and Regional Managing Offices	$18,105,833	$18,941,867	$836,034
523930	Investment Advice	$16,635,964	$16,882,090	$246,126
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	$15,934,023	$16,221,386	$287,363

Source: EMSI 2017 Q2 Dataset

Factors Driving Investment and Competitiveness

As the United States economy continues to bounce back from 2008 economic recession, the business climate will allow for corporate profits to rise. With increased profitability, businesses will feel more comfortable investing in IT services to improve their operational efficiency. Increased technology integration and product development will lead to an increase in private investment in IT related goods such as computers and software.

In the past decade, Virginia has invested more than $11.3 billion in the information technology industry, adding over 48,000 jobs. [4] Microsoft has invested in Virginia, including its $350 million investment to expand a data center in Boydton, VA. Carfax invested $15.8 million to expand headquarters in Fairfax and upgrade its data center in Loudon County. Additionally, Virginia offers tax exemptions by offering that all computer equipment bought or leased at any point before June of 2020 is exempt from Retail Sales and Use tax. The tax exemption is contingent on ensuring that the equipment is used in a facility within Virginia, that at least $150 million is invested in capital, and that the equipment's use generates a minimum of 50 new high paying jobs.[5] Currently there is a critical demand for Software Developers, Applications and Computer System Analysts. Meeting this demand can ensure that Virginia remains competitive in the IT/Communications industry.

Overall competition in the IT industry is high. The industry is based on a high level of technical expertise, quality of service, and availability of value-added services, while price is one of the lesser important factors. Consolidations among major companies allows firms to gain a competitive edge by expanding

[4] YesVirginia.org
[5] Miller, R (2009). "Virginia Passes Data Center Tax Incentives" Data Center Knowledge. Website: http://www.datacenterknowledge.com/archives/2009/05/13/virginia-passes-data-center-tax-incentives/

their service base. Additionally, senior companies have a competitive advantage in that they have a developed reputation and customer base.

While competition is high the barriers to entry in this industry are low. There are few local and state regulations and low startup costs for the IT industry. Establishing a new firm has only two requirements: an understanding of the IT field, and a functioning IT system. Larger corporations with a high capacity worldwide network of offices and services are substantial barriers to entry. While smaller firms cannot compete with them, new businesses often rely on these larger firms for good and services that aid in development such as server infrastructure and data storage. Smaller firms can gain a competitive advantage by tailoring their services to specific markets such as disaster recovery, database integration and maintenance and online retail development. By tailoring their services, they can provide services that are underserved by large corporate IT operators while facing lower overhead costs.

Computer System Design and Related Services

Computer System Design and Related Services Industry is projected to grow by 8.5% due to companies shifting to new technology and online services such as cloud computing. Downstream demand in finance and insurance will grow and further stimulate demand from the financial industry. Online financial services are expected to rise at an annualized rate of 8.7%, further increasing IT/Communications demand.

Low barriers to entry coupled with increasing revenues will encourage new companies to enter the industry, increasing competition. For companies to retain a competitive edge they need to focus on reputation and customer base. These factors are extremely valuable in attaining new work, especially for IT consultants in Computer Systems Design and Related Services which acquire the majority of their work from referrals and recommendations from previous clients.

Cybersecurity

Security software defends against viruses, malware, and other threats that could result in the loss of valuable data. Region 9's close proximity to Washington, DC caters to a growing cybersecurity industry. Currently, headquarters of 38 out of the Top 100 federal information technology companies are located in Virginia. [6]

The **Security Software (NAICS 51121)** industry has grown by an annualized rate of 4.0% over the past five years. The industry is projected to grow at an annualized rate of 2.9% from 2017 to 2022 causing revenues to reach $14.0 billion by 2022. Industry growth can be attributed to expansion in data, internet-enabled solutions, and cloud services, combined with an increase in services conducted online.

The wide-variety of features and services within the cybersecurity industry serves as a basis for competition, with many cybersecurity solutions being specifically tailored based on their customers' needs. A shift in service to software as a service (SaaS) had allowed customers to pay for the right to use

[6] YesVirginia.org

the software from a remote server instead of buying the physical version of the software. SaaS allows for constant updates which are imperative to secure devices from emerging threats

Availability of a trained workforce is a major factor driving this industry. Specifically, hiring affordable programmers represents the biggest barrier for new cybersecurity companies. To accommodate this need, Virginia has 18 universities offering cybersecurity-related degree programs, with 11 of the schools earning the Centers of Academic excellence in cyber defense of information assurance designation from the National Security Agency. [7] Region 9's neighbor, James Madison University in Harrisonburg, offers cybersecurity training.

Key External Drivers

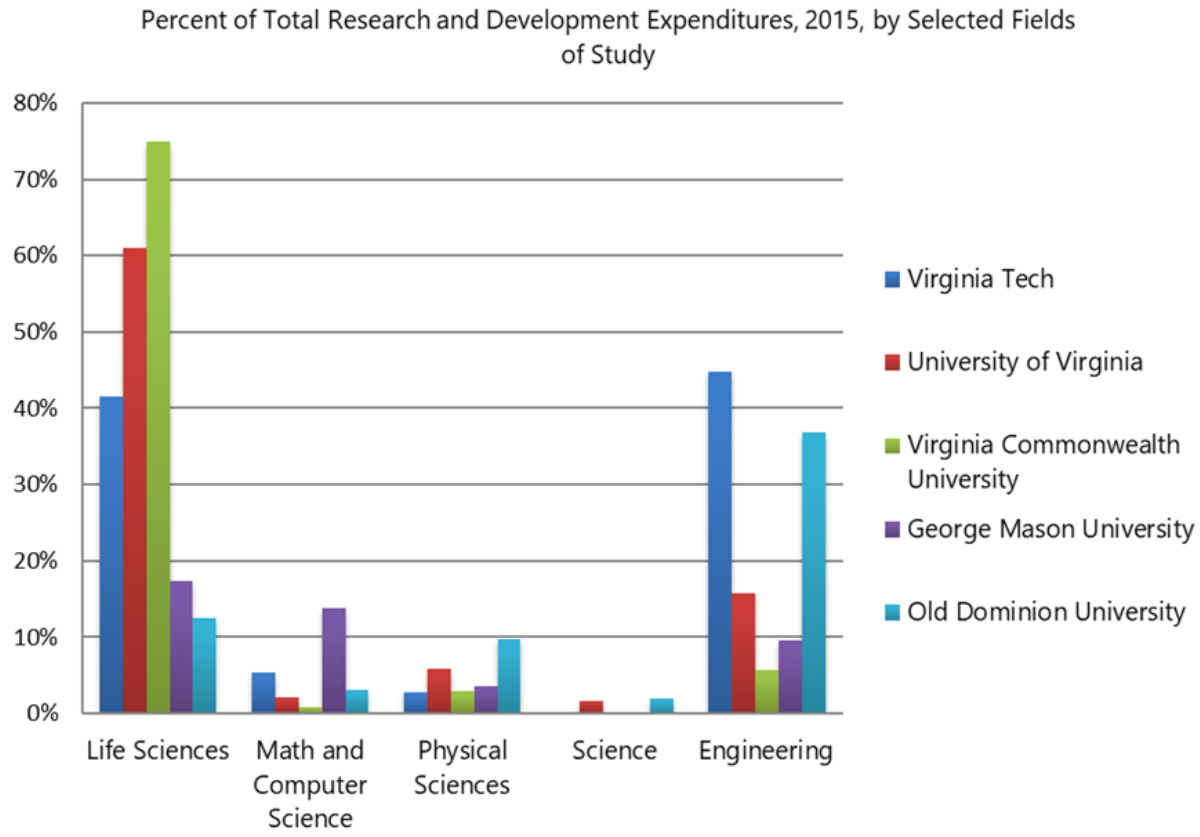
The overall health of the Information Technology/Communications industry primarily relies on the status economy as a whole, especially business growth and investment. As a result, external drivers for the industry are as follows:

- **Corporate profit** – Corporate profit is the measurement of profit earned across the entire economy, not just one specific industry. As corporate profit rises more businesses will be able to afford and demand consulting services, cyber security, system analysts and other IT/communication services. Corporate profit is expected to rise into 2022, representing a potential opportunity for the industry.
- **Demand from finance and insurance** – Finance and insurance companies are one of the largest markets for the IT/Communications industry. These companies require vast computing for the execution of trades and rely on IT firms to determine methods of storage and protection. When these companies expand, the demand for IT/Communications services increases. Demand from financial and insurance markets is expected to increase over the next five years, representing a potential opportunity for the industry.
- **Aggregate private investment** – This includes spending by individuals and businesses on physical structure, equipment and software. Especially for Computer Systems Design Services (NAISCS 541512), as businesses invest in software and other equipment they are more likely to require consultants. Private investment in computers and software generates demand for implementation assistance and technical support. Both aggregated private investment and specifically private investment in computers and software are expected to rise throughout the next five years.
- **Number of businesses** – Demand for Information Technology/Communication services is consistent with growth in the number of businesses. The number of businesses is expected to grow at a low rate, which represents a probable threat to the industry.

[7] YesVirginia.org

Regional Innovation Assets

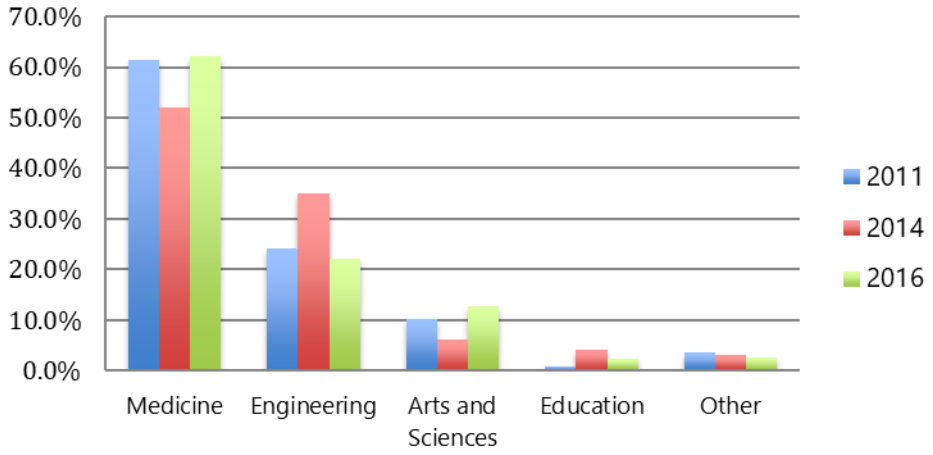
Below, federal research and development expenditures at major Virginia universities are graphed. Math and Computer Sciences expenditures by all selected universities lag far behind expenditures in Life Sciences and Engineering.



Source: National Science Foundation, Higher Education Research and Development Survey, 2015

Strong federally-funded research leads to disclosures of patentable inventions by UVA faculty and staff. The School of Medicine leads in disclosures, thus leading to a higher number of biotech related patents. However, the School of Engineering is also strong, resulting in information technology-related startups as well.

Disclosures by School, University of Virginia, 2011-2016, By Percentage

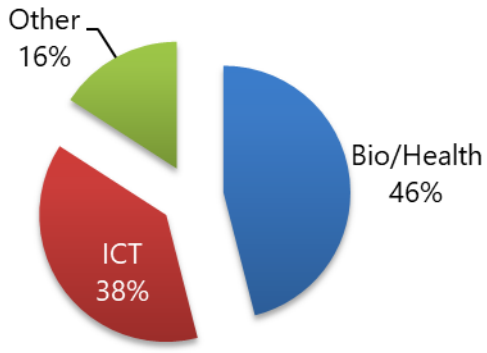


Source: UVA Licensing and Venture Group Annual Reports

Region 9 companies raised at least $129,942,000 through 53 funding events since 2011, and have a total of $233,745,000 in equity to date.

Information Technology/Communications startups account for 38% of equity infusions in Region 9, second to Biomedical & Biotechnology startups.

Equity Transactions in Region 9, May 2012-May 2017, By Sector



Source: Crunchbase

Success Factors

For Information Technology/Communications establishments to continue successfully in the industry, they will need to:

- Be able to compete on price and service offerings,
- Access a highly skilled workforce,
- Offer a variety of services to retain customers,
- Increase accessibility to consumers,
- Access niche markets,
- Develop a symbiotic relationship with another industry, and
- Establish strong relationships with high quality subcontractors to ensure that high-quality, timely and cost-efficient output can be guaranteed.

Factors Driving Location

Location of Information Technology/Communication companies is not based on the standard determining factors of market and population density. Instead locations depend on a skilled workforce and broadband. IT and Communications companies can work remotely to reach their targeted market.[8]

Currently, the Southeast region of the United States contains the highest share of IT industry establishments with over 26% of the nation's industry establishments. a result, it produces the greatest share of industry revenue and employment.[9]

Virginia alone holds nearly 4% of all IT establishments in the United States. Correspondingly, Virginia has one of the highest concentrations of technology workers in the country. Virginia is home to many companies specialized in internet technology, software development, fiber optics, cyber security and advanced communications. There is a strong sector of IT/data centers in Northern Virginia, and a significant portion of Region 9's northern workforce commutes to Northern Virginia.

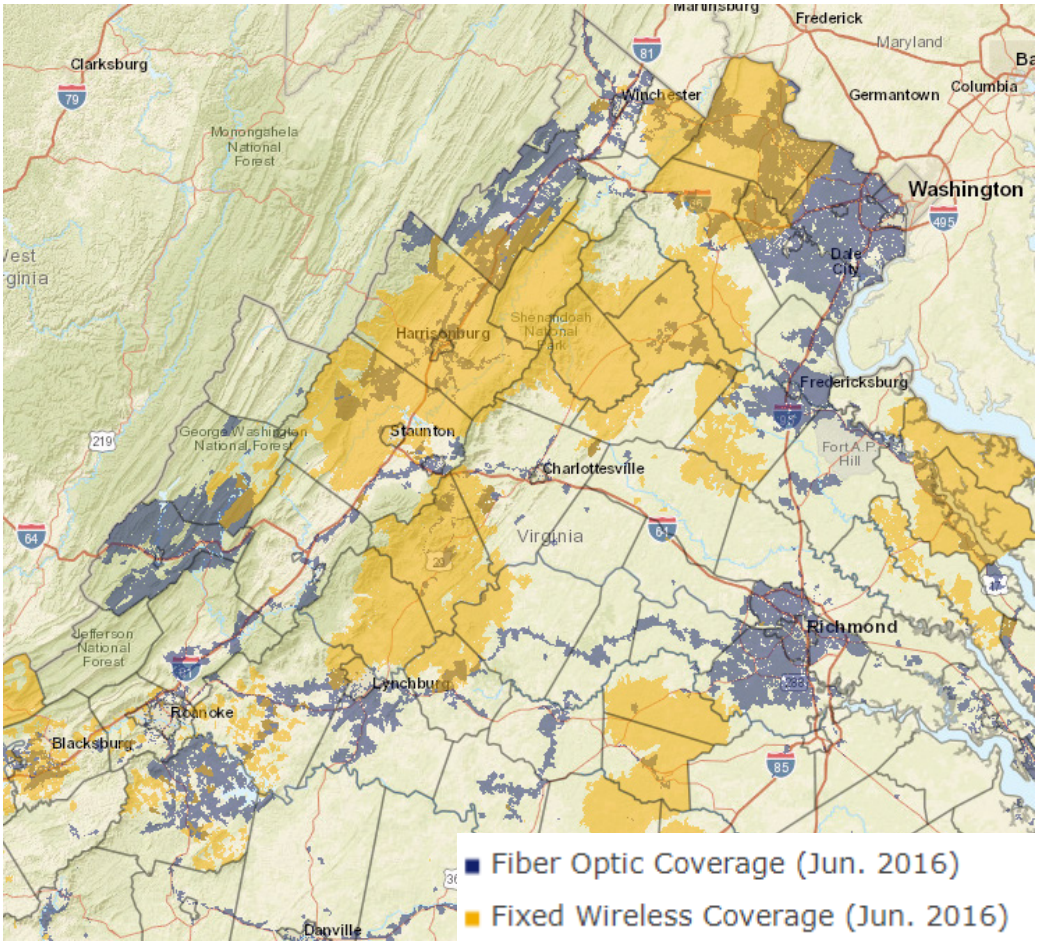
[8] Diment, D (2016). "IBISWorld Industry Report 51821 Data Processing & Hosting Services in the US". IBISWorld
[9] LeClair, M (2016). "IBISWorld Industry Report 54151: IT Consulting in the US". IBISWorld

Broadband Availability

Broadband connects businesses and individuals to the global marketplace, allowing businesses to connect and collaborate. Adequate broadband infrastructure is a necessity for businesses to be able to compete locally, regionally and globally. Approximately 15% of Virginia's population is classified as underserved, meaning they have access to less than two wired providers.

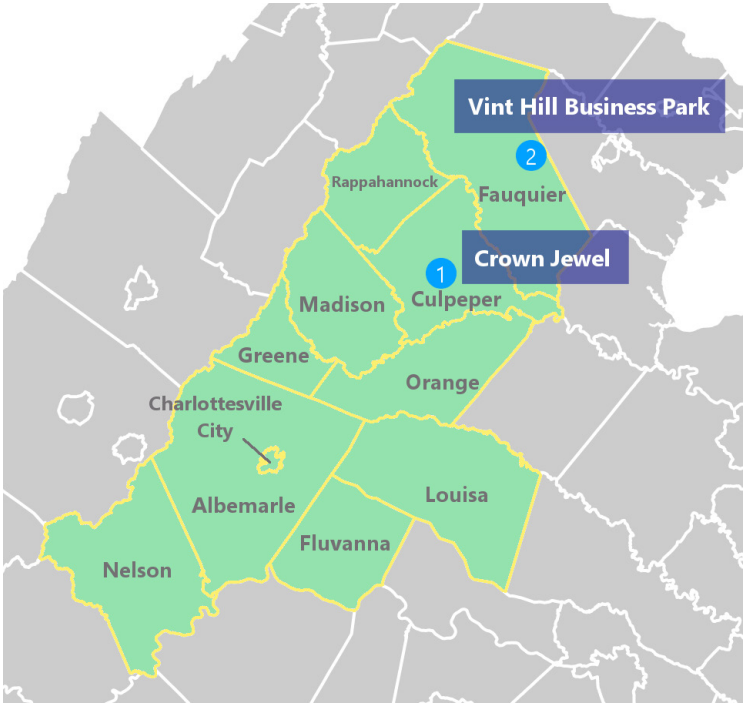
Adequate broadband availability is sporadic throughout Region 9. The map below shows that northern parts of the region are well served by fixed wireless coverage, however, nearly all of the county is absent of fiber optic coverage. Data centers rely on broadband fiber coverage to bring high speed access with reduced latency in the network. Broadband fiber coverage also empowers a remote workforce to compete for jobs without requiring them to commute, another opportunity to further retain the region's workforce which migrates to Northern Virginia on a daily basis.

Figure 1: Broadband Coverage in Region 9



Region 9 Sites Suitable for Information Technology/Communications

The following sites have been deemed favorable for attracting firms within the Information Technology/Communications industry sector, as they provide the necessary infrastructure, location, and capacity to support potential new businesses in this industry sector. Of the six sites visited and analyzed for potential development, two sites were determined to be strong options for future development.



Site #1: Culpeper County - Crown Jewel Site

Culpeper County's Crown Jewel site is located less than a mile east of the town of Culpeper. The land is gently sloping from northeast to southwest, and 122 of its 155 acres can be considered contiguous and developable. Neighbors include a wastewater treatment plant, two data centers, and a community college campus. The site is primarily accessed via McDevitt Drive, and is located less than a half mile from US 29. The targeted property is made up of four owners, and the zoning is split between Industrial and Rural.

Due to the site's existing neighbors, the Crown Jewel site has access to many existing utility supply lines, including electricity, gas, water, and wastewater with a large, expandable electrical substation located on site that could support up to a 40 MW load without requiring significant upgrades. Dark fiber communication lines are also in proximity, making the site a good fit for IT operations. Neighboring operations have proven that data centers can work in the area. The site could also support small, light manufacturing facilities, but due to the sloping topography of the site, potential operations will likely have to be limited in footprint to minimize extensive earthwork. Rezoning all parcels to Industrial would assist in the marketability of the site and decrease perceived risk associated with changing zoning classifications.

Site #2: Fauquier County - Vint Hill Business Park

The Vint Hill Business Park is currently home to a server assembly and data center, OVH, and an FAA terminal radar approach control (TRACON) facility. They have plots currently available ranging from 3 to 45 acres of developable area. The park has multiple on-site access roads, and can be reached from Highway 215, approximately 1.5 miles off US 29. The business park is in a well populated and well educated area, and the has access to all major utility services except for industrial wastewater. A new, large veteran's center is planned for acreage adjacent to the business park. The proposed parcels are properly zoned as Planned Commercial Industrial District.

The Vint Hill sites reap a number of benefits from their location. With established neighboring business operations, the sites have access to all necessary utilities. The business park is also located in a well-educated community that is very attractive for those looking to locate outside of the D.C. area. The Vint Hill site is particularly well suited for IT operations, business and financial services, or high value-add light assembly (e.g. medical devices, aerospace, electronics) with the community capable of providing an educated, currently out-commuting, workforce; however, the surrounding uses would generally be prohibitive for any kind of heavier industrial operation.

Top Information Technology/Communications Companies in Region 9

Region 9 Top Information Technology/Communications Firms

Company Size	Company Name	Locality
300+ Employees	Northrop Grumman	Albemarle
	S&P Global Market Intelligence	Charlottesville
	GE Intelligent Platforms	Albemarle
200 to 299 Employees	Merkle RKG	Charlottesville
100 to 199 Employees	WillowTree, Inc.	Charlottesville
	LexisNexis	Charlottesville
	Alere Informatics	Charlottesville
	TRC Solutions	Culpeper
	Apex Clean Energy	Charlottesville
50 to 99 Employees	Silverchair	Charlottesville
	Scholar One, Inc.	Charlottesville
	Convista, Inc.	Charlottesville
	Elder Research, Inc.	Charlottesville
	Meddius, LLC	Charlottesville
	SHINE Systems and Technologies	Charlottesville
	ExploreLearning	Charlottesville
	CCRi	Albemarle
	SRA International, Inc.	Charlottesville
	Frontline Test Equipment	Albemarle
15 to 49 Employees	EC Linc	Charlottesville
	Rockwell Collins Control Technologies, Inc.	Fauquier
	Signature Science, LLC	Albemarle
	Inova Solutions	Charlottesville
	Cableform Incorporated	Fluvanna
	Scitent eLearning Solutions	Charlottesville
	Equinix	Culpeper
	Tech Dynamism	Charlottesville
	Ting	Charlottesville
	Advanced Network Systems	Albemarle
	F1 Computer Solutions	Fauquier
	A-Systems, Inc.	Albemarle
	Nde Technologies, Inc	Charlottesville
	Morrison Computer Consultants	Albemarle
	Health Data Services	Albemarle
	Online Services & Sales, Inc.	Fauquier
	Level Edge Software, Inc.	Fauquier
	Sitewhirks, Inc.	Fauquier
	ETEK International Corporation	Fauquier
	Mindwrap, Inc.	Rappahannock
	AttoTek, Inc.	Culpeper
	PsiKick	Charlottesville
	FiberLight	Charlottesville
	CACI, Inc.	Albemarle

Industry Sector Definitions

List of 4-Digit NAICS Industries in Information Technology/Communications Industry Sector for Region 9

NAICS	Description	Total Jobs (2016)	Total Est. (2016)	Location Quotient
2382	Building Equipment Contractors	2,664	281	0.96
3332	Industrial Machinery Manufacturing	160	6	1.14
3341	Computer and Peripheral Equipment Manufacturing	35	2	0.17
3344	Semiconductor and Other Electronic Component Manufacturing	332	5	0.73
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	661	15	1.36
3353	Electrical Equipment Manufacturing	45	2	0.26
3359	Other Electrical Equipment and Component Manufacturing	220	4	1.36
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	239	30	0.31
4236	Household Appliances and Electrical and Electronic Goods Merchant Wholesalers	165	21	0.41
5112	Software Publishers	233	35	0.54
5171	Wired Telecommunications Carriers	386	24	0.53
5179	Other Telecommunications	43	11	0.42
5182	Data Processing, Hosting, and Related Services	357	20	0.95
5415	Computer Systems Design and Related Services	2,813	363	1.09
5416	Management, Scientific, and Technical Consulting Services	1,985	298	0.98
5417	Scientific Research and Development Services	1,144	62	1.35
Total		11,481	1,056	-

Source: EMSI 2017 Q2 Dataset

[i] The Regional Competitive Effect is part of a Shift Share Analysis. Shift Share Analysis distinguishes an industry's employment growth in a specific area that is attributable to local competitive advantages from growth that can be attributed to national employment trends or overall industry trends. Shift Share indicators help to answer the question "Why is employment growing or declining in this industry?" The **regional competitive effect** explains how much of the change in a given industry is due to some unique competitive advantage that the region possesses, because the growth cannot be explained by national trends in that industry or the economy as whole. This effect is calculated by taking the total regional growth of the given industry and subtracting the national growth for that same industry.

[ii] Location Quotient (LQ) analysis determines how concentrated a particular industry, demographic group, or other variable is compared to a larger geography. Concentration is a measure of local and regional strength when assessing economic growth potential. LQ is calculated by comparing the variable at a regional and national level. For example, if breweries account for 0.16% of all jobs in the region but only 0.015% of all national jobs then the LQ for breweries in that region would be 10.67 (0.16/0.015), demonstrating that breweries are 10 times more concentrated in that region than the national average.

[iii] The replacement demand looks at the number of jobs that are expected to be added to the regional economy between 2016 and 2021 and the number of jobs that will have openings due to normal turnover in the workforce such as retirement, death and changing careers. Occupations with a high number of replacement jobs compared to expected job growth may indicate an

occupation with a low wage. However, it may also indicate a large number of upcoming retirements in the coming years due to an aging workforce.

[iv] Job postings are collected from various sources and processed/enriched by Careerbuilder to provide information such as standardized company name, occupation, skills, and geography. EMSI performs additional filtering and processing to improve compatibility with EMSI data.

[v] EMSI occupation employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry.

Light Manufacturing

Region 9 Industry Profile

Overview

Major Products and Services:

- Wood product manufacturing
- Metal manufacturing
- Plastic manufacturing
- Aerospace, navigational, and biomedical electronics manufacturing

The Light Manufacturing industry sector includes 45 separate 4-digit NAICS industries engaged in light manufacturing operations. Compared to traditional manufacturing, which is typically capital-intensive and wholesale-oriented, light manufacturing requires relatively less investment in capital and infrastructure and more often involves the final assembly steps for consumer goods, high tech devices, medical components and a variety of other finished goods. Notable manufacturing activities in Region 9 based on 2016 employment include, but are not limited to, beverage manufacturing, plastics manufacturing, wood product manufacturing, and electronics related to the aerospace and biomedical industries. Food & Beverage Manufacturing is the focus of a separate profile; therefore it will not be discussed in detail in this analysis. Subsectors highlighted throughout this profile have all presented strong growth trends in recent years and show opportunity for the region going forward.

A detailed listing of the 4-digit NAICS industries included in the Light Manufacturing industry sector is provided at the end of this profile. Because of the cross-compatibility of many industries within each targeted sector, some industries may belong to multiple sectors.

Significance Within Region 9

Based on available sites, development tolerance and available workforce, Region 9 is better suited to pursue growth in Light Manufacturing as opposed to traditional, heavy production. During interviews with key regional stakeholders, a common theme was a concern by residents of multiple localities surrounding overdevelopment, which clashed with a need to further develop industrial sites in order to attract businesses. As a result, attempts to pursue ventures in environmentally unsustainable industries are likely to see opposition and obstruction by local special interest groups. Light Manufacturing takes a middle ground between these concerns, allowing industrial sites to produce finished goods with less capital intensive investment and minimal environmental impact.

Industry Trends

In 2016, Region 9 was home to 353 establishments in the Light Manufacturing industry sector. This number represents an increase of 52 establishments over the past 10 years, or growth of roughly 17%. The Commonwealth of Virginia and United States saw their numbers of establishments grow by 1% and decline by 8%, respectively.

Establishment Trends, Light Manufacturing Industry Sector, 2006-2016

Location	2006 Est.	2016 Est.	# Change (2006 - 2016)	% Change (2006 - 2016)	% of US Est. (2016)
Region 9	301	353	52	17%	0.1%
Virginia	4,944	5,010	66	1%	2%
United States	275,734	253,195	(22,539)	-8%	-

Source: EMSI 2017 Q2 Dataset

Historical and Projected Job Growth

Over the last 10 years, the Light Manufacturing industry sector in Region 9 has shed 363 jobs, decreasing the size of the industry by 4%. Growth in Virginia's industry sector job market fared worse than Region 9, as the state shed 43,000 jobs in industries like **Household and Institutional Furniture and Kitchen Cabinet Manufacturing (NAICS 3371)**. In the decade between 2016 and 2026, the industry is projected to rebound and add 931 jobs, resulting in a net job growth of 11% from current employment. This growth is expected to come in spite of lagging growth across the state, and net decline across the country.

Historical Change in Jobs, Light Manufacturing Industry Sector, 2006-2016

Location	2006 Jobs	2016 Jobs	# Change (2006 - 2016)	% Change (2006 - 2016)	Competitive Effect (2016)
Region 9	8,904	8,541	(363)	-4%	1,140
Virginia	206,295	163,157	(43,138)	-21%	(6,437)
United States	9,949,747	8,490,595	(1,459,152)	-15%	-

Source: EMSI 2017 Q2 Dataset

Projected Change in Jobs, Light Manufacturing Industry Sector, 2016-2026

Location	2006 Jobs	2016 Jobs	# Change (2016 - 2026)	% Change (2016 - 2026)	Competitive Effect (2026)
Region 9	8,541	9,472	931	11%	2,126
Virginia	163,157	168,790	5,633	3%	6,508
United States	8,490,595	8,428,933	(61,662)	-1%	-

Source: EMSI 2017 Q2 Dataset

Regional Competitive Effect[i]**:** A competitive effect of 1,140 jobs between 2006 and 2016 is evidence of strong economic, entrepreneurial, or other traits within the region that go beyond national industry or macroeconomic factors. This level of competitive edge is expected to increase in the decade to come.

Concentration[ii]**:** When examining a given industry, a location quotient (LQ) greater than 1 denotes that a given industry is more concentrated in a specified area than across the entire United States. With 45 industry industries in the examined industry sector, eight have a high enough location quotient (LQ) to be considered significantly concentrated within the region compared to the US as a whole (greater than 1.20). These industries are:

- **Beverage Manufacturing (NAICS 3121)**: LQ of 5.00
- **Textile and Fabric Finishing and Fabric Coating Mills (NAICS 3133)**: LQ of 1.34
- **Sawmills and Wood Preservation (NAICS 3211)**: LQ of 4.95

- **Other Wood Product Manufacturing (NAICS 3219)**: LQ of 1.60
- **Cutlery and Handtool Manufacturing (NAICS 3322)**: LQ of 3.48
- **Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing (NAICS 3334)**: LQ of 1.71
- **Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (NAICS 3345)**: LQ of 1.36
- **Other Electrical Equipment and Component Manufacturing (NAICS 3359)**: LQ of 1.36
- **Household and Institutional Furniture and Kitchen Cabinet Manufacturing (NAICS 3371)**: LQ of 1.42

Top Occupations Replacement Demand

The data below indicates the top five occupations required to staff companies within Light Manufacturing industry for the Central Virginia region. Note that the data below is for the Commonwealth of Virginia. While the top five occupations are projected to experience healthy growth, especially Sales Representatives Wholesale and Manufacturing and Team Assemblers, most of the openings over the next five years will be due to replacement demand, due to the aging population, which will bring upcoming retirements. All the top occupations have replacement demand greater than 60% over the next five years. With most significant replacement demand for Cabinetmakers and Bench Carpenters, followed by Sawing Machine Setters, Operators and Tenders, Wood and First-Line Supervisors of Production and Operating Workers, at nearly 90% and 72%, respectively.[iii]

Replacement Demand for Top Light Manufacturing Occupations (Virginia)

Occupations	Employed in Industry Group (2016)	Change (2016 - 2021)	Openings (2016 - 2021)	Annual Openings	Replacement Jobs (2016 - 2021)	Annual Replacement Jobs	% Replacement Jobs
Sales Representatives, Wholesale and Manufacturing	32,106	1,612	4,996	999	3,384	677	67.7%
First-Line Supervisors of Production and Operating Workers	13,134	422	1,481	296	1,057	211	71.3%
Team Assemblers	16,974	1,119	3,007	601	1,887	377	62.8%
Cabinetmakers and Bench Carpenters	2,824	12	127	25	114	23	89.6%
Sawing Machine Setters, Operators, and Tenders, Wood	2,092	117	423	85	306	61	72.3%

Source: EMSI Q2 2017 Dataset

Job Postings and Required Skills

The table below includes job posting data for the Central Virginia region between April and June of 2017 for the top occupations required to staff companies within the Light Manufacturing industry. The top occupation, by far, is Heavy and Tractor-Trailer Truck Drivers, with over 3,900 average monthly postings. Other top occupations include Retail Salespersons; Stock Clerks and Order Fillers; and Customer Service Representatives. For these top occupations, especially Heavy and Tractor-Trailer Truck Drivers, there is significantly greater demand than supply.

Light Manufacturing Job Postings vs. Hires, April 2017 - June 2017

Occupation	Avg Monthly Postings	Avg Monthly Hires
Heavy and Tractor-Trailer Truck Drivers	3,915	88
Retail Salespersons	406	380
Stock Clerks and Order Fillers	236	174
Customer Service Representatives	171	116
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	94	51
Maintenance and Repair Workers, General	84	93
General and Operations Managers	73	121
Managers, All Other	72	23
Accountants and Auditors	42	82
Bookkeeping, Accounting, and Auditing Clerks	38	119
Laborers and Freight, Stock, and Material Movers, Hand	31	144
First-Line Supervisors of Production and Operating Workers	27	18
Office Clerks, General	21	255
Industrial Engineers	17	5
Purchasing Agents, Except Wholesale, Retail, and Farm Products	17	14
Inspectors, Testers, Sorters, Samplers, and Weighers	16	17
Software Developers, Systems Software	12	38
Industrial Truck and Tractor Operators	12	25
Helpers--Production Workers	10	16
Industrial Machinery Mechanics	8	7
Shipping, Receiving, and Traffic Clerks	8	25
Production, Planning, and Expediting Clerks	3	14
Team Assemblers	2	39
Electrical and Electronic Equipment Assemblers	1	4
Printing Press Operators	1	7
Packaging and Filling Machine Operators and Tenders	1	27
Sawing Machine Setters, Operators, and Tenders, Wood	0	10
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	0	0
Cabinetmakers and Bench Carpenters	0	8

Source: EMSI Q2 2017 Dataset

Light Manufacturing Job Postings Hard Skills, April 2017- June 2017

Skill	Relevance Score	Postings with Skill
Road Transport	0.61	2,541
Wheels	0.46	1,014
Cargos	0.42	2,889
Driving	0.36	3,242
Cleaning	0.15	2,050
Leasing (Contract Law)	0.14	976
Hazardous Materials	0.13	1,298
Life Insurance	0.13	1,819
Health Insurance	0.12	1,311
Auxiliary Power Unit	0.11	360
Steering	0.08	347
Vision Insurance	0.07	376
Recruitment	0.07	3,104
Purchasing	0.06	873
Disability Insurance	0.05	409
Television	0.05	324
Insurance	0.03	2,395
Information Technology	0.03	695
Distribution (Business)	0.01	644

Source: EMSI Q2 2017 Dataset

Light Manufacturing Job Postings Soft Skills, April 2017- June 2017

Skill	Postings with Skill
Scheduling (Project Management)	1,233
Leading	464
Leadership	441
Listening	288

Source: EMSI Q2 2017 Dataset

Based on national job postings for Light Manufacturing, the most relevant hard skills include: Cold Calling; Manufacturing; Repairing (Computer Systems); Plumbing; and HVAC. National job postings also identify the most relevant top soft skills for Light Manufacturing as: Leadership; Coordinating; Creativity; and Leading. In addition, the following table lists the top five certifications required for this sector that were identified by national job postings, as well as the number of postings in which they were included:[iv]

Top 5 Certifications in Light Manufacturing Job Postings

Certification	Postings with Certification
Certified Global Meeting Planner	5,902
Commercial Driver's License (CDL)	4,878
Certified Quality Engineer	3,785
Master of Business Administration (MBA)	3,012
(American Society For Quality) ASQ Certified	2,833

Source: EMSI Q2 2017 Dataset

The top three national occupational postings for Light Manufacturing from April 2017 through June 2017[v] were identified as: Sales Representatives, Wholesale and Manufacturing (Except Technical and Scientific Products); Maintenance and Repair Workers (General); and General and Operations Managers. The knowledge, skills, and abilities for Sales Representatives, Wholesale and Manufacturing (Except Technical and Scientific Products) were identified as the following:

- **Knowledge:** Sales and Marketing; Customer and Personal Services; and English Language
- **Skills:** Active Listening; Speaking; and Persuasion
- **Abilities:** Oral Comprehension; Oral Expression; and Speech Clarity

The knowledge, skills, and abilities for Maintenance and Repair Workers (General) were identified as the following:

- **Knowledge:** Mechanical; Building and Construction; and Customer and Personal Service
- **Skills:** Equipment Maintenance; Repairing; and Troubleshooting
- **Abilities:** Arm-Hand Steadiness; Manual Dexterity; and Near Vision

The knowledge, skills, and abilities for General and Operations Managers were identified as the following:

- **Knowledge:** Administration and Management; Customer and Personal Service; and Personnel and Human Resources
- **Skills:** Active Listening; Coordination; and Monitoring
- **Abilities:** Oral Comprehension; Oral Expression; and Problem Sensitivity[1]

[1] *O*Net Online*. Customer Service Representatives; Software Developers/Applications; and Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products. https://www.onetonline.org/link/summary/41-4012.00; hhttps://www.onetonline.org/link/summary/49-9071.00; https://www.onetonline.org/link/summary/11-1021.00

Supply Chain: Demand, Purchases and Sales

Demand

Demand for a given industry or industry sector is calculated based on the estimated national demand from all industries and consumers. Industry wages, taxes, and other values added payments are indirectly part of the demand through the production of the supplying industry. Total demand by consumers and other industries in Region 9 for goods produced by the Light Manufacturing industry sector totaled $2.76 billion in 2016. Thirteen percent of this demand (or $364 million in goods and services) was met by establishments within the region's industry sector. The other 87% of demand was satisfied by imports from other states and elsewhere in Virginia.[2]

Demand in Region 9 for Goods Produced by the Light Manufacturing Industry Sector

Location	Demand Met in Region	% Demand Met in Region	Demand Met by Domestic Imports	% Demand met by Domestic Imports	Total Demand in Region
Region 9	$ 363,542,003	13%	$ 2,398,208,331	87%	$ 2,761,750,334

Source: EMSI 2017 Q2 Dataset

Purchases

A total of $1.29 billion in goods and services were purchased by the Light Manufacturing industry sector in 2016. Seventeen percent of purchases ($225 million in goods and services) were purchased locally, while 83% ($1 million in goods and services) required importing from outside of the region. Top industries from which the examined industry sector made purchases were largely raw material production and manufacturing, like **Plastics Material and Resin Manufacturing (NAICS 551114, total purchases of $92 million)** or **Logging (NAICS 113310, total purchases of $34 million)**. Virtually all the top purchasing industries required importing a majority of purchases, with two requiring importation for all purchases.

The following table shows the industries from which Region 9's Light Manufacturing industry sector purchased the greatest amounts of goods.

Top 10 Industries by Purchases Made by the Light Manufacturing Industry Sector

NAICS	Purchases From	Purchases Made in Region	% Made in Region	Domestic Imported Purchases	% Domestic Imported	Total Purchases
551114	Corporate, Subsidiary, and Regional Managing Offices	$23,138,832	20%	$95,177,102	80%	$118,315,935
325211	Plastics Material and Resin Manufacturing	$0	0%	$92,425,987	100%	$92,425,987
321113	Sawmills	$16,122,850	42%	$22,613,497	58%	$38,736,346
113310	Logging	$6,889,485	20%	$26,934,181	80%	$33,823,665
331420	Copper Rolling, Drawing, Extruding, and Alloying	$226,902	1%	$29,273,987	99%	$29,500,889
425120	Wholesale Trade Agents and Brokers	$568,679	2%	$24,574,391	98%	$25,143,070
111000	Crop Production	$3,118,673	13%	$20,621,238	87%	$23,739,911
533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	$5,900,976	33%	$11,765,310	67%	$17,666,286
336414	Guided Missile and Space Vehicle Manufacturing	$823,103	5%	$15,784,041	95%	$16,607,144
331110	Iron and Steel Mills and Ferroalloy Manufacturing	$0	0%	$16,377,517	100%	$16,377,517

Source: EMSI 2017 Q2 Dataset

[2] This data only includes demand with respect to industries and consumers within the United States.

Sales

Industry sales are calculated using the sum of the dollar value for all goods and services that other industries purchased from a given industry or industry sector. Since this calculation a.) uses historical data instead of estimates, and b.) does not include consumer spending, the total in-region sales for an industry or industry sector will often be lower than estimated in-region demand. Light Manufacturing establishments in the region primarily sell their products and services to industries related to hospitality, government, and manufacturing/processing. The industry's largest buyer in 2016 was **Unlaminated Plastics Film and Sheet (Except Packaging) Manufacturing (NAICS 326113)** with total sales of $1.27 million. Year-over-year sales declined harshly for **Periodical Publishers (NAICS 511120)** between 2015 and 2016, as the decline of print media threatens demand for paper products.

Top 10 Industries by Sales Made by the Light Manufacturing Industry Cluster

NAICS	Sales To	Total Sales in Region (2015)	Total Sales in Region (2016)	Change in Sales (2015 - 2016)
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	$10,855,901	$12,123,887	$1,267,985
321113	Sawmills	$10,072,297	$10,428,974	$356,677
901200	Federal Government, Military	$10,360,171	$10,316,863	($43,308)
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	$5,631,511	$6,994,721	$1,363,211
511120	Periodical Publishers	$9,072,258	$6,054,577	($3,017,680)
722511	Full-Service Restaurants	$4,615,331	$5,704,135	$1,088,805
238220	Plumbing, Heating, and Air-Conditioning Contractors	$4,304,261	$4,535,480	$231,219
312130	Wineries	$3,426,840	$4,513,823	$1,086,984
902999	State Government, Excluding Education and Hospitals	$4,580,468	$4,417,395	($163,072)
902622	Hospitals (State Government)	$5,163,771	$4,350,242	($813,528)

Source: EMSI 2017 Q2 Dataset

Factors Driving Investment and Competitiveness

Nationally, operators in the Light Manufacturing industry have innovated their techniques and diversified their offerings, which has protected them from revenue volatility due to dependence by an abundance of downstream markets. Demand can stem from markets such as defense, healthcare, construction, and research. Competition throughout the industry is high and can occur on the international level, with medium to high barriers to new entrants. However, most industries require substantial investment in commodity inputs such as steel, which gives competitive advantage to those able to utilize economies of scale and scope.

The industry tends to be subjected to significant regulations and changing technology, necessitating a highly skilled workforce and sophisticated production techniques. Labor is a momentous cost of production for establishments in this industry and thus, automation is becoming a defining characteristic of the industry and will soon be necessary to remain competitive.

Medical Device and Semiconductor Manufacturing

Through a variety of existing industries, Region 9 has shown promise in the development and manufacturing of electronic components and devices. The **Electromedical and Electrotherapeutic Apparatus Manufacturing industry (NAICS 334510)** industry, more commonly referred to as the Medical Device Manufacturing industry, was chosen as a complement to research and development in the biomedical and biotechnical sectors within the region. The industry has remained relatively steady through economic instability, due to an inelastic demand for healthcare products. This industry is projected to grow by 2.9% annually through the year 2022 at the national level. In recent history, legislative expansion in the healthcare industry has provoked demand from downstream markets, though further changes to the regulatory landscape may affect this shift. Regardless, an aging population will work to offset any potential regulatory changes in the coming years that could otherwise reduce demand. Industry players have begun to outsource some manufacturing activities and employ automation processes to stabilize profit margins in a dynamic regulatory environment.

Competition in the Medical Device Manufacturing industry is strong, and is driving merger and acquisition activity between large corporations and small new entrants. Establishments mainly compete on convenience, meaning that their ability to effectively distribute to high population areas is key. Also of utmost importance is the ability to demonstrate high production quality. This industry produces unique products that have enormous impacts on quality of life for consumers. Brand recognition is not a big factor, but instead products need to be associated with positive clinical outcomes and confident perceptions from doctors. Industry players in Medical Device Manufacturing tend to fiercely protect their intellectual property, and strive to be the first to market with a new product. This combination of factors generates intermediate barriers to entry because there is little information publicly available regarding products, and technology changes are swift and frequent.[3]

Being intrinsically tied to the manufacturing of other electronic devices, the **Semiconductor and Related Device Manufacturing industry (NAICS 334413)** is well-represented in the region, and is projected to see annualized national revenue growth of 0.9% for the five years leading up to 2022, as downstream industries like original equipment manufacturers (OEMs) increasingly demand faster, lighter, and more efficient processing devices for use in electronics. Despite this demand, pressures from lower operating costs abroad and an increasing commoditization of device production have made it increasingly difficult for US firms to compete against international rivals.[4]

Aerospace and Navigational Instrument Manufacturing

Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing (NAICS 334511) is fairly sheltered from economic turmoil due to diversity of downstream markets. This industry provides products such as search, detection, navigational instruments, and electricity measurement and testing tools to clients in the shipbuilder, construction, healthcare, and research industries. This industry is affected greatly be the level of government investment due to high

[3] Curren, J (2017). "IBISWorld Industry Report 33451b: Medical Device Manufacturing in the US". IBISWorld
[4] Miller, D (2017). "IBISWorld Industry Report 33441a: Semiconductor & Circuit Manufacturing in the US". IBISWorld

levels of public industry activity and success is associated with the value of the US dollar. Over the previous 5-year period, the industry was challenged by an appreciating dollar that diminished exports. However, the coming period is expected to revive the industry with revenue growth of 2% annually through 2022 due to depreciation of the dollar and increased energy market demand.

Competition in this industry is high, but concentration of market share is very low. Bigger firms are strengthened by acquiring smaller startups offering niche products. In contrast to the Medical Device industry, firms in this industry compete on a broad range of factors such as brand awareness, price, technology, innovation, and value-added services. Market share is gained by offering a variety of products in different niche markets. Barriers to entry in the Navigational Instrument Manufacturing industry are stringent as production requires significant R&D funds and large capital investments are required upon entry. The industry is subject to regulation and high-cost insurance, and success is contingent on forming strong relationships with suppliers.[5]

Beyond navigational systems, industries related to the manufacturing of aircraft parts and propulsion systems, like **Other Aircraft Parts and Auxiliary Equipment Manufacturing (NAICS 336413)** and **Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing (NAICS 336415)** has grown rapidly over the last five years as demands for aerospace vehicles for use in defense and travel have increased. Annualized revenue growth has averaged 4.9% in the past five years up to 2016, thanks to increases in air traffic and a need by both public and private organizations to expand and replace their fleets. Federal funding for defense programs, like the F-35, are expected to increase dramatically in the near future, particularly after multiple years of depressed DoD spending in the wake of the 2008 recession. Current concentration within the industry is moderate, particularly within the past few years as defense firms have acquired smaller rivals to streamline their supply chains and offset military spending cuts.[6]

Heating & Air Conditioning Equipment Manufacturing

The **Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing industry (NAICS 33341)** has shown substantial growth within the region in the last 10 years. It differs from the aforementioned industries in that it depends largely on one source of demand from the construction industry, as units are installed is most residential and nonresidential buildings. Consumer spending and disposable income can influence downstream demand in markets like food service. Demand can also be affected by government regulations and incentives regarding energy efficiency. These rules are becoming tighter, which is requiring certain systems to be replaced, thus increasing demand for the industry. In conjunction with steady construction of single family and multifamily homes, overall industry revenue is predicted to rise by 1.8% annually through 2022.

This industry has low concentration of market share and significant competition revolving around brand loyalty associated with quality. The majority of establishments in this industry employ 20 people or less.

[5] Miller, D (2017). "IBISWorld Industry Report 33451a: Navigational Instrument Manufacturing in the US". IBISWorld
[6] Soshkin, M (2016). "IBISWorld Industry Report 33641a: Aircraft, Engine & Parts Manufacturing in the US" IBISWorld

There are moderate barriers to entry for new businesses such as initial capital investments, large purchasing costs for production, and need for established relationships with suppliers. Low interest rates coupled with growing environmental concerns may boost demand in the foreseeable future.[7]

Sawmills, Wood Products, and Wood Preservation

The more heavily-forested areas of the region have a thriving logging, milling, and wood product manufacturing industry that has potential to be further leveraged. Industries like **Sawmills (NAICS 321113)**, **Wood Preservation (NAICS 321114)**, and **Other Millwork (including Flooring) (NAICS 32192)** have maintained job and revenue growth over the past 10 years. This industry covers a mix of heavy manufacturing of unfinished wood materials as well as light manufacturing of consumer wood products. Demand for materials for construction have bolstered demand for wood products, with the industry seeing revenue growth of 5.1% annually over the last five years up to 2016. Changes in demand for housing and other construction will continue to impact demand for millwork, wood preservation, and sawmills. Because of the environmental concerns associated with logging and wood preservation, care may need to be taken when trying to promote wood product manufacturing industries for economic development. [8]

Key External Drivers

Firms within the Light Manufacturing industry sector have seen variable success within the US market over the last decade, with a decline overall across all industries. Wages and employment growth vary both across and within industries, with a common correlation between high-skill, low-volume manufacturing and higher wages. Consolidation and automation has allowed the industry to maintain the same level of output, while reducing the level of industry employment. Additional external drivers for the industry are as follows:

- **Research and development (R&D) expenditures** – R&D investment is essential to the continued progress and innovation of more advanced products which boost revenues, and more efficient production techniques which reduce costs. Projections expect an increase in R&D expenditures across numerous light manufacturing industries the region may capitalize on these expenditures to stay at the cutting edge.
- **Per capita disposable income**– Increasing disposable income has different effects on each operator depending on brand status. Higher disposable income increases demand for premium brands. Expected increases in disposable income may provide an opportunity.
- **Demand for related industries** – The single greatest external driver in the performance of light manufacturing industries is demand for their respective product. For example, if home construction increases then demand for heating and ventilation will subsequently increase. Additionally, as print media companies face lower subscriptions, demand for paper products will drop.

[7] Morea, S (2017). "IBISWorld Industry Report 33341: Heating & Air Conditioning Equipment Manufacturing in the US". IBISWorld
[8] Hadad, J (2017). "IBISWorld Industry Report 32111 Sawmills & Wood Production in the US". IBISWorld

- **Trade-weighted index** – The trade-weighted index (TWI) is a measure of the US dollar against currencies of U.S. trading partners. Industry demand has an inverse relationship with TWI. The trade-weighted index is projected to grow rapidly over the 2017 year, which has the potential to stunt manufacturing growth.
- **Government consumption and investment** – So long as the US economy maintains its steady recovery from the 2008 economic recess ion, government spending and investment in projects related to the defense and aerospace industries are expected to increase, stimulating growth for the related manufacturing industries.

Success Factors

Success for local establishments within the Light Manufacturing industry sector will require the following:

- Establish a plan to incorporate scalability into the production process and quickly leverage demand growth,
- Maintain a strong and resilient supply chain,
- Cultivate relationships with suppliers within the industry,
- Understand local regulations and strategically negotiate with regulators,
- Recruit and maintain a highly-skilled workforce,
- Harness technology made newly available by research and development, and
- Develop a global export network to take advantage of demand across national and international markets.

Factors Driving Location

The growth and development of manufacturing industries relies on multiple characteristics, including:

- Proximity to raw resources
- Proximity to major distribution centers
- Availability of necessary infrastructure (water, sewage, and power)
- Availability of sufficient space to handle manufacturing capacity
- Availability of a workforce specialized in manufacturing skills

Contingent upon these requirements, the development of manufacturing around the US generally follows population density. Manufacturing across all industries is most prominent in states like California, Texas, Illinois, and New York.

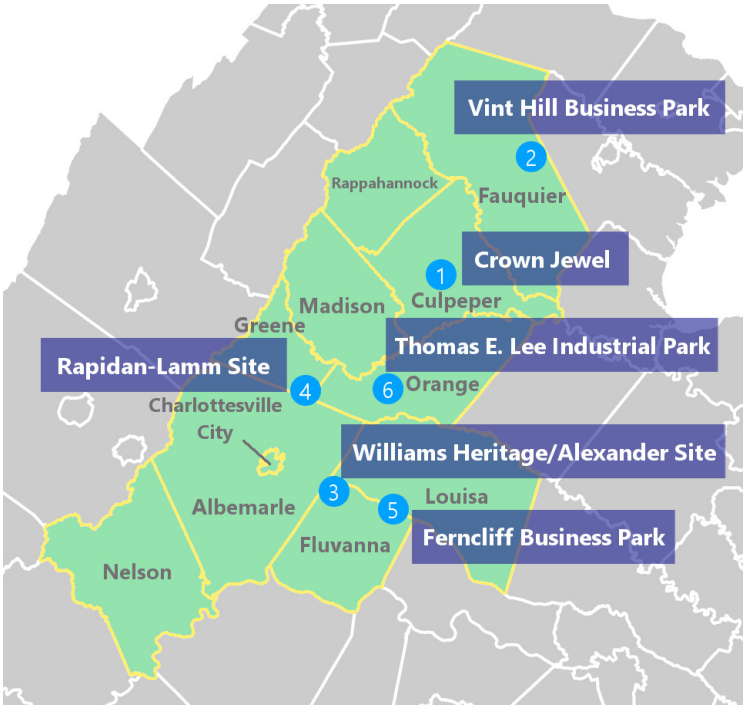
Given Virginia's unique characteristics, current manufacturing takes advantage of the Commonwealth's abundant forests, proximity to Federal Government agencies, and undeveloped space. Virginia is currently an industry player in defense research and manufacturing, thanks to its location close to the headquarters of many Federal Government agencies. Aerospace research and development is already a central focus of many northern Virginia counties (like Loudoun County) for future development, and with proper planning

and coordination Region 9 can take advantage of potential demand for aerospace electronics and parts manufacturing. The region has previously seen substantial growth in the last 10 years in aerospace parts manufacturing, and despite past job losses it continues to maintain strong job numbers in semiconductor and navigational devices manufacturing.

The manufacture of heating, ventilation, and air conditioning (HVAC) is more prominent at the extreme north and south ends of the eastern US, with states like Minnesota, Michigan, Pennsylvania, and New York accommodate demand for heating systems in colder climates. Conversely, states like Florida, Texas, and Georgia accommodate demand for cooling systems in hotter climates. Virginia is well-situated in a warm climate compared to much of the United States, which makes it well-suited for the manufacture of air conditioning systems but ill-suited for the manufacture of central air and heating systems.

Region 9 Sites Suitable for Light Manufacturing

The following sites have been deemed favorable for attracting firms within the Light Manufacturing industry sector, as they provide, or have the potential to provide, the necessary infrastructure, location, and capacity to support a potential new business in this industry sector. Of the six sites visited and analyzed for potential development, every site was determined to be a strong option for future development in some capacity given some constraints like logistics, natural gas availability, etc.



Site #1: Culpeper County - Crown Jewel Site

Culpeper County's Crown Jewel site is located less than a mile east of the Town of Culpeper. The land is gently sloping from northeast to southwest, and 122 of its 155 acres can be considered contiguous and developable. Neighbors include a wastewater treatment plant, two data centers, and a community college campus. The site is primarily accessed via McDevitt Drive, and is located less than a half mile from US 29. The targeted property is made up of four owners, and the zoning is split between Industrial and Rural.

Due to the site's existing neighbors, the Crown Jewel site has access to many existing utility supply lines, including electricity, gas, water, and wastewater with a large, expandable electrical substation located on site that could support up to a 40 MW load without requiring significant upgrades. Dark fiber communication lines are also in proximity, making the site a good fit for IT operations. Neighboring operations have proven that data centers can work in the area. The site could also support small, light manufacturing facilities, but due to the sloping topography of the site, potential operations will likely have to be limited in footprint to minimize earthwork. Rezoning all parcels to Industrial would assist in the marketability of the site and decrease perceived risk associated with changing zoning classifications.

Site #2: Fauquier County - Vint Hill Business Park

The Vint Hill Business Park is currently home to a server assembly and data center, OVH, and an FAA terminal radar approach control (TRACON) facility. They have plots currently available ranging from 3 to 45 acres of developable area. The park has multiple on-site access roads, and can be reached from Highway 215, approximately 1.5 miles off US 29. The business park is in a well populated and well educated area, and the has access to all major utility services except for industrial wastewater. A new, large veteran's center is planned for acreage adjacent to the business park. The proposed parcels are properly zoned as Planned Commercial Industrial District.

The Vint Hill sites reap a number of benefits from their location. With established neighboring business operations, the sites have access to all necessary utilities. The business park is also located in a well-educated community that is very attractive for those looking to locate outside of the D.C. area. The Vint Hill site is particularly well suited for IT operations, business and financial services, or high value-add light assembly (e.g. medical devices, aerospace, electronics) with the community capable of providing an educated, currently out-commuting, workforce.; however, the surrounding uses would generally be prohibitive for any kind of heavier industrial operation.

Site #3: Fluvanna County - Williams Heritage/Alexander Site

The Williams Heritage/Alexander site in Fluvanna County is the least characterized of the sites evaluated. The site was only recently identified as a potential industrial opportunity, and therefore no site preparation has been done. The 156-acre site is located adjacent to Highway 250, just 2 miles from I-64. The property is heavily wooded, has notable elevation changes, minimal utilities onsite, and is bordered on the west by a residential neighborhood. Zoning is currently Agriculture and would have to be changed in order to promote site as an industrial property.

Even though the Williams Heritage/Alexander site has had no development or work, there is flexibility in regards to how it can be developed. It will likely have access to water and sewer by 2019, with possible access to gas and electric. With necessary utilities, the site could support light manufacturing or agricultural value-added activities. However, the cost of bringing natural gas to site may be prohibitive. Due diligence activities should take priority moving forward, as more accurate site information will aid in more precise industry targeting. By doing some preliminary site preparation (clearing of trees, possible grading) and establishing a plan for bringing in infrastructure, this site would be more marketable.

Site #4: Greene County - Rapidan-Lamm Site

The Rapidan property is a 65-acre site that is far along in the development process. The site was cleared, graded, and prepared for a previous retail opportunity that did not materialize. Configuration of the site is roughly rectangular, and could support a single large development, or two or more smaller developments requiring approximately 30 acres apiece. The site is located directly on US 29, and neighbors a handful of retail and commercial operations to the north, with residential areas to the south and east (including a large apartment complex bordering the property). Current zoning of the parcel is listed as B-2 for General Business.

The preparation activities that have already been performed on the Rapidan site put it at an advantage in comparison to other sites, as potential buyers will not have to spend the time or money on these items. While the site itself could possibly support a light manufacturing facility, the surrounding residential areas of the site prevent this location from being a good fit for heavier industrial operations. Due to the significant residential development nearby, the site would likely be limited to commercial, retail, or office space. County Council has also expressed a desire to avoid any operation with large truck activity. Due to proximity to UVA and other biomedical/pharmaceutical research operations, there exists the opportunity to attract a similar facility to this site, but there is perceived to be a very small likelihood of that occurring.

Site #5: Louisa County - Ferncliff Business Park

The Ferncliff Business Park is a rural industrial park located in Louisa County. The park is 104 contiguous acres, with approximately 70 developable acres remaining. 40 greenfield acres to its southeast were also recently purchased. Current users in the park include Patriot Aluminum and Cavalier Produce. Two speculative buildings have just been built and can be joined for a combined floor size of 100,000 square feet. The park is located between Highway 250 (Three Notch'd Road) and I-64, and is accessed via Highway 250, a half mile from I-64's Exit 143. Not counting the additional 40 acres (zoning of this parcel is to be determined), the entire industrial park is zoned Industrial and Commercial.

Ferncliff is well suited to support several industries that do not require natural gas. The sites could be used for projects that fall within the identified industry targets of light manufacturing and agricultural value addition, again with the caveat that they cannot supply natural gas. If Three Notch'd Road could be expanded from two lanes, the location could be a good fit for a distribution center or similar project due to its interstate proximity. It is doubtful that the site could support large footprint requirements due to the topography of the park.

Site #6: Orange County - Thomas E. Lee Industrial Park

The Thomas E. Lee Industrial Park in Orange County has multiple parcels available for development. There is an 8-acre site with 100,000 square foot building pad in place. The 8-acre parcel adjoins a 16.8-acre parcel that is not currently under the county's control. Though the 16.8-acre is adjacent to a rail line, there is significant concern on any potential for bringing the rail into the site due to significant elevation change. There is also a non-adjacent 5-acre parcel that could support smaller operations. The park is rurally located, over 2.5 miles from the Town of Orange. Most major utilities are already within the park, with the notable exception of natural gas, which is located more than two miles away. All sites within the park are adequately zoned I-2, Industrial.

The T. E Lee sites could successfully support light manufacturing operations or potential food processing facility. There is not currently natural gas on site, but access could be extended to the site with an estimated cost of $1.5 million. Most industry will likely face transportation issues, as the closest interstate is approximately 18 miles away. Additional opportunity exists for the area if dark fiber is successfully brought in, but current marketing efforts should not focus on any IT or financial service type industry.

Top Light Manufacturing Companies in Region 9

Region 9 Top Light Manufacturing Firms

Company Size	Company Name	Locality
500+ Employees	American Woodmark Corporation	Orange
250 to 499 Employees	Builders First Choice	Culpeper
	Communications Corp of America	Culpeper
	GE Intelligent Platforms	Albemarle
	Klockner-Pentaplast of America	Louisa
	Masco Builder Cabinet Group	Culpeper
	Northrop Grumman	Albemarle
	Pepsi-Cola Bottling Company of Central Virginia	Charlottesville, Albemarle, and Fauquier
	Tri-Dim Filter Corp	Louisa
150 to 249 Employees	Aerojet Rocketdyne	Orange
	Continental	Culpeper
	CustomInk	Albemarle
	Green Applications	Orange
	MicroAire Surgical Instruments	Albemarle
	Ross Industries Inc	Fauquier
	TE Connectivity	Culpeper
	Zamma Corporation	Orange
100 to 149 Employees	Bingham and Taylor	Culpeper
	Euro-Composites	Culpeper
	Merchants Grocery Co. Inc	Culpeper
	RIDGID	Orange
	Smith-Midland Corporation	Fauquier
	Starr Hill Brewing	Albemarle
50 to 99 Employees	National Optronics	Charlottesville
	Pepsi-Cola Bottling Company of Warrenton	Fauquier
	Virginia Industries for the Blind	Charlottesville
	Madison Wood Preservers Inc.	Madison
	Hardwood Artisans	Culpeper
	Siemens Energy, Inc.	Albemarle
	Sealed Air Corp	Culpeper
	Alere	Charlottesville
	General Dynamics Corporation	Charlottesville
	California Sidecar & Escapade Trailers	Nelson
	Chemetrics Inc	Fauquier
	Rockwell Collins Control Technologies, Inc.	Fauquier
	Virginia Diodes Inc.	Charlottesville
	Piedmont Metal Fabricators	Louisa
	Allied Brass Manufacturing Co	Louisa
	Allied Concrete Company Inc.	Charlottesville
	Capitol Component	Culpeper
	Extreme Steel Inc.	Fauquier
	R.A. Yancey Lumber Corp	Albemarle
	Chemung Contracting	Culpeper
	Jefferson Area Builders	Culpeper
	Cedar Mountain Stone	Culpeper
	Lohmann Specialty Coatings	Orange
	Homestead Building Systems	Orange
	Mikro Systems	Albemarle

Industry Sector Definitions

List of 4-Digit NAICS Industries in Light Manufacturing Industry Sector for Region 9

NAICS	Description	Total Jobs (2016)	Total Est. (2016)	Location Quotient
3111	Animal Food Manufacturing	12	4	0.16
3112	Grain and Oilseed Milling	20	1	0.27
3113	Sugar and Confectionery Product Manufacturing	15	4	0.17
3121	Beverage Manufacturing	1,414	61	5.00
3133	Textile and Fabric Finishing and Fabric Coating Mills	52	3	1.34
3141	Textile Furnishings Mills	19	4	0.29
3149	Other Textile Product Mills	15	2	0.18
3152	Cut and Sew Apparel Manufacturing	31	3	0.21
3211	Sawmills and Wood Preservation	580	18	4.95
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	34	4	0.36
3219	Other Wood Product Manufacturing	465	19	1.60
3221	Pulp, Paper, and Paperboard Mills	11	2	0.09
3222	Converted Paper Product Manufacturing	184	2	0.56
3231	Printing and Related Support Activities	353	32	0.61
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	19	2	0.43
3254	Pharmaceutical and Medicine Manufacturing	54	7	0.15
3259	Other Chemical Product and Preparation Manufacturing	108	5	1.07
3261	Plastics Product Manufacturing	667	6	0.96
3271	Clay Product and Refractory Manufacturing	23	4	0.44
3272	Glass and Glass Product Manufacturing	15	2	0.14
3273	Cement and Concrete Product Manufacturing	231	11	0.99
3312	Steel Product Manufacturing from Purchased Steel	24	2	0.35
3315	Foundries	75	1	0.51
3322	Cutlery and Handtool Manufacturing	163	2	3.48
3323	Architectural and Structural Metals Manufacturing	77	8	0.17
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	106	15	0.24
3329	Other Fabricated Metal Product Manufacturing	74	4	0.22
3331	Agriculture, Construction, and Mining Machinery Manufacturing	45	1	0.17
3332	Industrial Machinery Manufacturing	160	6	1.14
3333	Commercial and Service Industry Machinery Manufacturing	59	5	0.53
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing	272	4	1.71
3341	Computer and Peripheral Equipment Manufacturing	35	2	0.17
3344	Semiconductor and Other Electronic Component Manufacturing	332	5	0.73
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	661	15	1.36
3353	Electrical Equipment Manufacturing	45	2	0.26
3359	Other Electrical Equipment and Component Manufacturing	220	4	1.36
3363	Motor Vehicle Parts Manufacturing	200	4	0.28
3364	Aerospace Product and Parts Manufacturing	450	4	0.75
3366	Ship and Boat Building	19	1	0.11
3369	Other Transportation Equipment Manufacturing	83	1	2.04
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing	456	30	1.42
3372	Office Furniture (including Fixtures) Manufacturing	118	4	0.87
3379	Other Furniture Related Product Manufacturing	40	1	0.86
3391	Medical Equipment and Supplies Manufacturing	260	16	0.67
3399	Other Miscellaneous Manufacturing	246	22	0.63
Total		8,541	353	-

Source: EMSI 2017 Q2 Dataset

[i] The Regional Competitive Effect is part of a Shift Share Analysis. Shift Share Analysis distinguishes an industry's employment growth in a specific area that is attributable to local competitive advantages from growth that can be attributed to national employment trends or overall industry trends. Shift Share indicators help to answer the question "Why is employment growing or declining in this industry?" The **regional competitive effect** explains how much of the change in a given industry is due to some unique competitive advantage that the region possesses, because the growth cannot be explained by national trends in that industry or the economy as whole. This effect is calculated by taking the total regional growth of the given industry and subtracting the national growth for that same industry.

[ii] Location Quotient (LQ) analysis determines how concentrated a particular industry, demographic group, or other variable is compared to a larger geography. Concentration is a measure of local and regional strength when assessing economic growth potential. LQ is calculated by comparing the variable at a regional and national level. For example, if breweries account for 0.16% of all jobs in the region but only 0.015% of all national jobs, then the LQ for breweries in that region would be 10.67 (0.16/0.015), demonstrating that breweries are 10 times more concentrated in that region than the national average.

[iii] The replacement demand looks at the number of jobs that are expected to be added to the regional economy between 2016 and 2021 and the number of jobs that will have openings due to normal turnover in the workforce such as retirement, death and changing careers. Occupations with a high number of replacement jobs compared to expected job growth may indicate an occupation with a low wage. However, it may also indicate a large number of upcoming retirements in the coming years due to an aging workforce.

[iv] Job postings are collected from various sources and processed/enriched by Careerbuilder to provide information such as standardized company name, occupation, skills, and geography. EMSI performs additional filtering and processing to improve compatibility with EMSI data.

[v] EMSI occupation employment data are based on final Emsi industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry.

Biomedical and Biotechnology

Region 9 Industry Profile

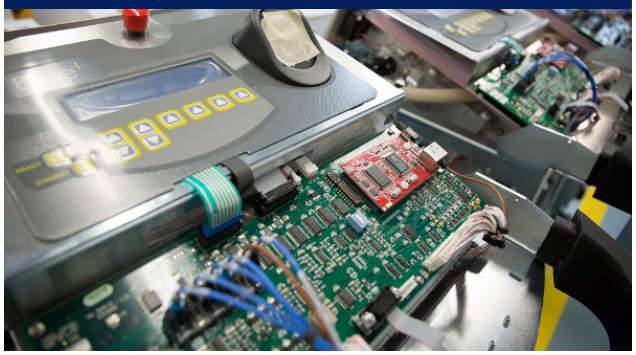
Overview

The Biomedical and Biotechnology industry sector is composed of eight 4-digit NAICS industries related to the development, manufacturing, usage, and disposal of medical and pharmaceutical products. Regional establishments are mainly comprised of product manufacturers (36%), research and development (50%), and diagnostic laboratories or waste treatment (16%). Manufacturing industries within Region 9's sector include irradiation therapy devices, electrotherapeutic devices, and surgical appliance manufacturing.

A detailed list of all NAICS industries within this sector is available at the end of this report. Because of the cross-compatibility of many industries within each targeted sector, some industries belong to multiple categories.

Major Products and Services:

- Biotechnology and pharmaceutical R&D
- Diagnostic laboratory services
- Irradiation device manufacturing
- Surgical appliance manufacturing
- Medical waste treatment and disposal



Significance Within Region 9

Biomedical and biotechnology research has flourished in Central Virginia, particularly in urban areas like Charlottesville where companies can closely collaborate and seek out top talent. Investments from government and educational institutions have driven innovations within the field and encouraged startups to set up shop and pursue the development and commercialization of novel techniques and technology. While this momentum is building, steps can be taken to encourage investment, especially after the start up stage, to ensure that firms have the resources to remain in Region 9 as they expand and create new high-wage jobs.

Industry Trends

In 2016, there were 137 Biomedical and Biotechnology establishments in the region, accounting for 0.2% of all businesses in the United States that are categorized under this industry sector. The number of establishments increased by 30 over the 2006-2016 period, a change of 28%. On a state and national scale, the Commonwealth of Virginia and the US observed an increase of 582 and 14,775 establishments (a 33% and 21% increase), respectively.

Establishment Trends, Biomedical and Biotechnology Industry Sector, 2006-2016

Location	2006 Est.	2016 Est.	# Change (2006 - 2016)	% Change (2006 - 2016)	% of US Est. (2016)
Region 9	107	137	30	28%	0.2%
Virginia	1,766	2,348	582	33%	3%
United States	69,216	83,991	14,775	21%	-

Source: EMSI 2017 Q2 Dataset

Historical and Project Job Change

Within the region, the Biomedical and Biotechnology industry sectors declined by a net 269 jobs in the last 10 years, a decline of roughly 10%. Job losses were focused within the **Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (NAICS 3345)** industry, which lost a net 432 jobs (a decline of 40%). This regional decline was similar across Virginia, which also saw a 10% decline (equaling a loss of over 5,000 jobs) between 2006 and 2016. Projected growth within the region for this industry sector is more positive, with 259 net new jobs (or 10% growth) expected by 2026. This anticipated growth will outpace those of both Virginia and the United States.

Historical Change in Jobs, Biomedical and Biotechnology Industry Sector, 2006-2016

Location	2006 Jobs	2016 Jobs	# Change (2006 - 2016)	% Change (2006 - 2016)	Competitive Effect (2016)
Region 9	2,803	2,534	(269)	-10%	(270)
Virginia	51,316	46,297	(5,019)	-10%	(8,208)
United States	2,219,830	2,265,383	45,553	2%	-

Source: EMSI 2017 Q2 Dataset

Projected Change in Jobs, Biomedical and Biotechnology Industry Sector, 2016-2026

Location	2006 Jobs	2016 Jobs	# Change (2016 - 2026)	% Change (2016 - 2026)	Competitive Effect (2026)
Region 9	2,534	2,793	259	10%	133
Virginia	46,297	47,334	1,037	2%	(3,726)
United States	2,265,383	2,427,401	162,018	7%	-

Source: EMSI 2017 Q2 Dataset

Regional Competitive Effect[i]: The Commonwealth of Virginia experienced a competitive effect of -8,208 net jobs over the 2006-2016 period. Region 9 also produced a negative competitive effect of -270 jobs in the same timeframe. This indicates that regional factors within both Region 9 and State contributed to a loss in jobs over the last decade, beyond what was seen elsewhere in the United States. Future projections are positive for Region 9, with a positive estimated competitive effect of 133 jobs within the region in spite of a projected negative competitive effect across Virginia. This positive projected competitive effect is evidence of strong potential for the industry sector within the region.

Concentration[ii]: Two 4-digit NAICS industries within the Biomedical and Biotechnology industry sector have a location quotient greater than 1.2, being **Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (NAICS 3345)** with an LQ of 1.36 as well as **Scientific Research and Development Services (NAICS 5417)** with an LQ of 1.35. A location quotient greater than 1.2 generally denotes a significant industry concentration within the region.

Top Occupations Replacement Demand

The following table includes the top five occupations identified to staff the Biomedical and Biotechnology industry sector within Region 9. However, the occupation data below is for the entire Commonwealth of Virginia and crosses over multiple industries. Nevertheless, it gives a good indication of the overall trends within these occupations. Over the next five years, while the top five occupations are projected to add several new jobs, the majority of job demand will come from replacement jobs. For Biological Technicians and Medical Scientists, Except Epidemiologists, over 70% of job demand will be due to replacement demand. This is likely because of the overall aging workforce population, as workers continue to retire.[iii]

Replacement Demand for Top Biomedical & Biotechnology Occupations in Virginia

Occupations	Employed in Industry Group (2016)	Change (2016 - 2021)	Openings (2016 - 2021)	Annual Openings	Replacement Jobs (2016 - 2021)	Annual Replacement Jobs	% Replacement Jobs
Software Developers, Systems Software	27,457	1,417	3,428	686	2,011	402	59%
Biochemists and Biophysicists	556	39	116	23	77	15	66%
Medical Scientists, Except Epidemiologists	1,957	118	429	86	311	62	73%
Biological Technicians	1,873	84	351	70	267	53	76%
Team Assemblers	16,974	1,119	3,007	601	1,887	377	63%

Source: EMSI Q2 2017 Dataset

Job Postings and Required Skills

The following table includes job posting data for Region 9 between April and June 2017 for the top occupations required to staff companies within the Biotechnology industry sector. The top occupations with job postings include Customer Service Representatives; Secretaries and Administrative Assistants, Except Legal, Medical, and Executive; Software Developers, Applications; Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products; and General and Operations Managers. Of these, there appears to be challenges in hiring Software Developers; Applications and Sales Representatives; and Wholesale and Manufacturing, Except Technical and Scientific Products. This indicates that there is likely more demand than supply for these occupations. On the other hand, there were more General and Operations Managers hired than there were job postings, which may indicate that companies are not relying directly on traditional job postings to hire.

Biomedical and Biotechnology Job Postings vs. Hires, April 2017 - June 2017

Occupation	Avg Monthly Postings	Avg Monthly Hires
Customer Service Representatives	171	116
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	170	135
Software Developers, Applications	100	40
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	94	51
General and Operations Managers	73	121
Medical Scientists, Except Epidemiologists	64	13
Accountants and Auditors	42	82
Bookkeeping, Accounting, and Auditing Clerks	38	119
Business Operations Specialists, All Other	38	59
Market Research Analysts and Marketing Specialists	35	39
Biological Technicians	29	14
First-Line Supervisors of Production and Operating Workers	27	18
Office Clerks, General	21	255
Industrial Engineers	17	5
Purchasing Agents, Except Wholesale, Retail, and Farm Products	17	14
Mechanical Engineers	17	7
Inspectors, Testers, Sorters, Samplers, and Weighers	16	17
Software Developers, Systems Software	12	38
Electrical Engineers	7	5
Architectural and Engineering Managers	5	5
Electronics Engineers, Except Computer	4	5
Microbiologists	3	5
Team Assemblers	2	39
Electromechanical Equipment Assemblers	2	2
Electrical and Electronic Equipment Assemblers	1	4
Biochemists and Biophysicists	0	4
Social Scientists and Related Workers, All Other	0	15

Source: EMSI Q2 2017 Dataset

Biomedical and Biotechnology Job Postings Hard Skills, April 2017- June 201

Skill	Relevance Score	Postings with Skill
Formal Learning	5.92	108
Typing	1.58	321
Molecular Biology	1.34	75
Biochemistry	0.93	60
Software Engineer	0.61	89
Administration	0.57	654
Biology	0.47	111
Computer Science	0.46	60
Top Secret (Intelligence)	0.44	93
Research	0.43	447
Analysis	0.28	406
JavaScript (Programming Language)	0.25	127
Defense (Legal)	0.20	98
C++ (Programming Language)	0.19	67
Sales	0.19	791
Cold Calling	0.18	122
Java (Programming Language)	0.18	125
Microsoft Excel	0.18	259
C Sharp (Programming Language)	0.17	77
.NET Framework	0.17	69
Engineering	0.17	335
Accounting	0.16	245
Microsoft Office	0.15	191
Accounts Payable	0.15	73
Cascading Style Sheets (CSS)	0.13	60

Source: EMSI Q2 2017 Dataset

Biomedical and Biotechnology Job Postings Soft Skills, April 2017- June 201

Skill	Relevance Score	Postings with Skill
Coordinating	0.05	147
Leadership	0.03	302
Listening	0.02	92

Source: EMSI Q2 2017 Dataset

Based on national job postings for Biotechnology, the most relevant hard skills include: Engineering; Accounting; Manufacturing; Cold Calling; and Analysis. National job postings also identify the most relevant soft skills for the Biomedical and Biotechnology industry sector as: Leadership; Coordinating; and Creativity. In addition, the top certifications required for this sector that were identified by national job

postings, as well as the number of postings in which they were included, are shown in the table on the table below:[iv]

Top 5 Certifications in Biomedical and Biotechnology Job Postings

Certification	Postings with Certification
Certified Public Accountant	20,611
Master of Business Administration (MBA)	19,388
Certified Internal Auditor	9,073
Certified Global Meeting Planner	7,101
Certified Information Security Manager	5,273

Source: EMSI Q2 2017 Dataset

The top three national occupational postings for Biotechnology from April 2017 through June 2017[v] were identified as: Customer Service Representatives; Software Developers/Applications; and Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products). The knowledge, skills, and abilities for Customer Service Representatives were identified as the following:

- **Knowledge:** Customer and Personal Services; English Language; and Knowledge of Administrative and Clerical Procedures and Systems
- **Skills:** Active Listening; Speaking; and Service Orientation
- **Abilities:** Oral Comprehension; Oral Expression; and Speech Clarity

The knowledge, skills, and abilities for Software Developers/Applications were identified as the following:

- **Knowledge:** Computers and Electronics; Engineering and Technology; and English Language
- **Skills:** Programming; Systems Analysis; and Systems Evaluation
- **Abilities:** Deductive Reasoning; Inductive Reasoning; and Problem Sensitivity

The knowledge, skills, and abilities for Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products) were identified as the following:

- **Knowledge:** Sales and Marketing; Customer and Personal Services; and English Language
- **Skills:** Active Listening; Speaking; and Persuasion
- **Abilities:** Oral Comprehension; Oral Expression; and Speech Clarity[1]

[1] *O*Net Online.* Customer Service Representatives; Software Developers/Applications; and Sales Representatives (Wholesale and Manufacturing, Except Technical and Scientific Products. https://www.onetonline.org/link/summary/43-4051.00; https://www.onetonline.org/link/summary/15-1132.00; https://www.onetonline.org/link/summary/41-4012.00

Supply Chain: Demand, Purchases and Sales

Demand

Demand for a given sector is calculated based on the estimated national demand from all industries and consumers. Industry wages, taxes, and other values added payments are indirectly part of the demand through the production of the supplying industry. As of 2016, total demand by consumers and other industries in Region 9 for goods produced by the Biomedical and Biotechnology industry sector was $885 million. Roughly 21% of this demand ($185 million) was met within the region. The other 79% of demand ($700 million) was satisfied by imports from elsewhere in the United States.[2]

Demand in Region 9 for Goods Produced by the Biomedical and Biotechnology Industry Sector

Location	Demand Met in Region	% Demand Met in Region 9	Demand Met by Domestic Imports	% Demand met by Domestic Imports	Total Demand in Region 9
Region 9	$ 185,033,100	21%	$ 700,062,856	79%	$885,095,955

Source: EMSI 2017 Q2 Dataset

Purchases

In 2016, the Biomedical and Biotechnology industry sector purchased a total of $274 million worth of goods and materials from other industries. 37% of these purchases were sourced from within the region, while another 63% were imported from elsewhere. Top industries for purchases from this sector include **Corporate, Subsidiary, and Regional Managing Offices (NAICS 551114)** with total in-region purchases of $8.4 million.

The table below shows the top 10 industries from which Region 9's Biomedical and Biotechnology industry sector purchased the greatest quantity of goods.

Top 10 Industries by Purchases Made by the Biomedical and Biotechnology Industry Sector

NAICS	Purchases From	Purchases Made in Region	% Made in Region	Domestic Imported Purchases	% Domestic Imported	Total Purchases
551114	Corporate, Subsidiary, and Regional Managing Offices	$8,369,056	45%	$10,288,373	55%	$18,657,429
541110	Offices of Lawyers	$5,948,260	50%	$6,018,472	50%	$11,966,732
541611	Administrative Management and General Management Consulting Services	$5,312,565	58%	$3,895,431	42%	$9,207,996
533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	$2,919,370	53%	$2,616,052	47%	$5,535,422
541330	Engineering Services	$1,283,089	26%	$3,683,842	74%	$4,966,931
531110	Lessors of Residential Buildings and Dwellings	$3,777,792	84%	$724,229	16%	$4,502,022
561110	Office Administrative Services	$3,313,197	74%	$1,166,945	26%	$4,480,142
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	$3,830,919	87%	$548,631	13%	$4,379,550
522110	Commercial Banking	$2,271,407	54%	$1,900,353	46%	$4,171,760
561320	Temporary Help Services	$1,604,178	39%	$2,554,415	61%	$4,158,593

Source: EMSI 2017 Q2 Dataset

[2] This data only includes demand with respect to industries and consumers within the United States.

Sales

Industry sales are calculated using the sum of the dollar value for all goods and services that other industries purchased from a given sector. Because this calculation a) uses historical data instead of estimates, and b) does not include consumer spending, the total in-region sales for a sector will often be lower than estimated in-region demand. Establishments within Region 9's Biomedical and Biotechnology industry sector primarily sold their products and services to government-related sectors in the region. The industry's largest buyer was **Federal Government, Military (NAICS 901200)**, followed by **Federal Government, Civilian, Excluding Postal Service (NAICS 901199)**, with 2016 sales of $15 million and $12.4 million, respectively. Sales within eight of the top ten purchasing sectors increased in the period 2015-2016, with **Hospitals (State Government) (NAICS 902622)** and **State Government, Excluding Education and Hospitals (NAICS 902999)** declining in purchases by $1 million and $36,000, respectively.

Top 10 Industries by Sales Made by the Biomedical and Biotechnology Industry Cluster

NAICS	Sales To	Total Sales in Region (2015)	Total Sales in Region (2016)	Change in Sales (2015 - 2016)
901200	Federal Government, Military	$14,983,233	$16,823,513	$1,840,280
901199	Federal Government, Civilian, Excluding Postal Service	$12,351,696	$14,135,781	$1,784,085
902612	Colleges, Universities, and Professional Schools (State Government)	$5,248,739	$5,490,438	$241,699
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	$4,111,503	$4,593,514	$482,010
902622	Hospitals (State Government)	$5,310,998	$4,289,473	($1,021,525)
902999	State Government, Excluding Education and Hospitals	$3,347,069	$3,311,207	($35,862)
621111	Offices of Physicians (except Mental Health Specialists)	$2,141,454	$2,428,106	$286,652
903999	Local Government, Excluding Education and Hospitals	$1,412,831	$1,608,064	$195,233
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	$1,035,816	$1,242,991	$207,175
903611	Elementary and Secondary Schools (Local Government)	$810,139	$858,812	$48,674

Source: EMSI 2017 Q2 Dataset

Factors Driving Investment and Competitiveness

Beyond instrument manufacturing and diagnostic laboratories, the largest industry for biomedical and biotechnology employment is in research and development (R&D). Investment and innovation within the region's Biomedical and Biotechnology industry sector has grown primarily out of major institutional funding from sources like the Federal Government, State Government, and the University of Virginia, with biotechnology-related research accounting for over 50% of academic R&D spending in the Commonwealth of Virginia.[3] Incentives for bioscience R&D include tax incentives, grants, and seed capital funds, and are tracked by Richmond-based non-profit Virginia Bio.

Private investment in the biomedical and biotechnology industry sector within the region is equally strong. The competitive landscape for the biomedical and biotechnology industry sector in the United

[3] Yes Virginia Key Industries: Life Sciences

States is marked primarily by significant merger and acquisition (M&A) activity, with a vast pool of small business start-ups investing in product innovation in the hopes of building a portfolio of intellectual properties that would warrant acquisition by a larger incumbent industry player. The Biotechnology Innovation Organization reported in 2017 that over 90% of the biopharmaceutical industry is made up of small, emerging companies.[4] These start-ups tend to be volatile, with a tendency to either rapidly scale once a new product has been developed or quietly exit the market once outside capital investment has dried up. Very rarely do smaller biomedical and biotechnology firms opt for an Initial Public Offering (IPO) instead of acquisition. It is also common for publicly-funded research centers to spin off research into private ventures—annually, the University of Virginia School of Medicine spins off 8 to 10 research projects into private ventures.

Since the biotechnology sector is a relative newcomer in the American economy, growth is expected to be robust. Annual national establishment growth is projected to be 2.2% annually at least until 2022. Changes to the regulatory environment within the US, both in biotechnology and related industries, like healthcare, could impact these projections. [5]

Key External Drivers

The Biomedical and Biotechnology industry is composed of hundreds of smaller firms competing amongst each other to develop a product innovative enough to compete with or get the attention of larger industry incumbents. Industry firms often rely on valuation based on prospective product releases, in the hopes of being acquired for their research. Additional external drivers for the industry are as follows:

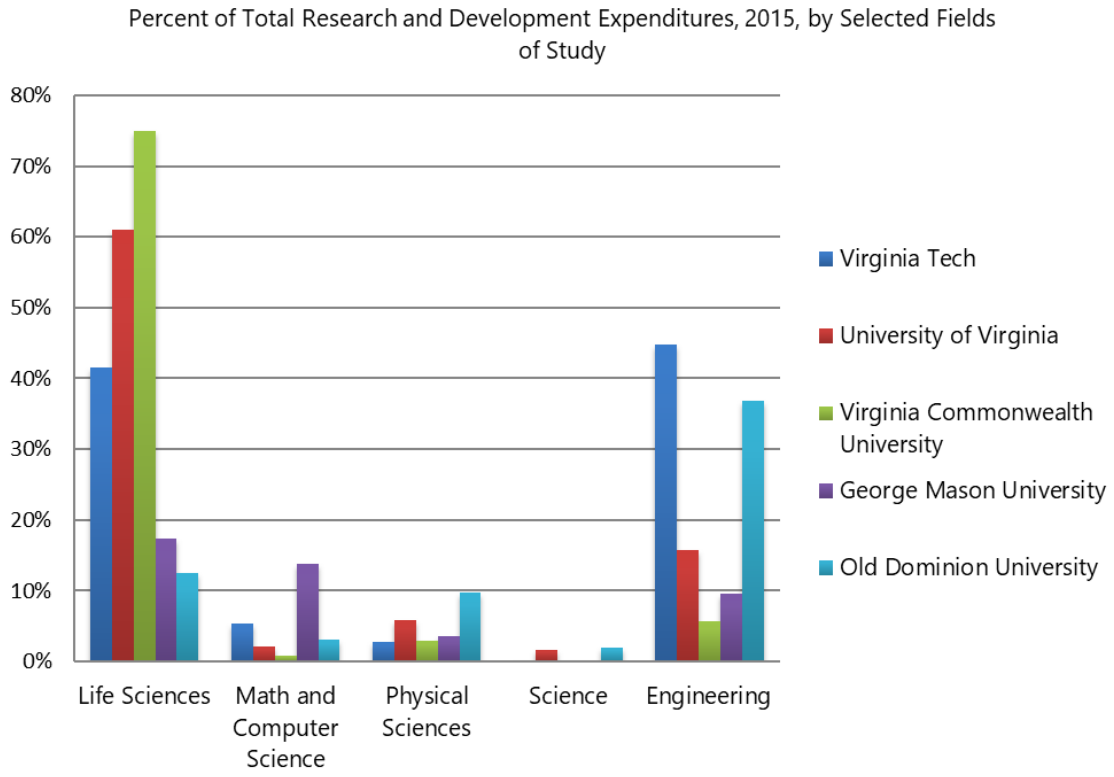
- **Expenditures for research and development**– Investment in Research and Development (R&D) is the lifeblood of innovation and growth in the biotechnology sector. Increases in R&D lead to more advanced products, which boost revenues, as well as better production techniques and waste management, which lowers costs.
- **Investor uncertainty**– Demand for capital in this sector is high. Though successful biomedical and biotechnology firms have potential to make significant returns, the increasing cost and decreasing likelihood of finding success in innovation may scare potential investors away. It can take 8-10 years to get through development and Food & Drug Administration approvals, costing firms tens of millions of dollars. Sustained access to reliable funds help produce an element of stability to the development of products.
- **Increasing life expectancy**– While there is benefit to greater life expectancies in the US, more people living to old age means more people being treated for age-related illnesses. As demand for treatments to these age-related conditions increases, there will be a greater demand for the research that the biomedical and biotechnology industries provide.

[4] Thomas and Wessel (2017). "Emerging Therapeutic Company Investment and Deal Trends". Biotechnology Innovation Organization
[5] Curran, M (2017). "IBISWorld Industry Report 33451b: Medical Device Manufacturing in the US". IBISWorld

- **Changes in corn prices**– As farmland for agricultural production becomes scarcer, demand for crops with greater yields will drive demand for research into crop productivity.
- **The Trade-Weighted Index (TWI)**- The TWI is a measure of the relative value of the US dollar compared to other major currencies. When the dollar's value increases, US goods, including biotechnology products, become relatively more expensive in foreign markets.

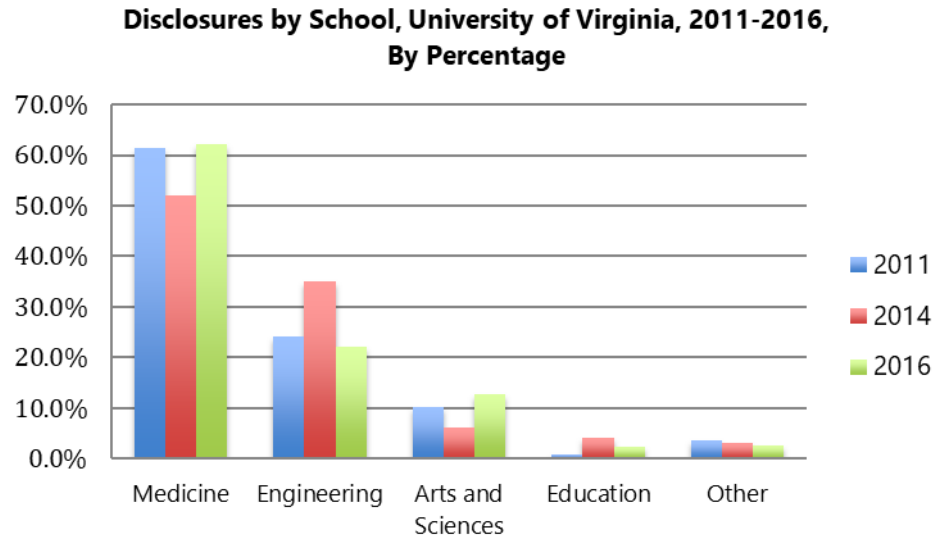
Regional Innovation Assets

Below, federal research and development expenditures at major Virginia universities are graphed. The University of Virginia (UVA) has notable strength in Life Sciences as well as Engineering.



Source: National Science Foundation, Higher Education Research and Development Survey, 2015

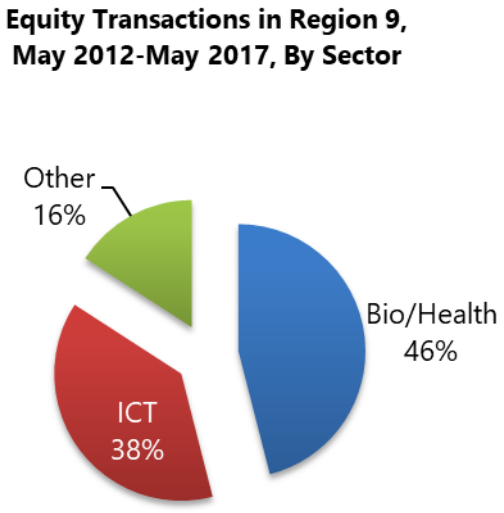
Strong federally-funded research leads to disclosures of patentable inventions by UVA faculty and staff. The School of Medicine is the predominant source of disclosures, thus leading to a high number of biotech related patents and subsequently, larger percentage of Biomedical and Biotechnology related startups.



Source: UVA Licensing and Venture Group Annual Reports

Region 9 companies raised at least $129,942,000 through 53 funding events since 2011, and have a total of $233,745,000 in equity to date.

Biomedical and Biotechnology startups received 46% of the equity infusions in Region 9.



Source: Crunchbase

Success Factors

For establishments within the Biomedical and Biotechnology sector to succeed, they will need to:

- Have the ability to successfully raise capital for start-up,
- Have a strong value proposition and clear message of the value of their product,
- Maintain a laser-focused scope of research to avoid superfluous costs,
- Observe relevant government legislation and industry standards to maintain a reputation of compliance,
- Pivot where necessary to adapt to new technology, and
- Properly hire and train skilled employees within the necessary field of research.

Factors Driving Location

Success in the Biomedical and Biotechnology sector is reliant on specific factors, many of which are only readily available in metropolitan areas around the country. These factors include:

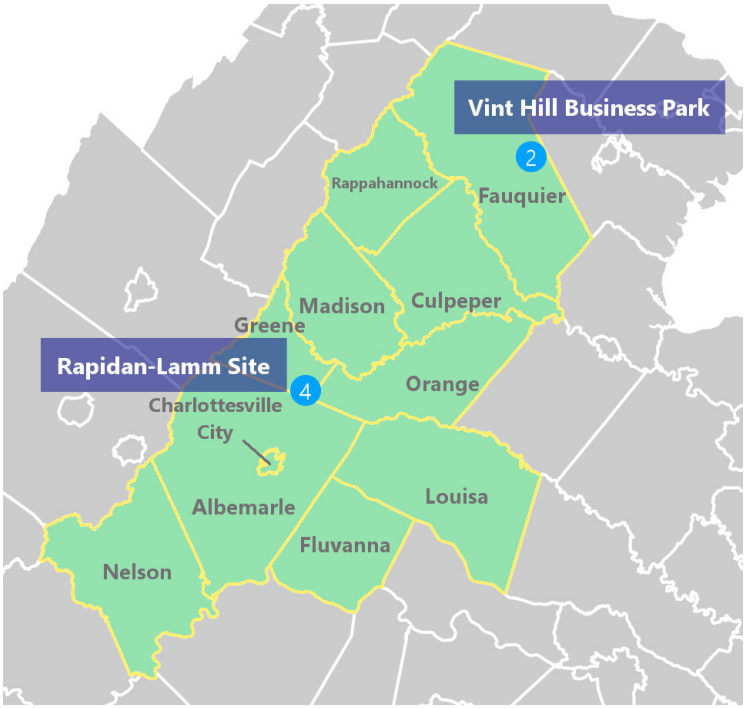
- Availability of skilled workers
- Availability of government funding
- Availability of venture and knowledge capital
- Proximity to larger firms within similar industries
- Proximity to the firm's area of research
- Level of government regulation and taxation

Most Biomedical and Biotechnology research occurs in the Bay Area of California (16.3% of establishments) and the Mid-Atlantic Area, including Boston, New York City, and Washington, DC (combined 18.7% of establishments), though San Diego, Atlanta, Georgia, and Raleigh-Durham-Chapel Hill, NC are also home to thriving Biomedical and Biotechnology research centers.[6]

[6] LeClair, M (2016). "IBISWorld Industry Report 54171: Scientific Research and Development in the US". IBISWorld

Region 9 Sites Suitable for Biomedical and Biotechnology

The following sites have been deemed favorable for attracting firms within the Biomedical and Biotechnology industry sector, as they provide, or have the ability to provide, the necessary infrastructure, location, and capacity to support potential new businesses in this sector. Of the six sites visited and analyzed for potential development, two sites were determined to be strong options for future development. It is important to note that these sites are located far away from major cities, and are best suited for large-scale research or manufacturing; smaller-scale research can be done in smaller spaces closer to more metropolitan research institutions.



Site #2: Fauquier County: Vint Hill Business Park

The Vint Hill Business Park is currently home to a server assembly and data center, OVH, and an FAA terminal radar approach control (TRACON) facility. They have plots currently available ranging from 3 to 45 acres of developable area. The park has multiple on-site access roads, and can be reached from Highway 215, approximately 1.5 miles off US 29. The business park is in a well populated and well educated area, and the has access to all major utility services except for industrial wastewater. A new, large veteran's center is planned for acreage adjacent to the business park. The proposed parcels are properly zoned as Planned Commercial Industrial District.

The Vint Hill sites reap a number of benefits from their location. With established neighboring business operations, the sites have access to all necessary utilities. The business park is also located in a well-educated community that is very attractive for those looking to locate outside of the D.C. area. The Vint Hill site is particularly well suited for IT operations, business and financial services, or high value-add light assembly (e.g. medical devices, aerospace, electronics) with the community capable of providing an educated, currently out-commuting, workforce.; however, the surrounding uses would generally be prohibitive for any kind of heavier industrial operation.

Site #4: Greene County: Rapidan-Lamm Site

The Rapidan property is a 65-acre site that is far along in the development process. The site was cleared, graded, and prepared for a previous retail opportunity that did not materialize. Configuration of the site is roughly rectangular, and could support a single large development, or two or more smaller developments requiring approximately 30 acres apiece. The site is located directly on US 29, and neighbors a handful of retail and commercial operations to the north, with residential areas to the south and east (including a large apartment complex bordering the property). Current zoning of the parcel is listed as B-2 for General Business.

The preparation activities that have already been performed on the Rapidan site put it at an advantage in comparison to other sites, as potential buyers will not have to spend the time or money on these items. While the site itself could possibly support a light manufacturing facility, the surrounding residential areas of the site prevent this location from being a good fit for heavier industrial operations. Due to the significant residential development nearby, the site would likely be limited to commercial, retail, or office space. County council has also expressed a desire to avoid any operation with large truck activity. Due to proximity to UVA and other biomedical/pharmaceutical research operations, there exists the opportunity to attract a similar facility to this site, but there is perceived to be a very small likelihood of that occurring.

Top Biomedical and Biotechnology Companies in Region 9

Region 9 Top Biomedical and Bioscience Firms

Company Size	Company Name	Locality
100+ Employees	MicroAire Surgical Instruments	Albemarle
50 to 99 Employees	Alere Informatics	Charlottesville
	Resource Environmental Solutions	Fauquier
	BIO-CAT	Louisa
	Chemetrics	Fauquier
	Mikro Systems	Albemarle
	National Optronics	Charlottesville
15 to 49 Employees	Afton Scientific	Albemarle
	Atlantic Research Group	Albemarle
	Biovista	Albemarle
	BrightSpec	Charlottesville
	Culpeper Home Medical	Culpeper
	Environmental Systems Service	Culpeper
	Focused Ultrasound Foundation	Charlottesville
	HemoShear Therapeutics	Charlottesville
	HemoSonics	Charlottesville
	INDOOR Biotechnologies	Charlottesville
	Lighthouse Instruments	Albemarle
	Perelandra	Culpeper
	Rivanna Medical	Charlottesville
	Signature Science	Albemarle
	Soils & Environmental Services	Fauquier
	Varian Medical Systems	Charlottesville

Industry Sector Definitions

List of 4-Digit NAICS Industries in Biomedical and Biotechnology Industry Sector for Region 9

NAICS	Description	Total Jobs (2016)	Total Est. (2016)	Location Quotient
3254	Pharmaceutical and Medicine Manufacturing	54	7	0.15
3332	Industrial Machinery Manufacturing	160	6	1.14
3333	Commercial and Service Industry Machinery Manufacturing	59	5	0.53
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	661	15	1.36
3391	Medical Equipment and Supplies Manufacturing	260	16	0.67
5417	Scientific Research and Development Services	1,144	68	1.35
5622	Waste Treatment and Disposal	91	7	0.77
6215	Medical and Diagnostic Laboratories	105	15	0.31
Total		2,534	137	-

Source: EMSI 2017 Q2 Dataset

[i] The Regional Competitive Effect is part of a Shift Share Analysis. Shift Share Analysis distinguishes an industry's employment growth in a specific area that is attributable to local competitive advantages from growth that can be attributed to national employment trends or overall industry trends. Shift Share indicators help to answer the question "Why is employment growing or declining in this industry?" The **regional competitive effect** explains how much of the change in a given industry is due to some unique competitive advantage that the region possesses, because the growth cannot be explained by national trends in that industry or the economy as whole. This effect is calculated by taking the total regional growth of the given industry and subtracting the national growth for that same industry.

[ii] Location Quotient (LQ) analysis determines how concentrated a particular industry, demographic group, or other variable is compared to a larger geography. Concentration is a measure of local and regional strength when assessing economic growth potential. LQ is calculated by comparing the variable at a regional and national level. For example, if breweries account for 0.16% of all jobs in the region but only 0.015% of all national jobs, then the LQ for breweries in that region would be 10.67 (0.16/0.015), demonstrating that breweries are 10 times more concentrated in that region than the national average.

[iii] The replacement demand looks at the number of jobs that are expected to be added to the regional economy between 2016 and 2021 and the number of jobs that will have openings due to normal turnover in the workforce such as retirement, death and changing careers. Occupations with a high number of replacement jobs compared to expected job growth may indicate an occupation with a low wage. However, it may also indicate a large number of upcoming retirements in the coming years due to an aging workforce.

[iv] Job postings are collected from various sources and processed/enriched by Careerbuilder to provide information such as standardized company name, occupation, skills, and geography. EMSI performs additional filtering and processing to improve compatibility with EMSI data.

[v] EMSI occupation employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry.