GO Virginia Region 5
Growth and Diversification Plan

Prepared for the GO Virginia Region 5 Council by the Dragas Center for Economic Analysis and Policy at Old Dominion University

December 10, 2021

Acknowledgments

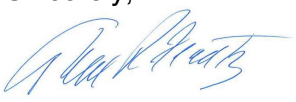
This report represents the required biennial update of the Region 5 Growth and Diversification Plan. The report was prepared for the Region 5 Council by the Dragas Center for Economic Analysis and Policy at Old Dominion University. The material in the report was reviewed, edited and recommended for approval by the State GO Virginia Board and by members of the Region 5 Council.

This plan update needs to acknowledge the creation of a truly collaborative region over the past five-plus years and thank those many individuals and organizations for their efforts. Public discussion and work to create a path forward began in earnest with the onset of COVID-19 in the Spring of 2020. Building upon the previous extensive public process undertaken by the Hampton Roads Planning District Commission, a collaboration of regional governmental and business organizations began an intense year-long process to create a playbook called the 757 Recovery & Resilience Action Framework. This unprecedented effort was funded, in part, by a GO Virginia grant and actively engaged over 200 volunteers in 11 industry and topic committees. The effort led to the framework being rolled out as a high profile public/ media presentation in March of 2021. An important feature of the Framework is its comprehensive emphasis on accountability. A six-month follow-up public presentation held in October reported on results in all committee areas as well as in 30 specific programs/projects included in the Action Framework.

The success of the Action Framework served as the inspiration for the process used in the preparation of this biennial update to the Growth and Diversification Plan. Reinvent Hampton Roads assembled a task force to assist Old Dominion University in producing an update to the previous plan. This not only reduced ODU's workload in completing the document, but builds an understanding of the important strategic recommendations in the plan and increases the level of ownership by task force partners.

We would like to thank the staff of Reinvent Hampton Roads for the coordination of this effort and the members of the GO Virginia Region 5 Council for their dedication to this important work for the long-term regional economic growth and sustainment of our region.

Sincerely,



Mr. Thomas R. Frantz
Chair

Ms. Anne C.H. Conner
Vice Chair

Table of Contents

List of Figures

List of Tables

Executive Summary

This report represents the biennial update of the Region 5 Economic Growth and Diversification Plan. To qualify to receive grants from the Virginia Growth and Opportunity Fund, a regional council shall review an economic growth and diversification plan not less than biennially. The biennial update provides members of Region 5 an opportunity to gauge economic conditions in the region, update and amend priority industry clusters in the region, and assess existing and future economic challenges that could be addressed through Go Virginia funding.

No assessment of Region 5's economic performance would be complete without a discussion of the public and economic shock associated with the COVID-19 pandemic. Prior to the pandemic, growth in real Gross Domestic Product (GDP), individual employment, and nonfarm payrolls (jobs) had improved, but the region continued to lag the performance of the Commonwealth and the nation. The pandemic's economic shock largely dissipated the gains in employment and nonfarm payrolls of the previous decade, and recent data suggest that the recovery in the region again lags that of Virginia and the nation. It remains to be seen if growth returns to the region at the competitive levels of 2018 and 2019 before the onset of the pandemic.

Within Virginia, Region 5 ranks in the bottom half of GO Virginia regions with respect to employment growth, establishment creation, innovation, and academic research and development. While Region 5 is part of the 'urban crescent', the superior performance of the Northern Virginia and Richmond regions (Regions 4 and 7) has diminished Region 5's share of Virginia's economic activity. More telling, residents of Region 5 have departed in greater numbers for other regions in the Commonwealth and the United States than others have sought to live in Region 5. While Region 5 continues to occupy a distinctive role in the national security of the United States, shifts in national spending priorities or the positioning of forces could dramatically impact the future prospects of the region. We should not assume that because federal, and

specifically, defense spending, has increased over the last five years that it will continue to do so over the next five years. We only need to point to the drawdown in forces in the 1990s as a relatively recent example of how priorities can shift at the national level. Diversification of the economic base is no longer a luxury to discuss in nebulous terms; it should be our 'North Star' guiding our discussions, plans, and journey to a more vibrant economic future.

Leveraging Region 5's priority industry clusters are a foundational element of this diversification strategy. Region 5's strengths are in industries related to water, technology, and energy. Ship Repair and Ship Building, Port Operations, Logistics and Warehousing, and Water Technologies employed approximately 100,000 workers at above average wages in the second quarter of 2021. Advanced Manufacturing, Cyber Security, Data Analytics, Modeling and Simulation, and Unmanned Systems and Aerospace are industries poised for growth nationally and, if we take concerted action, regionally. A new industry cluster in Clean Energy employed more than 23,000 workers at an average annual wage of almost $78,000 in the second quarter of 2021. However, as might be expected, the level of employment has largely been unchanged over the last decade, illustrating the need for Region 5 to invest in projects that will bolster growth in this industry. Given the growth potential of this industry cluster, competition will be fierce, but Region 5 can make the case that it can be the home of the manufacturing and assembly of products of the Clean Energy cluster and can potentially become a hub for the OSW industry as it establishes itself in the United States. Region 5 has enormous comparative advantages in these industries, and if we continue to focus on clean energy, it can become a major center on the East Coast.

To grow the priority industry clusters, Region 5 will need a capable workforce. The workforce was already stressed prior to the COVID-19 pandemic due to domestic outmigration. Now, with labor force participation down and the prospect of accelerating retirements in the near

term, assuming that the right workers will be available at the right time with the right skills needs to be our focus. Region 5 has the highest percentage of adults with an Associate Degree in 2019 but ranked below the other areas of the urban crescent in terms of adults with a 4-year or higher degree. A more pressing concern is the lack of progress with regards to STEM degrees. The number of Computer and Mathematical degrees has remained relatively the same over the last five years and the number of Engineering and Engineering Technology degree awards in 2020 was at the lowest level in Region 5 since 2011. If Region 5 is to provide the workforce to grow the engineering and technology-based priority industry clusters, it must develop a focused strategy to grow awards in these degree programs and, more importantly, keep new graduates in the region.

A continuing challenge for Region 5 remains innovation and entrepreneurship. Region 5 was more successful in attracting venture capital in 2019 and 2020 than earlier in the previously concluded decade. With the opening of the "Assembly" in Downtown Norfolk and the award of a large GO VA grant to the 757 Collab, Region 5 has considerable reason to hope for a turnaround in start-up funding. Region 5's record in terms of attracting venture capital pales in comparison to Region 4 and Region 7. Region 9 has seen venture capital investments over time increase from $12.0 million in 2010 to $155.7 million in 2020, more than 3 times that of the $48.7 million in venture capital attracted by Region 5 as reported by Pitchbook. These totals do not include placements. Academic research and development spending also lagged behind in Region 5 in 2019 and declined in absolute terms from 2010. Fostering the growth of an education-health-research complex in Region 5 that is similar to that at Virginia Commonwealth University or the University of Virginia is one possible route to raising Region 5's stature in innovation, venture capital funding, and academic research and development

spending.

Region 5 has, in the face of these challenges, not stood still. There has been a concerted effort to improve the portfolio of sites prepared for business expansion. This report identifies number of specific actions to continue this effort. In the face of the COVID-19 economic shock, a number of entities worked on a regional recovery plan. There is an ongoing effort to improve the 'brand' of the region and to develop a regional energy plan. This past year saw the incorporation of the RVA•757 Connects Mega-Region as a non-profit organization. The newly formed organization has developed an action agenda that is reflective of this plan including the widening of the 29-mile gap in I-64 and the creation of the Global Internet Hub. We continue to observe how investments in infrastructure for the Port of Virginia have had discernable results over time. The development of a new pediatric mental health facility by CHKD is a positive development and illustrates Region 5's potential comparative advantage in the education-health-research nexus. The recently signed MOU between ODU, EVMS, and Sentara is a positive development in this area. The challenge is for the region to develop and implement a concerted long-term development strategy that lifts private sector growth while continuing to leverage its strengths with regards to the nation's security.

The dominant theme of Region 5's 2021 biennial update is the need to bolster private sector growth over the coming decade. Returning to the pre-pandemic status quo in the hopes that increases in federal spending will raise the economic performance of the region is possible but would also sacrifice the region's comparative advantages in its priority industry clusters. We acknowledge there are institutional and legal constraints that make a regional strategy difficult to develop and implement but Region 5's performance over the previous decade should embolden us all to take concerted action. We need not sacrifice our role in the nation's defense

to improve economic growth, but we should also not sacrifice economic growth over the fear that diversification would diminish our role in the nation's defense. Now is the time to continue to do the work of preparing the foundation for a robust economy over the coming years.

Section 1: Introduction

The second biennial update to the GO Virginia Program's required Growth and Diversification Plan reviews and builds upon the original August 2017 effort as well as the initial biennial update of August 2019. In the past four years those documents have served as the guiding economic growth and diversification record for Region 5. In the spirit of the language of the GO Virginia Board, the Growth and Diversification Plan serves to "…. identify economic opportunities, needs, and challenges, establish priorities among those opportunities, and outline needed enhancements where GO Virginia grant funds can (a) support collaborative programs between at least two or more localities and (b) that will lead to the creation of more higher paying jobs."

In 2017, Go Virginia Region 5 submitted its initial Growth and Diversification Plan. The purpose of that plan was to provide data-driven recommendations to grow and diversify the economy in Region 5. The 2017 report identified economic opportunities and challenges as well as key industry clusters that could spur regional collaboration and the creation of new, higher-paying jobs.

In 2019, Go Virginia Region 5 produced its biennial update of the Growth and Diversification Plan. The update noted that the economic conditions in the region had improved since 2017 and was relatively optimistic about the economic performance of the region. The 2019 biennial update was centered on the theme of ***agility***, that is, creating an economic environment that would be sufficiently agile to withstand potential contractions in federal government spending. The 2019 update noted Region 5 could become more agile by increasing firm diversity (attracting companies whose operations were independent of federal government spending) and by increasing the ability of existing companies to find commercial applications for their current government contracting efforts (dual-use products and services).

The 2017 plan established, and the 2019 reaffirmed, three main economic goals for Region 5. In this biennial update, we assess progress towards these goals.

1. **Create a coordinated capacity for innovation in identified key industry clusters.**
2. **Increase the pace of small and medium-sized enterprise (SME) job creation through the expansion of existing firms with a specific focus on the attraction of firms in the key industry cluster to the region.**
3. **Close all skills, credentialing, and degree gaps in the key industry clusters' workforces by 2022 through intra-regional production and talent importation.**

The 2017 and 2019 reports identified and reaffirmed Region 5's focus on six key industry clusters. Since the summer of 2019, the reality of "clean energy" has become apparent as an aspirational cluster that will be increasingly important to the overall economic potential of Hampton Roads. Therefore, we have added a seventh cluster to the six previously identified priority clusters. In this report, we assess Region 5's performance with respect to job creation and firm diversity for the following priority industry clusters:

- **Port Operations, Logistics and Warehousing**
- **Advanced Manufacturing**
- **Cyber Security, Data Analytics and Mod-Sim**
- **Shipbuilding and Ship Repair**
- **Water Technologies**
- **Unmanned Systems and Aerospace**
- **Clean Energy**

All GO Virginia regions should use consistency with the Growth and Diversification Plan as they review requests for grants. As such, the development of this latest update represents an important opportunity for the Regional Council to reflect upon the economic challenges and

potentially the priorities for the regional economy moving forward. Improving economic resiliency and diversification is a prevailing theme in this update. Despite increases in federal spending in the region prior to the pandemic, fueling job creation and economic growth, the region's economic performance continued to lag Virginia and the United States. The employment gains of the previous decade disappeared in the initial months of the COVID-19 pandemic, and the recovery in the region lagged the Commonwealth and nation in 2021. When Region 5 is compared to its peer and aspirant regions across the United States, its relatively anemic performance highlights the challenges facing the region over the coming decade.

While the region excels in its distinctive role in national defense, the region's economic dependence on federal spending remains a concern. Fostering private sector job creation and regional innovation is imperative given potential shifts in national security policy and military affairs that could undermine the region's comparative advantages in producing weapon systems and basing defense assets. This update highlights the need to diversify the economic base to foster growth independent of federal government spending. Diversification could come from growth in key industry clusters through the emergence of new firms and expansion of existing firms. Diversification could also entail existing government contractors finding commercial use applications for their products and services. Regions that have grown faster than Region 5 typically have more firm diversity and firms engaging in dual-use production. The challenge for Region 5 is to identify and fund projects that not only move the region to a more diversified economy but also improve the economic resiliency of the region.

The remainder of the document is organized as follows. Section 2 surveys the performance of Region 5's economy. Section 3 provides a review of the region's priority industry clusters. Section 4 examines workforce gaps by these clusters. Section 5 examines the portfolio of economic development sites in Region 5 and provides recommendations to increase the number

and quality of sites. Section 6 provides an overview of recent developments in Hampton Roads that have had major impacts on our region. Section 7 discusses possible strategies and specific projects to address Region 5's economic challenges. Some of these identified strategies and projects may be eligible for future GO Virginia grants. Section 8 provides concluding remarks.

Section 2: Data Update for Region 5

A primary goal of the 2021 biennial update for Region 5's Growth and Diversification Plan is to assess the region's economic performance since the 2019 update. While Region 5 saw incremental improvements in economic activity at the end of the recently concluded decade, the COVID-19 pandemic has unwound many of these gains. Even though federal spending has continued to increase in Region 5 over the past twenty-four months, the region's recovery from the COVID-19 economic shock has been relatively tepid through the fall of 2021. Current economic conditions suggest that the improvements in economic performance near the end of the last decade were largely a product of increases in federal spending instead of fundamental changes to the structure of the regional economy.

As a starting point for our assessment of economic conditions in Region 5, we update the economic challenges identified in the 2017 report and reaffirmed in the 2019 update. We examine measures of economic performance to gauge Region 5's progress (or lack thereof) with respect to these challenges. We now have sufficient data to provide measures of performance over the previous decade and, in some cases, to gauge how the economy of Region 5 has reacted to the COVID-19 pandemic.

1. **Region 5's economic growth has not kept pace with Virginia or the United States.**
2. **Region 5 is overly reliant on a small set of large firms in its key cluster areas.**
3. **Region 5 is creating small and medium-sized enterprises (SMEs) at a pace far below its peer metro areas.**
4. **Region 5 is not creating a workforce for the next-generation knowledge-based economy at a quick enough pace.**
5. **Region 5 lacks a deliberate and comprehensive innovation strategy.**

Challenge 1
Region 5's economic growth has not kept pace with Virginia or the United States.

Region 5 is one of the three largest areas of economic activity in the Commonwealth of Virginia, with an economy that was only second in value to that of Region 7 (Northern) in 2019. Its economy was approximately 11.6% percent larger than that third largest regional economy (Region 4: South Central) in 2019. Regions 4, 5, and 7 form the 'urban crescent' that accounts for over 70% of the population and 75% of economic activity in the Commonwealth. However, Region 5's share of Virginia's population and economy have declined over the last two decades. As the region struggled to find its footing, job growth lagged, economic growth became inconsistent, and some residents sought their economic fortunes elsewhere. In this subsection, we explore how economic conditions changed over the last decade and discuss, where data are available, how the COVID-19 pandemic affected the region's short-term economic performance.

Population Growth in Region 5 Has Declined Since 1990

In 2020, approximately 1.7 million Virginians resided in Region 5, approximately 20.1% of the Commonwealth's total population. Region 5's share of Virginia's population, however, has continued to decline over the last two decades, falling from 23.6% in 1990 to 22.4% in 2000, to 20.8% in 2010, and finally to 20.1% in 2020. As illustrated in Table 1, the average annual growth rate of Region 5's population has declined from 0.8% (1990-1999) to 0.5% (2000-2009), to 0.3% (2010-2019). Region 5's population growth rate over the last decade was less than half that of the other relatively populous Go Virginia regions (South Central, Central, and Northern). In the last decade, Region 5's population growth rate ranked sixth among the nine Go Virginia regions and second-to-last among regions with positive population growth.

Figure 1 allows us to draw back and compare population growth in Region 5 with that of Virginia and the United States. It is important to highlight that population growth has slowed each

decade for Region 5, Virginia, and the United States. The average rate of population growth, however, was consistently slower in Region 5. From 2000 to 2020, Region 5's total population increased by 8.6%. Over the same period, the populations of Virginia and the United States increased by 20.9% and 16.8%, respectively.

Region 5's slower rate of population growth relative to that of Regions 4 (South Central), 6 (Eastern), and 7 (Northern) has shifted the progression of the geographic population center of Virginia. Prior to 1960, the U.S. Census estimated that the geographic population center of Virginia was west of Richmond. In 1970, the geographic population center began a dramatic shift to the northeast.[1] By 2040, the geographic population center will likely be near Fredericksburg. By 2040, the Weldon Cooper Center estimates that one-half of the state's population will live in Northern Virginia, which is broadly defined as the area bordered on the south by Fredericksburg, on the north by the Potomac River, and on the west by the Shenandoah Valley.[2] Faster population growth in Regions 4, 6, and 7 is, in effect, pulling the population center of the Commonwealth towards an area bounded in the southwest by the Richmond metropolitan area and in the northeast by the Virginia portion of the Washington, D.C. metropolitan area. The 'urban crescent' is becoming increasingly lopsided, weighed down by the growing population of Richmond and Northern Virginia regions.

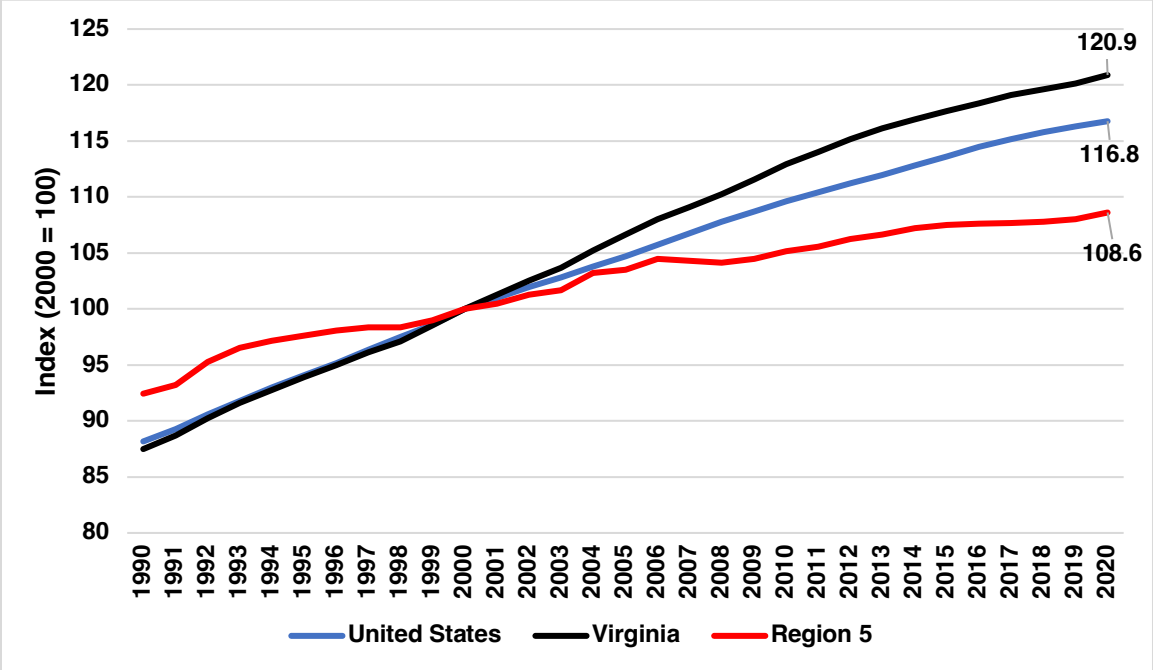
[1] U.S. Census Bureau. Historical State Centers of Population by State for 1810-2010 Censuses.
[2] University of Virginia Weldon Cooper Center for Public Service, Virginial Population Projections Map, Available at: https://demographics.coopercenter.org/virginia-population-projections-interactive-map

Table 1 - Population and Population Growth for the U.S., Virginia, and Go Virginia Regions 1990, 2000, 2010, and 2020

Region	1990	2000	2010	2020	1990-1999 Annual Growth	2000-2009 Annual Growth	2010-2019 Annual Growth	2019-2020 Annual Growth	2020 Population Share
Region 1: Southwest	393,511	398,740	401,794	375,761	0.2%	0.1%	-0.7%	-0.4%	4.4%
Region 2: West Central	643,350	700,085	762,227	781,531	0.8%	0.8%	0.3%	0.0%	9.1%
Region 3: Southside	366,116	387,778	383,740	362,593	0.6%	-0.1%	-0.6%	-0.5%	4.2%
Region 4: South Central	900,854	1,036,200	1,177,905	1,288,794	1.4%	1.4%	0.9%	0.7%	15.0%
Region 5: Hampton Roads	**1,468,905**	**1,589,071**	**1,670,906**	**1,726,010**	**0.8%**	**0.5%**	**0.3%**	**0.3%**	**20.1%**
Region 6: Eastern	291,414	376,459	471,026	525,157	2.6%	2.3%	1.1%	1.2%	6.1%
Region 7: Northern	1,472,561	1,829,631	2,245,591	2,544,942	2.1%	2.0%	1.3%	0.5%	29.6%
Region 8: Valley	386,523	445,222	509,099	544,536	1.4%	1.4%	0.7%	0.5%	6.3%
Region 9: Central	282,699	336,206	401,716	441,239	1.7%	1.9%	1.0%	0.7%	5.1%
Virginia	**6,216,884**	**7,105,817**	**8,024,004**	**8,590,563**	**1.3%**	**1.2%**	**0.7%**	**0.4%**	**--**
United States	**248,790,925**	**282,162,411**	**309,327,143**	**329,484,123**	**1.2%**	**0.9%**	**0.7%**	**0.4%**	**--**

Source: U.S. Census Bureau, Annual Intercensal Population Estimates 1990-2019, Vintage 2020 Population Estimates and Dragas Center for Economic Analysis and Policy. Percentages may not sum to 100 percent due to rounding. Estimated annual growth is the Compound Annual Growth Rate. Estimates, where possible, are for July 1st for comparison purposes. Resident population of the United States. Vintage 2020 estimates are based on the 2010 Census and were created without incorporation or consideration of the 2020 Census results.

Figure 1 - Index of Population Growth for the U.S., Virginia, and Region 5 1990 – 2020



Source: U.S. Census Bureau, 1990 Components of Population Change, 2000 Intercensal Estimates, 2020 Population Estimates and Dragas Center for Economic Analysis and Policy. Estimates, where possible, are for July 1st for comparison purposes. Resident population of the United States.

Table 2 displays the population growth rates for the localities in Region 5. Virginia Beach, the largest city in the Region, grew at an average annual rate of 0.7% from 1990 to 1999. In the subsequent two decades annual population growth in Virginia Beach fell to 0.2% (2000-2009) and 0.3% (2010-2019), a fraction of that of the Commonwealth and the nation. Chesapeake, on the other hand, has moved from the fourth largest city in Region 5 (1990) to the second largest city (2020). While Chesapeake's population growth has slowed relative to the first decade of the century, it still grew at an annual average rate of 1.0% from 2010 to 2019, more than three times the rate of Region 5 and faster than the state or nation. Suffolk, which experienced rapid population growth from 2000 to 2009 (3.0% per year on average), saw population growth slow in the most recent decade to an annual average rate of 0.9%. Suffolk, however, still grew nearly as

fast (0.9% per year) as Chesapeake and faster than the state or nation. It is entirely possible that Suffolk will be larger than Portsmouth by the mid-2020s and could approach the size of Hampton by the early 2030s.

While Chesapeake and Suffolk experienced above average population growth rates over the last decade, the populations of Hampton, Norfolk, and Portsmouth declined absolutely. A declining population is a signal that residents are 'voting with their feet' about economic and social conditions. A declining population erodes the property tax base, degrades the business climate, and signals to investors and businesses that opportunities are better elsewhere. With more than 1 in 4 residents of Region 5 living in Hampton, Norfolk, and Portsmouth, reversing these declines in population is imperative for the future growth of the region.

Among the smaller localities in Region 5, Isle of Wight County, James City County, Williamsburg, and York County grew faster than Region 5 over the last decade. James City County continued to post the highest average annual population growth rates in Region 5, growing four times faster than Region 5 as a whole. Williamsburg and York County saw upticks in the population growth rate over the last five years. The smaller localities of Accomack County, Franklin City, Northampton County, and Southampton County, however, observed absolute population declines over the last decade.

Why are some localities growing while others are contracting? The continued shift of the U.S. population from rural to urban areas may help explain the declining populations of some smaller localities but fails to explain the fortunes of Hampton, Norfolk, and Portsmouth. For large, urban areas of Region 5, economic opportunities are closely aligned with population growth. A declining population also presents a challenge for a region that wants to spur private sector job creation. If talent is leaving some cities in the region, workforce gaps may develop and persist, inhibiting the ability of the private sector to fill available jobs and create new jobs. Region 5

appears to be in a negative cycle of development where slow job growth erodes population growth which, in turn, further erodes future prospects for robust economic growth.

Table 2 - Population and Annual Population Growth for Region 5 and Region 5 Localities 1990, 2000, 2010, and 2020

Region	1990	2000	2010	2020	1990-1999	2000-2009	2010-2019	2019-2020	2020 Population Share
Accomack County	31,803	38,215	33,150	32,238	1.9%	-1.5%	-0.3%	-0.3%	1.9%
Chesapeake City	153,335	200,224	223,525	247,011	2.8%	1.1%	1.0%	0.7%	14.3%
Franklin City	8,444	8,269	8,579	7,833	0.2%	0.3%	-1.0%	-0.4%	0.5%
Hampton City	134,245	146,054	137,418	135,464	0.9%	-0.6%	-0.2%	0.3%	7.8%
Isle Of Wight County	25,178	29,849	35,319	37,725	1.7%	1.9%	0.6%	0.9%	2.2%
James City County	35,037	48,536	67,681	77,612	3.3%	3.5%	1.4%	1.0%	4.5%
Newport News City	172,324	180,236	180,905	179,062	0.5%	0.0%	-0.1%	-0.4%	10.4%
Norfolk City	261,425	234,986	243,019	242,803	-1.2%	0.3%	0.0%	-0.3%	14.1%
Northampton County	13,089	13,025	12,410	11,673	0.0%	-0.5%	-0.6%	-1.1%	0.7%
Poquoson City	11,033	11,582	12,148	12,257	0.5%	0.5%	0.1%	0.2%	0.7%
Portsmouth City	103,833	100,337	95,457	95,094	-0.3%	-0.6%	-0.1%	0.5%	5.5%
Southampton County	17,035	17,493	18,642	17,636	0.3%	0.7%	-0.5%	-0.9%	1.0%
Suffolk City	52,220	64,216	84,859	93,913	2.0%	3.0%	0.9%	1.8%	5.4%
Virginia Beach City	395,542	426,918	438,864	451,231	0.7%	0.2%	0.3%	0.1%	26.1%
Williamsburg City	11,701	12,012	13,706	15,259	0.3%	1.5%	1.0%	1.6%	0.9%
York County	42,661	57,119	65,224	69,199	3.0%	1.5%	0.6%	0.9%	4.0%
Hampton Roads	**1,468,905**	**1,589,071**	**1,670,906**	**1,726,010**	**0.8%**	**0.5%**	**0.3%**	**0.3%**	**-**

Source: U.S. Census Bureau, 1990 Components of Population Change, 2000 Intercensal Estimates, 2020 Population Estimates and Dragas Center for Economic Analysis and Policy. Percentages may not sum to 100 percent due to rounding. Estimated annual growth is the Compound Annual Growth Rate. Estimates, where possible, are for July 1st for comparison purposes. Resident population of the United States. Vintage 2020 estimates are based on the 2010 Census and were created without incorporation or consideration of the 2020 Census results.

Components of Population Change in Region 5

Population change is driven by three components: the natural increase in the population (births minus deaths), net domestic migration, and net international migration. Regions that are growing typically have more births than deaths and inflows of new residents that are greater than outflows of current residents. From 2010 to 2020, the total population of Region 5 increased by 58,173 individuals[3].

Figure 2 illustrates the components of population change in Region 5 from 2010 to 2020. Over this period, the natural increase in the population was 83,413. Births outnumbered deaths for every year from 2010 to 2020, however, the margin peaked at 10,177 in 2012 and declined in subsequent years. In 2020, there were an estimated 4,879 more births than deaths in Region 5, a 52.1% decline from the 2012 peak.

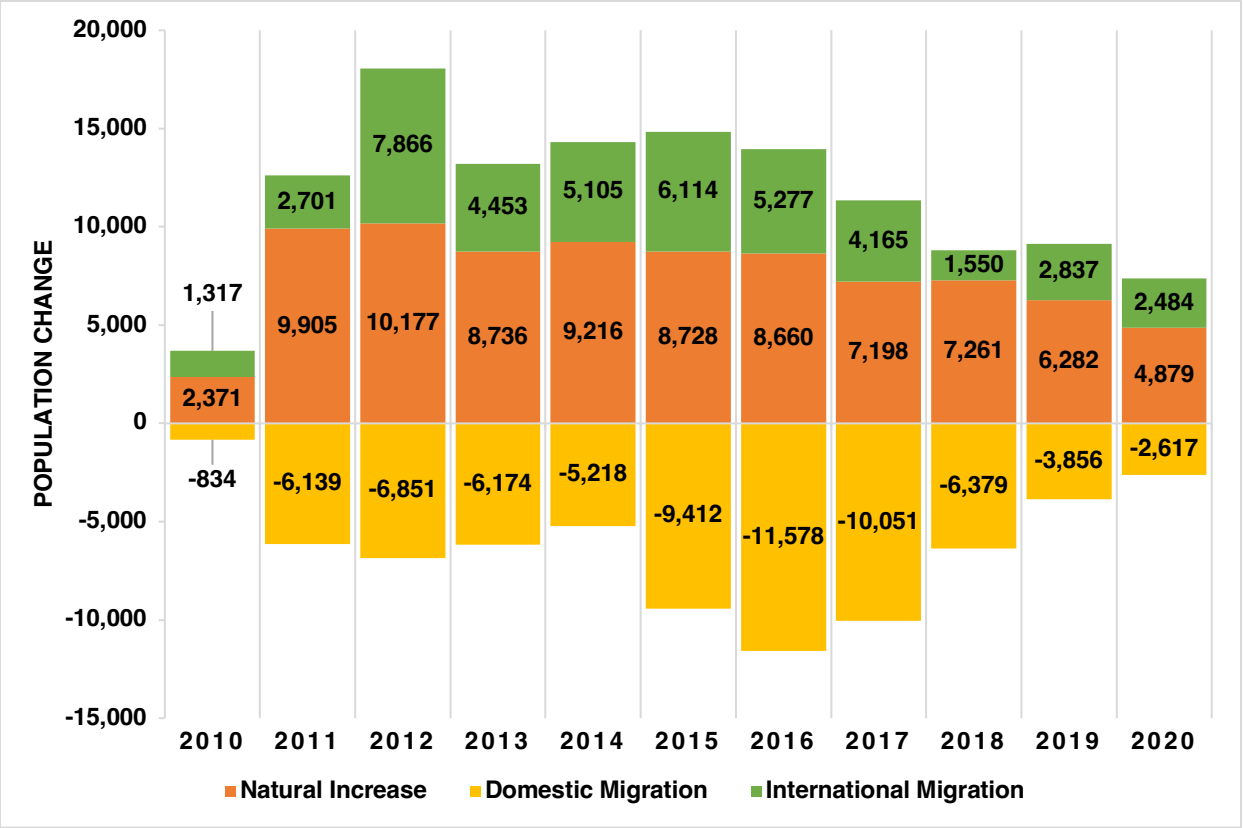
From 2010 to 2020, net international migration was 43,869 individuals and international arrivals outnumbered international departures in every year. However, like the natural increase in the population, net international migration peaked at 7,866 in 2012 and largely declined in subsequent years. By 2020, there were an estimated 2,484 more international arrivals to Region 5 than departures from Region 5 to overseas locations.

Figure 2 also reveals net domestic migration was -69,109 from 2010 to 2020 as domestic departures outnumbered domestic arrivals to Region 5 in every year. The trough of net domestic migration was in 2016, when 11,578 more individuals left Region 5 for locations in the United States than chose to emigrate to Region 5. If there is a modicum of good news, it is that the level of net domestic migration was -2,617 in 2020, a 77.4% decline from the levels observed in 2016.

[3] U.S. Census Bureau Components of Population Change estimates are adjusted to be consistent across geographies and therefore are not comparable with the equivalent change in the total population estimates illustrated in Table 2.

The data show that, without international migration, Region 5 would have barely grown from 2010 to 2020. With continued restrictions on international travel through most of 2021, there is a distinct possibility that Region 5 did not experience population growth in 2021. Whether international migration returns to previously observed levels remains an open question that can only be answered in the coming years.

Figure 2 - Components of Population Change for Region 5
2010 – 2020



Source: U.S. Census Bureau, 2020 Components of Change Estimates and Dragas Center for Economic Analysis and Policy. Vintage 2020 estimates are based on the 2010 Census and were created without incorporation or consideration of the 2020 Census results.

From 2010 to 2020, two regions in Virginia, Region 1 (Southwest) and Region 3 (Southside), saw absolute declines in total population over this period as deaths outnumbered births (negative natural increase), domestic departures outnumbered domestic arrivals (negative

domestic migration), and low levels of positive international migration. Region 2 (West Central) also observed more deaths than births, but the negative natural increase in the population was offset by positive domestic and international migration.

Among the larger regions in Virginia, Region 5 was joined by Region 7 (Northern) in experiencing negative net domestic migration from 2010 to 2020. Combined, Region 5 and Region 7 saw over 174,000 more domestic departures than arrivals over this period. While some of these departures were for other locations in the Commonwealth, some residents left the state entirely, as evidenced by Virginia's negative domestic migration of -80,255 over the period. Unlike Region 5, Region 7's negative domestic migration of -105,197 was completely offset by its positive level of international migration.

Table 3 - Components of Population Change, Virginia and GO Virginia Regions 2010 – 2020

Region	Natural Increase	Domestic Migration	International Migration	Population Change
Region 1: Southwest	-14,331	-12,729	1,114	-25,946
Region 2: West Central	-1,924	5,363	16,631	20,070
Region 3: Southside	-13,284	-9,997	1,888	-21,393
Region 4: South Central	40,522	39,291	32,781	112,594
Region 5: Hampton Roads	**83,413**	**-69,109**	**43,869**	**58,173**
Region 6: Eastern	17,487	31,940	6,821	56,248
Region 7: Northern	237,839	-105,197	179,947	312,589
Region 8: Valley	6,265	19,513	10,012	35,790
Region 9: Central	10,684	20,670	9,165	40,519
Virginia	**366,671**	**-80,255**	**302,228**	**588,644**

Source: U.S. Census Bureau, 2020 Components of Change Estimates and Dragas Center for Economic Analysis and Policy. Vintage 2020 estimates are based on the 2010 Census and were created without incorporation or consideration of the 2020 Census results.

Population Change Among Adults Age 20 to 34 Years in Region 5

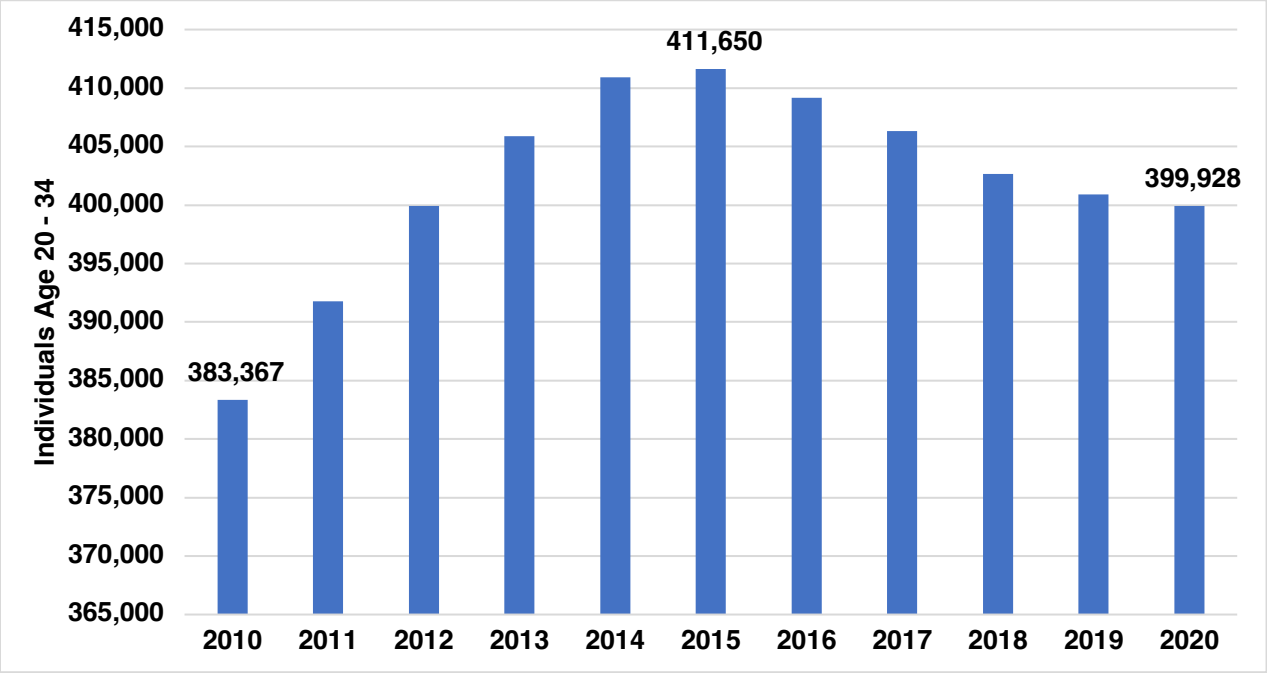
Whether a region can retain and attract younger individuals is key to population and economic growth. Inflows of 'Generation Z' and 'Millennials' are a signal of the attractiveness of a region not only in terms of economic opportunities but also in quality of life.[4] These inflows are needed as older generations retire from the workforce. Prior to the COVID-19 pandemic, 'baby boomer' retirements were an increasing challenge for regions seeking to bolster economic growth. Early evidence suggests that retirement rates have ticked upward in response to the economic shock of the pandemic.[5]

Figure 3 illustrates the population of individuals age 20 to 34 in Region 5 from 2010 to 2020. From 2010 to 2015, the number of younger adults increased in the region, growing from 383,367 (22.9% of the population) to 411,650 in 2015 (24.1% of the population). However, from 2016 to 2020, the population of individuals age 20 to 34 in Region 5 has declined, falling to 399,928 individuals (23.2% of the population) in 2020.

[4] Individuals in 'Gen Z' were born between 1997 and 2012 while 'Millennials' were born between 1981 and 1996. 'Gen X' spans birth years 1965 to 1980 while 'Baby Boomers' span two time periods, 1946 to 1954 and 1955 to 1964.

[5] Niguel Faria e Casto, "The COVID Retirement Boom", Federal Reserve Bank of St. Louis, October 15, 2021. https://research.stlouisfed.org/publications/economic-synopses/2021/10/15/the-covid-retirement-boom

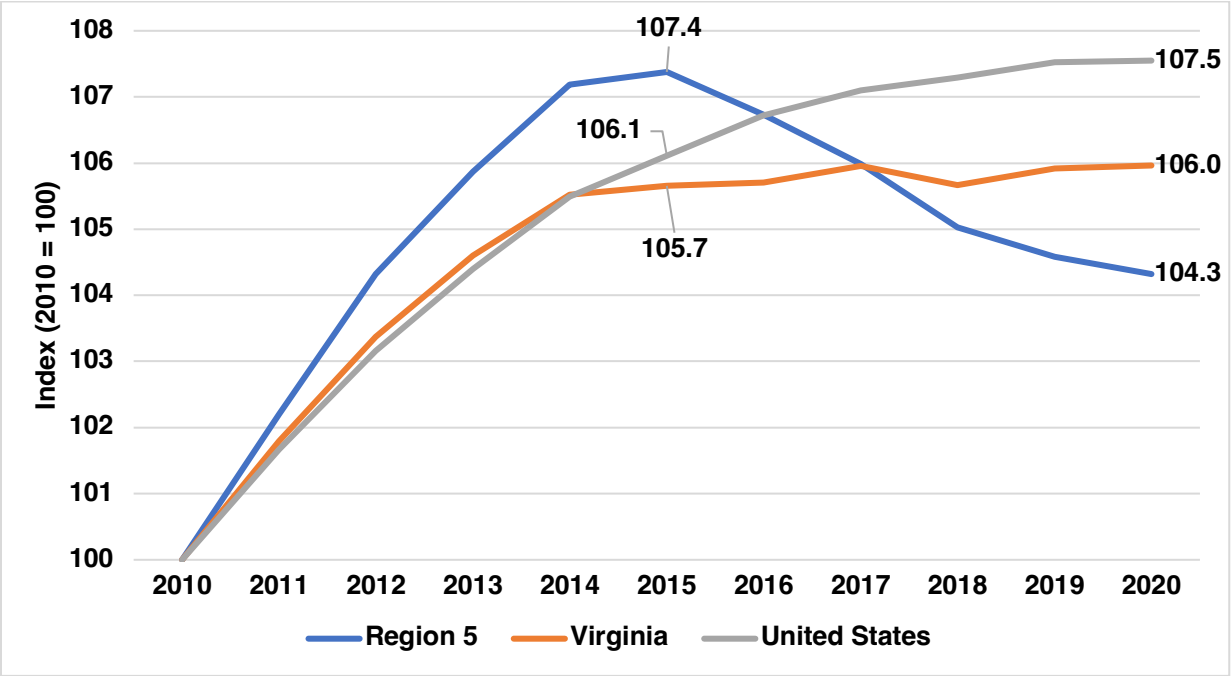
Figure 3 - Population Age 20 – 34 in Region 5
2010 – 2020



Source: U.S. Census Bureau, 2020 Components of Change Estimates and Dragas Center for Economic Analysis and Policy. Vintage 2020 estimates are based on the 2010 Census and were created without incorporation or consideration of the 2020 Census results.

Region 5's fortunes in attracting adults age 20 to 34 are mirrored to some extent at the state level. Figure 4 provides an index comparing the population in each year to 2010 for Region 5, Virginia, and the United States. Region 5's population of younger adults grew more quickly than the Commonwealth or nation from 2010 to 2015. At it's peak in 2015, Region 5's population of adults age 20 to 34 was 7.4% larger than it was in 2010, compared with 5.7% and 6.1% for Virginia and the United States, respectively. However, by 2020, Virginia's population of individuals 20 to 34 was 6.0% larger than it was 2010 while the national population was 7.5% larger. Region 5's younger adult population was only 4.3% larger in 2020 when compared to 2010 due to the outright decline in the number of adults age 20 to 34 in Region 5 from 2016 to 2020.

Figure 4 - Age 20 – 34 Population Growth, United States, Virginia and Region 5 2010 – 2020



Source: U.S. Census Bureau, 2020 Components of Change Estimates and Dragas Center for Economic Analysis and Policy. Vintage 2020 estimates are based on the 2010 Census and were created without incorporation or consideration of the 2020 Census results.

One possible explanation for the reversal of Region 5's fortunes with respect to younger adults is the relatively tepid pace of economic growth in the previous decade. Domestic migration, which was negative over the decade, was likely driven, in part, by younger adults. We can reasonably conclude that part of the domestic outmigration from Region 5 was younger individuals. Whether these individuals were seeking better economic fortunes, an improved quality of life, or cultural amenities is not known. The outright decline of younger individuals over the last five years is a troubling development for the economic prospects of the region and will likely impede efforts to close workforce gaps and invigorate private sector growth.

Table 4 illustrates the change in the population age 20 to 34 for GO Virginia regions, Virginia, and the United States from 2010 to 2020. Two regions, Region 1 and Region 3, observed absolute declines in this population for this period. Region 5 and Region 7 (both of which

experienced net domestic outmigration over this period) saw smaller increases than the Commonwealth or the nation. On the other hand, Regions 2 and 8 grew at the national rate of 0.7% per year and Region 4, 6, and 9 grew faster than the national rate. The smaller increases in the young adult population for two of the most populous regions in the Commonwealth partly explain why Virginia experienced slower growth in the population of adults aged 20 to 34.

Table 4 - Change in Population Age 20 – 34, Virginia and GO Virginia Regions 2010 - 2020

Region	2010 Population Ages 20 – 34	2020 Population Ages 20 – 34	Annual Growth
Region 1: Southwest	67,699	62,699	-0.8%
Region 2: West Central	155,196	165,930	0.7%
Region 3: Southside	64,355	63,239	-0.2%
Region 4: South Central	238,924	268,991	1.2%
Region 5: Hampton Roads	**383,367**	**399,928**	**0.4%**
Region 6: Eastern	84,823	100,006	1.7%
Region 7: Northern	497,768	517,142	0.4%
Region 8: Valley	99,535	106,503	0.7%
Region 9: Central	78,761	85,601	0.8%
Virginia	**1,670,428**	**1,770,039**	**0.6%**
United States	**62,914,600**	**67,664,401**	**0.7%**

Source: U.S. Census Bureau, 2020 Components of Change Estimates and Dragas Center for Economic Analysis and Policy. Vintage 2020 estimates are based on the 2010 Census and were created without incorporation or consideration of the 2020 Census results. Estimated annual growth is the compound annual growth rate.

Gross Domestic Product at the Metropolitan Level

Nominal and real (inflation-adjusted) Gross Domestic Product (GDP) is a gauge of economic performance at the region, state, and national level. GDP estimates are available quarterly at the national and state level, with lags of one (national) and six months. At the

metropolitan statistical and county level, GDP estimates are typically lagged one year and these estimates are subject to substantial revision in the coming years. County level GDP estimates also do not aggregate to metropolitan area estimates, so our best measure of regional economic performance is at the metropolitan statistical area (MSA) level. With these important caveats in mind, we first examine the economic performance of the Virginia Beach – Norfolk – Newport News ("Hampton Roads") metropolitan statistical area (MSA).[6]

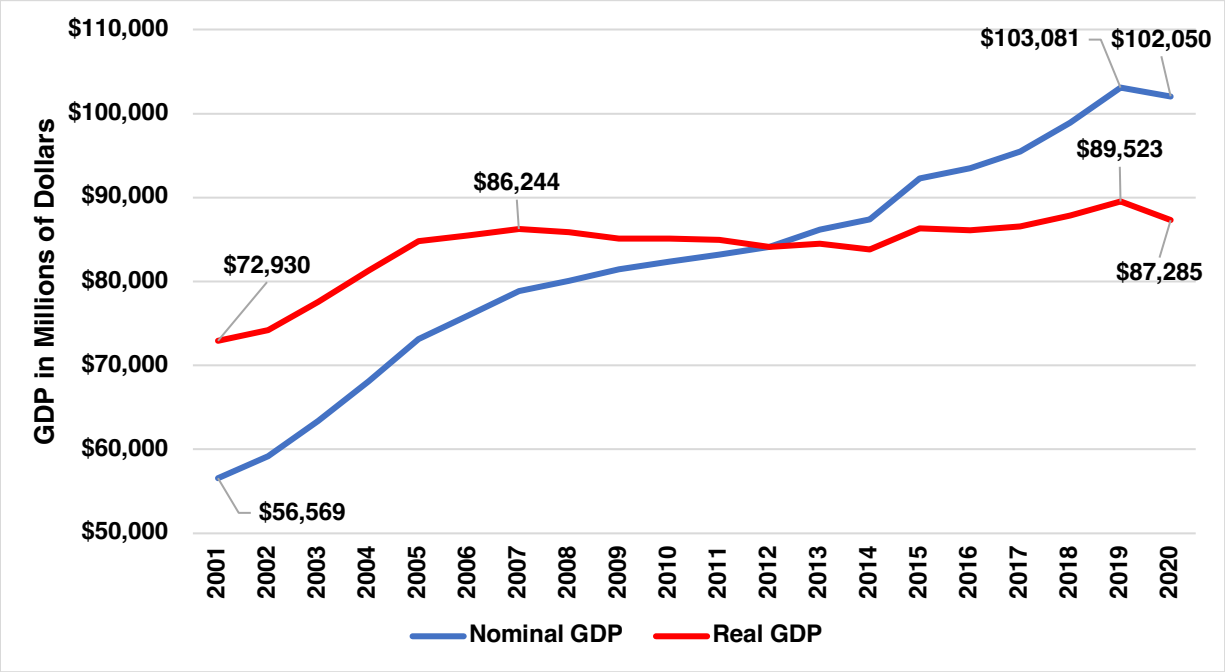
Recently released estimates of Gross Domestic Product for Counties and MSAs by the Bureau of Economic Analysis (BEA) on December 8, 2021, include revised estimates for 2001-2019 and new data for 2020. However, revised estimates, especially for 2017 through 2020, are based on classifying military personnel by place of work and deployed personnel are no longer counted as employed in a region by BEA even though they may be stationed in a region. Consequently, revised data show that Real GDP in Hampton Roads declined by 4.2% and 4.8% in 2018 and 2019 respectively compared to BEA's previous estimates for these years. Similar declines are observed for Honolulu (HI), San Diego (CA), and Bremerton (WA) metro areas. These three metros along with Hampton Roads include five of the ten largest naval bases in the US. Therefore, we continue to use the previous estimates through 2019 while we discuss this issue with the BEA.

Figure 5 displays the levels of nominal and real GDP for the Hampton Roads MSA from 2001 to 2020. Metropolitan real GDP grew rapidly from 2001 to 2007, peaking at $86.2 billion in constant dollars in 2007. The twin impacts of the Great Recession of 2007 – 2009 and the impact

[6] The Virginia Beach – Norfolk – Newport News MSA consists of the following cities: Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg. The counties in the MSA are: Camden County (North Carlina), Currituck County (North Carolina), Gates County (North Carolina), Gloucester County, Isle of Wight County, James City County, Mathews County, Southampton County, and York County,. This geographic definition is slightly different than the Go Virginia Region 5 cities and counties. Where possible we will examine data at the Region 5 level, but occasionally, we will have to fall back on the MSA for certain data.

of the Budget Control Act of 2011 and its subsequent amendments (commonly referred to as 'sequestration' and 'caps on discretionary spending', respectively) are readily apparent given the stagnation of real GDP from 2008 to 2014. Real economic activity did increase in three consecutive years (2017 – 2019) at the end of the previous decade, however, real GDP contracted in 2020 as the COVID-19 pandemic roiled the regional economy.

Figure 5 - Nominal and Real Gross Domestic Product
Virginia Beach-Norfolk-Newport News, VA-NC Metropolitan Statistical Area
2001 – 2020*

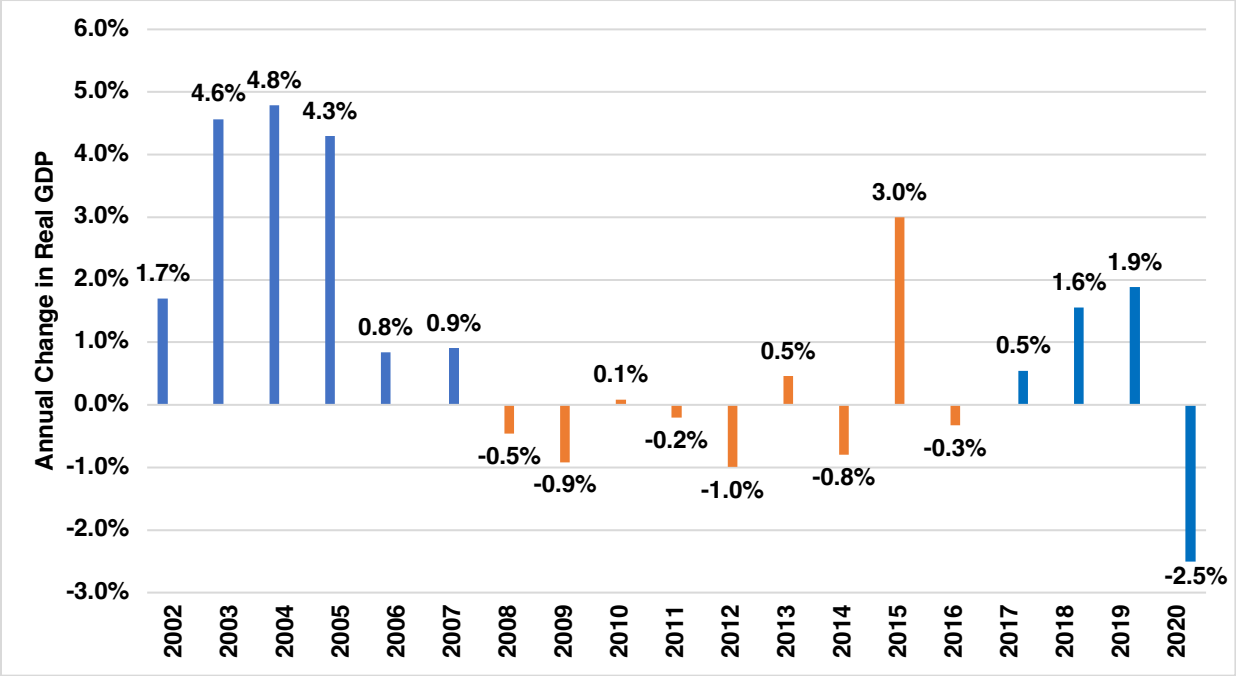


Source: U.S. Bureau of Economic Analysis. Real GDP in chained 2012 dollars. Hampton Roads reflects the Virginia Beach-Norfolk-Newport News, VA-NC (Metropolitan Statistical Area). 2020 forecast provided by the Dragas Center for Economic Analysis and Policy.

Figure 6 shows the annual change in real GDP for the Hampton Roads MSA from 2002 to 2020. From 2001 to 2007, the real GDP grew at an annual average rate of 2.4%, outpacing Virginia and the United States as rapid increases in defense spending in the region fueled growth. In the lost decade that followed, however, the annual average rate of real GDP growth was 0.03%, that is, the economy was essentially stagnant from 2008 to 2016. The lingering impacts of the

Great Recession were amplified by declines in federal spending in the region, reductions in military personnel stationed in the metropolitan area, and lackluster private sector job creation. Increases in federal spending, especially defense spending, from 2017 to 2019 lifted real GDP growth in the region, although the average rate of growth (1.7%) paled in comparison to that at the start of the century. Lastly, even though federal spending in Region 5 has continued to increase this decade, these increases were insufficient to offset the economic impacts of the COVID-19 pandemic.

Figure 6 - Growth in Real Gross Domestic Product
Virginia Beach-Norfolk-Newport News, VA-NC Metropolitan Statistical Area
2002 – 2020



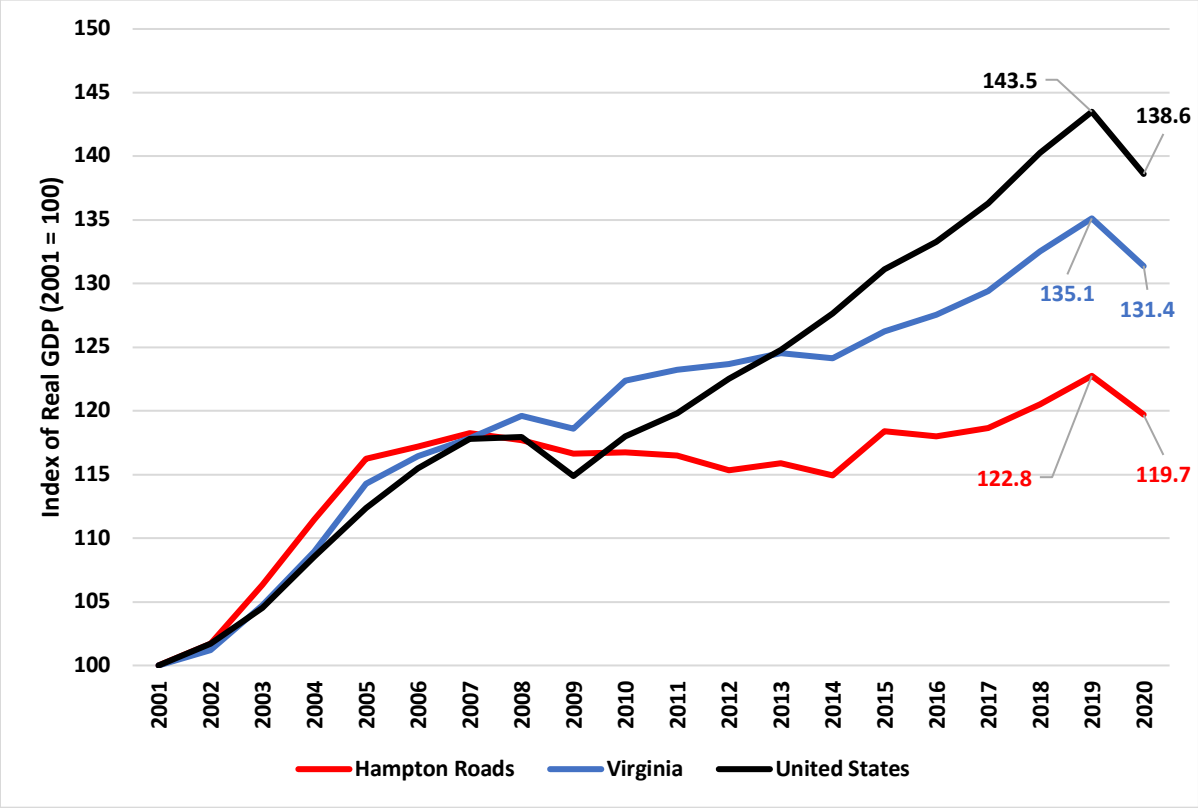
Source: U.S. Bureau of Economic Analysis. Real GDP in chained 2012 dollars. Annual percentage change in real GDP. 2020 forecast provided by the Dragas Center for Economic Analysis and Policy.

Figure 7 compares real economic growth in the Hampton Roads MSA, Virginia, and the United States from 2001 to 2020. From 2001 to 2007, real GDP in Hampton Roads grew by 18.3%, one half a percentage point higher than the 17.8% increase for the Commonwealth and the nation. However, after 2007, real GDP growth lagged in the region relative to the state and

the nation. By 2019, the last year prior to the COVID-19 pandemic, real GDP in Hampton Roads was 22.8% larger than in 2001. Over the same period, real GDP in Virginia and the United States increased by 35.1% and 43.5%, respectively.

In 2019, real GDP in Hampton Roads was $89.5 billion. If the Hampton Roads MSA had grown at the same pace as the U.S. economy from 2001 to 2019, real GDP in 2019 would have been approximately $104.7 billion. In other words, if Hampton Roads had kept pace with the United States, its economy would have been $15.2 billion larger in 2019. The $15.2 billion represents the cost to residents of the metropolitan area for a decade of anemic economic growth.

Figure 7 - Index of Real GDP
Hampton Roads Metropolitan Statistical Area, Virginia, and the United States
2001 – 2020*



*Source: U.S. Bureau of Economic Analysis. Real GDP in 2012 chained dollars. *2020 Real GDP for U.S. and Virginia are estimates, 2020 forecast for Hampton Roads provided by the Dragas Center for Economic Analysis and Policy. Base year of the index is 2001.*

The COVID-19 economic shock is also apparent in Figure 7. Nationally, real GDP contracted by 4.9 percentage points from 2019 to 2020. Virginia's real GDP fell by 3.7 percentage points in 2020. Hampton Roads, so far, appears to have fared better than the Commonwealth or the nation, experiencing a decline in real GDP of 3.1 percentage points. The question remains: will the region return to its lackluster economic performance of the prior decade, or will it make structural changes to foster higher growth in the coming years?

Gross Domestic Product Across GO Virginia Regions

In December 2019, the BEA released its first official estimates of GDP by county following the 2018 release of experiment estimates at the county level.[7] The county level estimates provide insight into the economic performance of independent cities and counties in Region 5. As with the metropolitan level estimates of GDP, the county level estimates are subject to revision and are published with a significant lag. As national and state GDP data are published quarterly, county level estimates will not typically sum to state or national level estimates. While lagged, the estimates allow us to compare economic performance across and within GO Virginia regions.

Region 5's 16 independent cities and counties increased their level of real economic activity from $86.4 billion in 2010 to $89.4 billion in 2019, an average annual rate of growth of 0.4%. Region 5's economic performance was in the bottom half of GO Virginia regions from 2010 to 2019 (Table 5). As Region 5 grew significantly slower than other large regions, its share of Virginia's real GDP declined from 19.6% in 2010 to 18.3% in 2019. Region 7 (Northern) grew at a four-times faster annual rate (1.7%), increasing its share of Virginia's economic activity from 39.2% in 2010 to 41.2% in 2020. Region 4 grew even faster, with an average annual growth of 2.1% from 2010 to 2019. Together, Regions 4, 5, and 7 make up Virginia's 'urban crescent' and

[7] For additional discussion see, "A Primer on Local Area Gross Domestic Product Methodology" at https://www.bea.gov/system/files/2020-02/county-GDP-article.pdf

accounted for 76.0% of Virginia's real GDP in 2019, a 2.2 percentage point increase from 2010. **However, unless Region 5 picks up the pace of growth, it is likely to be eclipsed by Region 4 in coming years as the second largest economic region in the Commonwealth.**

Table 5 - Real Gross Domestic Product, Virginia and GO Virginia Regions
2010 and 2019
Billions of 2012 Dollars

Region	2010	Share of Virginia's 2010 GDP	2019	Percent of Virginia's 2019 GDP	Estimated Annual Growth
Region 1: Southwest	$14.0	3.2%	$13.7	2.8%	-0.3%
Region 2: West Central	$31.7	7.2%	$33.2	6.8%	0.5%
Region 3: Southside	$11.6	2.6%	$11.7	2.4%	0.1%
Region 4: South Central	$66.1	15.0%	$80.1	16.4%	2.1%
Region 5: Hampton Roads	**$86.4**	**19.6%**	**$89.4**	**18.3%**	**0.4%**
Region 6: Eastern	$14.6	3.3%	$16.7	3.4%	1.5%
Region 7: Northern	$173.0	39.2%	$200.9	41.2%	1.7%
Region 8: Valley	$22.8	5.2%	$23.7	4.9%	0.4%
Region 9: Central	$17.7	4.0%	$20.0	4.1%	1.3%
Virginia	$441.2	--	$487.3	--	1.1%

Source: U.S. Bureau of Economic Analysis, Gross Domestic Product by County, 2019 and Dragas Center for Economic Analysis and Policy. Real GDP in 2012 chained dollars. Percentages may not sum to 100 percent due to rounding. Estimated annual growth is the compound annual growth rate.

Table 6 displays the GDP estimates for localities within Region 5. Norfolk (23.2%), Virginia Beach (22.2%), Newport News (14.5%), and Chesapeake (10.4%) accounted for 70.3% of economic activity in 2019. Adding in Hampton (7.2%), Portsmouth (6.4%), and Suffolk (3.9%) yields the 'Seven Cities.' The Seven Cities accounted for 87.8% of real GDP in 2019. If one adds in the combined area of James City County and Williamsburg (5.1%), almost 93% of economic activity occurred in the Seven Cities, James City County, and Williamsburg. This share has increased from 90.7% in 2010. In other words, $0.93 of every dollar of economic activity in 2019 occurred in these localities, and the share has increased over the last decade. While Region 5 is

geographically diverse, economic activity is increasingly concentrated in Region 5's larger independent cities.

Table 6 - Real Gross Domestic Product by Region 5 Locality 2010 and 2019

Location	2010	Share of 2010 GDP	2019	Share of 2019 GDP	Estimated Annual Growth
Accomack County	$2,548	2.9%	$1,372.2	1.5%	-6.6%
Chesapeake City	$8,897	10.3%	$9,280.4	10.4%	0.5%
Hampton City	$6,618	7.7%	$6,421.6	7.2%	-0.3%
Isle Of Wight County	$1,727	2.0%	$1,388.6	1.6%	-2.4%
James City + Williamsburg, VA	$4,199	4.9%	$4,566.3	5.1%	0.9%
Newport News City	$10,658	12.3%	$12,974.3	14.5%	2.2%
Norfolk City	$20,678	23.9%	$20,764.9	23.2%	0.0%
Northampton County	$549	0.6%	$500.0	0.6%	-1.0%
Portsmouth City	$5,158	6.0%	$5,706.9	6.4%	1.1%
Southampton + Franklin, VA	$764	0.9%	$733.8	0.8%	-0.5%
Suffolk City	$4,086	4.7%	$3,474.7	3.9%	-1.8%
Virginia Beach City	$18,029	20.9%	$19,858.3	22.2%	1.1%
York + Poquoson, VA	$2,470	2.9%	$2,359.7	2.6%	-0.5%
Region 5	**$86,382**	**---**	**$89,402**	**---**	**0.4%**

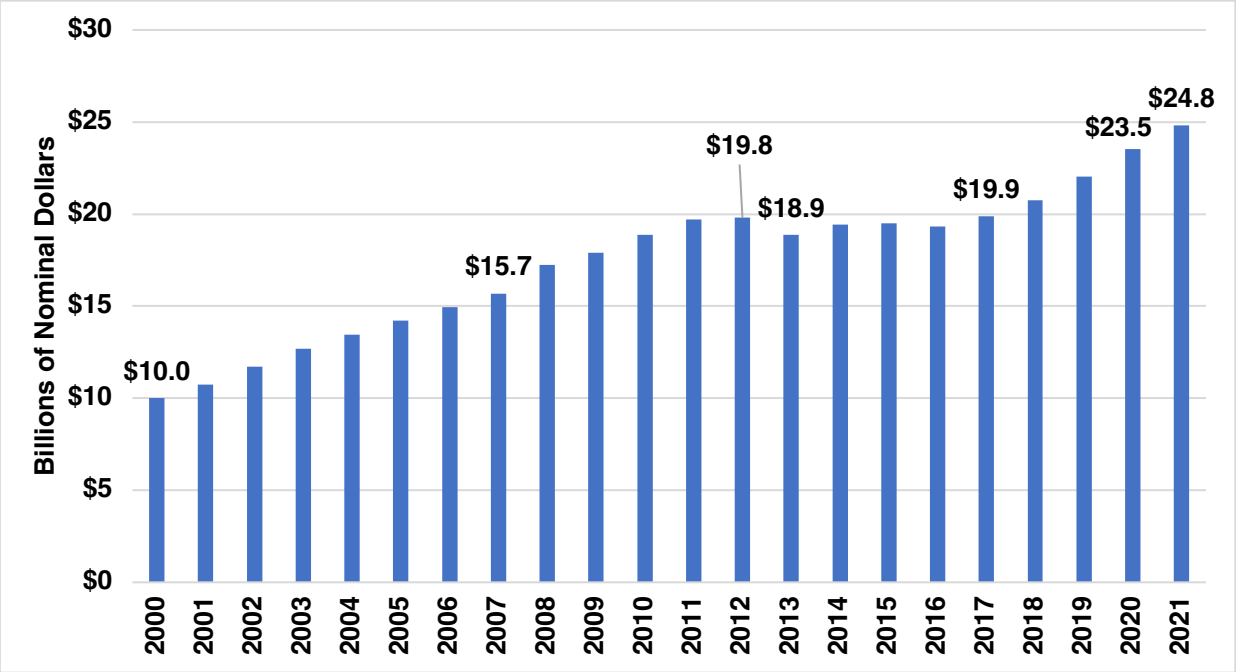
Source: U.S. Bureau of Economic Analysis, Gross Domestic Product by County, 2019 and Dragas Center for Economic Analysis and Policy. Real GDP in 2012 chained dollars. Percentages may not sum to 100 percent due to rounding. When necessary, the BEA combines localities to produce GDP estimates. Estimated annual growth is the Compound Annual Growth Rate.

Defense Spending in Hampton Roads

Region 5 plays a distinctive role in the national security of the United States. Tens of thousands of active duty servicemembers are stationed, trained, and deploy from the region annually. Region 5's manufacturers build and maintain ships and submarines, and federal contractors provide goods and services to the Department of Defense (DoD) and the larger federal government.

Figure 8 displays direct DoD spending in the Hampton Roads MSA from 2000 to 2021. DoD spending in the region increased by 56.8% from 2000 to 2007, fueling the surge in economic activity observed in this period. DoD spending increased by another 26.3% from 2007 to 2012, when nominal DoD spending in Region 5 peaked at $19.8 billion. The passage of the Budget Control Act of 2011 and the imposition of discretionary spending caps, however, resulted in a approximately $1 billion decline in direct DoD spending in 2013. DoD spending in the region did not return to 2012 levels until 2017, a period of economic stagnation in the metro area. From 2017 to 2021, we estimate that direct DoD spending in the Hampton Roads metropolitan area increased by 24.8%, reaching an estimated $24.8 billion in 2021. If not for the COVID-19 pandemic, regional economic growth would have likely accelerated as a result.

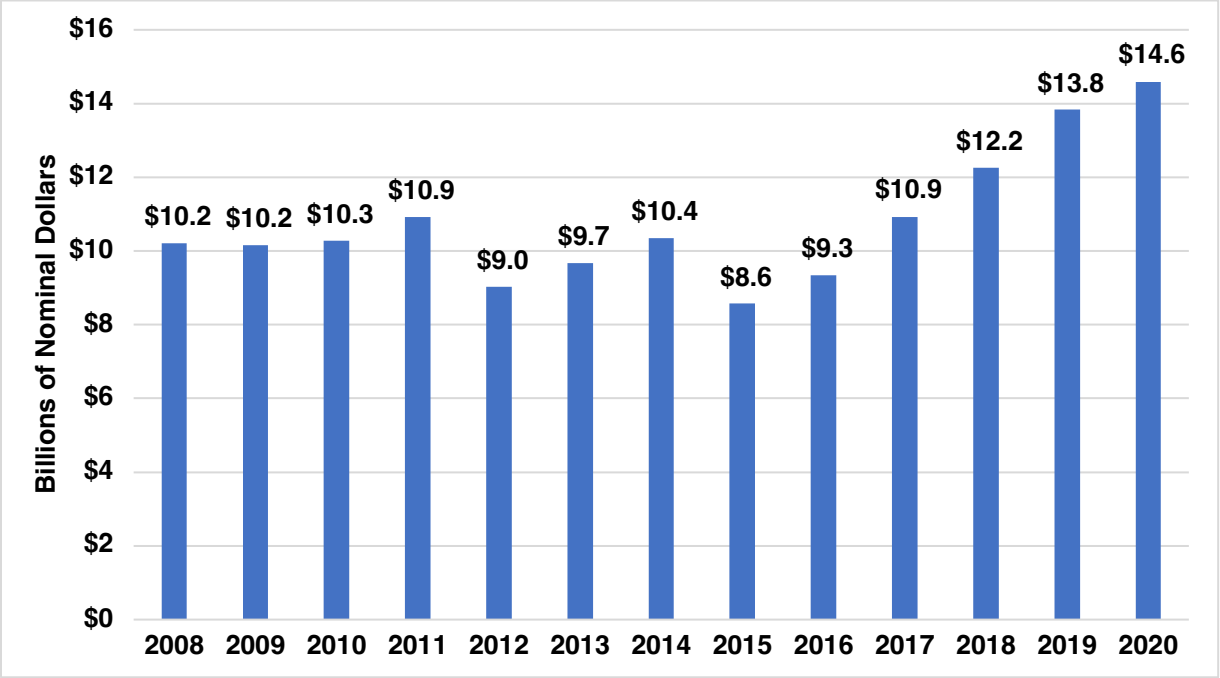
Figure 8 – Nominal Direct Department of Defense Spending in Hampton Roads
Billions of Nominal Dollars
2000 – 2021*



*Source: Department of Defense and Dragas Center for Economic Analysis and Policy. *2021 is an estimate.*

Figure 9 illustrates the level of federal contracts in Region 5 since 2008. Contract spending is one mechanism by which the federal government spends money in the region. Not surprisingly, contract spending peaked in FY 2011 at $10.9 billion and fell to $8.6 billion in 2015 due to budget sequestration, caps on discretionary spending, and the diversion of ship maintenance funds to operations overseas. Since 2015, federal contract spending has rebounded and reached $14.6 billion in 2020. It is likely that contract spending will increase in the near term, but the rapid downturn in the early part of the last decade should serve as a warning sign in how quickly the region's fortunes can change.

Figure 9 - Federal Spending on Contracts in Region 5
Billions of Nominal Dollars
2008 – 2020

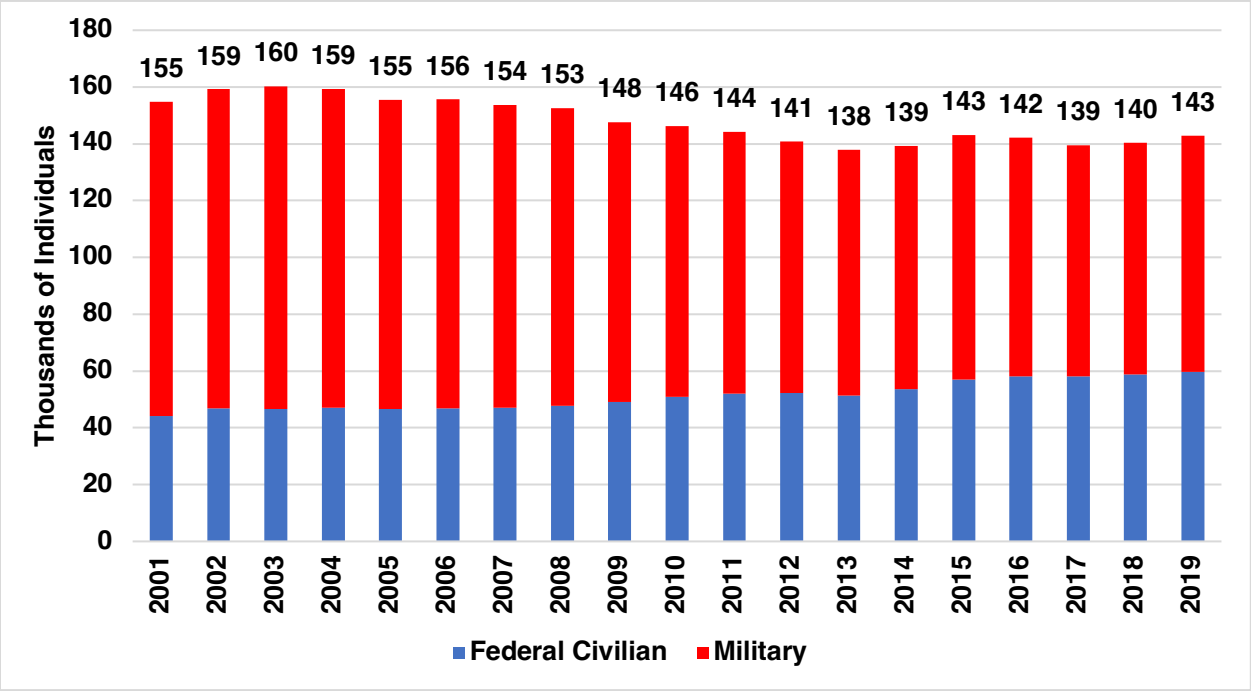


Source: USAspending.gov and Dragas Center for Economic Analysis and Policy. Data obtained November 2021.

An important transmission mechanism of federal spending into the region is the employment of federal civilian employees and military personnel. Figure 10 presents the

composition of total federal employment in Region 5 from 2001 to 2019[8]. The number of military personnel employed in Region 5 has declined from a peak of 113,632 in 2003 to 83,386 in 2019. Over the same period, federal civilian employment increased from 46,551 to 59,587, partly offsetting the decline in military personnel.

Figure 10 - Military and Federal Civilian Employment in Region 5
Thousands of Individuals
2001 – 2019



Source: U.S. Bureau of Economic Analysis, CAEMP25N, Total Full-Time and Part-Time Employment by NAICS Industry, and Dragas Center for Economic Analysis and Policy.

Table 7 illustrates that Region 5 (Hampton Roads), Region 4 (South Central), and Region 7 (Northern) accounted for 89.5% of all federal military and civilian personnel in Virginia in 2019. Of the 138,183 military personnel in the Commonwealth, 60.3% were in Region 5, 22.2% were in

[8] The Bureau of Economic Analysis released Personal Income and Employment estimates on November 16, 2021. This release included revised estimates for 2016-2019 and the release of 2020 estimates. The revised estimates now classify military personnel by place of work and are based on estimates provided by the Defense Manpower Data Center. Deployed personnel are no longer counted as employed in a region even though they may be stationed in a region. The data are no longer backward compatible prior to 2016. For these reasons, we present the previous estimates through 2019 while we discuss this issue with the BEA.

Region 7, and 9.6% were in Region 4. Of the 201,455 federal civilian employees in Virginia, 87.5% were located in Regions 4, 5, and 7. In 2019, Region 7 accounted for almost 1 in every 2 federal civilian employees (49.4%), followed by Region 5 (29.6%), and Region 4 (8.5%).

As noted previously, Regions 4, 5, and 7 comprise the 'urban crescent' of Virginia. Population, economic activity, and federal employment are concentrated in these three regions. These concentrations are a symptom of the growing economic divide between urban and rural Virginia. A downturn in military or federal employment would not only dramatically impact the prospects for economic growth in Region 5, it would ripple throughout the urban crescent, lowering growth in the regions that produced more than 7 out of every 10 dollars in economic activity in the Commonwealth in 2019.

Table 7 - Military and Federal Civilian Employment in GO Virginia Regions and Virginia 2019

	Military	Share	Federal Civilian	Share	Total	Share of Virginia Total
Region 1: Southwest	1,160	0.8%	1,461	0.7%	2,621	0.8%
Region 2: West Central	2,512	1.8%	4,925	2.4%	7,437	2.2%
Region 3: Southside	1,123	0.8%	1,151	0.6%	2,274	0.7%
Region 4: South Central	13,322	9.6%	17,143	8.5%	30,465	9.0%
Region 5: Hampton Roads	**83,386**	60.3%	**59,587**	29.6%	**142,973**	**42.1%**
Region 6: Eastern	2,403	1.7%	11,303	5.6%	13,706	4.0%
Region 7: Northern	30,729	22.2%	99,616	49.4%	130,345	38.4%
Region 8: Valley	1,726	1.2%	3,703	1.8%	5,429	1.6%
Region 9: Central	1,822	1.3%	2,566	1.3%	4,388	1.3%
Virginia	138,183	---	201,455	---	339,638	---

Source: U.S. Bureau of Economic Analysis, CAEMP25N, Total Full-Time and Part-Time Employment by NAICS Industry, and Dragas Center for Economic Analysis and Policy.

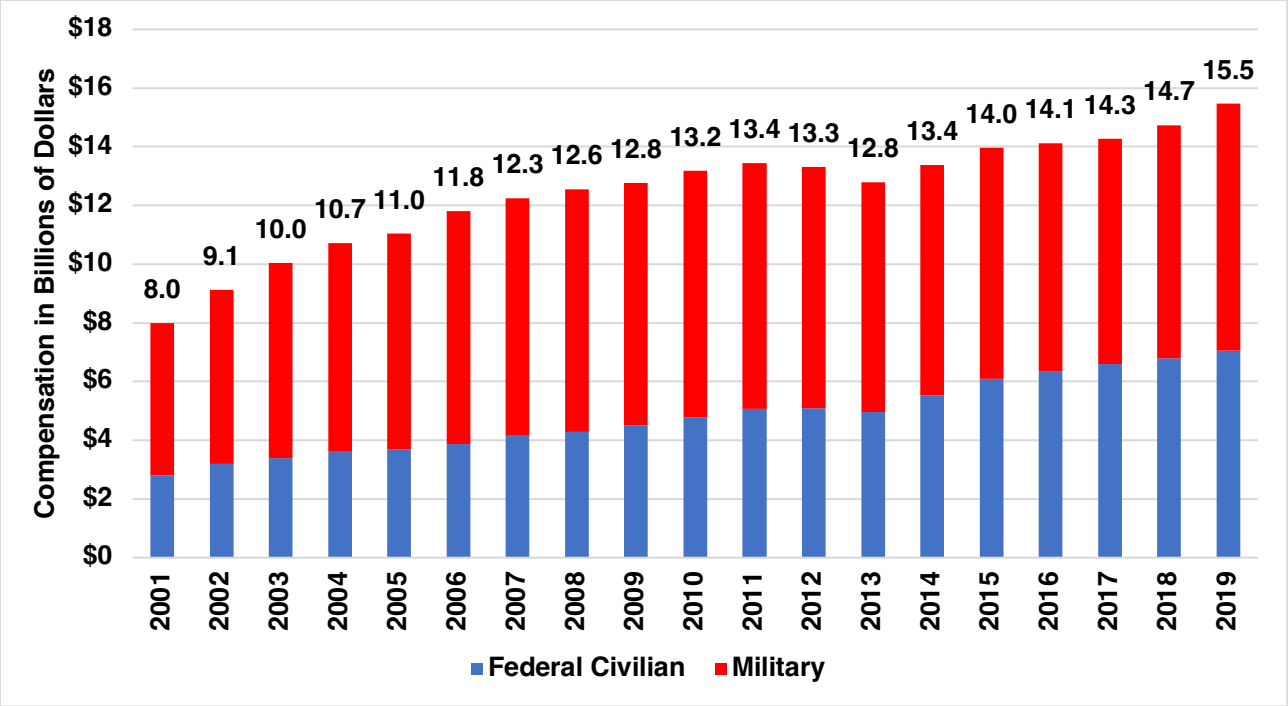
Total compensation measures wages and salaries as well as employer contributions to defined benefit plans.[9] Increasing levels of total compensation are an indicator of rising wages and salaries in a region. Increasing levels of total compensation may also represent a shift in the composition of jobs towards higher paying jobs, another positive indicator of economic performance.

Figure 11 illustrates that the total compensation of federal civilian employees and military personnel (wages, salaries, and benefits) reached $15.5 billion in 2019. The average annual compensation for a federal civilian employee in Region 5 in 2019 was $118,439, nearly 1.8 times greater than the average compensation of $67,120 for all employees in Region 5.[10] Average compensation for military personnel in 2019 was $100,821, approximately 1.5 times greater than the average compensation for the region.

[9] Compensation includes wages and salaries as well as actual employer contributions and imputed contributions to reflect benefits paid directly and accrued by defined pension plan participants through service in the current period.

[10] Average compensation per job is compensation of employees divided by number of full-time and part-time wage and salary employment.

Figure 11 - Military and Federal Civilian Compensation in Region 5
Billions of Nominal Dollars
2001 – 2019



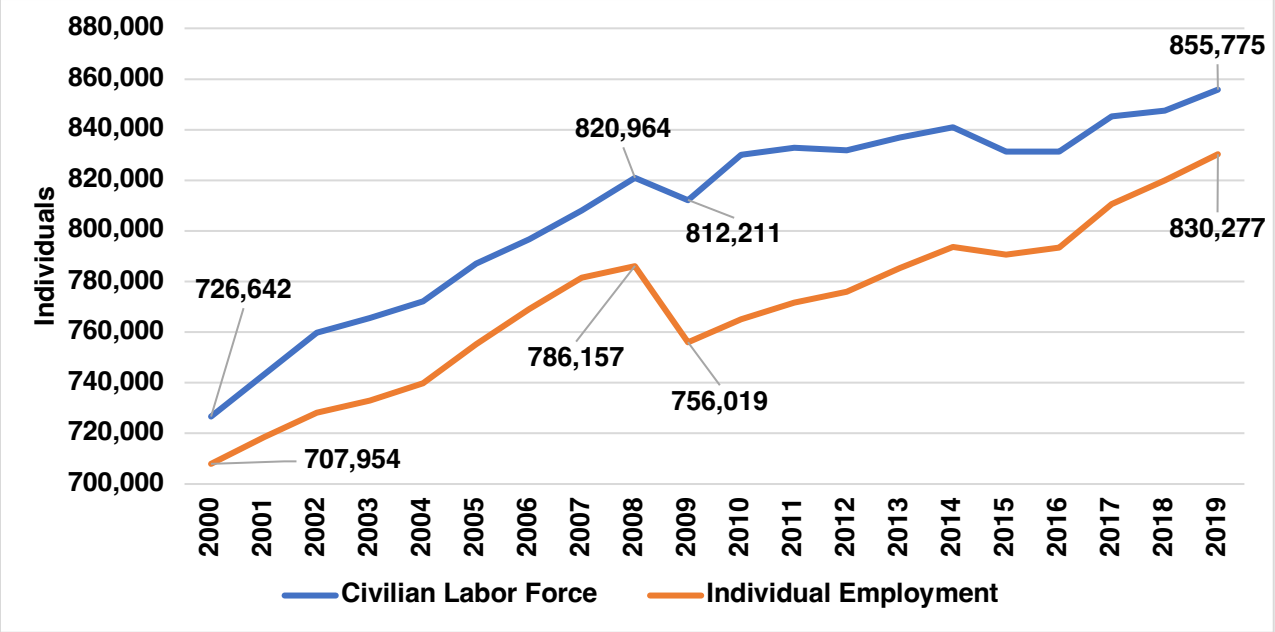
Source: U.S. Bureau of Economic Analysis, CAEMP25N, Total Full-Time and Part-Time Employment by NAICS Industry, and Dragas Center for Economic Analysis and Policy. Compensation includes wage, salaries, employer provided benefits, and employer contributions to social insurance programs.

Region 5's dependence on federal civilian and military employment is highlighted by the simple realization that the private sector would need to significantly boost job growth if federal employment contracted in the coming years. In other words, a reduction in military personnel would require the private sector to create at least 1.5 new jobs for every lost military employee to maintain total compensation. A reduction in federal civilian employment would require the private sector to create almost two new jobs for every federal civilian job lost. Given the region's recent economic performance, it is doubtful that such job creation would occur without significant structural changes in the regional economy.

Individual Employment Growth in Region 5

Robust growth in individual employment is a clear signal of the economic performance of a region.[11] Figure 12 displays the change in the civilian labor force and individual employment in Region 5 from 2000 to 2019. From 2000 to 2008, the civilian labor force and individual employment increased at an average annual rate of 1.5% and 1.3%, respectively. While the civilian labor force grew in the aftermath of the Great Recession, growth was slower, averaging only 0.3% a year from 2010 to 2019. Individual employment, however, grew at 0.9% per year over the previous decade.

Figure 12 – Annual Average Civilian Labor Force and Employment in Region 5 2000 – 2019

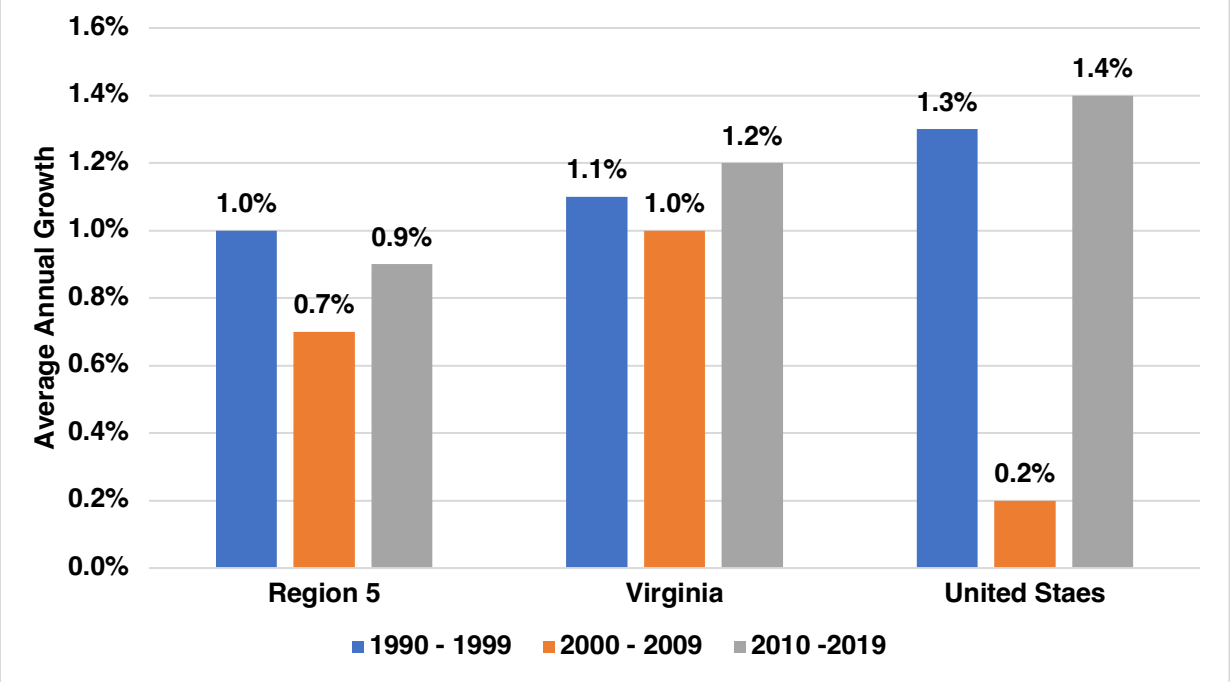


Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, 1990 – 2021 and Dragas Center for Economic Analysis and Policy. Data last revised by the BLS on March 19, 2021. Annual average of monthly data.

[11] Individual employment estimates are obtained for the Current Population Survey's reference week. Individuals are considered employed if they meet any of the following criteria: (1) worked at least 1 hour as a paid employee, (2) worked at least 1 hour in their own business, profession, trade, or farm, (3) were temporarily absent from their job, business or farm, and (4) worked without pay for a minimum of 15 hours in a business or farmed owned by a family member.

As illustrated in Figure 13, average annual growth in individual employment for Region 5 was consistently lower than Virginia over the last three decades. While Region 5's individual employment grew at a faster pace than the United States in the first decade of the century, average annual growth lagged in the most recently completed decade due to the lingering impacts of the Great Recession and the ripple effects of sequestration in the early part of the last decade.

Figure 13 – Annual Growth in Employment, Region 5, Virginia, and the United States 1990 – 2019



Sources: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, 1990-2021 and Dragas Center for Economic Analysis and Policy, Data last revised on March 19, 2021. Annual average of monthly data. Average annual growth rate is the Compound Annual Growth Rate.

Table 8 illustrates that Region 5 has been among the middle of the pack (at best) among GO Virginia regions with respect to individual employment growth over the last three decades. Region 7 has consistently outperformed Region 5 and grew 0.7 percentage points faster a year over the last decade. Region 4 and Region 5 grew at roughly the same rate from 1990 to 2009 but Region 4's individual employment growth was almost double that of Region 5 from 2010 to 2019. The lagging performance of Region 5 relative to the other regions in the urban crescent

reflects its slower pace of economic activity and the increasing concentration of output and employment in Region 4 and Region 5.

Table 8 - Employment Growth, GO Virginia Regions and Virginia 1990 – 2019

	Annual Employment Growth 1990-1999	Annual Employment Growth 2000-2009	Annual Employment Growth 2010-2019
Region 1: Southwest	0.2%	0.2%	-0.3%
Region 2: West Central	0.8%	0.0%	0.5%
Region 3: Southside	0.0%	-0.9%	0.6%
Region 4: South Central	1.1%	0.7%	1.7%
Region 5: Hampton Roads	**1.0%**	**0.7%**	**0.9%**
Region 6: Eastern	2.6%	2.2%	1.5%
Region 7: Northern	1.4%	1.6%	1.6%
Region 8: Valley	1.5%	0.8%	1.3%
Region 9: Central	1.3%	1.7%	1.6%
Virginia	**1.1%**	**1.0%**	**1.2%**
United States	**1.3%**	**0.2%**	**1.4%**

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, 1990 – 2021 and Dragas Center for Economic Analysis and Policy. Data last revised by the BLS on March 19, 2021. Annual growth rate is the Compound Annual Growth Rate.

No discussion of employment growth would be complete without an examination of how the COVID-19 pandemic has affected Region 5, Virginia, and the United States. Table 9 illustrates that Region 5 observed the second largest contraction (-5.8%) in individual employment from 2019 to 2020 among GO Virginia regions. Region 5's decline in individual employment was 0.4 percentage points higher than the Commonwealth but 0.4 percentage points less than the United States. Only two regions, Region 6 and Region 8, saw individual employment declines of less than 5% when compared to 2019.

While Region 5 experienced a somewhat smaller shock to individual employment in 2020, its recovery from this shock has lagged the Commonwealth and the nation. From September 2020 to September 2021, individual employment in Region 5 only grew by 0.5%, compared to 1.5% for Virginia and 4.2% for the United States. Given that Region 5 lagged the state and nation in employment growth prior to the pandemic, it should be no surprise that it has lagged in employment recovery to date. Region 5's relative slow pace of recovery with respect to individual employment has occurred even as federal spending has increased year-over-year in the region. The lagging pace of recovery should be a warning sign of economic prospects to come unless there are structural changes to the economic fortunes of Region 5.

Table 9 - Employment Growth, GO Virginia Regions and Virginia 2019 – 2020 and 2020 – 2021 Year-over-Year

	Change in Employment 2019 - 2020	**Change in Employment September 2020 – September 2021**
Region 1: Southwest	-5.0%	4.0%
Region 2: West Central	-5.6%	1.6%
Region 3: Southside	-5.2%	4.3%
Region 4: South Central	-5.6%	-0.5%
Region 5: Hampton Roads	-5.8%	0.5%
Region 6: Eastern	-4.9%	2.0%
Region 7: Northern	-5.3%	2.0%
Region 8: Valley	-4.6%	3.8%
Region 9: Central	-6.1%	1.0%
Virginia	**-5.4%**	**1.5%**
United States	**-6.2%**	**4.2%**

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, 1990 – 2021 and Dragas Center for Economic Analysis and Policy. Data last revised by the BLS on March 19, 2021. Percentage employment in annual employment for 2019 – 2020 and Year-over-Year Change in employment for September 2020-2021.

Employment Growth Among Region 5's Localities

Table 10 illustrates annual average employment growth rate for the jurisdictions within Region 5. Five jurisdictions, Chesapeake, Isle of Wight County, James City County, Suffolk, and York County have shown consistent employment growth exceeding 1% per year since 1990. From 2010 to 2019, James City County's employment grew at an average annual rate of 2.0% followed by Chesapeake at 1.6%. Suffolk's individual employment grew by 1.5% over this period while Williamsburg (1.2%), Isle of Wight County (1.1%) and York County (1.1%) grew slightly faster than 1% a year. On the other hand, Northampton County saw employment contract at an annual average rate of 1.1% over the most recent decade. Economic performance and employment opportunities create a strong incentive for individuals to move into or depart localities in the region. The challenge is to create the conditions for growth not only in the largest employment jurisdictions but all across Region 5.

Table 10 also illustrates the significant shock of the COVID-19 pandemic to individual employment. Most localities in Region 5 experienced employment declines exceeding 5% from 2019 to 2020 with the larger localities experiencing declines closer to 6%. All of the 'Seven Cities' experienced individual employment declines of approximately 5.8%. Accomack County saw the largest decline, with individual employment falling by 6.9% in one year.

The recovery in individual employment has been lackluster when compared to other GO Virginia regions, the Commonwealth, and the nation. While Accomack and Northampton counties have seen individual employment climb by 4.5% and 4.4%, respectively, from September 2020 to September 2021 (the latest data available), growth has been much smaller among the larger localities in the region. Individual employment has not grown by more than 0.5% in any of the 'Seven Cities.' This simple observation

shows that the anemic economic recovery is not due to one locality in Region 5 but is a signal of the general economic conditions in the region.

Table 10 - Employment Growth in Region 5 Localities
1990 – 2021*

	Employment Growth 1990-1999	Employment Growth 2000-2009	Employment Growth 2010-2019	Change in Employment 2019 - 2020	Change in Employment September 2020 – September 2021
Accomack	-0.4%	0.5%	0.5%	-6.9%	4.5%
Chesapeake City	3.4%	1.3%	1.6%	-5.8%	0.3%
Franklin City	1.5%	0.3%	0.8%	-4.0%	3.0%
Hampton City	0.4%	-0.1%	0.4%	-5.8%	0.3%
Isle of Wight	2.0%	2.2%	1.1%	-5.6%	0.7%
James City	3.3%	3.3%	2.0%	-5.7%	0.3%
Newport News City	0.6%	0.9%	0.5%	-5.8%	0.3%
Norfolk City	-1.9%	0.0%	0.6%	-5.8%	0.3%
Northampton	-0.7%	0.9%	-1.1%	-4.8%	4.4%
Poquoson City	0.6%	0.3%	0.6%	-5.6%	0.8%
Portsmouth City	-0.5%	0.0%	0.5%	-5.8%	0.3%
Southampton	1.2%	0.3%	0.4%	-3.8%	4.2%
Suffolk City	2.6%	3.2%	1.5%	-5.8%	0.4%
Virginia Beach cCty	1.3%	0.3%	0.9%	-5.7%	0.3%
Williamsburg City	1.0%	0.8%	1.2%	-5.8%	0.2%
York	3.9%	1.0%	1.1%	-5.8%	0.3%
Region 5	**1.0%**	**0.7%**	**0.9%**	**-5.8%**	**0.5%**

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, 1990 – 2021 and Dragas Center for Economic Analysis and Policy. Data last revised by the BLS on March 19, 2021. Annual growth rate is the Compound Annual Growth Rate.

Per Capita Income in Region 5

Per capita income is a measure of the average income earned by residents of a region. Faster growth in per capita income is a signal that a region is not only growing but growing through the creation of higher paying jobs. Regions that lag in per capita income growth may have slower employment growth, or the composition of employment is tilted towards lower paying jobs. If individuals vote with their feet about economic opportunities, they will tend to seek out regions that offer increasing economic opportunity, an opportunity that is measured, in part, by per capita income growth over time.

Region 5's real per capita income lagged behind both Virginia and the United States in absolute terms and average growth over the last decade. In 2020, Region 5's nominal per capita income was $54,539, 8.3% below the nation ($59,450) and 12.0% ($61,958) below the Commonwealth. Table 11 shows the change in per capita income over the last three decades for Region 5, Virginia, and the United States. While real per capita income grew more rapidly in the first decade of the century in Region 5, annual growth lagged considerably in the recently concluded decade, especially when compared to the United States.

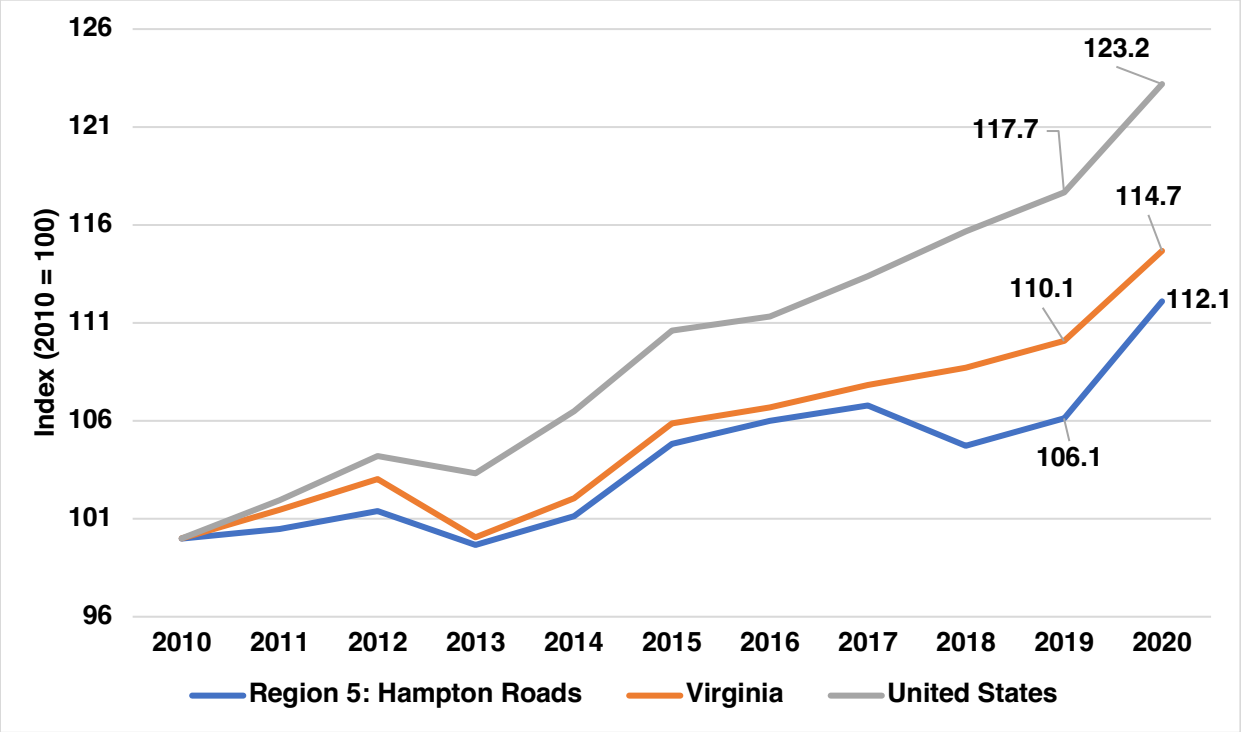
Table 11 - Per Capita Income and Growth in Real Per Capita Income
United States, Virginia, and GO Virginia Region 5, 1990-2020

	2020 Nominal Per Capita Income	Real Income Growth 1990-1999	Real Income Growth 2000-2009	Real Income Growth 2010-2019	Change in Real Income 2019-2020
Region 5	$54,539	1.1%	1.5%	0.7%	5.6%
Virginia	$61,958	1.6%	0.9%	1.1%	4.2%
United States	$59,450	1.5%	0.3%	1.8%	4.7%

Source: U.S. Bureau of Economic Analysis, Personal Income by County, Table CAINC1 and National Income and Product Accounts, and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate. Base year for real per capita income is 2012.

Figure 14 shows how a slower rate of annual growth results in Region 5 falling behind the Commonwealth and the United States. From 2010 to 2019, real per capita income in Region 5 increased by 6.1%. Over the same period, real per capita income increased by 10.1% in the Commonwealth and 17.7% in the nation. Simply put, Region 5 failed to keep pace with the state or nation, and this relatively poor economic performance has translated in lower population growth, real GDP growth, and real per capita income growth. Slower personal income growth is another incentive for residents of Region 5 to leave the region in search of economic opportunities elsewhere in the Commonwealth or by leaving the state entirely.

Figure 14 – Change in Per Capita Income in Region 5, Virginia, and the United States 2010 – 2020

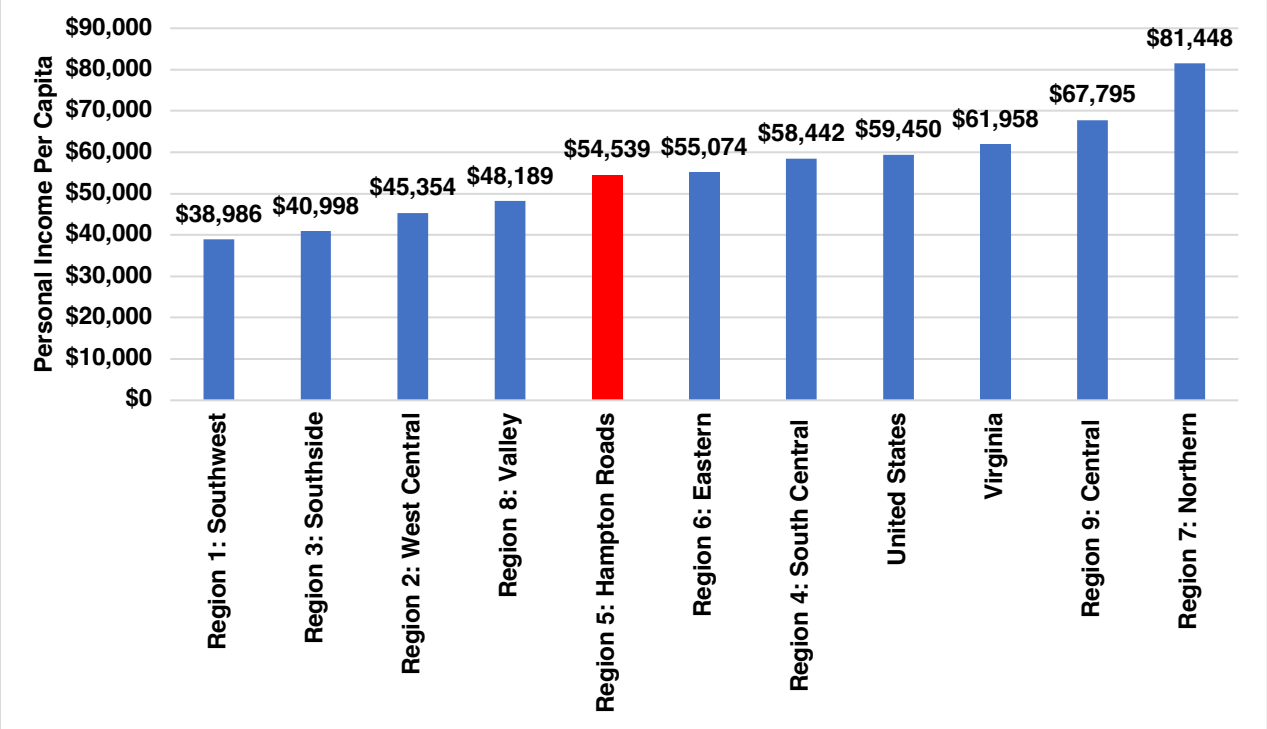


Source: U.S. Bureau of Economic Analysis, Personal Income by County, Table CAINC1 and National Income and Product Accounts, and Dragas Center for Economic Analysis and Policy. Base year for real per capita income is 2012.

Figure 15 displays 2020 personal income for the GO Virginia regions, Virginia, and the United States. Region 5's 2020 per capita income ranks 5th among the 9 regions. Not surprisingly,

Region 7 has the highest level of personal income per capita ($81,448) in 2020; however, Region 7's average annual rate of growth in real per capita income (0.8%) was more than Region 5 (0.7%) but less than the Commonwealth (1.1%). Region 9 had the second highest level of per capita income in 2020 and the highest rate of growth (2.1%) over 2010 – 2019. Region 9 was the only Go Virginia region to grow faster than the United States over the previous decade.

Figure 15 - Nominal Per Capita Income, U.S., Virginia, and GO Virginia Regions 2020



Source: U.S. Bureau of Economic Analysis, Personal Income by County, Table CAINC1, National Income and Product Accounts, and Dragas Center for Economic Analysis and Policy.

Table 12 displays 2020 nominal per capita income and annual average growth rates in real per capita income for localities in Region 5. While Accomack, the Southampton County and Franklin City combined locality, and Northampton County posted the highest per capita income growth rates for Region 5 from 2010 to 2019, we must note that each of these localities lost

population from 2010 to 2019. Thus, the increase in per capita income is driven more by population change than increased economic activity for these jurisdictions.

The combined jurisdiction of James City County and Williamsburg had the highest per capita income levels in 2020 at $68,279, followed by the combined area of York and Poquoson at $62,645. Virginia Beach, the largest jurisdiction in Region 5, had the 4th highest level of per capita income at $60,796 in 2020. With the exception of Virginia Beach, however, per capita income growth has slowed this decade for the most populous jurisdictions in Region 5.

Region 5's economic performance in the last decade left much to be desired. Regional population growth, GDP growth, and employment growth lagged the other regions that comprise the urban crescent of the Commonwealth. While Region 5 grew faster near the end of the last decade, the COVID-19 pandemic erased many of these gains and Region 5's recovery, when compared to the nation, is underwhelming through the fall of 2021. Region 5's dependence on federal spending has not shielded it from the impacts of the pandemic, illustrating the need to leverage Region 5's existing strengths to improve private sector job creation independent of federal government spending. Without long-term structural changes to the regional economy, a shift in national security priorities towards the Pacific or a change in national spending priorities would further undermine the region's economic performance.

Table 12 - Per Capita Income in Region 5 Localities
1990-2020

Location	2020 Nominal Per Capita Income	Real Income Growth 1990-1999	Real Income Growth 2000-2009	Real Income Growth 2010-2019	Change in Real Income 2019-2020
Accomack County	$53,762	0.2%	3.3%	2.5%	6.9%
Isle Of Wight County	$59,285	1.7%	2.7%	0.6%	4.7%
Northampton County	$62,614	1.3%	2.6%	3.4%	10.6%
Chesapeake City	$53,622	1.1%	1.8%	0.1%	5.9%
Hampton City	$46,165	1.0%	0.9%	0.1%	7.8%
Newport News City	$45,781	0.0%	1.7%	0.3%	8.8%
Norfolk City	$42,996	1.1%	0.8%	-0.1%	7.6%
Portsmouth City	$44,871	0.4%	2.1%	0.1%	8.7%
Suffolk City	$55,561	1.6%	2.6%	0.5%	5.5%
Virginia Beach City	$60,796	1.1%	0.9%	1.0%	4.4%
James City + Williamsburg, VA	$68,279	2.9%	1.1%	0.8%	3.5%
Southampton + Franklin, VA	$46,909	1.1%	0.3%	2.4%	6.7%
York + Poquoson, VA	$62,645	0.6%	1.9%	0.5%	3.3%

Source: U.S. Bureau of Economic Analysis, Personal Income by County, Table CAINC1, National Income and Product Accounts, and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate. Base year for real per capita income is 2012. When necessary, the BEA combines localities.

Challenge 2
Region 5 is Overly Reliant on a Small Set of Large Firms in its Key Cluster Areas.

Of all the challenges set forth in the 2017 Region Growth and Diversification Plan, Challenge 2 was identified as the most critical for the region's future success. Region 5 is home to tens of thousands of military personnel and DoD civilian employees working on 18 military installations throughout the region. Numerous private sector firms in the region play a key role in the manufacturing, maintenance, and support of the nation's military assets. Region 5's role is not limited to its relationship with the DoD. There are more Coast Guard personnel stationed in Region 5 than any other location in the United States. Jefferson Lab, one of the nation's premier federal research laboratories, is located in Newport News. NASA Langley Research Center, which focuses on aeronautical research, is located in Hampton. In all, there are 16 federal departments and agencies with a significant presence in Region 5.

Indeed, a strength and weakness of Region 5 is its relationship with the federal government and, in particular, the DoD. With an estimated $25 billion in direct DoD spending in Region 5 in 2021, the total economic impact of DoD spending likely exceeded $40 billion. In other words, 4 out of every 10 dollars of economic activity in Region 5 is directly or indirectly influenced by DoD spending. The dependence on federal, and in particular, DoD spending means that the economic fortunes of the region are determined, in large part, by the policies and politics in Washington, D.C. The large inflows of federal spending to the region also incentivize firms to increase in size due to the demands of the federal government and the need to navigate the federal contracting system. These large firms are among the largest employers in Region 5 and tend to dominate the industries in which they operate.

To examine the question of industry concentration, we compare an industry's share of employment in Region 5 with its share of national employment.[12] These 'location quotients' (LQs) provide insight into whether an industry has a smaller, equal, or larger share of regional employment relative to the national average.[13] If an industry in Region 5 has a LQ of 2, for example, the industry's share of regional employment is twice the national average. In other words, the industry is two times as concentrated in the region than the national average. We can also examine wage location quotients (WQs) which examine whether an industry has a smaller, equal, or larger share of regional wages relative to the national average.

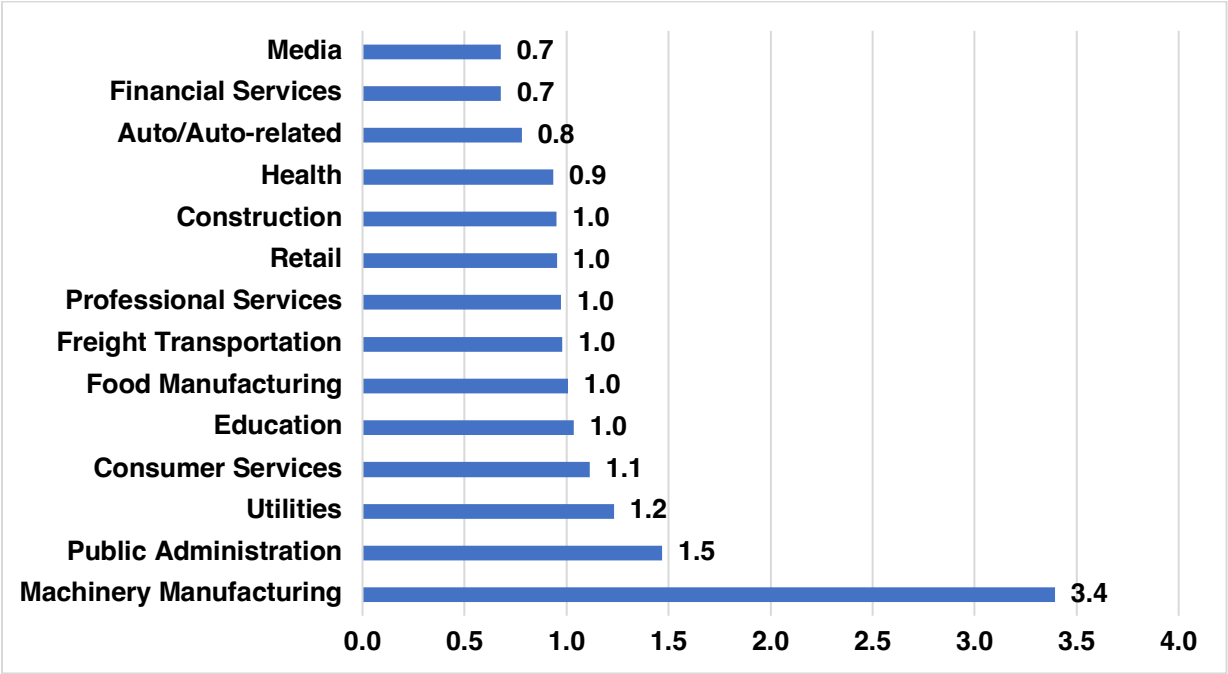
Location quotients are useful for a variety of reasons. First, location quotients can be used to identify industries that have higher-than-average per capita employment. Second, industries with high location quotients are typically exporting goods and services outside the region. These industries import money into a region and typically generate a higher economic impact than firms that circulate money within a region. Third, industries with declining location quotients may be losing their competitive advantage, thus location quotients can serve as a signal of a region's declining (or improving) economic fortunes. Lastly, we must consider the overall size of each industry's employment in the region. A high LQ is a signal of concentration but the impact of the industry on the regional economy is dependent on the level of employment. A high-wage industry with an LQ of 2 that employs 10,000 people will typically have a greater impact than a low-wage industry with an LQ of 5 that only employs 500 people. In this example, the high-wage industry would likely have a WQ greater than 1 while the lower-wage industry would likely have a WQ less than 1, signaling a higher-than-average proportion of wages were paid in the high-wage industry.

[12] A location quotient is equal to the ratio of local concentration to national concentration. Local concentration is equal to an industry's employment to total employment in a region. Likewise, national concentration is equal to an industry's employment to total employment nationally.

[13] For more information, see Bureau of Economic Analysis, "QCEW Location Quotient Details" available at: https://www.bls.gov/cew/about-data/location-quotients-explained.htm

Figure 16 presents a selection of industries, defined by 2-digit and 3-digit North American Industry Classification System (NAICS) codes, for Region 5 by location quotient (LQ). Machinery Manufacturing immediately stands out with a LQ of 3.4; that is, Machinery Manufacturing's share of regional employment was 3.4 times higher than the national average in the second quarter of 2021. In the same quarter, public administration had a LQ of 1.5, which is not entirely surprising given the role of the federal government in the regional economy. Utilities and consumer services had LQs greater than 1 but, as we discuss below, a high LQ in consumer services is not beneficial for the growth of high-wage jobs in Region 5.

Figure 16 – Employment Location Quotients for Region 5
Selected Industries (2-digit NAICS and 3-digit NAICS)



Source: JobsEq, Industry Clusters for Region 5 as of 2021 Q2.

Table 13 presents location quotients, average employment and wages, and average annual employment growth from 2011 Q2 to 2021 Q2 for Region 5. Machinery Manufacturing again stands out with the highest average annual employment growth (2.1%), average wages ($72,891) above the regional average ($52,705), and more than 48,000 residents working in the

industry. Taken together, these indicators highlight Region 5's comparative advantage in Machinery Manufacturing and its impact on the regional economy. Investments in this industry cluster would leverage existing strengths and undoubtedly foster wage growth in the region.

Table 13 – Employment, Wages, and Location Quotients in Region 5 Selected Industries (2-digit NAICS and 3-digit NAICS), 2021 Q2

Industry	Employment	Average Wages	Average Annual Employment Growth	Employment Location Quotient	Wage Location Quotient
Machinery Manufacturing	48,166	$72,891	2.1%	3.4	4.1
Public Administration	55,531	$75,564	1.1%	1.5	1.9
Utilities	4,340	$56,922	0.6%	1.2	1.3
Consumer Services	119,263	$26,136	-0.1%	1.1	1.1
Education	79,643	$42,804	-1.6%	1.0	1.0
Food Manufacturing	9,183	$49,963	-0.6%	1.0	1.1
Freight Transportation	21,888	$63,648	1.3%	1.0	1.4
Professional Services	117,285	$65,480	0.5%	1.0	0.9
Retail	104,004	$36,839	-0.5%	1.0	0.9
Construction	44,066	$55,646	0.0%	1.0	1.0
Health	106,248	$53,940	0.9%	0.9	1.1
Auto/Auto-related	9,967	$45,500	0.6%	0.8	0.8
Financial Services	21,856	$84,994	-0.1%	0.7	0.6
Media	7,848	$57,827	-2.5%	0.7	0.3

Source: JobsEq, Industry Clusters for Region 5 as of 2021 Q2 and the Dragas Center for Economic Analysis and Policy.

Another cluster of interest is the Utilities industry. In 2021 Q2, this cluster had an employment LQ of 1.2 and a wage LQ of 1.3. In other words, the cluster's shares of regional employment and wages were higher than the national average. Annual employment growth for the Utilities industry was, however, only 0.6% from 2011 Q2 to 2021 Q2, and average employment in 2021 Q2 was only 4,340, the smallest among the clusters presented in Table 13. There is the possibility for Region 5 to leverage the higher-than-average concentration in the Utilities cluster

into a competitive advantage. The new cluster in Clean Energy that includes offshore wind and solar energy would be a key focal point in this effort.

While the health industry cluster had an employment LQ of 0.9 and a WQ of 1.1 in 2021 Q2, it's growth over the last decade suggests that an opportunity exists to gain a significant competitive advantage. The health cluster was the third largest in terms of employment in 2021 Q2, only behind Consumer Services (119,263) and Professional Services (117,285). The health cluster, however, grew by 0.9% from 2011 Q2 to 2021 Q2, faster than Professional Services (0.5% per year) and Consumer Services (-0.1% per year). Region 5 only needs to look at how the creation of a medical-research-education complex at Virginia Commonwealth University increased the flow of research funds and students into the Richmond region. A similar opportunity exists for key investments in Region 5.

Consumer services in Region 5 has an employment LQ of 1.1 and employed over 119,000 individuals in the second quarter of 2021. Leisure and hospitality services are within the Consumer Services cluster and Region 5 is a travel and tourism destination. However, average wages in Consumer Services were only $26,136 in the second quarter of 2021. Even though the Consumer Services industry had nearly 2.5 times the number of employees as the Machinery Manufacturing industry in 2021 Q2, its WQ was only 1.1, compared to 4.1 for Machinery Manufacturing. In other words, the Consumer Services industry had more employees but a smaller share of total wages because average wages were significantly lower than the Machinery Manufacturing industry. Not only that, Consumer Services industry employment declined at an annual average rate of 0.1% from 2011 Q2 to 2021 Q2. State level data suggest that "job quits" have also soared in this industry since the beginning of the COVID-19 pandemic. In other words, workers are leaving the industry in search of higher wages. We caution that investments in this

cluster may generate jobs, but the data suggest that these new jobs will pay less than the regional average and, in some cases, are dependent on the seasonality of tourism in Region 5.

Table 14 presents location quotients, wages, and employment for the priority industry clusters for Region 5.[14] Ship Repair and Ship Building has an employment LQ of 44.9 and a wage LQ of 56.2. In other words, the proportion of regional employment and total wages in the Ship Repair and Ship Building cluster in Region 5 were 45 and 56 times higher, respectively, when compared to the national average. Industry employment grew at an annual rate of 2.4% from 2011 Q2 to 2021 Q2, and average annual wages were $74,910 in the second quarter of 2021, more than $22,000 higher than the regional average. Employment in this cluster was dominated by a few large firms in Region 5. This should not be a surprise given the presence of large employers such as Huntington Ingalls Industries/Newport News Shipbuilding and BAE Systems Norfolk Ship Repair.

The Unmanned Systems and Aerospace Cluster had an employment LQ of 3.6 and wage LQ of 4.2 in 2021 Q2. Region 5 appears to have a competitive advantage in this cluster as well given the employment LQ of 3.6, but the Unmanned Systems and Aerospace cluster was more diverse than the Ship Repair and Ship Building cluster in 2021 Q2. Employment in this cluster grew at a 2.7% annual rate over the decade, and average annual wages were $93,665 in the second quarter of 2021. These data points suggest that the region has a competitive advantage in this cluster, growth is rapid, and key investments could help drive regional growth in the future.

The third cluster that shows promise is Advanced Manufacturing. Advanced Manufacturing had an employment LQ of 2.7 and a wage LQ of 3.6 in 2021 Q1. As with Unmanned

[14] These clusters are based on the clusters determined as priorities by the Region 5 council and presented starting on page 33 of Region 5's Economic Growth and Diversification Plan (https://www.dhcd.virginia.gov/sites/default/files/Docx/gova/region-five/region-5-growth-diversification-plan.pdf)

Systems and Aerospace, the employment LQ of 2.7 suggests that Region 5 has a competitive advantage in the cluster. While average annual wages were $72,696 in the second quarter of 2021, almost $20,000 more than the regional average, average growth in employment over the last decade was only 0.3%. While this is higher than the regional average of 0.1%, we remind the reader that the region lagged the state and the nation in terms of employment growth. For Region 5 to maintain and expand its competitive advantage in advanced manufacturing, it must identify strategies to retain and attract firms to boost employment growth and output in this cluster.

Water Technologies has an employment LQ of 1.3 and an average annual wage of $80,994, significantly above the regional average of $52,705. This cluster is larger than the Port Operations cluster which has an employment LQ of 1.1 and an average wage of $63,304. However, the Port Operations cluster has grown at an annual rate of 2.6% over the last decade while the Water Technologies cluster grew at an 0.8% annual rate. Both clusters have average wages above the regional average and outperform regional employment growth. Ideally, strategies would boost growth in the Water Technologies cluster and maintain growth in the Port Operations cluster. Doing so would improve private sector growth in Region 5.

The newly identified Clean Energy industry cluster had an employment LQ of 1.3 and a wage LQ of 1.3 in 2021 Q2. Among the priority clusters, the Clean Energy cluster had the third-highest average salary at $77,752, approximately 1.5 times higher than the regional average. While there were more than 23,000 individuals employed on average in this cluster, it has neither grown nor contracted over the last decade. However, as evidenced by recent announcements regarding wind and solar in the region, there is an existing competitive advantage and momentum that could be leveraged by investments in this industry.

Of the priority clusters identified in previous reports, only the Cyber Security, Data Analytics, and Modeling and Simulation cluster has employment and establishment LQs below 1.

The data suggest that Region 5 does not currently have a comparative advantage in this cluster. However, it is worth noting that this cluster did grow at a 4.3% annual rate over the last decade, though this may be attributable to its relatively small size (4,511 employees in 2021 Q2) rather than a competitive advantage which the region could leverage to increase growth.

Table 14 - Location Quotients and Average Employment for Priority Clusters in Region 5
2021 Q2

Clusters	**Employment**	**Average Wages**	**Average Annual Employment Growth Q2 2011 – Q2 2021**	**Employment Location Quotient**	**Wage Location Quotient**
Ship Repair and Ship Building	41,512	$74,910	2.4%	44.9	56.2
Unmanned Systems and Aerospace	27,764	$93,665	2.7%	3.6	4.2
Advanced Manufacturing	10,048	$72,696	0.3%	2.7	3.6
Water Technologies	37,484	$80,994	0.8%	1.3	1.2
Port Operations, Logistics, and Warehousing	17,614	$63,304	2.6%	1.1	1.6
Cyber Security, Data Analytics and Modeling and Simulation	4,511	$72,215	4.3%	0.6	0.5
Clean Energy	23,637	$77,752	0.02%	1.3	1.3
All Industries	766,238	$52,705	0.1%	--	--

Source: JobsEq and Dragas Center for Economic Analysis and Policy. Data as of 2021 Q2 and based on a four-quarter moving average. Annual growth is the compound annual growth rate.

Challenge 3
Region 5 is Creating Small and Medium Sized Enterprises (SMEs) at a Pace Far Below its Peer Metro Areas.

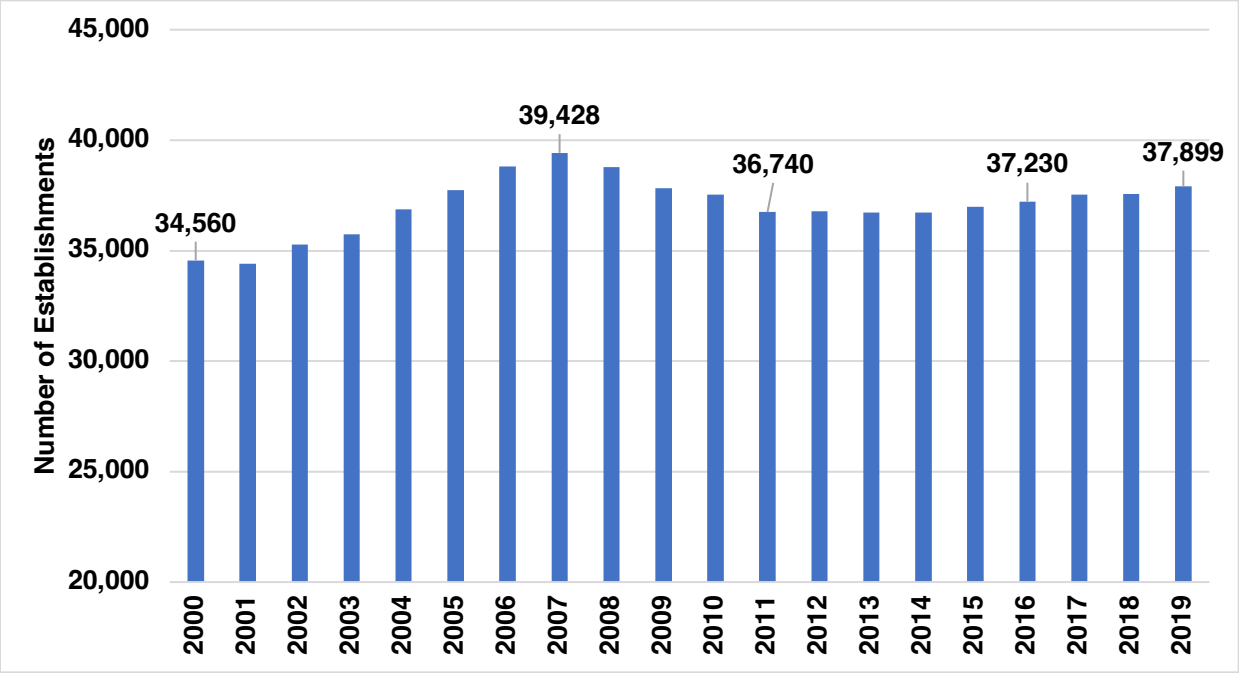
An establishment is a single physical location where business is conducted or where services or industrial operations are performed. A region's economic activity is not only reflected in the value of output and the number of individuals employed by businesses but also in whether the number of establishments is growing over time. Businesses, like individuals, can vote about economic opportunities in a region by expanding or contracting the number of establishments. Figure 17 illustrates that, at the start of the century, establishment growth in Region 5 mirrored the pace of growth in the regional economy. From 2000 to 2007, the number of establishments in Region 5 increased by 14.1%, from 34,560 to 39,428. As the regional economic conditions worsened in the aftermath of the Great Recession, the number of establishments fell from 39,428 in 2007 to 36,740 in 2011, a decline of 6.8%. The number of establishments increased by 3.2% from the trough in 2011 to 2019, however, the number of establishments in 2019 was still 3.9% below the 2007 peak.

We also caution that the data in Figure 17 do not capture the impact of the COVID-19 pandemic on establishments in Region 5. Data from the United States Census Bureau Small Business Pulse Survey for the week ending October 11, 2021 highlighted the impact of the pandemic nationally and in the Hampton Roads MSA.[15] While 22.9% of national respondents replied the pandemic had a 'large negative effect' on their business, 30% of survey respondents in Hampton Roads gave the same response. Another 44.9% of national respondents and 38.7% of those small businesses surveyed in Hampton Roads said the pandemic had a 'moderate

[15] The Small Business Pulse Survey measures the impact of the COVID-19 pandemic on small businesses in the United States. Estimates reflect the survey period of October 4, 2021, to October 11, 2021. Data are publicly available at the national, state, and for the fifty most populous metropolitan statistical areas in the United States. https://www.census.gov/data/experimental-data-products/small-business-pulse-survey.html

negative impact' on their business. The Small Business Pulse Survey data reveal that almost 7 in 10 small businesses in Hampton Roads said the pandemic had a large or moderate impact on their business. While medium and large-size business may have fared better due to diversification and capital depth, other data suggest that these businesses have been impacted as well. In other words, the data suggest that we will observe a decline in the number of establishments in the region, statewide, and nationally when data for 2020 become available in mid-2022.

Figure 17 - Number of Establishments in Region 5
2000 – 2019

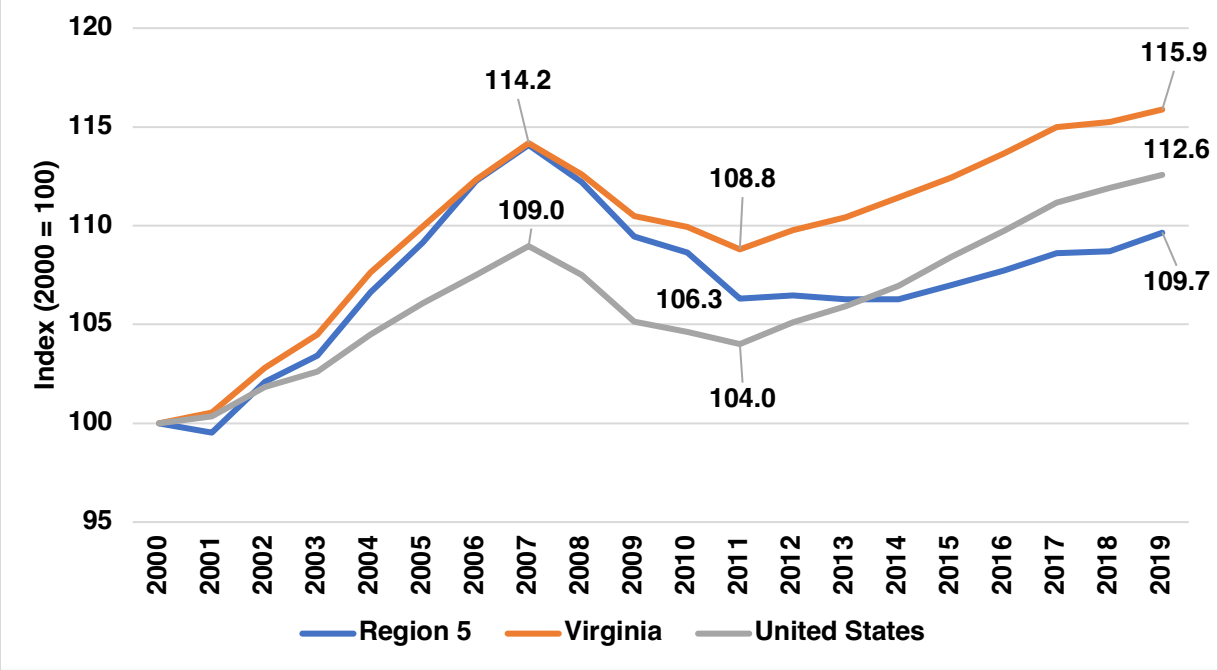


Source: U.S. Census Bureau, County Business Patterns and Dragas Center for Economic Analysis and Policy.

Figure 18 compares the growth in the number of establishments in Region 5 with Virginia and the United States from 2000 to 2019. In 2007, the number of establishments in Region 5 was 14.1% higher than it was in 2000; only slightly below Virginia (14.2%) and 5.1 percentage points higher than the national average. After the trough in the number of establishments in 2011, Region 5 diverged from Virginia and fell behind the United States. In 2019, the number of establishments

in Virginia and the United States was 15.9% and 12.6% higher, respectively, than 2000. In Region 5, the number of establishments was only 9.7% higher. The increase in the economic activity in Region 5 at the end of the last decade helped lift establishment growth; otherwise the number of establishments would have likely been unchanged over the entire decade. However, we note that these increases in economic activity were largely fueled by increases in federal government spending in the region instead of significant structural changes in private sector job or establishment creation.

Figure 18 – Establishment Growth in Region 5, Virginia, and the United States 2000 – 2019



Source: U.S. Census Bureau, County Business Patterns and Dragas Center for Economic Analysis and Policy.

Table 15 presents the annual establishment growth for Region 5, other GO Virginia Regions, Virginia, and the United States. A familiar story emerges from this data. From 1990 to 1999, establishment growth in Region 5 was positive, yet Region 5 growth was tied for last in the Commonwealth along with Region 3 (Southside). From 2000 to 2009, establishment growth

averaged 1% per year, the same as the previous decade. Region 5 outperformed four other regions and the nation, but this was mostly due to the impact of the Great Recession on establishment growth in other regions and nationally rather than a significant improvement in Region 5's economic fortunes.

From 2010 to 2019, establishment growth in Region 5 slowed dramatically to an annual average rate of 0.1%. Region 5's establishment growth over this period was significantly lower than the Commonwealth (0.6% per year) and the nation (0.8% per year) and also lagged other regions in the urban crescent. It is worth noting that Region 4's establishment growth was the same as the national average while Region 7 was the only region with establishment growth above the national average. With this in mind, Region 5's economic performance was closer to the GO Virginia regions that saw contractions in population and employment over the decade than regions that outperformed the state as a whole.

Table 15 - Annual Average Establishment Growth, U.S., Virginia, and GO Virginia Regions 1990 – 2019

	Annual Establishment Growth 1990 – 1999	Annual Establishment Growth 2000 – 2009	Annual Establishment Growth 2010 – 2019
Region 1: Southwest	1.2%	-0.9%	-1.3%
Region 2: West Central	1.5%	0.4%	-0.1%
Region 3: Southside	1.0%	-0.3%	-0.9%
Region 4: South Central	1.3%	1.0%	0.8%
Region 5: Hampton Roads	**1.0%**	**1.0%**	**0.1%**
Region 6: Eastern	2.5%	1.9%	0.4%
Region 7: Northern	2.6%	1.9%	1.4%
Region 8: Valley	1.2%	0.9%	0.2%
Region 9: Central	2.0%	1.3%	0.6%
Virginia	**1.7%**	**1.1%**	**0.6%**
United States	**1.4%**	**0.6%**	**0.8%**

Source: U.S. Census Bureau, County Business Patterns and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate.

Table 16 presents establishment growth rates by jurisdiction for Region 5. From 2010 to 2019, establishment growth exceeded the national average only in Isle of Wight County, Suffolk, and Williamsburg. Suffolk's stands out with an average annual establishment growth rate of 1.3%, more than double the Commonwealth average. While this is a deceleration from the previous decade, we note that establishment growth in Suffolk is in line with increases in population, employment, and other measures of economic activity. Suffolk illustrates that when economic conditions are more favorable, entrepreneurs will increase the pace of establishment growth.

Table 16 - Annual Average Establishment Growth, U.S., Virginia, and Region 5 Localities 1990 – 2019

	Annual Establishment Growth 1990 – 1999	Annual Establishment Growth 2000 – 2009	Annual Establishment Growth 2010 – 2019
Accomack County	1.2%	0.2%	-1.6%
Chesapeake City	3.4%	2.0%	0.4%
Franklin City	-2.4%	2.5%	-1.6%
Hampton City	0.0%	-0.2%	-0.3%
Isle Of Wight County	1.6%	2.2%	1.0%
James City County	12.8%	5.4%	0.6%
Newport News City	0.4%	0.3%	-0.1%
Norfolk City	-1.2%	0.8%	-0.9%
Northampton County	0.4%	0.5%	-0.7%
Poquoson City	0.5%	2.5%	0.0%
Portsmouth City	-0.6%	0.9%	-0.7%
Southampton County	2.8%	-1.6%	-1.0%
Suffolk City	0.7%	2.9%	1.3%
Virginia Beach City	1.7%	0.7%	0.6%
Williamsburg City	-4.7%	-5.5%	1.0%
York County	5.5%	2.4%	0.5%
Region 5	**1.0%**	**1.0%**	**0.1%**
Virginia	**1.7%**	**1.1%**	**0.6%**
United States	**1.4%**	**0.6%**	**0.8%**

Source: U.S. Census Bureau, County Business Patterns and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate

Suffolk's performance stands out, however, because the pace of establishment growth in many of the other localities in Region 5 paled in comparison. Of the Seven Cities in Region 5, the

average annual rate of establishment was negative in four (Hampton, Newport News, Norfolk, and Portsmouth), below the state average in one (Chesapeake), equal to the state average in one (Virginia Beach), and faster than the state or nation in one (Suffolk). Of the sixteen localities in Region 5, establishment growth was negative in eight over the previous decade.

Small Firm Job Creation in Region 5

Small firms have historically powered job creation in the United States but historically to a lesser extent in Region 5. Figure 19 displays the share of jobs created by firms with fewer than twenty employees in Region 5, Virginia, and the United States. As the share of jobs created by small firms can be volatile on an annual basis, we estimate the five-year averages to highlight trends over time.

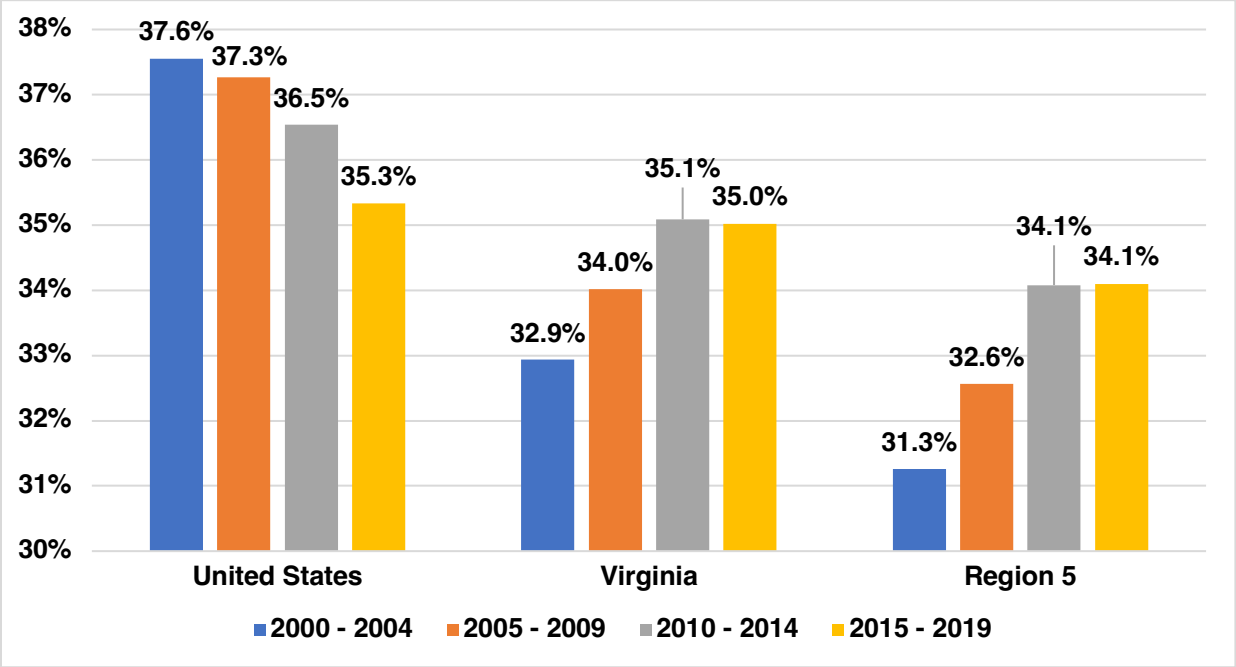
Figure 19 illustrates that small firms have been responsible for a higher percentage of new jobs nationally than in Region 5 or the Commonwealth. At the turn of the century, small firms created more than 37% of new jobs in the United States, compared to about 33% in Virginia, and just over 31% in Region 5. However, the share of new jobs created by small firms has steadily declined for the United States this century. In other words, the mythology that very small firms are the engines of job creation is fading at the national level.

Yet, while small firm jobs as percentage of total creation has declined nationally, it rose in Region 5 and Virginia. In Region 5, the percentage of jobs created by small firms jumped from an average of 32.6% from 2005 to 2009 to 34.1% from 2010 to 2019. In Virginia, the percentage increased 34.0% from 2005 to 2009 to 35.1% from 2010 to 2014 before declining slightly to 35.0% from 2015 to 2019.

However, we must express two notes of caution. First, Region 5's recent gains are merely bringing it up to the national average, a national average that has declined this century. Second, as discussed previously, almost 70% of small businesses in the Hampton Roads MSA reported

significant or moderate impacts from the COVID-19 pandemic. If small businesses were disproportionally impacted by the pandemic, then small firm creation will likely have plummeted in 2020, biasing this measure in favor or larger firms. In all likelihood, this means that small firm job creation will not be a reliable measure of economic performance in the coming years until the economic shocks from the COVID-19 pandemic fully dissipate.

Figure 19 - Percent of Jobs Created by Small Firms, U.S. Virginia, and Region 5
Firm Size – 0 to 19 Employees
2000 – 2019, 5-Year Averages



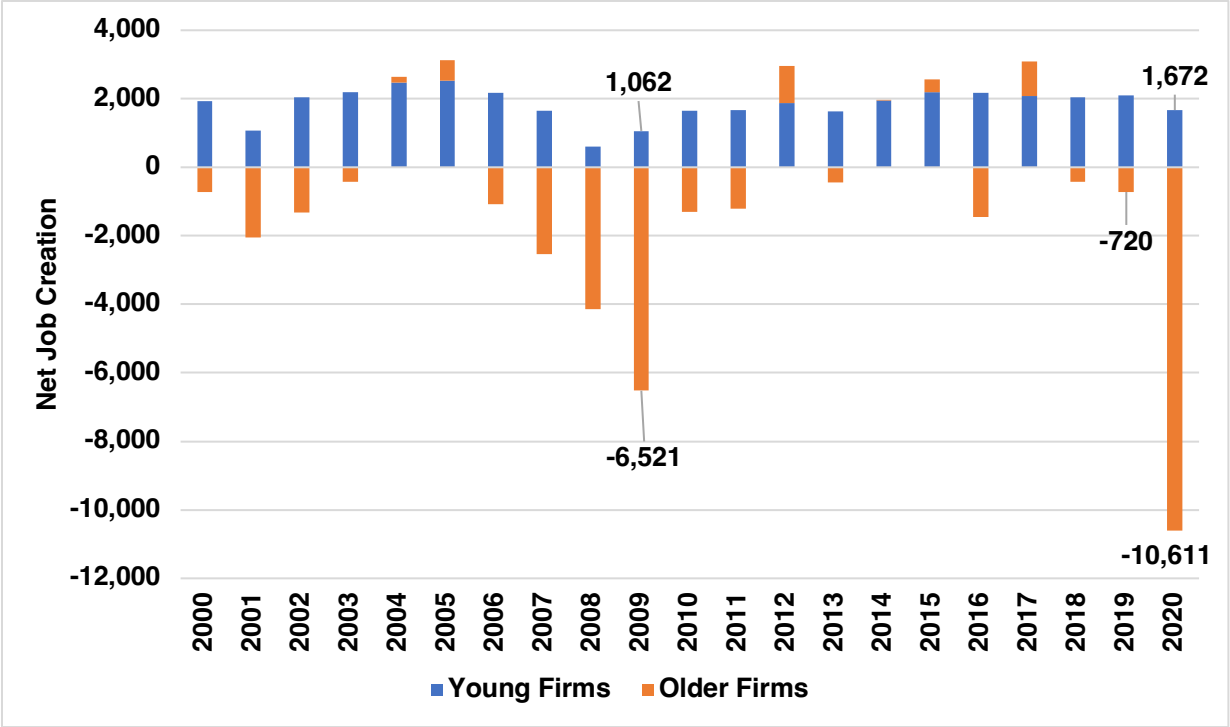
Source: U.S. Census Bureau, Quarterly Workforce Indicators and Dragas Center for Economic Analysis and Policy. Annual averages. Private sector firms only.

Young Firm Job Creation in Region 5

Young firms, defined as firms five years or younger, are the greatest source of job creation each year in the United States. In 2019, young firms were responsible for 95% of net job creation (job creation minus job destruction) in the nation. The most vibrant, dynamic economic regions of the country typically have high levels of young firm job creation. We can examine net job creation to ascertain how important young firms are to Region 5's economy.

Figure 20 displays annual average net job creation for younger and older firms in the Virginia portion of the Hampton Roads metropolitan statistical area from 2000 to 2020. One immediate observation is that net job creation by younger firms was positive every year from 2000 to 2020. **In many years, young firms were responsible for the positive job creation in the private sector in Hampton Roads because net job creation by older firms was negative.**

Figure 20 – Net Job Creation by Young and Older Firms for Hampton Roads MSA 2000 – 2020



Source: U.S. Census Bureau, Quarterly Workforce Indicators. Net job creation is the difference between job creation and job destruction. Young firms are firms age 5 years or younger. Virginia portion of the Virginia Beach – Norfolk – Newport News metropolitan statistical area. Private firms only.

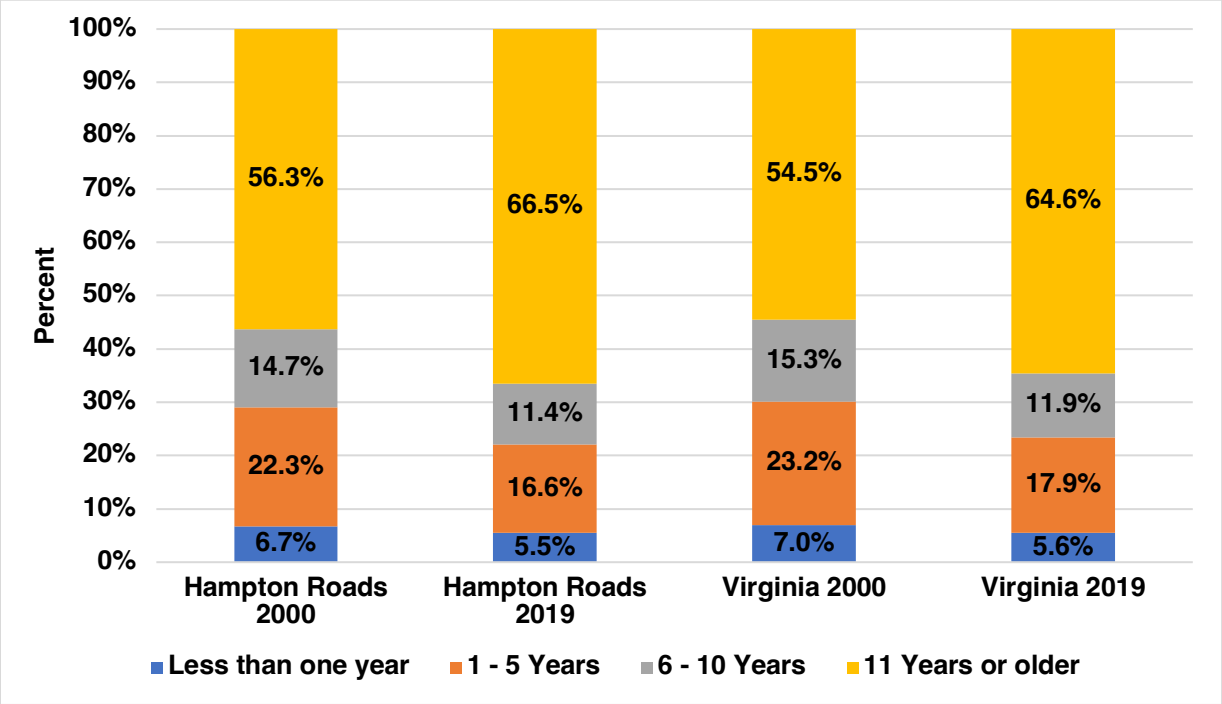
Figure 20 also highlights that older firms have driven job losses in Hampton Roads this century and were responsible for the majority of jobs lost in the Great Recession and the COVID-19 recession. This is not surprising as older firms tend to be larger and so are responsible for more job destruction in aggregate than smaller firms. In 2020, due to the COVID-19 pandemic, net job creation for younger firms fell from 2,092 jobs in 2019 to 1,672 jobs in 2020. Net job

creation, on the other hand, for older firms declined sharply from -720 jobs in 2019 to -10,611 jobs in 2020.

Creating more young firms, however, is not merely a regional challenge. Figure 21 displays the distributions of establishments by firm age in the Hampton Roads metropolitan area and Virginia in 2000 and 2019. In 2000, young firms made up 29.0% and 30.2% of establishments in Hampton Roads and the Commonwealth, respectively. In 2019, these shares had declined to 22.1% for Hampton Roads and 23.5% for Virginia. This phenomenon has occurred nationally as well and has sparked a conversation about the decline in establishment creation and the consequences of firm concentration among older firms.

In 2000, 77.4% and 75.8% of employees in Hampton Roads and Virginia worked for firms that were 11 years or older. By 2019, these shares had increased to 82.7% and 82.4%. Increasing firm concentration and employment concentration are occurring together, and this makes it difficult for new firms to compete with entrenched businesses for market share regionally, across the state, and nationally. Spurring startup activity is one strategy to increase young firm growth and job creation.

Figure 21 – Establishment Distribution by Firm Age: Hampton Roads and Virginia 2000 and 2019



Source: U.S. Census Bureau, Business Dynamic Statistics. Virginia Beach – Norfolk – Newport News metropolitan statistical area.

Challenge 4
Region 5 is Not Creating a Workforce for the Next-Generation Knowledge-Based Economy at a Quick Enough Pace.

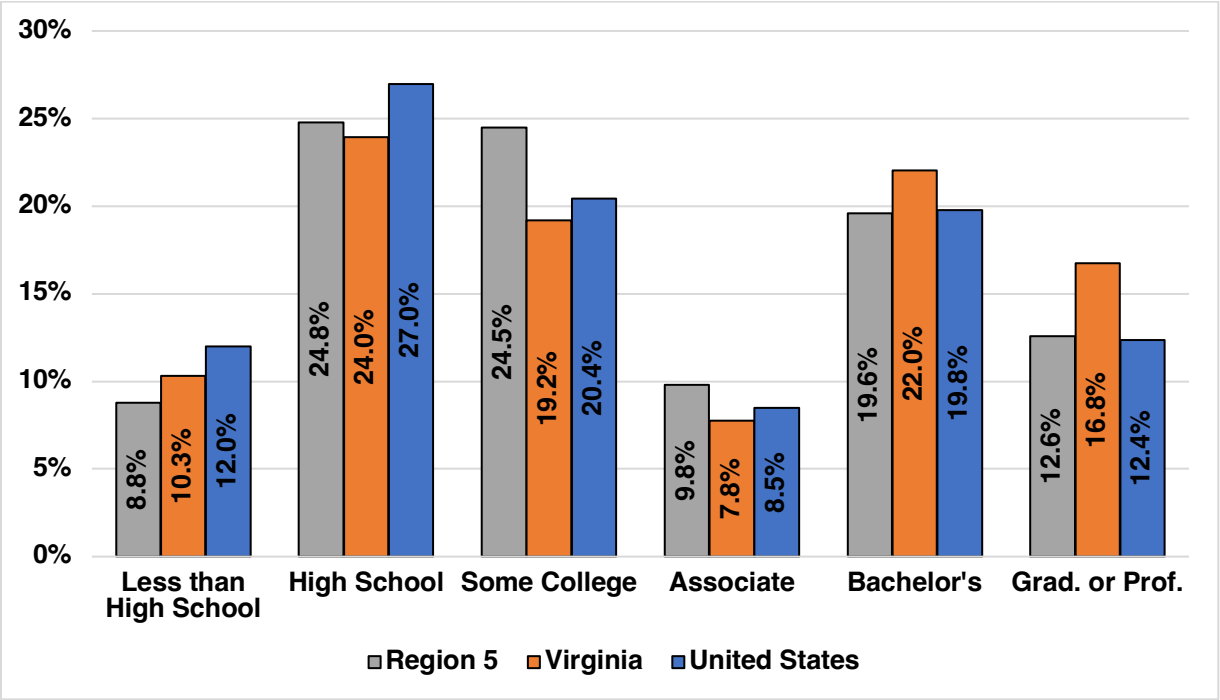
Workforce development is the linchpin of a region's economic development strategy. Without the right workers at the right place at the right time, existing firms cannot expand to exploit new business opportunities, new firms will struggle to launch, and economic development efforts will fall flat because firms will see that economic conditions in a region are not conducive to their business goals. A region has two strategies to meet the demands of employers: produce skilled workers in sufficient numbers at all levels of education and attract workers from other regions to fill gaps in the workforce. Failing that, workforce gaps will develop, business demands for labor will be unmet, and regional economic activity will not meet its full potential.

Figure 22 shows that in 2019, only 8.8% of adults in Region 5 had less than a high school education in 2019, compared with 10.3% of adults in the Commonwealth, and 12.0% of adults in the United States. While the percentage of adults with a high school degree was lower in Region 5 than the nation, this was because of a higher proportion of adults had either attended some college or had graduated with an Associate degree. The higher percentage of adults with Associate degrees in Region 5 may be directly correlated with the presence of large manufacturing firms that, in some cases, require these or more advanced degrees to move into the management ranks. Examining completion of four-year degrees, 32.2% of adults 25 and older had at least a four-year degree in 2019. This is only slightly above the national population (32.1%) but was 6.6 percentage points below the Commonwealth average (38.8%).

One important point to note is that the nature of education is changing in some industries. The pace of change in information technology and cyber security-related industries, for example, is so rapid that employers focus on currency of education rather than quantity of education. In

other words, in an increasingly dynamic work environment, certificates and shorter degrees may be preferred in some industries.

Figure 22 - Educational Attainment of Population Aged 25 Plus
United States, Virginia, and Region 5, 2019



Source: U.S. Census Bureau, American Community Survey 2019 5-year estimates, and Dragas Center for Economic Analysis and Policy.

Table 17 illustrates the distribution of education attainment across GO Virginia regions, Virginia, and the United States. Within Virginia, Region 5 has the highest proportion of residents who hold an Associate's degree (9.8%). This is a decline from previous surveys of the population, in part because more of the population now hold 4-year and higher degrees. Several of the region's core industry clusters such as advanced manufacturing and ship building and repair rely heavily on skilled workers. Developing a skilled trade workforce relies, in part, on the ability of community colleges to produce graduates in the trades. Maintaining and expanding these programs that enable graduates to enter the workforce with an Associate degree is a crucial element of any workforce development strategy.

In 2019, 42.0% of adults 25 and older in Region 5 had an Associate degree, Bachelor's degree, or graduate or professional degree. This share was less than other major GO Virginia Regions, including Region 4 (44.9%) and Region 7 (64.7%). Region 7 'pulls' the Virginia average upward because of the high level of human capital in the region, however, Region 5 does not rank among the top-3 regions in terms of the share of adults with a Bachelor's degree or a more advanced degree.

Table 17 - Educational Attainment of Population Aged 25 Plus
United States, Virginia, and GO Virginia Regions, 2019

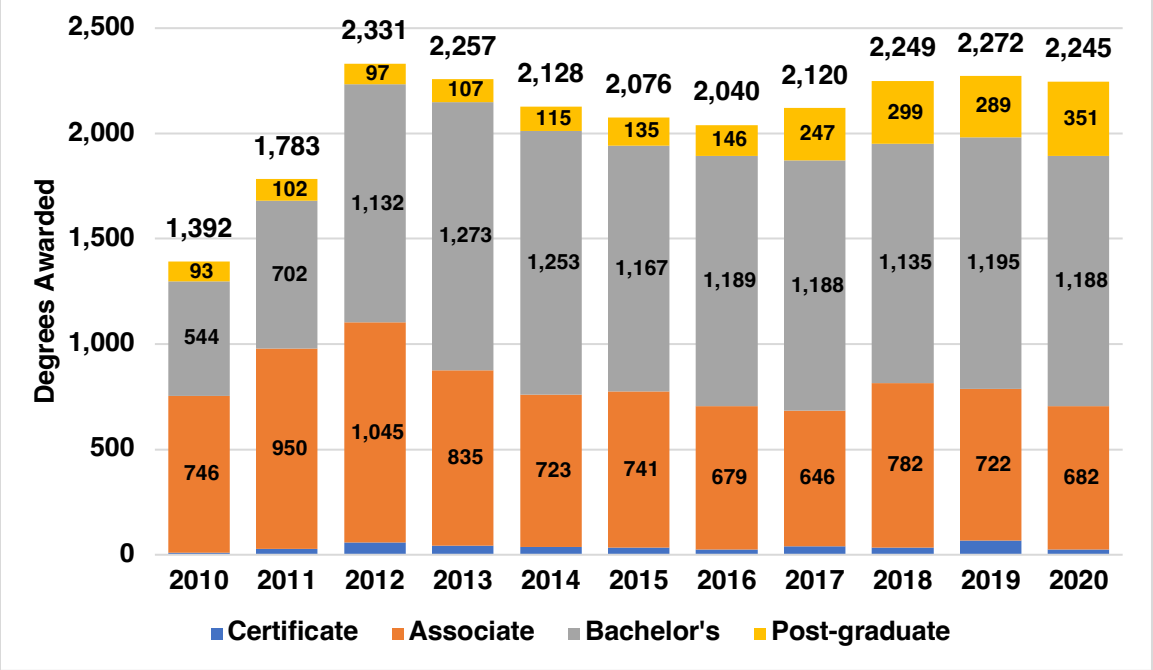
	Less Than High School	High School Graduate	Associate degree	Bachelor's Degree	Graduate or Prof. Degree	Any College Degree
Region 1: Southwest	19.0%	35.4%	9.3%	10.2%	5.8%	25.3%
Region 2: West Central	10.8%	30.5%	9.5%	17.0%	11.6%	38.1%
Region 3: Southside	18.5%	35.3%	8.9%	10.2%	5.7%	24.8%
Region 4: South Central	10.2%	25.0%	7.4%	23.1%	14.4%	44.9%
Region 5: Hampton Roads	**8.8%**	**24.8%**	**9.8%**	**19.6%**	**12.6%**	**42.0%**
Region 6: Eastern	9.5%	28.9%	8.0%	19.0%	12.3%	39.3%
Region 7: Northern	7.9%	13.7%	5.9%	30.6%	28.2%	64.7%
Region 8: Valley	13.5%	34.2%	7.3%	15.8%	10.5%	33.6%
Region 9: Central	10.4%	25.2%	6.6%	21.3%	17.1%	45.0%
Virginia	**10.3%**	**24.0%**	**7.8%**	**22.0%**	**16.8%**	46.6%
United States	**12.0%**	**27.0%**	**8.5%**	**19.8%**	**12.4%**	40.7%

Source: U.S. Census Bureau, American Community Survey 2019 5-year estimates, and Dragas Center for Economic Analysis and Policy.

Previous Growth and Diversification plans for Region 5 cautioned regional leaders about the shortage of local degree awards in occupations that we would consider STEM (Science, Technology, Engineering and Mathematics) related. These skills are considered the skills of the future and, while these skills have traditionally been seen as purview of higher education, STEM skills are becoming ubiquitous at all levels of education.

Figure 23 presents the degrees awarded in a STEM subset, computer and math. Awards in Computer and Mathematical Occupations grew by over 61.3% from 2010 to 2020. The number of Bachelor's degrees more than doubled over this period, and the number of doctorates increased almost four-fold. Associate awards, however, have declined from a peak of 1,045 in 2012 to 682 in 2020. Certificate awards, curiously, are not a significant component of total awards for Region 5 even though anecdotal evidence from employers suggests that certificates are in increasing demand in these fields.

Figure 23 - Degrees Awarded in Computer and Mathematical Occupations Region 5, 2010 - 2020

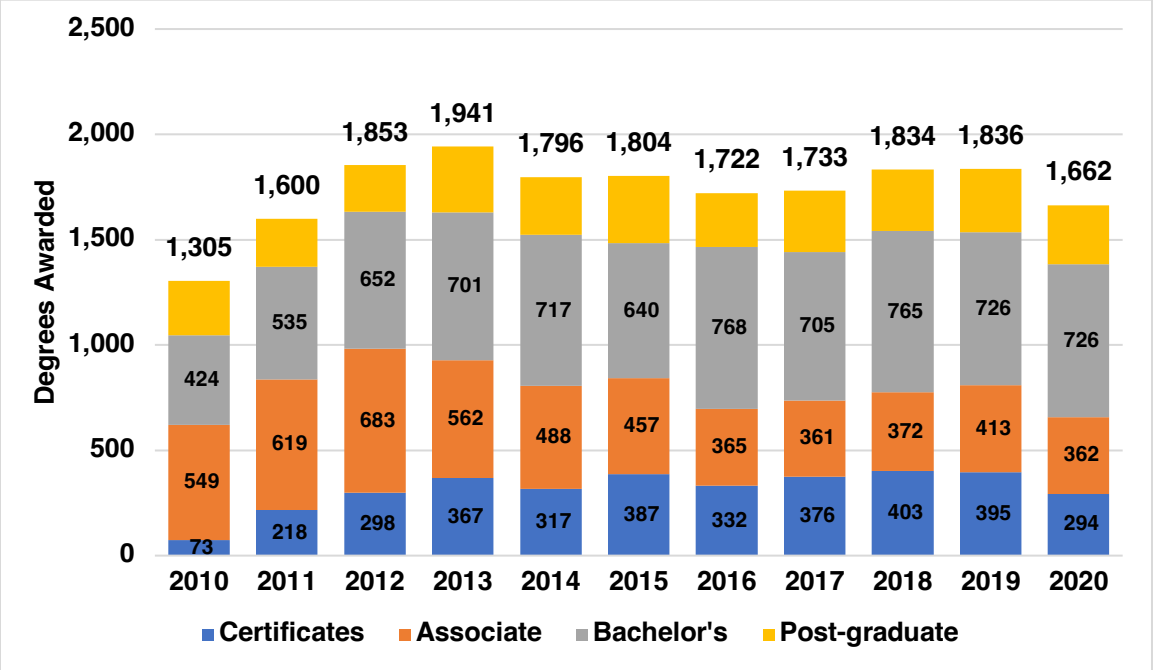


Source: JobsEQ. CIP Code 15-0000.

Another key educational area for the region is Engineering. All of the seven priority clusters in Region 5 have significant workforce demands in engineering and engineering-related fields. The region's advanced manufacturing cluster's success will, in part, depend on the ability of the region to produce graduates able to work in the cluster. Figure 24 shows that awards peaked at 1,941 in 2013 and had declined to 1,662 in 2020. The composition of awards has

shifted over time. In 2010, only 5.6% of awards were certificates. By 2020, 17.7% of awards were certificates. However, we note that the number of certificate awards peaked at 403 in 2018 and was 294 in 2020. The decline in certificate awards is a concern because it suggests that higher education institutions may not be meeting the demands for curricula currency of the region's employers. While the number of Associate degrees has dropped steadily from 2010 to 2020 (from 42.1% of awards to 21.8% of awards), the number of Bachelor's degrees has increased over the same period. In 2010, there were 424 Bachelor awards. In 2020, there were 726 Bachelor awards, an increase of 71.2%. Only Bachelor awards increased absolutely from 2010 to 2020, a signal of increasing student demand.

Figure 24 - Engineering and Engineering Technologies and Engineering-Related Fields Region 5, 2010 - 2020



Source: JobsEQ.

Drawing back to the larger picture, Region 5 has not kept pace with the level of human capital generation in the Commonwealth in STEM fields. In 2010, the region awarded 21.2 percent of computer and mathematical degrees in the Commonwealth. By 2020, the share had declined

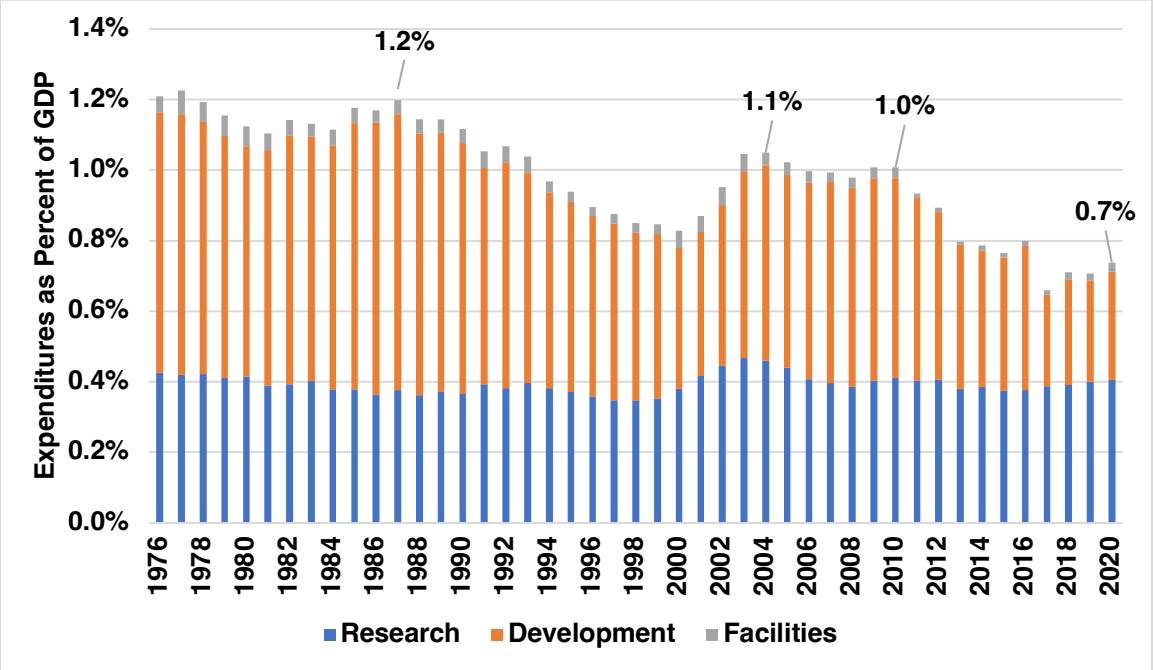
to 20.6 percent. The number of engineering and engineering technology degrees awarded in the Commonwealth increased from 1,790 in 2010 to 2,841 in 2020. Over the same period, the number of engineering and engineering technology degrees awarded in Region 5 increased from 1,305 to 1,662. Therefore, the share of degrees awarded in the region declined from 72.9 percent in 2010 to 58.5 percent in 2020. These developments are troubling given the region's economic development goals.

Challenge 5
Region 5 Lacks a Deliberate and Coordinated Innovation Strategy.

Improving economic development in the key industry clusters and spurring growth in the broader economy will rest, in part, on the ability of Region 5 to spur innovation. Innovative ideas, products, and processes are essential to modernizing existing industries. Innovation is also key to maintaining and expanding a region's competitive advantages in key industry clusters. A region that lacks an innovation culture and environment is likely to lag its relatively more innovative peers over time.

Broadly speaking, Region 5's economic relationship with the federal government may influence the pace of innovation in the region. Figure 25 shows that federal R&D expenditures have declined as a percent of GDP, from a peak of 1.1 percent in 2004 to 0.7 percent in 2020. The relative decline in federal research and development spending is troubling, not only for national competitiveness but also for the region.

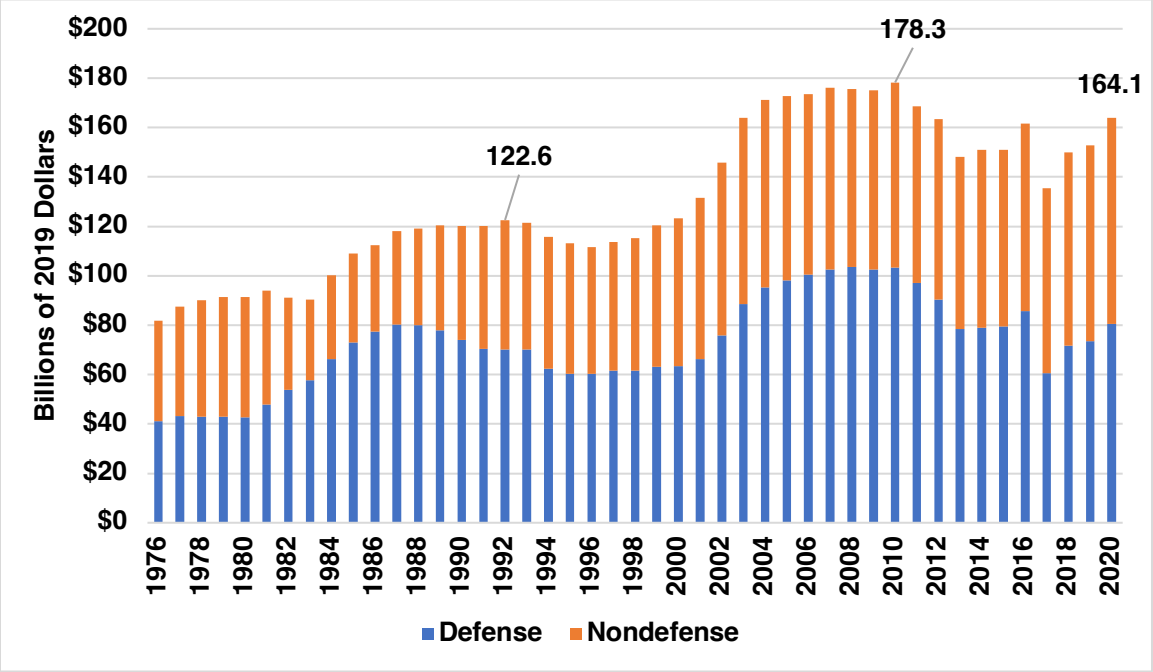
Figure 25 - Federal Research and Development Expenditures as Percentage of GDP FY 1976 – FY 2020



Source: American Association for the Advancement of Science (2020), https://www.aaas.org/programs/r-d-budget-and-policy/historical-trends-federal-rd

Figure 26 illustrates the change in federal research and development expenditures from FY 1976 to FY 2020. Federal expenditures peaked in FY 2010 at $178.3 billion in constant dollars. By FY 2017, federal research and development expenditures had fallen to $135.4 billion, a decline of 24.0%. By FY 2020, federal research and development expenditures had increased back to $164.1 billion in constant dollars, only $14.2 billion off the FY 2010 peak. However, the composition of federal research and development expenditures changed significantly over this decade. In FY 2010, DoD research and development spending accounted for 58.0% of all federal research and development spending. By FY 2020, DoD research and development was only 49.1% of federal spending. Given that Region 5 has a significant economic relationship with the DoD, it is likely that these reductions in federal DoD research and development spending influenced research and development in Region 5.

Figure 26 - Real Federal Defense and Nondefense R&R Expenditures FY 1976 – FY 2020



Source: American Association for the Advancement of Science (2020). Note: FY 2020 data does not yet contain emergency COVID-19 R&D. https://www.aaas.org/programs/r-d-budget-and-policy/historical-trends-federal-rd

Venture capital activity is a direct outcome of innovation activity in a region. The higher the level of innovation and its perceived commercial applications, the higher the likelihood that venture capitalists will invest funds in a region's firms. Table 18 presents venture capital activity in Region 5 from 2010 to 2020 as reported to Pitchbook. In the immediate aftermath of the Great Recession, there was hardly any venture capital activity in Region 5. Venture capital activity increased and peaked at $83.0 million in 2018 before declining to $48.7 million in 2020.

Table 18 illustrates that Region 7 (Northern) has attracted the preponderance of venture capital funding in recent memory. In 2010, Region 7 accounted for 87.1% of all venture capital funding in the Commonwealth. However, this share has trended downward over time, and was only 64.1% in 2020. Region 5's share peaked at 8.8% of all funding in Virginia in 2018 and was 4.2% of all funding in 2020.

With respect to venture capital funding, Region 5 would do well to examine what is working in Region 9. In 2010, Region 9 only accounted for 2.4% ($12.0 million) of all venture capital funding in Virginia. In 2019, this share was 6.5% ($77.2 million). In 2020, this share spiked to 13.5% as the level of venture capital funding increased to $155.7 million. In other words, in 2019, for every dollar of venture capital funding in Region 5, Region 9 attracted $1.6 dollars. In 2020, for every dollar of venture capital funding in Region 5, Region 9 attracted $3.2 dollars. While venture capital funding has fluctuated annually, over the last five years of data, Region 9 averaged $93.8 million dollars in funding compared to $49.1 million in Region 5. In other words, Region 9, with an economy not even one-quarter the size of Region 5, attracted almost double the venture capital over the last five years.

Another measure of innovation in an economy is the number of patents. Patents are an imperfect measure of innovation. A new patent for an improved children's toy may have a greater impact on a regional economy than a new patent for a web-browsing function (or vice versa). With this caveat in mind, it is reasonable to argue that regions with a higher level of patents, all else being equal, are more likely to be perceived as being innovative relative to regions with a lower number of patents.

Table 19 displays the number of patents in each GO Virginia Region from 2010 to 2020. The number of patents issued to residents of Region 5 has remained relatively unchanged over this period. On average, 249 patents were awarded to residents of Region 5 in a given year. Region 5's share of total patents has declined from 9.5% in 2010 to 6.3% in 2020 as there have been an increasing number of patents earned in Region 7. Region 7 stands out for having a majority of patents recipients in each year. Unlike venture capital funding, however, Region 7's share of patents increased from 2010 to 2020, from 51.7% of all patents in 2010 to 62.3% of patents in 2020.

Table 18 – Venture Capital and Angel Investments by GO Virginia Region
2010 – 2020
Millions of Dollars

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Region 1: Southwest	$11.0	$0.2	$0.2	$0.0	$0.0	$0.0	$0.0	$0.5	$0.0	$1.9	$10.0
Region 2: West Central	$5.4	$79.8	$3.7	$2.6	$8.7	$8.0	$2.5	$31.7	$1.0	$61.9	$17.4
Region 3: Southside	$6.1	$2.5	$7.3	$0.0	$0.0	$0.3	$0.0	$0.0	$0.0	$13.6	$13.0
Region 4: South Central	$28.9	$38.3	$27.0	$15.6	$110.3	$35.8	$187.5	$34.1	$105.0	$97.8	$104.2
Region 5: Hampton Roads	**$0.0**	**$6.0**	**$6.2**	**$24.2**	**$5.5**	**$14.0**	**$25.1**	**$39.4**	**$83.0**	**$49.5**	**$48.7**
Region 6: Eastern	$1.2	$1.6	$2.0	$4.2	$0.4	$0.0	$0.0	$0.5	$0.0	$0.2	$0.1
Region 7: Northern	$433.6	$570.4	$400.7	$629.6	$513.1	$556.4	$553.7	$554.5	$664.5	$870.9	$741.5
Region 8: Valley	$0.0	$11.9	$0.2	$1.1	$0.5	$20.4	$7.7	$0.2	$5.5	$20.1	$66.3
Region 9: Central	$12.0	$30.3	$16.6	$54.0	$42.2	$17.4	$45.4	$109.6	$81.2	$77.2	$155.7
Total	$498.1	$740.9	$463.9	$731.3	$680.7	$652.2	$821.9	$770.3	$940.3	$1,193.1	$1,157.0

Source: TEConomy (2021).

Table 19 – Patenting Activity by Inventors Living in Each GO Virginia Region
2010 – 2020

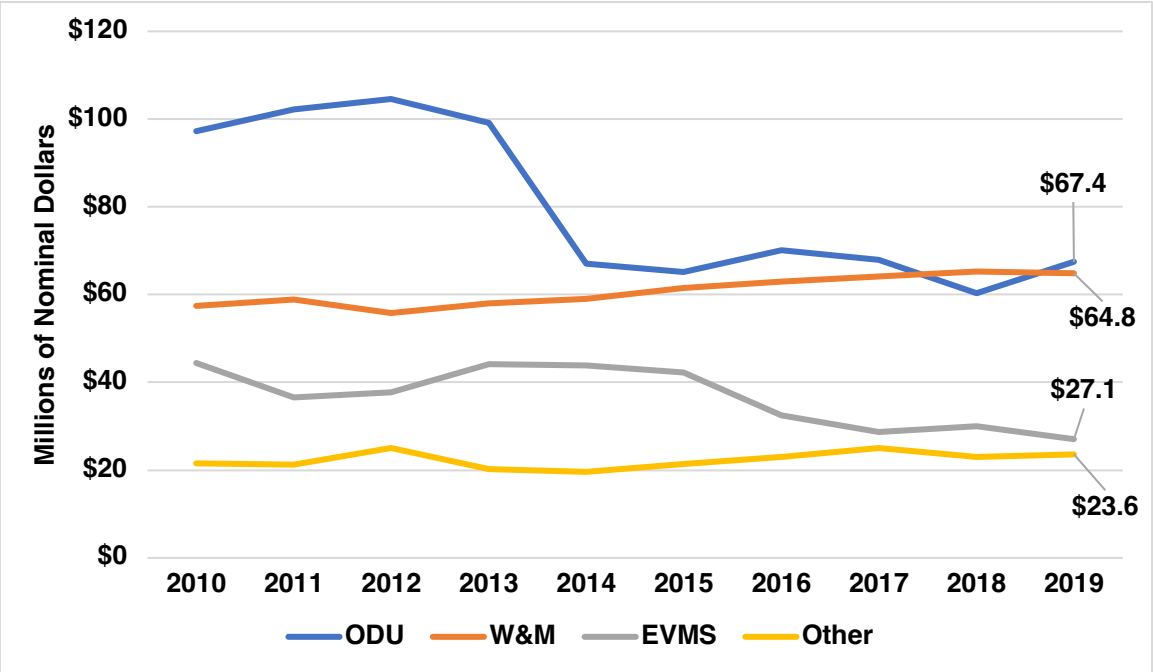
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Region 1: Southwest	21	26	18	37	38	26	22	26	25	22	23
Region 2: West Central	200	232	222	271	321	337	288	305	317	337	361
Region 3: Southside	13	16	27	18	29	24	27	36	38	34	53
Region 4: South Central	359	343	315	342	353	364	377	355	430	560	503
Region 5: Hampton Roads	**240**	**182**	**261**	**247**	**282**	**240**	**230**	**266**	**265**	**247**	**283**
Region 6: Eastern	69	53	57	80	84	69	78	56	61	70	81
Region 7: Northern	1,299	1,382	1,519	1,708	1,822	1,917	1,980	2,053	2,227	2,714	2,795
Region 8: Valley	94	98	60	78	98	77	81	105	81	92	79
Region 9: Central	220	236	291	246	308	281	258	308	297	324	306
Total	2,515	2,568	2,770	3,027	3,335	3,335	3,341	3,510	3,741	4,400	4,484

Source: TEConomy (2021).

Academic research and development by higher education institutions can power innovation in a regional economy. Academic research that translates into commercial applications creates a virtuous cycle of economic development where research generations applications which, in turn, generate funding that leads to more research. Close collaboration and pollination between higher education and the private sector enriches both sectors and can foster a culture of innovation and entrepreneurial risk-taking.

Figure 27 presents academic research and development for higher education institutions in Region 5 from 2010 to 2020. In 2010, academic R&D in Region 5 was $220.6 million. However, academic R&D fell sharply in 2014, primarily due to a reduction in R&D at Old Dominion University. In 2020, academic R&D in Region 5 was $182.9 million. Even if we start our examination after the decline in ODU's research and development spending in 2014, regional R&D by institutions of higher education has largely stagnated at 2014 levels. The region's higher education institutions have not been successful in attracting higher levels of R&D funding.

Figure 27 – Academic Research and Development
2010 – 2020
Millions of Nominal Dollars



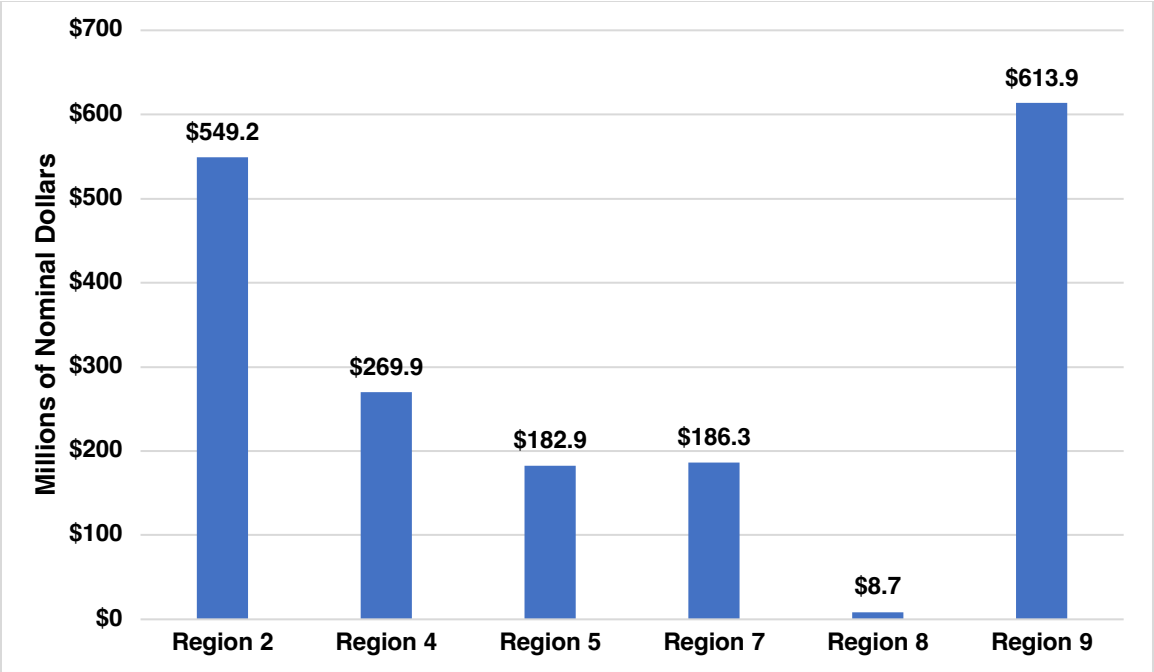
Source: TEConomy (2021).

Figure 28 compares levels of academic research and development funding across GO Virginia regions for 2020. Combined, the higher education institutions in Region 5 lagged Virginia Tech (Region 2) which generated $542.0 of Region 2's $549.2 million in research and development spending in 2019. Region 5's higher education institutions also lagged Virginia Commonwealth University, which generated $255.6 million of $269.9 million in Region 4's academic R&D spending. Combined, Region 5's institutions lagged George Mason University in Region 7 ($186.3 million) and the University of Virginia, Charlottesville in Region 9 ($613.9 million). While the data are a snapshot in time, the levels of academic R&D spending in Region 5 appear to pale in comparison with other Go Virginia regions.

From 2010 to 2019, the University of Virginia increased research and development funding from $276.3 million to $613.9 million. Over the same period, George Mason University increased

funding from $84.1 million to $186.3 million. Virginia Commonwealth University increased funding from $197.7 to $255.6 million. Virginia Tech increased funding from $398.2 million to $542 million over the same period. **For those GO Virginia regions in Figure 28, only Region 5 observed a decline in academic R&D spending from 2010 to 2019.**

Figure 28 – Academic Research and Development, GO Virginia Regions, 2019
Millions of Nominal Dollars



Source: TEConomy (2021). Institutions of higher education only, does not include federally funded research institutions or organizations.

The measures of innovation in Region 5 highlight one conclusion: the region requires a concerted effort to address its performance. Innovation cannot be fixed overnight and requires a long-term vision that leverages existing strengths in the region. Looking northward to Virginia Commonwealth University suggests that an education-health-research nexus exists that could foster innovation in Region 5. The key industry clusters could also serve as innovation incubations as well as finding commercial applications for the research done at Jefferson Lab and NASA Langley.

Final Thoughts

The 2021 biennial data update reveals that Region 5 has lagged behind other regions in the urban crescent, the Commonwealth of Virginia, and the nation in almost every indicator of economic activity. The gains in economic activity at the end of the recent decade have largely dissipated in the face of the COVID-19 pandemic, and the region's recovery has lagged that of peer and aspirant regions in Virginia and across the United States. While defense spending has increased in recent years, Region 5's economy has not responded with higher rates of growth akin to the turn of the century.

Fostering a higher rate of private sector employment growth is crucial to reduce Region 5's vulnerability to shifts in national security policy or the federal government's spending priorities. The old proverb that 'No tree can grow to the sky' applies here in that, at some point, defense budgets will peak and decline. If Region 5 does not diversify its economy, it faces the prospect of a destructive cycle of economic development where declines in federal spending lead to job and population losses which, in turn, lead to further job and population losses. The economic impacts of sea level rise will only amplify the economic undercurrents facing the region.

There is a modicum of good news. Region 5 does appear to have a competitive advantage in several key industry clusters. Key investments and collaboration across localities to foster economic development efforts can retain these competitive advantages. We remind that economic competition is not static, and if Region 5 does not invest and promote these key clusters, Region 5's competitive advantages will erode over time. Longer-term strategies to increase academic research and development and foster regional innovation will complement efforts to expand the region's competitive advantages in these clusters.

Section 3: A Brief Review of Region 5's Priority Industry Clusters

Region 5 identified six priority industry clusters in 2017 and reaffirmed the importance of these clusters in the 2019 biennial update of its Growth and Diversification Plan. The six previously identified clusters are joined by a new priority industry cluster in Clean Energy. In this section, we briefly review the six previous industry clusters of interest, their recent economic performance, and prospects and challenges for growth over the coming decade. We then introduce and discuss the Clean Energy cluster.

Background

The 2017 GO Virginia Region 5 Growth and Diversification Plan used three criteria to identify priority industry clusters: (1) Capacity existed in the cluster that could be scaled; (2) occupations in the identified clusters were forecasted to grow nationally; and (3) an opportunity existed for Region 5 to create a national identity in the identified clusters. Industry clusters were classified into one of three categories: mature, stars, and emerging.

Mature Clusters are industry clusters with high location quotients but with relatively slow or negative employment growth. Regions should not abandon growth strategies for mature clusters but must recognize the importance of deliberate intervention to advance the cluster. Growing mature clusters typically involves innovation strategies and seeking out new markets for the firms' products and services.

Star Clusters are industry clusters that present opportunities to leverage competitive advantages for economic growth. These clusters have location quotients above 1 and relatively high rates of employment growth. Fostering growth in these clusters can create a virtuous development cycle where growth begets increased talent and opportunities which begets more growth. These clusters still require important growth strategies. Often, star clusters become disconnected across a region as firms in the cluster locate in disparate locations throughout the

region. In addition, star clusters tend to give birth to small, related firms that may go unnoticed. As a result, star clusters can benefit from frequent asset mapping and situational analysis that identifies the firms in the cluster and brings them together to discuss emerging market opportunities.

Emerging clusters are industry clusters that have location quotients below 1 but are experiencing relatively high employment growth at the national and regional level. Emerging clusters have very specific needs to evolve into star clusters. First, these clusters need strong regional trade associations to facilitate networking. Networking among the cluster firms provides firm density which assists with developing a regional brand in the emerging cluster. Second, firms in emerging clusters need a process for innovation to keep up with the rapid changes in technology happening in the cluster. Finally, emerging clusters need very clear and deliberate workforce development strategies. The "newness" of the emerging cluster means that a large stock of talent may not exist. This could inhibit firm growth and firm attraction. Workforce development strategies for emerging clusters should focus on both short-term quick credentialing programs as well as medium to longer-term Bachelor's and advanced degrees programs to promote sustainability of the cluster. Chances are the emerging clusters will need to import talent in the short run to fill workforce gaps that might exist.

Previously Identified Priority Industry Clusters

Advanced Manufacturing is an industry cluster that encompasses materials and food manufacturing in which research and development spending is in the 80th percentile ($450 a worker or higher) and where more than 21% of occupations in the industry require a STEM education. There is substantial crossover in the region between firms that work in this industry cluster and significant advanced manufacturing assets as well. There was an average of 10,000 employees in this cluster in Region 5 in the second quarter of 2021 with an average annual wage

of more than $72,000. Average employment growth, however, was only 0.3% from 2011 Q2 to 2021 Q2. While this rate of employment growth was higher than the region (0.1%), it lagged the state and nation. This cluster had an employment location quotient of 2.7 and wage location quotient of 3.6 in 2021 Q2, highlighting the relative concentration and potential competitive advantage in this cluster. Given the speed of change in this industry, Region 5 will need to move with agility to address changing workforce demands and site needs for this cluster to grow over the coming decade.

Cyber Security, Data Analytics and Modeling and Simulation is an industry cluster that encompasses a range of activities, inclusive of cyber security, data analytics/data engineering, and modeling and simulation. These activities often overlap in the industry cluster and the cluster is characterized by rapid technological change. The changing needs of this cluster are also reflected in workforce demands. Data analytic tools, for example, are quickly moving towards R, Python, and other platforms and away from legacy, closed-source platforms. Region 5's educational institutions must be nimble to meet these workforce demands, especially given the rapid and likely sustained transition to remote work in this industry over the last twenty-four months. There were slightly more than 4,500 workers in this cluster in 2021 Q2 with an average annual wage over $72,000. While average employment growth was the highest among the priority clusters at 4.3% from 2011 Q2 to 2021 Q2, this is likely due to the smaller size of the cluster. The employment (0.6) and wage (0.5) location quotients were well below 1, signaling that Region 5 does not have a concentration or competitive advantage in this cluster.

Port Operations, Logistics, and Warehousing is an industry cluster that is broadly defined as economic activity focused on material moving, shipping services, and warehousing. Region 5 has a natural competitive advantage in this industry cluster given the harbors formed by waters of the James, Nansemond, and Elizabeth rivers and the Chesapeake Bay. In the second

quarter of 2021, more than 17,000 workers were employed in this industry cluster with an average annual wage of over $63,000, almost $11,000 higher than the average annual wage in Region 5. Average employment in this cluster grew at an average annual rate of 2.6% from 2011 Q2 to 2021 Q2, significantly faster than the region or the state as a whole. Region 5 also has an economic competitive advantage in this industry cluster, with an employment location quotient of 1.1 and wage location quotient of 1.6.[16] Recent investments in the Port of Virginia have increased capacity and throughput. A continuing challenge is to move from transitioning cargo through the region to using port traffic to generate value-added goods where they are then exported to other locations. The lack of an interstate directly from Region 5 to metropolitan areas to the south continues to constrain growth in this cluster.

Ship Repair and Ship Building is an obvious choice as a priority industry cluster for Region 5 given the visible concentration of firms engaged in this industry around the region. Region 5 has a history in this industry stretching back to the founding days of the nation and is a linchpin of the nation's shipbuilding effort. There were more than 41,000 employees on average in 2021 Q2, earning an average salary of almost $75,000. Employment growth from 2011 Q2 to 2021 Q2 was strong, averaging 2.4% annually. The employment (44.8) and wage (56.2) location quotients clearly point out the concentration of this industry in Region 5. In the short-term, this industry cluster is likely to perform well, given the environment of rising defense budgets and maintenance backlogs. Key investments by the region in building a workforce to use digital shipbuilding tools and other advanced manufacturing skills have benefits for this and other

[16] A location quotient measures an industry's share of employment (or wages) of a region's employment and compares that share to the national share. If a location quotient is above 1, it implies that an industry is more highly concentrated in employment (or wages) in a region than the national average. Location quotients are a signal of a region's competitive advantage in an industry.

clusters as well. However, there is no guarantee that we will not see a return to volatile hiring and layoff cycles as defense budgets and priorities change in the future.

Water Technologies is an industry cluster that includes firms in architecture, engineering, and urban planning, as well as firms and institutions doing coastal and climate research. Given the likely impacts of climate change in the coming decades on localities in Region 5, it should be no surprise that an increasing number of firms and institutions are pivoting to produce goods, services, and research in this industry. In 2021 Q2, there were more than 37,000 employees in this industry with an average annual wage of almost $81,000. Employment growth from 2011 Q2 to 2021 Q2 was slower than many other clusters, however, averaging 0.8% per year. The employment (1.3) and wage (1.2) location quotients suggest that Region 5 has a competitive advantage in this industry cluster. The region needs to emphasize the need for work in this area and attract new firms to this cluster to retain its competitive advantage in the coming decade.

Unmanned Systems and Aerospace is a key industry cluster that includes firms in aircraft manufacturing (including drones), aircraft parts manufacturing, robotic manufacturing, and aerospace engineering.[17] Undoubtedly, unmanned systems will only rise in importance over the coming decade. Drones, automated long-distance transport, robotic-assisted manufacturing, and other technologies are either emerging in the marketplace or on the immediate horizon. There were over 27,000 employees in this cluster in 2021 Q2 with an annual average wage of almost $94,000. We caution that these estimates may be overstated as firms may not be 'fully committed' to unmanned systems and aerospace, working in manned and unmanned systems simultaneously. This cluster grew at an average annual rate of 2.7% from 2011 Q2 to 2021 Q2. Its employment (3.6) and wage (4.2) location quotients signal that Region 5 has a competitive

[17] It is important to note that underwater navigational equipment employment and underwater remote vehicles employment currently sit within the Ship Building and Ship Repair cluster.

advantage in this cluster. We recognize, however, that the technological change in this cluster is extremely fast, and the region cannot afford to debate strategies and actions over the course of years. We need only remind the reader that just fifteen years ago, only a handful of nation-states had the capability to field drones on a consistent basis. Today, individuals and firms can use drones of increasing capability for a wide variety of uses.

Clean Energy – A New Priority Industry Cluster for Region 5

Clean Energy is the newest priority industry cluster for Region 5. The Clean Energy cluster spans firms that engage in activities in the renewable energy space, including solar and wind power manufacturing, construction, and generation. Over the next four decades, the U.S. Energy Information Administration projects that most of the addition to the national energy supply will be from renewable sources of energy, thus the growth prospects for this cluster are significant.

The Clean Energy cluster meets the first criteria for a priority industry cluster: existing capacity that can be scaled for growth. There were almost 24,000 employees in this cluster in Region 5 in 2021 Q2, with an average annual wage of almost $78,000. The Clean Energy cluster can also leverage existing priority clusters to facilitate growth. Advanced Manufacturing, Shipbuilding and Ship Repair, and Unmanned Systems and Aerospace utilize common occupational skills with this cluster. Port Operations, Logistics, and Warehousing can facilitate the importation and exportation of products from this cluster. Finally, Water Technologies can cross-pollinate given the expansion of the offshore wind industry and the continued development of solar energy in Region 5.

The Clean Energy cluster also meets the second criteria in that occupations in this cluster are forecasted to grow nationally. The BLS forecasts that many occupations in the clean energy sector will grow as fast or faster than average national job growth. These occupations include environmental scientists, environmental engineers, geoscientists, wind turbine technicians, and

solar photovoltaic installers. In fact, the BLS projects the latter two occupations to be among the fastest growing occupations in the nation. Recently passed infrastructure legislation bodes well for the potential growth of this cluster nationally.

The Clean Energy cluster also meets the third criteria: that a priority cluster has or presents an opportunity for Region 5 to establish a national reputation in that cluster. GO Virginia Region 5 is a significant hub of the offshore wind industry. Region 5 is home to the largest offshore wind project in the country and is the home port of the only wind turbine installation vessel in the United States. Region 5 will also be the location of the first offshore wind rotor blade finishing and manufacturing facility in the nation.

The Clean Energy cluster will be anchored by the offshore wind industry, which includes both the construction, operation, and maintenance of nearby offshore wind projects and the growth of a regional supply chain to support the development of projects along the entire U.S. East Coast. The national transition to clean energy and the anticipated concentration in Region 5 of clean energy firms working in offshore wind may lead to broader opportunities in the Clean Energy cluster. Many clean energy sectors will rely on the development of similar types of expertise and technology for success. This expertise and technology can be applied across sectors to grow a cluster broader than offshore wind. With an anchor in offshore wind, the opportunity exists for the clustering of clean energy firms specializing in areas such as battery storage, alternative fuels, power transmission and distribution, and other advancements to facilitate a transition to clean energy that are yet to be identified.

However, we would be remiss to note that the Clean Energy cluster in Region 5 has not grown over the previous decade. Its employment (1.3) and wage (1.3) location quotients suggest that Region 5 has a potential competitive advantage in the clean energy space, but a lack of growth also means that this advantage can slip away over the next

decade. This is not surprising considering the forward-looking nature of the clean energy industry. Taking concerted action now to leverage existing competitive advantages is key to growing the Clean Energy cluster and fostering private sector job growth in Region 5.

Section 4: Examining Workforce Gaps in the Priority Clusters

A workforce gap emerges in a region when there is insufficient supply in a region's workforce to meet the demand for workers in an industry or industries. Given that a region's workforce and the demand for workers is dynamic, we should expect workforce gaps to emerge and close, especially when a region is experiencing high rates of economic growth. Workforce gaps may also persist because a region is unable, due to lagging economic performance and opportunities, to retain and attract talent in key industries.[18]

Figure 29 presents the projected workforce gaps by selected major occupations in Region 5 from 2022 to 2025. For example, if the number of projected completions in post-secondary degree programs for healthcare practitioners (a measure of occupation supply) is less than the projected average annual job openings for healthcare practitioners (a measure of occupation demand), then a projected workforce gap exists. On the other hand, if projected post-secondary awards for sales-related occupations exceed the projected demand for sales related occupations, then a projected workforce surplus will exist.

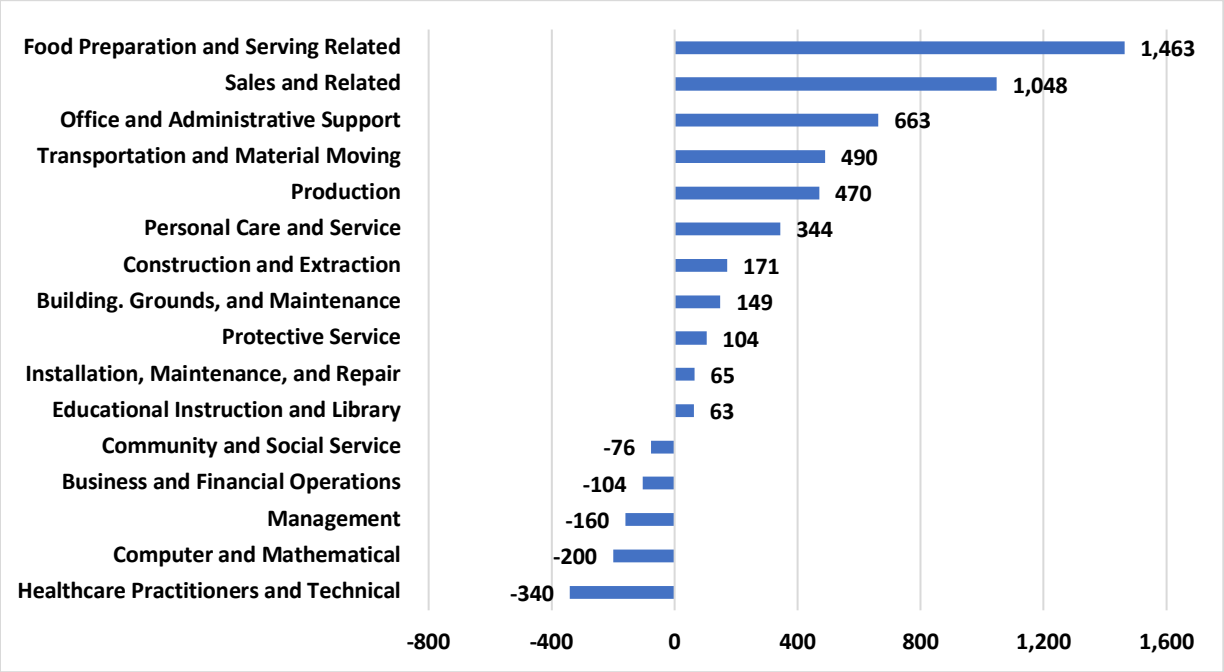
From 2022 to 2025, the largest annual workforce gap is projected for healthcare practitioners and related healthcare technical occupations. We project that employers will need 340 more workers in this occupational field than will be available through the award of post-secondary degrees. The next largest gap will be in jobs in computer and mathematical-related occupations. We project an annual workforce gap of 200 jobs over the next three years. These two occupation groups are followed by management and business occupations which will have

[18] The 2019 biennial update of the Growth and Diversification Plan highlighted the findings from the Council for Adult and Experiential Learning (CAEL) and Avalanche Consulting, who were retained by the Hampton Roads Workforce Council in 2018 to produce a gap analysis for industry clusters in Region 5 that closely (but not perfectly) matched the priority clusters identified in the original growth and diversification plan. We perform our own analysis in this section.

annual average workforce gaps of 160 jobs and 104 jobs, respectively. More troubling for Region 5 is that these broad occupations typically pay more than the regional average.

Workforce surpluses will exist in some of the lower-wage occupations in Region 5. There will be an average of more than 1,400 workers available to work in food preparation and serving occupations than jobs for these individuals from 2022 to 2025. The region is also overproducing sales, office support, and administrative workers. The workforce gap analysis for Region 5 suggests that the region's workforce production is not well aligned with Region 5's goal of producing more higher-skilled workers to work in higher-than-average paid occupations.

Figure 29 – Workforce Gaps in Region 5 by Major Occupation 2022 – 2025



Source: JobsEQ and the Dragas Center for Economic Analysis and Policy. Occupations only with workforce gaps or surpluses greater than 50 a year.

Of particular interest are those occupations that earn more than the Region 5's average annual wage, as filling and creating jobs in these occupations aligns with the overarching goal of creating high paying jobs in the region. Of the nearly 163,000 jobs in the seven key priority industry

clusters in the second quarter of 2021, almost 60% (95,405) earned more than the region's annual average of $56,290.

Table 20 presents occupational employment for the priority clusters where the occupations earned more than the regional annual average wage. Employment in the priority clusters was concentrated in four major groups of occupations: Architectural and Engineering (24.4%), Business and Finance (20.2%), Computer and Mathematical (14.3%), and Management (12.4%). These four groups of occupation accounted for 71.3% of total employment within priority industry clusters in the second quarter of 2021, more than double the Region 5 average for all industries of 35.5%. Nearly one out of every four priority cluster employees were in architectural and engineering occupations, compared to 6.6% for all industries in the region.

Table 21 shows the distribution of employment across minor occupation groups in each priority industry cluster.[19] Engineers (18.6%), Business Operations Specialists (17.1%), and Computer Occupations (13.5%) comprised the largest shares of total priority industry cluster employment in 2021 Q1. Engineers were the single largest minor occupation group in the Advanced Manufacturing (29.6%) and Clean Energy (31.0%) clusters. Business and Operations Specialists (17.1%) also represented a significant share of employment across priority clusters. In all seven clusters these occupations accounted for at least 10% of total employment in 2021 Q2. Port Operations and Logistics was the only priority cluster in which the majority of employment is not concentrated in engineering, business, management, or computer occupations. As one might expect, more than one in three individuals employed in the Port Operations and Logistics cluster were in Transportation and Material Moving occupations.

[19] Minor group occupation is defined as the 3-digit Standard Occupational Classification (SOC) occupation name obtained from the United States Bureau of Labor Statistics.

Table 20 - Priority Cluster Employment by Major Occupation Group, Region 5
Q2 2021

Major Occupation Group	Employment in Priority Industry Clusters	Percent of Priority Industry Cluster Employment	Percent of Employment in All Industries
Architecture and Engineering	23,300	24.4%	6.6%
Business and Financial Operations	19,265	20.2%	19.7%
Computer and Mathematical	13,624	14.3%	5.8%
Management	11,820	12.4%	3.4%
Life, Physical, and Social Science	3,437	3.6%	2.4%
Office and Administrative Support	3,375	3.5%	5.4%
Production	3,145	3.3%	3.4%
Construction and Extraction	2,956	3.1%	3.0%
Transportation and Material Moving	2,833	3.0%	2.5%
Installation, Maintenance, and Repair	2,501	2.6%	6.7%
Sales and Related	2,437	2.6%	8.0%
Healthcare Practitioners and Technical	2,021	2.1%	10.0%
Arts, Design, Entertainment, Sports, and Media	1,834	1.9%	3.7%
Legal	1,622	1.7%	0.6%
All Other Occupations	1,237	1.3%	18.8%
All Occupations*	95,405	--	--

Source: JobsEQ and the Dragas Center for Economic Analysis and Policy. Employment restricted to occupations with an average annual wage above the regional average for all industries of $52,705.

Table 21 - Annual Employment for Selected Minor Occupation Groups
Region 5, Key Industry Clusters
Q2 2021

	Advanced Manufacturing	Unmanned Systems and Aerospace	Clean Energy	Cyber Security, Data Analytics and Mod-Sim	Port Operations, Logistics, and Warehousing	Ship Repair	Water Technologies	Share of Employment in All Priority Clusters
Architects, Surveyors, and Cartographers	2	33	438	4	2	5	584	1.1%
Drafters, Engineering Technicians, and Mapping Technicians	577	739	891	12	11	954	1,274	4.7%
Engineers	1,486	2,122	5,021	69	58	3,908	5,110	18.6%
Business Operations Specialists	547	5,875	1,887	1,532	888	1,850	3,781	17.1%
Financial Specialists	179	1,084	366	155	150	282	691	3.0%
Computer Occupations	221	1,263	1,730	415	255	869	8,120	13.5%
Mathematical Science Occupations	30	253	84	68	30	33	253	0.8%
Advertising, Marketing, Promotions, Public Relations, and Sales Managers	39	14	80	58	52	48	303	0.6%
Operations Specialties Managers	239	525	351	133	308	527	1,044	3.3%
Other Management Occupations	165	1,456	987	314	114	300	1,607	5.2%
Top Executives	165	408	570	205	326	450	1,033	3.3%
All Other Minor Occupations	1,373	7,301	3,769	677	3,473	5,576	5,229	28.7%
Total Cluster Employment	**5,022**	**21,073**	**16,172**	**3,642**	**5,666**	**14,802**	**29,028**	--

Source: JobsEQ and the Dragas Center for Economic Analysis and Policy. Share of total employment for individuals employed in occupations that pay an average annual salary above the regional average for all employees of $52,705.

Figure 29 presents potential occupation gaps in Region 5 from 2022 to 2025 for selected minor occupation groups.[20] A workforce gap exists when the projected award of secondary degrees is less than projected demand for the occupation. A workforce surplus exists when projected awards are greater than projected demand over the period. Only one occupation, Drafters Engineering and Mapping Technicians, is projected to have a surplus of 19 workers over the three-year period. A small change in economic conditions could easily result in this projected surplus becoming a workforce gap.

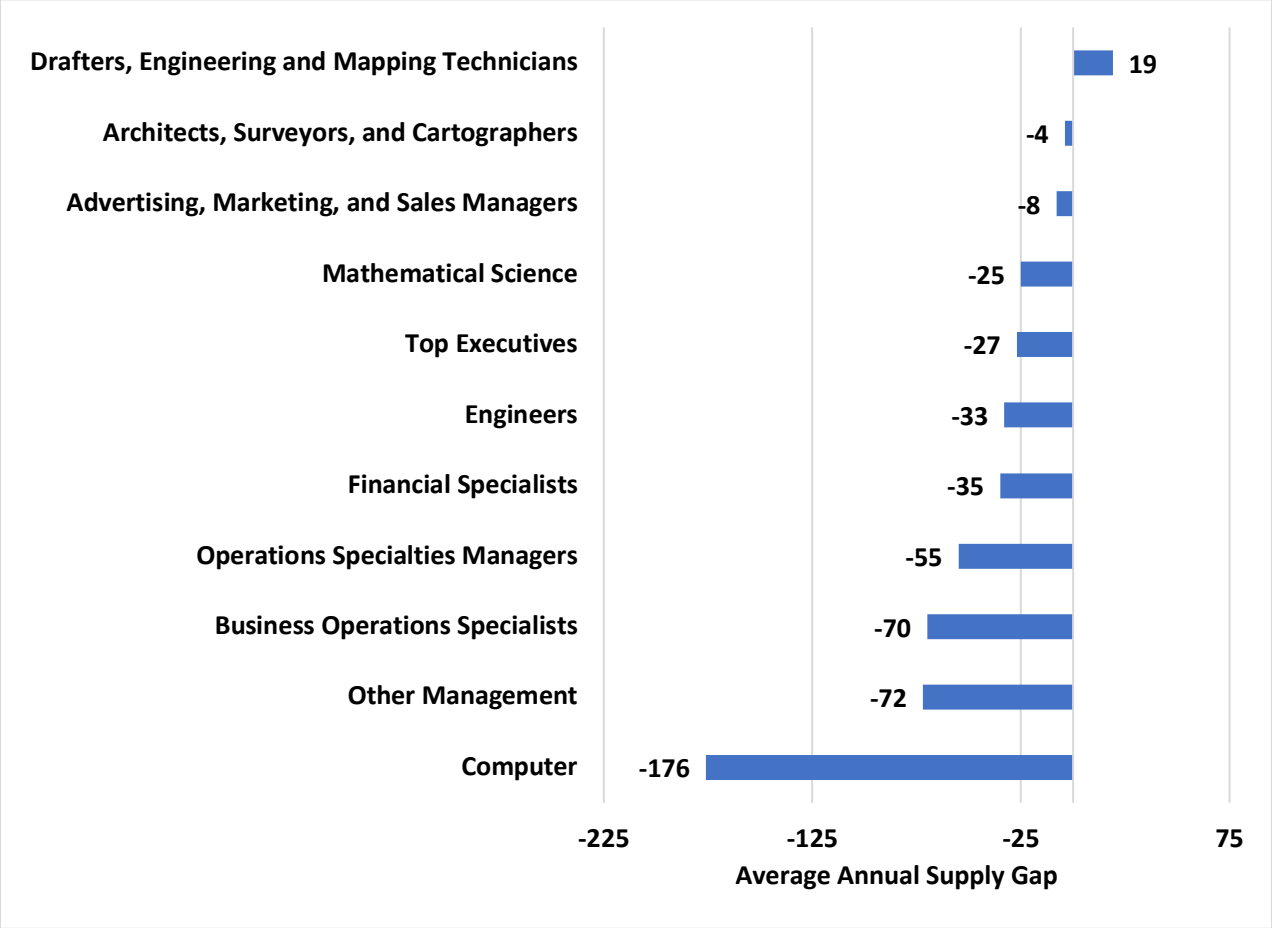
Over the next three years, Region 5 is likely to experience workforce gaps in a number of occupations that are foundational to the growth of the key industry clusters. More than 1 in 4 employees in the Water Technologies cluster was employed in a computer occupation in 2021 Q1, followed by the Cyber Security, Data Analytics, and Modeling and Simulation (11.4%), and Clean Energy (10.7%) industry clusters. We project there will be an annual workforce gap of 176 workers in computer occupations over this period. Employers in Region 5 will not be able to close this gap unless they can attract talent from elsewhere; however, as we noted previously, domestic outmigration remains a persistent issue for Region 5. If domestic migration were to increase over this period, the annual workforce gap in computer occupations may increase as individuals with computer occupation skills are in high demand across the United States.

The projected workforce gaps are not limited to STEM occupations. Workers in business and operations occupations earned more than the regional average in 2021 Q1. These occupations include Business Operations Specialists, Operations Specialties Managers, and Financial Specialists. We project there will be an annual workforce gap of 160 jobs among these

[20] Gap estimates for minor group occupations are measured as the sum of individual (6-digit) occupation gaps tied to a given industry cluster. Differences in individual occupations across industry clusters result in different gap estimates for minor occupation groups. Thus, for each minor occupation group, we select the largest occupation gaps across the seven priority clusters.

three occupations over 2022 – 2025. As with computer occupations, the higher pay of these occupations is correlated with higher levels of skills and education and also mobility. If Region 5 cannot increase its pace of growth and economic opportunities, these workforce gaps may widen, not narrow, in the coming years.

Figure 29 – Potential Average Annual Occupation Gaps Over Three Years (2022-2025) Selected Minor Occupations Region 5



Source: JobsEQ. Minor occupation groups for four major occupation groups: Architectural and Engineering, Business and Finance, Computer and Mathematical, and Management.

Two STEM fields, Mathematical Science and Engineers, will also have workforce gaps from 2022 to 2025. We project annual average workforce gaps of 33 Engineers and 25 Mathematical Science positions over this period. These gaps are particularly concerning given previous Region 5 plans stressing the need to increase the supply of workers in these

occupations. Our review of the data also illustrated that the number of awards in these fields has not increased significantly over the last five years. Thus, the workforce gap is likely to persist in the short-term unless the number of awards increases in Region 5 or Region 5 experiences an influx of highly skilled domestic migrants.

The workforce gap analysis highlights the need for Region 5 to more closely align higher education outputs with the projected demands of employers, especially those in priority industry clusters. Creating higher paying jobs requires employer demand for workers and workers in sufficient numbers to fulfill those needs. Region 5 cannot depend on domestic migration to fulfill workforce gaps and may need to further boost regional workforce supply to offset the impact of domestic migration in the coming years. Closing these workforce gaps is crucial to promoting development in the identified key industry clusters.

Section 5: Economic Development Site Inventory

Region 5 can improve economic growth and firm diversification if it expands the region's portfolio of sites that are prepared for business expansion. Companies that intend on making new investments and expanding market opportunities prioritize sites that offer low development risk and speed to market. Region 5, by identifying and expanding sites that complement firms in its key industry clusters, can increase the likelihood that firms in search of new business sites will select the region.

The Virginia Economic Development Partnership (VEDP) defines "Business-Ready" as part of its Virginia Business Ready Sites Program (VBRSP). Table 22 displays the continuum of tiers in the VBRSP. Region 5 adheres to VEDP's definitions.

Table 22 - VBRSP Tier System Identifies Prepared and Competitive Sites

Raw Land	Tier 1-2	Tier 3	Tier 4-5
Identified for development and marketing to prospects.	Site controlled for marketing and development.	Zoned industrial or commercial, due diligence completed.	"Project-ready". Infrastructure can be in place within 12-18 months.

Source: VEDP

Concerns among local business leaders about GO Virginia Region 5's portfolio of economic development sites led to the initiation of a study in June 2016 to prepare a regional sites inventory. This study was supported by a GO Virginia capacity building grant. The regional inventory and a subsequent state-wide study found that about 90% of the sites in Region 5 and across the state were in lower VBRSP Tier Levels and were not competitive for attracting investment.

An October 2021 VEDP study estimated that the Commonwealth had experienced significant job and revenue losses since 2016 due to the lack of business-ready sites. The study estimated that approximately 28,000 direct jobs and 21,000 indirect and induced jobs were lost

over the study period. About $27 billion in capital expenditures were not made and the estimated loss in annual state revenues was between $170 million and $215 million.

A team of local and regional partners is currently implementing the Hampton Roads Economic Development Sites Readiness Project. This project will complete the due diligence and infrastructure work needed to advance three sites totaling 495 acres from Tier 2 to Tier 4. This GO Virginia grant-funded project is the latest in several key milestones in an ongoing effort to improve the region's portfolio of business ready sites. The key milestones in this process were:

1. **June 2016: Regional Economic Development Sites Inventory -** supported by GO Virginia Region 5 Capacity Building grant.

2. **December 2017: Port of Virginia Opportunity Analysis** – identified improved site readiness as key to port-related economic development opportunities.

3. **October 2018: Hampton Roads Site Characterization/Assessment Study** – identified the VBRSP Tier Levels for 20, 100+ acre sites prioritized for further evaluation in the 2016 Regional Sites Inventory.

4. **2019: VEDP Site Evaluation Study** – 466 sites of 25 acres or more (including 72 in GO Virginia Region 5) were evaluated to determine VBRSP Tier Levels and sector suitability to drive limited investment dollars to the State's most competitive sites.

5. **2020 - 2021: DHCD/VEDP Collaboration** – state agencies work together with local and regional stakeholders to update guidance for grant funding for site development.

6. **July 2020 - Ongoing: Hampton Roads Economic Development Sites Readiness Project** – a GO Virginia grant-funded project to implement site development work to advance sites from Tier 2 to Tier 4.

The map "Economic Development Site Readiness" shows the current inventory of sites in GO Virginia Region 5. The Business-Ready Sites (Tier 4 or 5) and Advancing Sites shown on the map are also identified in Table 23 below. Additional information on sites is available on state, regional or local Economic Development Offices (EDO) websites.

Table 23 – Business-Ready Sites & Advancing Sites in GO VA Region 5

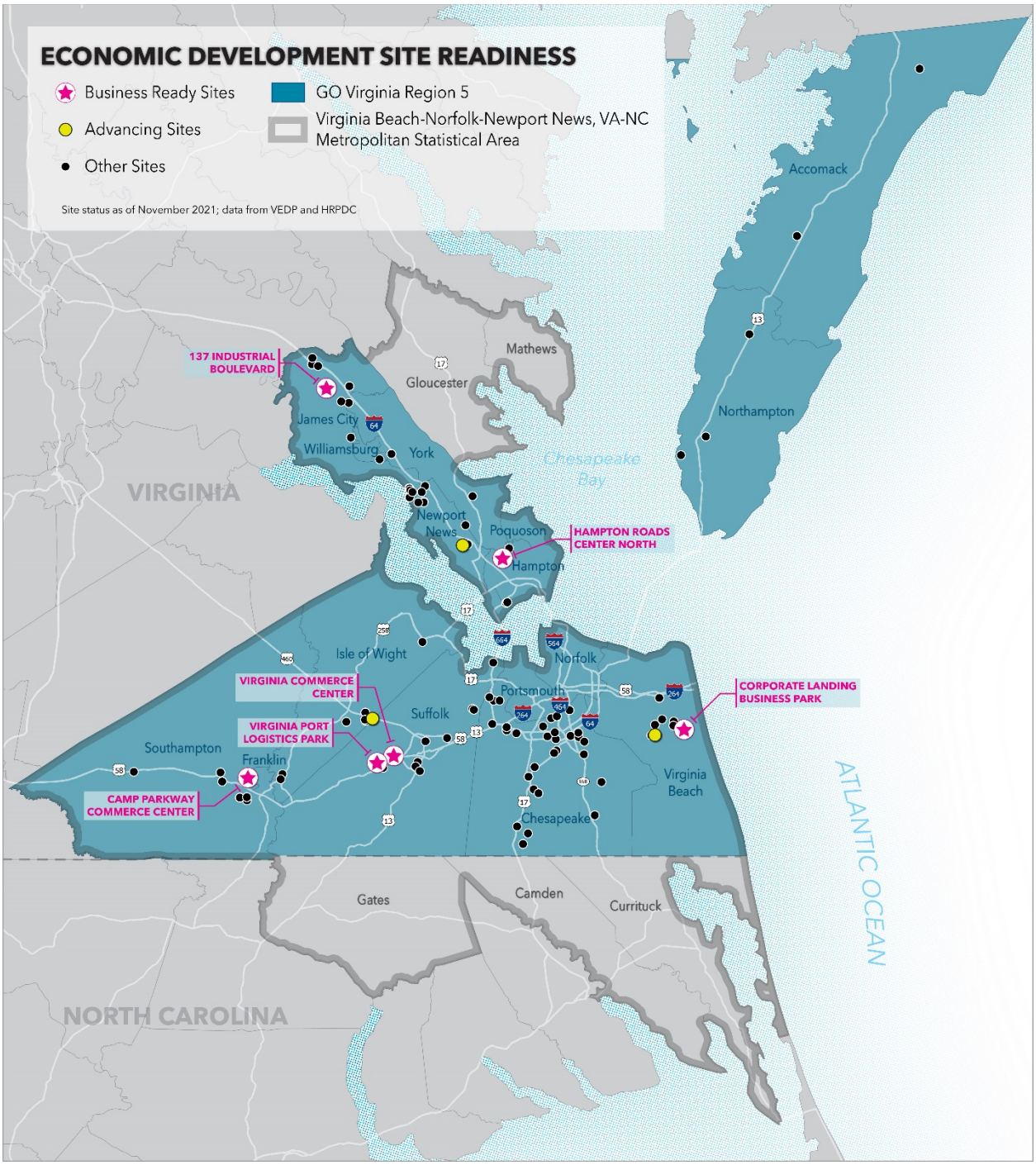
Site	*Locality*	*Acres*	*Tier Level*
137 Industrial Blvd.	James City County	10	4
Hampton Roads Center North	Hampton	95	4
Camp Parkway Commerce Park	Southampton County	345	4
Virginia Commerce Center	Suffolk	50	4
Virginia Port Logistics Park	Suffolk	300	4
Corporate Landing Business Park	Virginia Beach	92	4
Phase I			
Shirley T. Holland	Isle of Wight County	268	Advancing to 4
Tech Center Research	Newport News	64	Advancing to 4
Innovation Park	Virginia Beach	163	Advancing to 4
Phase II			Existing Tier
Mitsubishi Site	Chesapeake	83	2
Franklin Industrial Air Park	Isle of Wight County	65	2
US Route 460/12360 Windsor Blvd.	Isle of Wight County	83	2
Carlton Farm Industrial Park	Newport News	162	2
Oakland Industrial Park	Newport News	112	2
Southampton Business Park	Southampton County	32	2
Southampton Commerce & Logistics Center	Southampton County	40	2

The three Existing GO Virginia site opportunities are: (1) Shirley T. Holland/Isle of Wight (completion by end of 2021), (2) Tech Center Research/Newport News (completion by end of 2021), and (3) Innovation Park/Virginia Beach (completion by end of 2022).

As the first phase of the Hampton Roads Economic Development Sites Readiness Project nears completion, local and regional partners are working together and have identified seven new site development opportunities totaling 577 acres. This collaborative planning effort is preliminary and should be ready for GO Virginia submission in the Spring of 2022. The recommended next steps are:

- Continue to leverage local investment in site preparation with State grant funds to advance strong Tier 2 sites to Tier 4 and 5.

- Complete a regional planning process to identify and prioritize new site development opportunities. Evaluate site readiness, sector suitability, cost of site improvements and return on investment to identify and prioritize the region's site development opportunities.
- Use the results of the regional planning process to identify existing and emerging site corridors, clusters, and/or districts. Use the data to support additional coordination between site development and infrastructure planning and investment at a regional scale.
- Continue to explore joint site development opportunities including potential roles for the Eastern Virginia Regional Industrial Facilities Authority (EVRIFA).
- Actively encourage all local jurisdictions to join the EVRIFA.
- Actively advocate for substantially increased State funding for the "Business-Ready Sites Programs" administered by VEDP.
- For improved coordination once the currently underway regional planning process is completed, (estimated Spring of 2022) transfer the ongoing management of the sites inventory process to the HR Alliance and the Regional Economic Development (RED) Team.
- Ongoing management of the EVRIFA should be relocated to the HR Alliance. This would be a potentially valuable addition to the Alliance's "Tool Kit."
- Create a collaboration, with the City of Chesapeake providing leadership, between VEDP, the HR Alliance, EVRIFA, and other interested stake holders, to explore the best approach and schedule to develop the "Williams Farm" mega-site. This 4,000-acre site is adjacent to 3,000 acres in North Carolina that provides an opportunity for interstate collaboration.


ECONOMIC DEVELOPMENT SITE READINESS
Business Ready Sites
Advancing Sites
Other Sites
GO Virginia Region 5
Virginia Beach-Norfolk-Newport News, VA-NC Metropolitan Statistical Area
Site status as of November 2021; data from VEDP and HRPDC
137 INDUSTRIAL BOULEVARD
HAMPTON ROADS CENTER NORTH
VIRGINIA COMMERCE CENTER
VIRGINIA PORT LOGISTICS PARK
CAMP PARKWAY COMMERCE CENTER
CORPORATE LANDING BUSINESS PARK
Accomack
Northampton
Mathews
Gloucester
James City
Williamsburg
York
Chesapeake Bay
Newport News
Poquoson
Hampton
Isle of Wight
Norfolk
Portsmouth
Suffolk
Southampton
Franklin
Virginia Beach
Chesapeake
Gates
Camden
Currituck
NORTH CAROLINA
ATLANTIC OCEAN

Section 6: Recent Developments in Region 5

Since December 2017, when the initial GO Virginia grant was awarded to Region 5, the region has received grants totaling $23.8 million for 36 projects. These grants fall within the highly successful GO Virginia program categories with nine in Cluster- Scale Up, three in Site Development and Infrastructure, seven in Startup Ecosystem, and 17 in Workforce Development. Combined with the local match of about $31,6 million, these grants resulted in a total investment of $55.4 million. A complete listing of the GO Virginia grants received is provided in Appendix A. In addition, Region 5 has engaged in numerous initiatives since August 2019. This section provides a brief description of major initiatives, and a complete listing of all initiatives is provided in Appendix D.

Hampton Roads Alliance Restructuring

Ambitious economic development in Hampton Roads requires a complimentary and strong regionally focused lead entity. Hampton Roads' respective localities, private sector businesses, academic institutions and non-profits have all agreed that the Alliance should serve as the lead economic development organization and point of contact for outside investors. Through the fundraising efforts of the Alliance capital campaign and partnership with Reinvent Hampton Roads, many new private sector investors came on board while others increased contributions, doubling total funding.

The Master Agreement for Regional Economic Development (RED) was executed in September by all localities in Region 5. As outlined in the Master Agreement, the restructuring led to a smaller, more nimble Alliance Board, creating a more effective working group of C-suite leaders and Mayors. Also, the mission of the Alliance has fundamentally evolved by adding a "Business Retention & Expansion" leg of economic development at the regional level. This BRE

work is significant since an estimated 75 percent of job growth comes from firms already present in the region. Close coordination with local economic development offices is crucial to the success of this work and is accomplished through the RED teams.

757 Recovery and Resilience Action Framework

The 757 Recovery and Resilience Action Framework is a game plan created by a stakeholder collaboration for the 757's business community to help accelerate the region's economic recovery from the COVID-19 pandemic — and to do so in a way that builds a more resilient economy that is better prepared to weather future shocks. Organized and partially funded by a GO Virginia grant around a vision of economic empowerment and growth for all, the Action Framework advances five strategic pillars: Build Regional Unity; Grow New Jobs; Grow, Retain, and Attract Talent; Build Resiliency; and Advance Regional Infrastructure. Each of these pillars includes specific corresponding program areas with concrete goals, action steps, and quantifiable measures to track and report performance.

Envision 2020 Regional Rebranding Initiative

Hampton Roads' regional rebranding initiative, Envision 2020, released its findings in December 2019. The Regional Branding Initiative was guided by a task force of 30 community leaders and a stakeholder group of more than 100 community advocates who have shepherded the project from its inception. This GO Virginia funded initiative began as a mission to understand current perceptions about the region's brand identity. The Envision 2020 task force's research has shown that even residents and local business leaders have had trouble defining who and what Hampton Roads is.

Backed by a nine-month research effort which included surveying more than 3,000 people the Envision 2020 Regional Branding Initiative found that "The 757" branding resonates most

strongly across all of Hampton Roads' communities. Branding is useful in attracting young professionals to live and work in the region and as an "internal pride" campaign, but not necessarily for external economic development attraction.

Hampton Roads Infrastructure Coalition

The Hampton Roads Infrastructure Coalition (HRIC) was established by a group of 17 regional organizations to prepare the first comprehensive prioritized listing of regional projects. The group developed a high priority list of critical infrastructure regionally based projects approved by all localities in Region 5 as part of the FY2022 appropriations process and the President's American Recovery Act. The HRIC's initiatives focus on water resources, surface transportation, clean energy, broadband, education, and housing.

Regional Energy Master Plan

The Atlantic Coast Pipeline (ACP) was initially announced in 2014 in response to a lack of energy supply and delivery diversification for millions of families, businesses, schools, and national defense installations across North Carolina and Virginia. Robust demand for the ACP was driven by the regional retirement of coal-fired electric generation in favor of environmentally superior, lower cost natural gas-fired generation.

Since the termination of the (ACP) in July 2019, the Hampton Roads region has faced a challenge to provide enough energy to support future economic development, particularly through industrial projects. A Request for Qualifications (RFQ) was issued in November 2021 to contract the services of a consultant to conduct an assessment study of the anticipated supply and demand for energy in Region 5 and provide recommendations for an energy mix that will support development over the next 20 to 30 years. The end goal is to create a Regional Energy Master

Plan that will guide the region to an energy secure future. The GO Virginia-funded analysis will commence in Q1 2022 with completion by December 2022.

Hampton Roads Workforce Council and Peninsula Council for Workforce Development Merger

On July 1, 2021, the Hampton Roads Workforce Council officially merged with the Greater Peninsula Workforce Board to serve the 757 as one region, one workforce, and one economy.

Hampton Roads Economic Development Site Readiness Project

In the face of the current economic climate and future aspirations, being site-ready is paramount to winning the attention of companies who would invest in Region 5. Having shovel-ready sites, or the availability of quality sites that can be shovel-ready within 12-18 months, gives companies more incentive to invest in our region over another, which may be outside of the Commonwealth.

The Hampton Roads Economic Development Site Readiness Project leverages funds to complete due diligence work recommended by earlier studies, including the Enhanced Site Characterization project recently performed by the Virginia Economic Development Partnership (VEDP). This effort will assist in promoting the availability of shovel-ready sites to prospective businesses, which would, in turn, help to create higher paying jobs in Region 5. A GO Virginia application was submitted in June of 2020 where three sites in Region 5 received funding to help accelerate the development to Tier 4. A list of potential sites for a second round of GO Virginia grant funding to advance site readiness has also been identified.

Eastern Virginia Regional Industrial Facility Authority

The Eastern Virginia Regional Industrial Facility Authority (EVRIFA) was formed and funded by GO Virginia to provide a regional authority mechanism to enhance the economic base of the member localities by sharing the cost and revenue of economic development projects, regardless of geographic location. Not all members have to participate in a particular project, and any project partnership would have its own agreement requiring governing bodies' approval.

The following member localities currently comprise EVRIFA: Chesapeake, Franklin, Gloucester County, Hampton, Isle of Wight County, James City County, Newport News, Poquoson, Williamsburg, and York County.

RVA757 Connects (Mega Region)

The mission of RVA757 Connects is to create an Innovation Corridor by increasing collaboration in infrastructure connectivity, innovation, and workforce talent development. RVA and 757 have joined forces to spark the I-64 Innovation Corridor — an 8,000 square-mile region that runs from Richmond to Hampton Roads along Interstate I-64. The objective of this corridor is to connect, collaborate, and create new ways to deliver business opportunities, scientific breakthroughs, world-class healthcare, military advancements, artistic endeavors, and equitable social and economic opportunities. RVA757 Connects has received a GO Virginia grant in order for Regions 4 and 5 to conduct a talent pool study for the Innovation Corridor.

Campus 757

Campus 757 was launched in April 2021 to work with local universities and corporations to retain and develop young professionals in Hampton Roads. Campus757 is building a community for students to excel professionally after graduation by providing access to career

resources, internships, and job positions across industry sectors. The GO Virginia funded initiative will inform and guide students with programs and resources to launch their careers, establish a home base in Hampton Roads and leave a lasting impact in the community.

The "Assembly"

Assembly brings together leading creative and technology companies in one iconic building. It is purposefully designed for shared energy, inspiration, and resources to make each company stronger and to build a collective community with an even greater impact. The facility offers top-notch amenities including a rooftop deck, library, recording studio, event space and other attractive features. Single desks up to 5,400 SF are available for lease. The intent is to offer world-class design to enable collaboration, shared resources, and programming. Already located in the Assembly building are 757 Collab, 757 Accelerate, 757 Angels, and Navy Tech Bridge.

Navy Tech Bridge

In May 2021, the Assistant Secretary of the Navy for Research, Development and Acquisition announced the creation of six more "Tech Bridges" nationwide, which included the Mid-Atlantic Tech Bridge (MATB) in Hampton Roads. The MATB is a partnership between the U.S. 2nd Fleet and three Navy warfare centers in the region — Naval Surface Warfare Center Dahlgren Dam Neck Activity, NSWC Carderock Norfolk Detachment, and Naval Information Warfare Center Atlantic Hampton Roads Detachment.

Tech Bridge establishes off-base spaces to lower barriers of entry for innovators to connect with Department of the Navy personnel and collaborate on problem solving. The Mid-Atlantic Tech Bridge will connect local startups, academia, and industry partners with the largest U.S. Naval base in the world.

Port of Virginia Expansion

The Port's terminal capacity expansion project was completed in fall 2020, following the final phase of construction at NIT South and the arrival at NIT new ship-to-shore cranes. Eighty-six automated stacking cranes were delivered over 27 months. The port now has the capacity to process an additional one million containers or 45% additional capacity: 600,000 additional units at the Virginia International Gateway and 400,000 additional units at Norfolk International Terminal. The combined cost of the project was nearly $800 million.

Norfolk Harbor & Channels Deepening Project

The work to deepen the western side of Thimble Shoal Channel, which leads into the Norfolk Harbor, to 55 feet began on December 1, 2019, and is scheduled to be completed by the end of 2024. Once complete, the commercial channels serving the Norfolk Harbor will be able to simultaneously accommodate a two-way flow of ultra-large container vessels. The total cost of the project, including the preliminary engineering and design work, is $350 million. Deeper and wider channels will support many Virginia businesses and fuel cargo growth, job creation and economic investments across the Commonwealth.

James River Barge Service to RVA

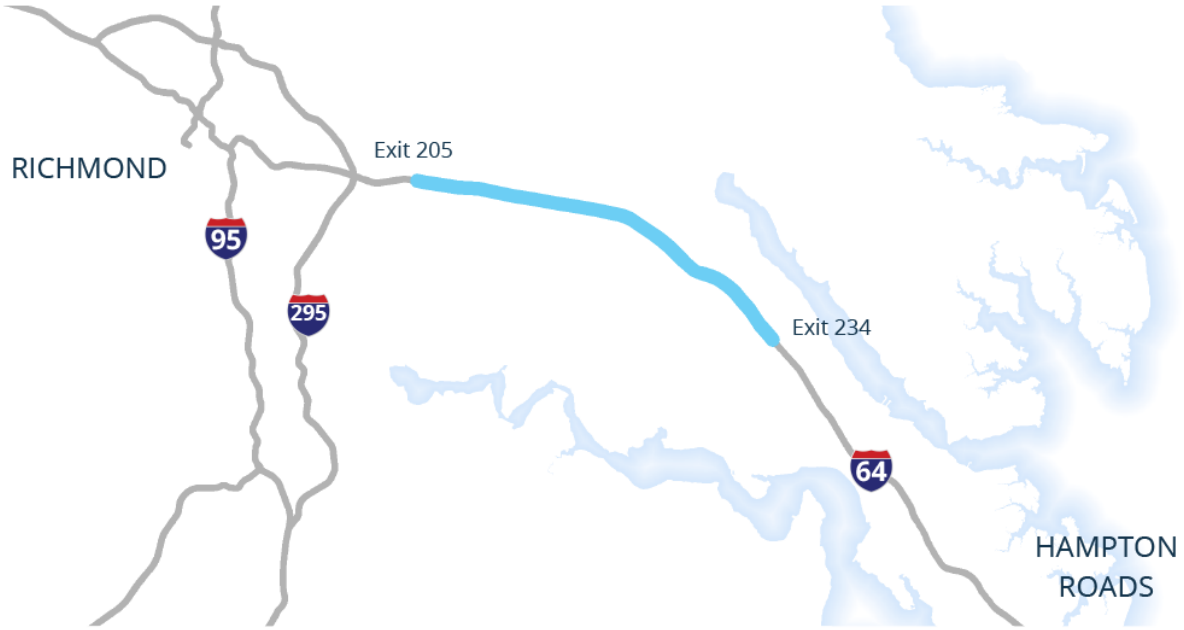
James River Barge Service, a weekly container-on-barge service from Hampton Roads to Richmond, provides a maritime alternative to I-64 by transporting goods on the James River via barges, removing container traffic from local roads and highways. The Richmond Marine Terminal has spent $6 million on two new barges and is now in a position to provide the thrice-weekly rotation.

HRBT Expansion

The Hampton Roads Bridge-Tunnel Expansion is the largest highway construction project in Virginia's history, costing over $3.8 billion. This transformative undertaking funded by a regional set of taxes is scheduled for completion by the end of 2025. The project will widen the current four-lane segments along nearly ten miles of the I-64 corridor in Norfolk and Hampton, with new twin tunnels under the harbor.

I-64 Widening to Six Lanes

The purpose of the I-64 Widening Project is to improve mobility in Region 5, and especially on the Peninsula. The Virginia Department of Transportation delivered the project, providing three travel lanes in each direction in three segments, which are now completed. The remaining 29-mile gap between Hampton Roads and Richmond is the top priority roadway project of RVA757 Connects and is depicted in the diagram below.



Chesapeake Bay Bridge Tunnel Expansion

The Chesapeake Bay Bridge-Tunnel (CBBT) expansion is under construction with projected completion in 2024. When complete, the new tunnel will carry two lanes of traffic southbound, and the existing tunnel will carry two lanes of traffic northbound.

The $756 million parallel tunnel at Thimble Shoals is being built to improve traffic safety and reduce congestion near Virginia Beach during the busy summer tourist season. The additional tunnel also can serve as an emergency backup.

Norfolk International Airport Expansion / Breeze Airlines Hub Established

Norfolk International Airport has outlined an airport expansion project in its Master Plan Update, ensuring that ORF's airfield, passenger terminal and aircraft gates, support facilities, and surface and transportation-related facilities can adequately accommodate existing and anticipated activity levels well into the future.

The airport has also added Breeze Airways to its roster of airlines. Breeze Airways, a new U.S.-based airline, provides low-cost, nonstop service to mid-size markets and is investing $5.2 million to establish an operations center in Norfolk. The company targets underserved cities without nonstop service and has identified dozens of route opportunities from Norfolk International Airport. Virginia successfully competed with several other locations for this project, which will create 116 new jobs.

Military Circle Design Competition

The Military Circle area has been a regional crossroads for decades. The intersection of two major boulevards—Military Highway and Virginia Beach Boulevard—created a transportation and economic crossroads in the mid-20th century that led to the growth of much of the early retail

development in the region. The Norfolk Economic Development Authority (NEDA), purchased much of this area in 2020 with the ambitious goal to redevelop the area into a thriving walkable district to support an inclusive, healthy, and sustainable mixed-use community.

The Authority has received three proposals to redevelop the Military Circle Mall area and is developing a public input forum and survey. Accepted proposals are from Crossroads Partnership, Norfolk MC Associates, and Wellness Circle.

Dollar Tree HQ - Summit Pointe

Dollar Tree's headquarters expansion has been completed, and the Summit Pointe mixed-use commercial center is underway. The $110 million expansion of Dollar Tree's headquarters in the Greenbrier area of Chesapeake is the tallest commercial building in the city. This 13-story tower boasts 325,000 square feet of Class A office space and added 600 high-paying jobs to the Hampton Roads area.

Phase Two began with the Helix apartment building, completed in summer 2020. Next came 555 Belaire, a six-story office building finished early this year. With Mosaic now under construction, the final element of Phase Two will likely be another residential building, which would break ground in early 2022 and be completed in fall 2023.

Summit Pointe is presently zoned to develop one million square feet of office space, more than 1,400 residences, up to 500,000 square feet of retail space, and 250,000 square feet of hospitality and conference space.

Transatlantic Subsea Cables

Hampton Roads is a global gateway, offering unparalleled connectivity. The region is home to the highest capacity transatlantic subsea cables in the world: MAREA, BRUSA, Dunant, and coming in 2023, CONFLUENCE-1.

MAREA, owned by Microsoft and Facebook and operated by Telxius, brought the first ultra-high-speed 200 terabits per second (Tbps) fiber optic cable from Bilbao, Spain, to Corporate Landing. BRUSA, owned and operated by Telxius, brought the second cable (138 Tbps) from Rio de Janeiro and Fortaleza (Brazil) to Virginia Beach in 2018. Dunant, owned by Google, connected Virginia Beach to Europe in late 2020. Dunant is the first long-haul subsea cable to feature a 12-fiber pair space-division multiplexing (SDM) design delivering a record-breaking capacity of (250 Tbps) across the ocean.

CONFLUENCE-1 is a proposed undersea cable system linking prominent undersea cable landing stations on the East Coast of the U.S. The cable is scheduled to be ready for service in 2023. CONFLUENCE-1 will serve as a diverse, more direct, and more secure alternative to current linkages via existing terrestrial routes between Miami and New York.

Amazon Distribution and Fulfillment Centers

Amazon is constructing two major facilities in Hampton Roads: a robotics fulfillment center in Suffolk creating 1,000 jobs that, other than the Pentagon, will be the largest logistic building by volume in the world, and a processing center (cross-dock) in Chesapeake creating 500 jobs. Both should open in early 2022 and will significantly benefit the Port of Virginia.

Amazon also plans to open two new delivery stations – a 165,000 square foot facility on Sewells Point Road in Norfolk and a 111,600 square foot facility on W. Mercury Boulevard in Hampton. These stations will each create 200 full-time and part-time jobs.

Hampton Roads Maritime Collaborative for Growth and Innovation

The Hampton Roads Maritime Collaborative for Growth & Innovation (HRMC) was announced in 2021. HRMC is an umbrella organization providing thought leadership, alignment, and organizational structure to identify, prioritize, and pursue impactful opportunities for long-term economic development and innovation in the Hampton Roads maritime industrial base ecosystem.

In November, HRMC released "A Pathway for Maritime Innovation in Hampton Roads," prepared by TEConomy Partners that identifies opportunities to leverage and expand the region's innovation and workforce support for industry partners. ODU also announced the establishment of the ODU Maritime Initiative. The Initiative will coordinate and grow the University's maritime-related degree and certificate programs, talent development, entrepreneurship and research and innovation. It will expand opportunities to engage industry partners across a broad spectrum of maritime domains, including the Port of Virginia, offshore wind energy, the Navy, shipbuilding and repair, autonomous systems and cybersecurity in catalyzing workforce, research, and innovation.

Hampton Roads is already putting the pathway recommendations and ODU's leadership role into action. On behalf of a coalition of Hampton Roads and northeast North Carolina partners, Reinvent Hampton Roads recently applied for the "Build Back Better Regional Challenge" grant through the U.S. Economic Development Administration. The application identified the theme of maritime innovation as one industry cluster, with three of the seven projects proposed based directly upon the "Pathways" report.

Virginia Offshore Wind

Virginia has a goal of 5,200 MW of offshore clean energy capacity by 2034, and the Dominion Coastal Virginia Offshore Wind (CVOW) project will help get the state there. The project

calls for the construction and operation of 176 turbines. During operations and maintenance, the CVOW project is expected to support about 1,100 long-term jobs. Dominion Energy has completed a two-turbine, 12 MW CVOW pilot wind farm located adjacent to the commercial development becoming operational in October 2020 and is the first Offshore Wind Project in Federal waters in the United States.

HII/NNS Unmanned Vehicle Manufacturing Facility

Huntington Ingalls Industries (HII) has completed the first phase of its Unmanned Systems Center of Excellence with the construction of a 22,000 square-foot facility. The first of two planned buildings on the 20-acre campus in Hampton will be used to assemble hull structures for Boeing's Orca Extra Large Unmanned Undersea Vehicle (XLUUV) program for the U.S. Navy. Structural development of the main facility, a 135,000 square-foot building, is now complete. The purpose-built, state-of-the-art facility will be used for unmanned systems prototyping, production and testing.

HII partnered with the Virginia Economic Development Partnership (VEDP), the city of Hampton and the Alliance to secure the project. More than 250 high quality jobs will be created to support unmanned systems design and production.

VRC Metal Systems Cold Spray Technology

VRC Metal Systems opened in Chesapeake to deliver cold spray to the Norfolk Naval Shipyard. With respect to shipyard applications, cold spray has the potential to repair components previously deemed beyond capable repair as well as provide more durable repairs for those items previously epoxy/electroplate repaired. VRC Metal Systems, LLC, in collaboration with Mid-Atlantic Tech Bridge and the U.S. Navy, leased an industrial facility in Chesapeake, creating up to 10 new jobs for the Hampton Roads region. The company's initial investment will create a

commercial entity to be used for both industrial repair and innovative manufacturing process applications utilizing the company's cold spray technology. This nascent technology has the potential to revolutionize the ship repair industry.

CHKD Pediatric Mental Health Building

The $224 million CHKD Pediatric Mental Health Hospital is under construction and is expected to transform mental health care for children across the mid-Atlantic, filling a critical gap in a shortage of pediatric mental health services. The 60-bed facility will offer a new level of care, standing out among the nation's top pediatric mental health hospitals, with innovative patient- and family-centered design, research-based treatments, academic training programs for the next generation of child psychiatrists, and unparalleled support and community involvement. The facility, scheduled to open in 2022, will also provide outpatient therapy and a "partial hospitalization" program that provides intensive care to children who will spend most of the day at the hospital, but still reside at home.

EVMS Waitzer Hall

The $80 million, 11-story EVMS New Education and Academic Support Building is a vital hub for the collaborative work that defines EVMS's distinctive approach to medicine and supports the next generation of leadership and growth at EVMS. The new EVMS Education & Academic Administration Building (Waitzer Hall) expands the capacity and consolidates existing spaces for teaching, study, student support and administrative workplace.

Brock Cancer Center

Sentara Healthcare has officially opened the doors to the Sentara Brock Cancer for patient care and comprehensive cancer treatment. This new patient-centered facility transforms cancer care in Hampton Roads by bringing together expert care teams, community organizations and

holistic cancer treatment services within one location. The Sentara Brock Cancer Center is a $93.5 million, 253,000 square-foot facility and regional hub for the Sentara Cancer Network.

The Sentara Brock Cancer Center brings together care team partners from Virginia Oncology Associates (VOA), Eastern Virginia Medical School (EVMS) Medical Group and additional community providers. By partnering with like-minded clinical teams and community organizations, cancer patients, survivors and their families will benefit from increased access to cancer resources and services, expanded screening, awareness and prevention efforts, treatment options, and survivorship care.

New Veterans Affairs Clinic To Open in Chesapeake

The U.S. General Services Administration announced plans to construct a Department of Veterans Affairs Community-Based Outpatient Clinic on a 25-acre parcel of land on the Chesapeake Regional Hospital campus. The new 196,000square-foot facility is designed to improve veterans' access to outpatient services such as primary care, mental health, and eye clinic services, as well as new specialty care and advanced imaging services. The new location is also expected to reduce drive times as patients will no longer need to drive to Hampton for routine appointments. Construction is scheduled to begin in 2022, and the facility should open in Fall 2024.

Section 7: Possible Strategies to Address Region 5's Economic Challenges

1. Workforce Development and Talent Attraction

Employers across the industry spectrum are experiencing a worker shortage that seemed to increase exponentially in the aftermath of the COVID-19 pandemic. *The Wall Street Journal* notes that, as of October 2021, 4.3 million workers have left the labor force, fundamentally shifting the race to attract talent. Employers with low-paying jobs are seeing the need to automate away positions once held by people, while higher-paying employers are competing with companies from across the globe due to the ability to work remotely. The Hampton Roads region must attempt to upskill workers to fill high-skilled, high-paying jobs whenever possible; this should be done on a regional basis with organizations like the Hampton Roads Workforce Council, Reinvent Hampton Roads, local universities, and corporate recruiting professionals working in tandem. The RVA-757 megaregion should also leverage its collective assets to retain companies and their accompanying talent. In addition, organizations like the Hampton Roads Alliance and Hampton Roads Workforce Council should leverage their business intelligence and marketing tools to attract talent to the region; this should be done based on existing target industry studies and aim first to bring in higher skill/higher wage talent that employers cannot procure from the existing population. Emerging industries like offshore wind will require additional workforce recruitment efforts, which should be prioritized as well.

2. Enhancing Opportunities Derived from the Port of Virginia

The Port of Virginia's presence provides a cornerstone of the regional economy. Studies have shown that many companies have chosen to locate or expand in Virginia because of the Port, but a great deal of regional activity is still tied to transporting goods to Chicago and other westward markets via the region's rail and highway infrastructure. The region must position itself

to serve as a value-added hub for companies, rather than serving as a "throughway" to markets like Chicago. Marketing the region as such and attracting companies will ensure more investment, job opportunities, and allow the local economy to retain dollars that are currently passing through the area and locating elsewhere in the United States.

3. Enhance Shipbuilding and Defense Contracting Capabilities

Although sequestration disproportionately affected defense-heavy areas like Region 5, aging military equipment and vessels provide an opportunity for economic expansion. Huntington Ingalls, the region's largest employer, is uniquely qualified to address the U.S. Navy's aging fleet of vessels through both repair and replacement contracts. Companies that work alongside Huntington Ingalls and other similar defense contractors should prioritize these efforts and seek opportunities to do so in an expeditious manner. Given that the plurality of Region 5's economy is directly related to defense, any enhancements to the existing portfolio of work or number of defense contractors in the region will have a significant positive impact on investment and employment.

4. Name Recognition and Marketing

Hampton Roads embarked upon a regional branding initiative, entitled Envisioning 2020, which examined the defining features of Hampton Roads and Region 5. Regional leaders concluded that the region has not yet coalesced around a name or brand; instead, an internal pride building campaign is needed to establish cohesion. The "757" moniker was adopted to build such regional pride and market the assets that bring the region together, but an outward-facing marketing campaign is vital to recruit companies, talent, and even tourists to the region. Hampton Roads has very little name recognition domestically, and virtually none internationally. The Hampton Roads Alliance should lead efforts to market the region to businesses, while all regional organizations, municipalities, and large corporations should work together on a regional marketing

strategy. Repetition of the name, brand, and region's "value proposition" should be consistent no matter where the information is presented and should be funded appropriately to ensure as wide a distribution as possible.

5. Site Readiness & Regional Industrial Facilities Authority Utilization

As discussed in Section 5, enhancing site readiness is among the most important strategies Region 5 can undertake to secure new businesses and retain existing companies that are in expansion mode. Virginia Economic Development Partnership (VEDP) executives point to a lack of developable sites and buildings as the main factor in losing more than $5 billion in project-related capital investment in recent years; it is also increasingly making Region 5 unable to compete for projects. Working together as a region to obtain funding through GO Virginia, VEDP's Business Ready Sites Program, and local matching funds is critical to ensure that the region can attract major facilities to locate and grow. The Regional Industrial Facilities Authority (RIFA) should be a cornerstone of this effort, as localities can share the burden of investment and collectively benefit from revenues obtained by projects located on so-called "mega sites." Through the RIFA, even localities that are primarily built out can invest in large tracts of land in neighboring localities that will attract shared revenues and employ people from across Region 5. All localities in Region 5 should consider joining the RIFA and work with regional organizations including Reinvent Hampton Roads, the Hampton Roads Alliance, and the Hampton Roads Planning District Commission to identify opportunities and sites that could benefit from a regional investment strategy.

6. Maritime Innovation

A study by TEConomy Partners completed in 2021 provided recommendations on how to leverage opportunities in maritime innovation across Region 5. The study examined high-level industries within the maritime ecosystem, including defense, port operations, offshore wind

energy, and coastal resilience services. Recommendations to support maritime innovations include creating hubs and centers of excellence in maritime industries and supporting components that cut across industries and will benefit multiple companies and customers. Old Dominion University's OpenSeas effort, the Hampton Roads Maritime Collaborative for Growth & Innovation (HRMC), the Hampton Roads Alliance, and other regional players focused on attracting and scaling up maritime businesses in the region should follow and seek funding to execute the recommendations derived from the TEConomy study. Recommendations from this study were incorporated in the Economic Development Administration's Build Back Better Regional Challenge grant application filed in mid-October to create:

a. **Technology Advancement & Innovation Commercialization Programming Hub**: Build space and develop operational and programming strategies to expand the Tech Center Research Park's Science and Technology Accelerator Network Program which supports the advancement of NASA innovations. This project will drive inclusive economic growth by strengthening partnerships with HBCUs and national networks to attract founders of color to the region and provide necessary business growth support services. The total project cost is estimated at $16 million with a match of $25 million from private and public sources.
b. **Autonomous Systems National Hub:** Bring together and maximize the impact of three ongoing initiatives: 1) York County's donation of land for a 20-acre Unmanned Systems Training, Testing & Demonstration Facility; 2) A regional strategic playbook for autonomous systems in collaboration with the Unmanned Systems Center at Center for Innovative Technology (CIT) and VISA; and 3) a 10-member Eastern Virginia Regional Industrial Facility Authority (EVRIFA) established to shepherd the development of appropriate industrial spaces. This project will help accelerate the development of the York County site and the identification of regional demonstration projects and infrastructure. The total project cost is estimated at $22 million

including a match from VISA state budget allotments, state funding and land contributions from York County.

c. **Maritime Small Business Innovation Collaborative**: Build upon regional organizations such as OpenSeas and 757Collab to create a maritime-focused collaborative that leverages blue economy issues and institutional research to create and grow innovation-based companies. The total project cost is estimated at $18.25 million with a match from CIT, state funding, customers and investors.

d. **ODU Maritime Cybersecurity and Data Analytics Center of Excellence in Virginia Beach**: Create a home for academic programs for cybersecurity and data analytics, a cybersecurity credentialing center, and the Internet Shipping Computational Platform and Test Bed. The Coastal Virginia Center for Cyber Innovation, a regional node of the Commonwealth Cyber Initiative responsible for bringing together regional businesses and higher education institutions to promote research and economic development related to cybersecurity, will move its headquarters to the Center. The total project cost is estimated at $9.75 million with a match of $2 million from the Coastal Virginia Center for Cyber Innovation's annual allocation that it receives as part of the Commonwealth Cyber Initiative.

7. Jefferson Lab Diversification

As one of the smaller national laboratories focused on a single science area, Jefferson Lab needs to diversify its mission. Following the Department of Energy's decision to locate the Electron Ion Collider (EIC) at Brookhaven Lab on Long Island, a partnership has formed whereby the Jefferson Lab staff will assist in the design and fabrication of the EIC. This work will provide real benefits to the region for the next several years, but it will not address the underlying need to diversify the mission of the Jefferson Lab.

The U.S. Department of Energy has proposed, in the President's budget introduced at the end of May, the development of a fourth “supercomputer” on the East Coast. The construction of a High-Performance Data Facility would create the needed diversification of Jefferson Lab’s mission. The facility will cost approximately $500 million, and, unlike the EIC, it offers much greater opportunities for commercialization.

8. RVA757 Connects /The I-64 Innovation Corridor

The creation of a mega region focused on connecting Hampton Roads and Richmond along the I-64 corridor offers significant opportunities to both sub-regions. Formally incorporated as a 501-C-3, the organization has inventoried a significant number of innovative institutions and companies along I-64 and has developed a list of priority projects which offer tremendous value to both sub-regions. Included in this list for advocacy and action in 2022 are the construction of the 29-mile gap on the Interstate to widen the current four lanes to six lanes. Also, on the agenda is continued support for the extension of the existing Virginia Capital Trail from Richmond to Williamsburg to historic Fort Monroe as the Birthplace of America Trail (including the construction of the African landing memorial).

Also on the agenda for next year is the significant effort to become a Global Internet Hub by building off the incredible presence of the transatlantic high-capacity cables and the connections to the fourth-largest hosting facility operated by QTS in Henrico County. The analysis of other Global Internet Hubs demonstrates that once concentration is recognized widely, a virtuous cycle occurs with additional data centers, data analytic operations, Artificial Intelligence programmers and users, and cyber security companies clustering throughout the megaregion.

Finally, through a GO Virginia grant, a task force analyzed the collective workforce in the megaregion and identified existing and projected talent gaps for the years ahead.

9. Clean Energy

Over the next 30 years, the U.S. will shift from a fossil fuel-based economy to a more sustainable economy based on “clean energy.” The shift offers great opportunities for our region to focus on the development of Offshore Wind (OSW) energy. Due to our Mid-Atlantic location and acknowledged operational advantages of the port of Virginia, Hampton Roads stands to gain a potential strategic advantage over other locations on the East Coast if we act now.

In early November, Dominion Energy filed its construction and operations plan with BOEM for the $9.8 billion OSW installation of 176 turbines off the shore of Virginia Beach. This facility will be the largest OSW facility in North America, providing 2,640 MW of electricity to power 660,000 homes. To make this possible, Dominion Energy has contracted for an installation vessel at a cost of $500 million. This vessel, the first Jones Act-compliant ship, will be homeported in Hampton Roads and provide capacity to install additional OSW facilities along the coast.

Avangrid Renewables’ Kitty Hawk project will follow the Dominion project and will be serviced out of the port of Virginia. As other OSW projects come online the ability to utilize the Portsmouth Marine Terminal and other properties such as Lambert’s Point will help secure a Hampton Roads advantage.

The recent Siemens Gamesa announcement of a $200 million blade finishing facility to be located on the PMT property and the HR Alliance activities following the XODUS supply chain study should produce dividends for the region. Hampton Roads’ situation is further advantaged by the three-state MOU (VA/MD/NC) executed in 2021. The XODUS analysis of existing supply chain businesses contemplating expenditures for product diversification suggests the establishment of a fund to incentivize the advanced shift in production for OSW.

In addition to the lead provided by OSW, other elements of the clean energy cluster including solar, while not tied to our locational advantages, have the potential to make the region a center for clean energy. Solar developers have already installed over 1,100 MW of collector capacity as shown in Appendix E.

Other opportunities such as “green hydrogen” production will be tested in conjunction with the OSW project. Also, innovative technologies for the conversion of solid waste into electricity, clean diesel fuel and other products are actively under consideration. Finally, battery storage firms are already taking shape in the region. If we embrace all the elements of clean energy, Hampton Roads can become a leading center nationally for this increasingly important industry. With this in mind, the Hampton Roads Alliance applied for and received a GO Virginia grant to prepare a regional energy assessment in 2022.

10. Public Health

The Hampton Roads region currently exhibits wide health disparities. While this presents a major problem, it also presents a very real opportunity. Reinvent Hampton Roads managed an analysis of the region’s healthcare system to examine best practices around the country. ODU, EVMS, Sentara, CHKD, and NSU, as well as the Commonwealth of Virginia, participated in this analysis in varying degrees. The Manatt study recommended multiple approaches to address these disparities as well as ways to structure a productive relationship of system components. One such approach calls for a collaborative effort to establish the first school of public health in the Commonwealth. This approach is to be guided by a recently proposed MOU that spells out the participants and their respective responsibilities.

Improving health literacy is another complementary approach to improve public health while at the same time increasing the productivity of the labor force. Healthier757 is a 501-C-3 organization devoted to establishing a regional solution utilizing an innovative platform

developed by EDLogics, a local startup. This approach is based on gamification and offering prizes through competitions and presents an appealing way to engage in learning about improving personal health.

Finally, Hampton Roads is the largest region in the country without a freestanding Hospice House. A nonprofit has been formed to address this situation. The Hospice House of Hampton Roads has partnered with the City of Virginia Beach to construct and operate the much-needed facility. They have already raised $4.6 million of the $9 million estimated to build, staff, and open such a prototype facility in the region. There is hope that once the initial facility is constructed in 2022, that a series of Hospice facilities can be realized throughout the region over the coming years.

11. Comprehensive Infrastructure

The COVID-19 pandemic has brought a series of federal initiatives to construct severely needed infrastructure designed to transform the regional economy and create jobs. The unprecedented influx of trillions of dollars in Federal funding served as a wake-up call for Hampton Roads and resulted in the establishment of the ad hoc Hampton Roads Infrastructure Coalition (HRIC). The purpose of HRIC is to monitor activities at the Federal and State levels and to develop a comprehensive prioritized regional package of infrastructure projects that have the very real potential to transform the regional economy.

Fortunately for us, the region had already established trusting relationships between the various regional organizations and the Hampton Roads Planning District Commission/Hampton Roads Transportation Planning Organization. They have been preparing prioritized project lists including roads, bridges, tunnels, a broadband fiber ring, the port's dredging of the harbor channel, public transit, trails, airport improvements, and flooding and sea-level rise. The sum of

these various megaprojects total in the billions of dollars; our region could not have progressed in such a fiscally constrained environment without congressional action.

Previously mentioned, but worth repeating here again, are projects such as a 29-mile gap on I-64 to connect Hampton Roads and Richmond, the concept of extending I-87 to the South to access the markets of Raleigh/Durham, transformative projects such as constructing the Broadband Fiber Ring throughout the entire region, extending an improved Route 58 to connect more efficiently to I-95 and I-85, continuing further improvements to the port and airport, and, finally, sea level rise and drainage projects (including those just authorized by a 70% voter approval on the recent bond issue referendum in Virginia Beach).The collective impact of investments of Federal dollars will generate thousands of jobs in Hampton Roads as well as the rest of the country.

12. <u>Diversity, Equity, and Inclusion</u>

In the wake of the social justice movements of 2020, businesses and economic developers have placed a greater emphasis on diversity, equity, and inclusion as strategies to address economic challenges. Regional leaders, as part of the 757 Framework, will focus on two key initiatives. First, we will deliver diversity and inclusion education and training to the 1,000 companies and nonprofits, including best practices from Hampton Roads companies and nonprofits who embrace diversity and inclusion. Second, we will aggressively support and grow minority entrepreneurs, startups, and small businesses. We will inventory support services and resources in the region and formulate a comprehensive minority supplier support ecosystem.

In addition, regional organizations should promote opportunities for internships for students of color and partner with the region's HBCUs (Hampton University and Norfolk State) to link major regional employers with graduating students. Finally, organizations like the Hampton Roads Workforce Council and local economic development departments should partner with

public school systems to implement additional career & technical education and internship opportunities for students at every high school in the region. These efforts will serve to provide potential regional employees with additional skills and a higher wage potential, and, in turn, will enhance the productivity quotient of the overall employee base.

Section 8: Concluding Remarks

This report serves as Region 5's biennial update to its initial Growth and Diversification Plan. While the 2019 update pointed to recent improvements in some measures of economic performance, we, unfortunately, cannot do the same. Since the Great Recession of 2007 – 2009, Region 5's economic performance has lagged the state and the nation. Region 5's performance has also lagged that of Region 4 (centered in the Richmond metropolitan area) and Region 7 (centered in Northern Virginia). Region 5's share of economic activity and population in the Commonwealth has declined over the last decade, and the economic center of gravity in the Commonwealth is increasingly concentrated between Richmond and Northern Virginia.

Region 5 has consistently fallen below the pace of job creation in the Commonwealth and the nation since the Great Recession. Region 5's annual employment growth from 2010 to 2019 was 7th out of all GO Virginia regions. Per capita income growth in Region 5 also lagged the Commonwealth and the nation. More recently, Region 5's recovery from the economic shock of the COVID-19 pandemic has been slower than that of Virginia and the United States. Even though the Port of Virginia has moved a record amount of cargo traffic in 2021 and the hotel industry has, by and large, recovered from the losses of 2020, the region still has underperformed its peer and aspirant regions. It should be no surprise that Region 5 has experienced domestic outmigration, which appears to be concentrated among residents of prime working age. If these trends continue, Region 5 may experience an outright decline in its total population in the coming decade.

Region 5's dependence on federal spending fueled economic growth at the beginning of the century, but this relationship no longer appears to be as reliable as it once was. Even though federal, and specifically, DoD spending has increased since 2016, the region has not observed a corresponding burst of economic activity. Given the increasing levels of federal debt and the continued pivot of national security strategy towards the Pacific, the region should prepare itself

for a tapering of growth in federal spending or, in the worst case, an outright decline in federal spending in the region. Given that federal civilian employers and military personnel earn almost twice that of the private sector average, such a shift in spending priorities would be a significant economic shock to the region. In other words, Region 5 would have to create almost two private sector jobs for the loss of one federal employee or military servicemember, and its recent record of job creation does not lend confidence to this occurring in the near-term. Diversifying the region's economy is no longer a luxury, it is a necessity to bolster private sector job creation, attract and retain talent, and reduce future economic shocks.

The measures of innovation in Region 5 highlight one conclusion: the region requires a concerted effort to address its performance. Innovation cannot be fixed overnight and requires a long-term vision that leverages existing strengths in the region. Looking northward to Virginia Commonwealth University and the University of Virginia suggests that an education-health-research nexus could be formed in Region 5 to foster innovation. The key industry clusters could also serve as innovation incubations as well as finding commercial applications for the research done at Jefferson Lab and NASA Langley. These are not overnight investments or policy changes but fostering long-term structural change should be a high priority for economic development in Region 5.

Section 3 examined Region 5's priority industry clusters. This report reaffirms the previously identified clusters and adds a new cluster in Clean Energy. These clusters occupy the intersection of manufacturing, technology, and the environment. While Region 5 must face the challenge posed by sea level rise, it is also an opportunity for the region to grow in this emerging industry space. Recent announcements regarding the construction of windmills of the coast of Region 5 are a signal that the Clean Energy cluster could grow faster than it has over the past decade. Investments in business ready sites (discussed in Section 5) are one part of the solution

to grow higher-paying jobs in the priority industry clusters. However, we continue to caution that, without concerted action, competitive advantages can quickly erode as other regions pursue aggressive development strategies.

Section 4 provided a look at the state of the region's workforce. Our analysis concludes that Region 5 has not made progress with regards to the goal of generating more awards in STEM fields. Without sufficient numbers of awards in engineering, mathematics, and computer-related fields, the priority industry clusters will face increasing difficulties in attracting and retaining talent. Broader economic conditions, to include the "Great Resignation" and domestic outmigration from Region 5, will only exacerbate workforce gaps in the coming years.

Section 6 provides a review of actions taken within the Region 5 improve coordination and growth while Section 7 offers recommendations on specific actions to foster long-term growth. No one strategy is likely to produce a 'home run' in terms of economic development. We recommend an open conversation about building the foundation for economic diversification and resiliency that requires smaller actions in the short run that build up to long-term change. Investments in infrastructure, leveraging the success of the Port of Virginia, and building collaboration among institutions of higher education and the private sector will be key to moving Region 5 forward. Site development can help move Region 5 from a transit region for cargo to a region that produces intermediate imports that are then re-exported at higher value. Lastly, as we have seen over the past two years, investments in public health can pay rewards not only in healthier communities but resiliency in the face of unexpected events. If the pandemic has made one thing clear, it is that we, as a region, cannot afford to return to the status quo.

Appendix A - Go Virginia Grants Awarded as of October 2021

Project	GO VA Award	Match Committed	Total Investment	Grant type	GO Virginia Strategy Area
Retooling Manufacturers	$2,950,000	$1,475,000	$4,425,000	Competitive	Cluster Scale-Up
VA Bio-Connect	$1,599,653	$1,599,653	$3,199,306	Competitive	Cluster Scale-Up
VCA #1	$642,713	$750,100	$1,392,813	Per capita	Workforce Development
VDSP #1	$647,540	$1,877,000	$2,524,540	Per capita	Workforce Development
757 Seed Fund	$140,000	$256,000	$396,000	Per capita	Startup Ecosystem
HR RIFA and Drone Park	$150,000	$150,000	$300,000	Per capita	Site Development & Infrastructure
VDSP #2	$647,540	$1,877,000	$2,524,540	Per capita	Workforce Development
VCA #2	$642,713	$750,100	$1,392,813	Per capita	Workforce Development
757 Angel Network	$240,000	$479,000	$719,000	Per capita	Startup Ecosystem
AN Sewer & Site Study	$65,000	$65,000	$130,000	Enhanced Capacity	Site Development & Infrastructure
HR Coalition for Talent Dev.	$99,705	$100,000	$199,705	Enhanced Capacity	Workforce Development
The GIG	$85,117	$115,728	$200,845	Enhanced Capacity	Startup Ecosystem
COVA MAP	$1,532,500	$1,636,500	$3,169,000	Per capita	Workforce Development
REI:757	$266,667	$133,333	$400,000	Per capita	Startup Ecosystem
Campus757	$95,838	$96,500	$192,338	Enhanced Capacity	Workforce Development
ES HydroDrone	$99,300	$92,680	$191,980	Enhanced Capacity	Cluster Scale-Up
757 Recovery & Resilience	$100,000	$100,000	$200,000	ERR FAST Access	Cluster Scale-Up
OSW Supply Chain Hub	$529,788	$290,840	$820,628	Per capita	Cluster Scale-Up
GWP Target Industry	$36,375	$18,244	$54,619	Enhanced Capacity	Cluster Scale-Up
HRED Sites Readiness	$1,122,240	$8,056,960	$9,179,200	Per capita	Site Development & Infrastructure

Appendix A - Go Virginia Grants Awarded as of October 2021 (Cont.)

Project	GO VA Award	Match Committed	Total Investment	Grant type	GO Virginia Strategy Area
HRWC Talent Pipeline	$663,696	$332,000	$995,696	Per capita	Workforce Development
VA Virtual Maritime TT	$100,000	$200,000	$300,000	ERR FAST Access	Workforce Development
Regional Robotics Hub	$73,000	$38,000	$111,000	Enhanced Capacity	Cluster Scale-Up
RVA757 Connects	$90,000	$45,000	$135,000	Enhanced Capacity	Workforce Development
Maritime Trades Program Exp.	$99,137	$49,569	$148,706	ERR FAST Access	Workforce Development
757 Collab Bridge	$32,000	$120,024	$152,024	Enhanced Capacity	Startup Ecosystem
Startup Stability Program	$197,000	$235,295	$432,295	ERR Per Capita	Startup Ecosystem
Resilience & Adaptation Econ	$2,937,163	$3,696,411	$6,633,574	Competitive	Workforce Development
VA K-12 Computer Science	$2,424,537	$3,106,015	$5,530,552	Competitive	Workforce Development
Campus757	$500,000	$250,000	$750,000	Per capita	Workforce Development
VA SBDC Mentor Program	$882,794	$442,497	$1,325,291	Competitive	Cluster Scale-Up
Cybersecurity Job Creation System	$1,450,000	$1,643,637	$3,093,637	Competitive	Workforce Development
757Collab	$2,415,573	$1,390,286	$3,805,859	Per capita	Startup Ecosystem
Neighborhood	$85,222	$42,611	$127,833	ERR Fast Access	Workforce Development
SPARK	$100,000	$55,000	$155,000	Enhanced Capacity	Workforce Development
HR Energy Master Plan	$84,000	$42,000	$126,000	Enhanced Capacity	Cluster Scale-Up
Total	**$23,826,811**	**$31,607,983**	**$55,308,794**	**--**	**--**

Appendix B – GO Virginia Region 5 Announcements - August 2019 to October 2021

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Siemens Gamesa Renewable Energy	Portsmouth	221115	Manufactures offshore wind blades	October 2021	N	310	$83.64
Global Concentrate	Franklin City	311411	Produces and bottles juice concentrate	September 2021	N	50	$121.00
Aery Aviation, LLC	Newport News	336412	Full-service commercial and government services provider to the aerospace industry	September 2021	E	211	$15.30
Prism Maritime	Chesapeake	541330	Full-service provider of maritime support services to the U.S. government	August 2021	E	166	$4.02
SVT Robotics	Norfolk	511210	Provider of a software platform which accelerates and simplifies the deployment of industrial robotics	August 2021	E	37	$0.10
MI Technical Solutions, Inc.	Chesapeake	541512	Provides information technology solutions for military vessels	July 2021	E	10	$0.52
Kristi Corporation USA	Suffolk	115310	Supplier of raw materials for aluminum and steel metallurgical industries	June 2021	N	10	$1.06
Lyon Shipyard	Norfolk	336611	Full-service repair and industrial service provider	June 2021	E	119	$24.40
Anchor Sandblasting and Coatings	Norfolk	238320	Provides sandblasting, pressure washing, and painting services to the maritime industry	May 2021	E	45	$0.25
Breeze Airways	Norfolk	481111	Start-up low cost airline corporate services	May 2021	N	116	$5.20
indieDwell	Newport News	321991	Steel modular housing manufacturing	May 2021	N	220	$2.00

Appendix B – GO Virginia Region 5 Announcements - August 2019 to October 2021 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Kimley-Horn & Associates, Inc.	Virginia Beach	518210	Data center	May 2021	E	0	$102.00
Dante Valve Company	Norfolk	332911	Manufacturer and distributor of valves and related products	April 2021	E	40	$1.86
Sunny Farms, LLC	Virginia Beach	111419	Hydroponic greenhouse	April 2021	N	155	$59.60
Katoen Natie Norfolk, Inc.	Norfolk	493110	Plastics and polymers warehousing and distribution	April 2021	E	35	$61.00
JRF Ship Repairs	Portsmouth	336611	Ship building repair	April 2021	E	0	$0.50
CMA CGM	Norfolk	483111	Provides transportation and shipping services	February 2021	E	415	$36.00
Coastal Precast	Northampton	327390	Manufactures concrete ready mix	February 2021	E	41	$7.50
Tabet Manufacturing Company, Inc.	Norfolk	332322	Developer and manufacturer of large suite communications equipment and custom solutions for military and industrial consumers	January 2021	E	68	$6.51
Atlantic Wind Transfers	Norfolk	488390	Provides support services to offshore wind farms	January 2021	N	3	$0.03
Premium PPE	Virginia Beach	315210	Manufacturer of AmeriShield branded masks and personal protective equipment	October 2020	E	180	$5.30
Plasser American*	Chesapeake	333120	Manufacturer of railway construction and maintenance equipment	October 2020	E	98	$52.60
Amazon	Norfolk	492110	Fulfillment center	September 2020	E	100	$10.00

Appendix B – GO Virginia Region 5 Announcements - August 2019 to October 2021 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Acoustical Sheetmetal Company (ASC)`	Virginia Beach	332322	Manufacturer of sound attenuating and weather protective enclosures for on-site power	July 2020	E	200	$15.80
SJS Industrial	Virginia Beach	332812	Provides powder, ceramic, and clear coating services	June 2020	E	0	$1.00
East Coast Repair & Fabrication	Newport News	488390	Performs maintenance and repairs on marine vessels	June 2020	E	332	$64.40
Apex Systems, Inc.	Virginia Beach	561320	Provides professional staffing and IT solutions	June 2020	E	147	$1.88
Valkyrie Enterprises, Inc.	Virginia Beach	541330	System engineering and acquisition support, readiness, modernization	May 2020	E	100	$0.68
Huntington-Ingalls	Hampton	336611	Unmanned submarines	May 2020	E	268	$46.00
Total Fiber Recovery	Chesapeake	322110	Produces recycled pulp	February 2020	N	68	$48.99
KD Navien*	James City	332410	Provides tankless water heaters, boilers, and combi-boilers for residential and commercial markets	February 2020	N	180	$77.50
Bicast	James City	424990	Manufactures and distributes souvenirs	February 2020	E	18	$1.00
Acesur USA LLC*	Suffolk	311224	Olive oil blending, bottling, and packaging	January 2020	N	29	$10.97
GMAX Industries, Inc.	Franklin City	326199	Manufacturer and sourcing agent of medical disposable products	January 2020	N	40	$10.50
DOMA Technologies, LLC	Virginia Beach	541513	Cloud-based data and document management	December 2019	E	300	$1.40

* Indicates that the Company has headquarters in another country.

Appendix B – GO Virginia Region 5 Announcements - August 2019 to October 2021 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
G2 Ops	Virginia Beach	541511	Provides system modeling, systems engineering, and cybersecurity services	December 2019	E	10	$0.40
Bon Bon Farms	Southampton	311224	Provides hemp plugs to farms	December 2019	N	162	$8.50
Hubbard Peanut Company	Franklin City	311911	Peanut manufacturing	November 2019	E	10	$1.60
InMotion Hosting, Inc.	Virginia Beach	517311	Provides business web hosting services	November 2019	E	50	$12.20
TST Fabrication, LLC	Norfolk	332999	Sheet metal fabrication	November 2019	E	34	$4.09
Priority Title & Escrow LLC	Virginia Beach	541191	Professional services	November 2019	E	200	$0.40
DroneUp, LLC	Virginia Beach	551114	HQ; web and mobile platform for on-demand drone pilot services	October 2019	E	41	$0.13
SRP Companies	Virginia Beach	493190	Warehouse facility	October 2019	N	131	$1.16
LifeNet Health	Virginia Beach	339112	Regenerative organ and tissue R&D	September 2019	E	44	$1.80
Eagle Aviation Technologies, LLC	Newport News	336411	Manufactures and designs prototype systems and components for the aviation, space, and marine industries.	September 2019	E	75	$0.21
Tegra Global	Norfolk	315280	Apparel manufacturer and supply chain provider	September 2019	E	200	$0.00
Flower Baking Co.	Norfolk	311812	Commercial bakery	August 2019	E	16	$0.00
POSH	Virginia Beach	561421	Virtual receptionist	August 2019	N	60	$0.00
IP Configure	Norfolk	541715	Video surveillance research and development software	August 2019	E	0	$12.00

* Indicates that the Company has headquarters in another country.

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Superior Float Products	Norfolk	332420	Manufacturer of therapeutic floatation tanks and floatation tank equipment	July 2019	E	8	$0.35
Mitsubishi Chemical Composites America, Inc.*	Chesapeake	331313	APOLIC metals and plastics manufacturing	July 2019	E	30	$5.00
Arreff Terminals, Inc.	Portsmouth	484110	Organic grain handler and trans loading	June 2019	E	12	$3.00
Repair Tech	Franklin City	332313	Specializes in millwright, piping, steel fabrication, and machining services	May 2019	E	0	$1.00
Smithfield Foods, Inc.*	Suffolk	541614	Logistics office	May 2019	E	140	$1.31
Fornazor International, Inc.	Norfolk	488210	Trans load facility	May 2019	E	15	$2.50
Preferred Freezer Services	Portsmouth	493120	Temperature-controlled distribution	April 2019	E	60	$60.00
BN Media Associates, LLC	Virginia Beach	551114	Online media and retail company	April 2019	E	5	$0.28
Three Ships	Virginia Beach	311920	Coffee roasters	April 2019	E	15	$0.25
Seaward Marine Services, Inc.	Norfolk	811310	Marine repair services	April 2019	E	30	$8.00
Land & Coates	Norfolk	493110	Warehouse and distribution of lawn care equipment	April 2019	E	0	$9.00
Point One USA, LLC	Virginia Beach	541618	Training for military and law enforcement professionals	March 2019	E	15	$1.50
Cloverleaf Cold Storage	Chesapeake	493120	Cold storage warehousing and food logistics	January 2019	E	33	$21.00
SPARQ Global, LLC	Virginia Beach	541512	Cyber security	January 2019	E	250	$20.00

* Indicates that the Company has headquarters in another country.

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Lipton*	Suffolk	311920	Tea, bagged and instant	December 2018	E	10	$2.90
Target Corporation	Suffolk	423990	Distribution center	December 2018	E	225	$2.80
Standard Calibrations, Inc.	Chesapeake	334513	Sensor and instrumentation calibration, repair, and configuration	December 2018	E	89	$9.60
Enviva LP	Southampton	321999	Manufactures wood pellets	December 2018	E	0	$75.00
BMZ*	Virginia Beach	335911	U.S. HQ; rechargeable batteries	November 2018	E	30	$2.81
Hampton Farms	Southampton	311911	Peanut butter production	October 2018	E	14	$5.74
Belmont Peanuts	Southampton	311911	Peanut processing	September 2018	E	15	$2.50
Auxiliary Systems Inc.	Norfolk	336611	An auxiliary system manufacturer for commercial and government clients in the marine industry	July 2018	E	0	$0.22
IMS: GEAR Virginia LLC*	Virginia Beach	333612	Manufacturer of automotive equipment	June 2018	E	0	$1.05
Newport News Shipbuilding (HII)	Newport News	336611	Shipbuilding and repair	June 2018	E	2000	$8.75
Custom Panel & Controls LLC	Virginia Beach	238210	Electrical contractor servicing the marine and commercial industries	June 2018	E	15	$2.30
New Ravenna	Northampton	327120	Designer and manufacturer of stone and glass mosaics for residential, commercial, and hospitality installations	June 2018	E	31	$0.83
Sugar Skull Creative	Virginia Beach	512110	Full-service video production	May 2018	E	0	$0.10
Porpoise	Virginia Beach	323113	Custom workshop	May 2018	E	0	$0.07
Wave Riding Vehicles	Virginia Beach	339920	Surfboard manufacturing	May 2018	E	0	$0.12

* Indicates that the Company has headquarters in another country.

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
MI Technical Solutions, Inc.	Chesapeake	541512	Professional engineering and technical services operations	April 2018	E	15	$0.10
Blue Bell	Suffolk	493120	Warehouse and distribution of ice cream products	April 2018	E	30	$6.40
Studio Center	Virginia Beach	512110	Broadcast advertising production company	April 2018	E	20	$1.30
Willard Marine	Virginia Beach	336611	East Coast HQ; small custom boats for government, military, and commercial uses	April 2018	E	20	$0.00
BCF	Virginia Beach	541810	Advertising and public relations	April 2018	E	0	$0.28
CSC	Virginia Beach	541512	Information technology services	April 2018	E	10	$0.10
DCS Corporation	Virginia Beach	541330	Mission-critical engineering services	April 2018	E	2	$0.08
Halcrow	Virginia Beach	541330	Engineering Services	April 2018	E	3	$0.20
Impression in Print	Virginia Beach	323111	Creates, warehouses, and distributes branded products	April 2018	E	10	$1.14
Ironclad Technology Group	Virginia Beach	541512	IT and engineering services	April 2018	E	0	$0.18
Klett Consulting Group	Virginia Beach	541611	Financial consulting for public and private clients	April 2018	E	12	$0.35
Loan Care, LLC	Virginia Beach	522291	Corp HQ; Consumer loan processing	April 2018	E	50	$0.10
Nexus Direct	Virginia Beach	541860	Advertising, marketing, and fundraising	April 2018	E	2	$0.18
Novonics Corporation	Virginia Beach	541512	Management support, systems engineering, software development, test evaluation services	April 2018	E	2	$0.05

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
reQuire, LLC	Virginia Beach	541511	Web-based lien release tracking and reporting services	April 2018	E	36	$0.00
RK&K	Virginia Beach	541330	Full-service engineering company	April 2018	E	12	$0.10
SYNTECH	Virginia Beach	541512	Integrated computer systems design	April 2018	E	4	$0.05
Tidewater Fleet Supply	Virginia Beach	423120	Full-line automotive, truck, and heavy equipment parts distributor	April 2018	E	0	$1.25
Turner Strategic Technologies	Virginia Beach	541512	Tactical and IT consulting, environmental management, engineering support	April 2018	E	18	$0.17
Virginia Asset Group, Inc.	Virginia Beach	522320	Community based financial services firm	April 2018	E	5	$0.00
Restaurant Depot	Virginia Beach	493110	Wholesale & distribution of restaurant equipment	April 2018	E	50	$9.00
Epic Manufacturing	Virginia Beach	339112	Metal fabrication for industrial, medical, and defense industries	April 2018	E	0	$2.00
North End Bag Company	Virginia Beach	314910	Manufactures and sells handcrafted canvases and leather goods	April 2018	E	0	$0.20
Air Marine Systems, Inc.	Virginia Beach	423690	Resell of new and used marine & aviation used parts	April 2018	E	0	$1.10
Allied Technology Group, Inc.	Virginia Beach	541330	Provides engineering and information management solutions	April 2018	E	18	$0.05
Avis Budget Group, Inc.	Virginia Beach	561499	Customer service center	April 2018	E	100	$0.10
Azzure Denim	Virginia Beach	315990	Clothes design, manufacture, and distribution	April 2018	E	0	$0.00
Broad Bay Clothing	Virginia Beach	315990	Manufacturer of logo clothing	April 2018	E	5	$0.43
Centurion Document Management	Virginia Beach	561499	Document management services	April 2018	E	0	$0.10

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Consumer Recovery Associates	Virginia Beach	522320	Finance and collection services	April 2018	E	8	$0.00
EIMSKIP USA, Inc.*	Virginia Beach	488510	U.S. HQ; global shipping and logistics provider	April 2018	E	5	$0.10
Global Supply Solutions (GSS Gear)	Virginia Beach	423910	Supplier of tactical and outdoor gear	April 2018	E	3	$0.05
HBI Priority Freight	Virginia Beach	488510	Line haul freight services	April 2018	E	0	$0.10
Hermes Abrasives*	Virginia Beach	327910	US HQ; manufacturer of industrial abrasives	April 2018	E	30	$5.00
Liberty Tax Services	Virginia Beach	541213	Corporate headquarters; financial services and call center operations	April 2018	E	0	$0.18
NCS Pearson, Inc.*	Virginia Beach	541511	Training and testing services	April 2018	E	0	$0.15
Precision Measurements, Inc.	Virginia Beach	541370	HQ; National land surveying company	April 2018	E	4	$0.05
Prime Lending, Inc.	Virginia Beach	522310	Mortgage funding and services	April 2018	E	5	$0.15
Special Tactical Services (STS)	Virginia Beach	334511	Provides weapons and tactical training	April 2018	E	20	$0.60
Transformational Defense Industries, Inc.	Virginia Beach	332994	Develops and manufactures weapon operating systems	April 2018	E	35	$3.00
Mygrant Glass Company	Virginia Beach	423120	Wholesale and distribution of auto glass	April 2018	E	25	$0.00
Serco, Inc.*	Virginia Beach	551114	Provides services to the federal government	April 2018	E	118	$0.00
Virginia Natural Gas	Virginia Beach	551114	Regional HQ; natural gas service provider	April 2018	E	110	$6.50

*Indicates that the Company has headquarters in another Country.

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Tegra Global	Norfolk	315990	Apparel manufacturer and supply chain provider	March 2018	E	300	$4.00
Fairlead Boatworks	Newport News	336611	Ship building and repair	March 2018	E	60	$3.00
Liebherr USA*	Newport News	333120	Manufactures construction machinery	March 2018	E	0	$45.00
Commune Bakery LLC	Virginia Beach	311812	Commercial bakery	March 2018	E	5	$0.16
Valkyrie Enterprises, LLC	Norfolk	541330	System engineering and acquisition support, readiness, modernization	February 2018	E	30	$0.00
Terramar USA*	Norfolk	424910	Supplier of raw materials for animal feed	February 2018	E	20	$0.00
Electric Motor & Contracting	Chesapeake	811310	Re-manufactures electric motors for the maritime, water/waste, and energy industries	January 2018	E	0	$3.00
Sumitomo Machinery Corporation of America*	Chesapeake	333249	Global leader in power transmission and recognized as one of the premier power transmission and control solution providers	January 2018	E	26	$10.00
Muhlbauer, Inc.*	Newport News	334413	Consultant and manufacturer of automation solutions for smart card and label, semiconductor backend, and vision industries.	January 2018	E	5	$7.00
Instant Systems	Norfolk	326112	Specializes in creating custom, medical grade bags for storage and transport of biological materials.	December 2017	E	5	$0.46
Geico Corporation	Virginia Beach	524210	Finance and Insurance	December 2017	E	500	$0.00
Global Technical Systems	Virginia Beach	333611	Electro-mechanical energy storage system manufacturing.	December 2017	E	1110	$54.70

*Indicates that the Company has headquarters in another Country.

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
TDI LLC	Virginia Beach	314999	Specialized distributor of high end tactical equipment.	November 2017	E	15	$2.20
Farmhouse Cidery	Virginia Beach	312120	Craft beer manufacturer.	November 2017	E	9	$0.75
Mythics	Virginia Beach	541512	Company is an award-winning Oracle systems integrator, consulting firm, and elite Oracle platinum resale partner.	November 2017	E	30	$7.50
J&F Alliance Group	Hampton	541511	Augmented reality and integrated logistics	November 2017	E	119	$0.10
Chemres	Chesapeake	325211	Global supplier of commodity and engineering resins.	November 2017	E	5	$3.00
Standard Calibrations, Inc.	Chesapeake	811219	Industry leader of sensor and instrumentation calibration, repair, and configuration with an outstanding reputation for quality and safety.	November 2017	E	14	$0.29
GBS Group	Virginia Beach	541330	HQ; Navy ship modernization and technology insertion	November 2017	E	15	$0.13
GET Solutions	Virginia Beach	541330	Provides geotechnical engineering/construction materials testing services with in-house drilling capabilities, environmental testing, and certified soil and concrete testing laboratories.	October 2017	E	10	$3.65
STIHL Inc.*	Virginia Beach	333991	Manufactures outdoor power tools.	October 2017	E	0	$25.00
Maximus	Hampton	561422	Call Center to support federal government contracts	October 2017	E	230	$0.57
SimIs Inc.	Portsmouth	541611	Modeling, simulation, information security solutions, engineering services	September 2017	E	50	$0.00
Marina Electrical Equipment	York	335311	Manufactures weatherproof electrical equipment in the marina industry.	September 2017	E	0	$0.50

Appendix C – GO Virginia Region 5 Announcements - August 2017 to July 2019 (Cont.)

Company Name	Locality	NAICS	Business Description	Month Announced	New / Expansion	New Jobs	Investment ($M)
Hermes Abrasives*	Virginia Beach	327910	US HQ; manufacturer of industrial abrasives	September 2017	E	12	$3.75
Leesa Sleep	Virginia Beach	442299	Corp HQ; manufacturer, marketing, and online sales of high end consumer products	September 2017	E	50	$0.10
PortRail Crane Service LLC	Portsmouth	532412	Crane service and repair	August 2017	E	30	$0.40
Broad Bay Cotton Company	Virginia Beach	323113	Producer of textile products for colleges and universities	August 2017	E	10	$0.13
LifeNet Health	Virginia Beach	621991	Regenerative medicine company expanding its HQ, R&D, and warehouse facilities	August 2017	E	114	$12.25

* Indicates that the Company has headquarters in another country.

Appendix D - Economic Accomplishments/Changes since August 1, 2019

1	Expansion of Port of Virginia-completed.
2	Dredging of harbor channel-underway, to be completed by end of 2024.
3	HRBT Expansion-underway, to be completed by end of 2025.
4	Hampton Roads Alliance restructuring completed.
5	I-64 widening to 6 lanes-segments: segments 1, 2 , and 3 complete.
6	RVA757 Connects established.
7	Hampton Roads Maritime Collaborative for Growth and Innovation-established.
8	Hampton Roads Workforce Council and Peninsula Council for Workforce Development-merged.
9	Norfolk Airport Expansion-underway, Breeze airlines establishes a hub.
10	ODU-Goal to become recognized as a world leader in maritime, announced November 4, 2021.
11	"HRIC"-Hampton Roads Infrastructure Collaborative established and prepares the first comprehensive regional, prioritized listing of projects.
12	Transatlantic subsea cables completed.
13	Broadband Authority-created.
14	CHKD Pediatric Mental Health Building-under construction.
15	EVMS Waitzer Building-completed.
16	James River Barge Service to RVA-increased.
17	757 Recovery and Resilience Action Framework-completed.
18	The "Assembly"-completed.
19	Navy Tech Bridge-established.
20	Campus 757-underway.
21	Atlantic Coast Pipeline-Canceled, creates need for Regional Energy Master Plan.
22	Amazon-Distribution and fulfillment centers-under construction.
23	Summit Point-Dollar Tree HQ completed; mixed use commercial center underway.

Appendix D - Economic Accomplishments/Changes since August 1, 2019 (Cont.)

24	Norfolk Southern HQ leaves region for Atlanta.	
25	Chesapeake Bay Bridge Tunnel Expansion-under construction.	
26	Sites Inventory-Completed, ready sites- projects underway.	
27	VRC Metal Systems-Opens in Chesapeake, cold spray effort.	
28	Military Circle Design Competition-submitted & under review.	
29	HII/NNS Unmanned Vehicle Manufacturing Facility-under construction in Hampton.	
30	Regional Branding Analysis-completed.	
31	Brock Cancer Center-completed with Sentara.	
32	Brock Environmental Center expansion-completed with Virginia Beach City Public Schools.	
33	Relocation of the F-22 formal training unit to Langley Air Force Base from Florida by the end of 2022.	
34	Suffolk reports over 1.2 million square feet of speculative industrial space in Plan review.	
35	Route 58 widening and modernization for 3.1 miles ($76M) part of the strategic connection to I-95/ I-85 and acknowledged as a “corridor of statewide significance”.	
36	Eastern Virginia Regional Industrial Facility Authority (EVRIFA)-established.	
37	Navlen, Inc., James City County to manufacture tankless water heaters.	
38	Jefferson Lab-although Hampton Roads didn't win the EIC substantial engineering work and construction authorized in partnership agreement, High Performance Data Facility HPDF) included in proposed Federal budget.	
39	Ferguson HQ completed.	
40	Liebher USA HQ completed.	
41	New Veterans Affair Clinic to Open in Chesapeake	
42	Additional Tourism/Quality of Life projects-completed	
	A.	Marriott Hotel in VB.
	B.	Elizabeth River Trail Foundation.
	C.	Renovation of art galleries in Colonial Williamsburg.

Appendix D - Accomplishments/Changes since August 1, 2019 (Cont.)

	Additional Tourism/Quality of Life projects-completed (Cont.)	
	D.	Gas Light Hotel & Gallery in Norfolk.
	E.	19th Street/ VIBE Virginia Beach.
	F.	Midtown Row in Williamsburg.
	G.	37 North at Fort Monroe.
43	Virginia Offshore Wind (OSW)	
	A.	First OSW turbines in Federal waters operational.
	B.	Tri-State OSW MOU signed (VA, NC, MD).
	C.	Dominion and Avangrid projects-proceeding.
	D.	Port of Virginia and Ørsted sign lease for 40 acres of PMT for load-out.
	E.	Commonwealth OSW committee established between Virginia Energy and ODU.
	F.	OSW Supply Chain Analysis-completed by Hampton Roads Alliance (XODUS).
	G.	Virginia OSW Landing-opened by Hampton Roads Alliance.
	H.	Siemens-Gamesa announces Blade Fabrication Facility at Portsmouth Marine Terminal (PMT).
	I.	Dominion Energy announces “lay-down” area at PMT.
	J.	OSW Turbine Installation “Jack-up” vessel under construction ($500M) to be ported in Hampton Roads.

Appendix E - Solar Power Projects as of October 31, 2021

Utility Scale Solar Projects: (1,095 MW total)	
1	Woodland, Isle of Wight County, 19 MW
2	Amazon Solar Farm Virginia–Southampton, Southampton County, 100 MW
3	Oceana, City of Virginia Beach, 18 MW
4	Spring Grove I, Surry County, 98 MW
5	Colonial Trail West, Surry County, 142 MW
6	Gloucester, Gloucester County, 20 MW
7	Myrtle, City of Suffolk, 15 MW
8	Bedford Solar, City of Chesapeake, 70 MW
9	Rochambeau, James City County, 20 MW
10	Chesapeake, City of Chesapeake, 118 MW*
11	Pleasant Hill, City of Suffolk, 20 MW*
12	Cavalier, Surry and Isle of Wight Counties, 170 MW*
13	Grassfield, City of Chesapeake, 20 MW
14	Norge, James City County, 20 MW
15	Camellia, Gloucester County, 20 MW
16	Solidago, Isle of Wight County, 20 MW
17	Winterberry, Gloucester County, 20 MW
18	Stratford, Suffolk County, 15 MW*
19	Surry, Surry County, 20 MW*
20	Ho Fel, Isle of Wight County, 50 MW*

Appendix E - Solar Power Projects as of October 31, 2021 (Cont.)

Utility Scale Solar Projects:	
21	Amazon Solar Farm Virginia–Accomack, Accomack County, 80 MW
22	Cherrydale, Northampton County, 20 MW
23	Kings Creek Commerce Center, York County, 20MW
24	Busch Industrial Park, York County, Lithium-ion Battery facility, 180 MW facility
Solar Distributed Generation Projects (less than or equal to 3 MW, total 14.13 M):	
1	Old Dominion University, City of Norfolk, 0.13 MW
2	Western Branch HS, City of Chesapeake, 1 MW
3	USS Boykins (1), Southampton County, 1 MW*
4	USS Boykins (3), Southampton County, 3 MW*
5	CenterPoint Solar 1, Suffolk County, 1 MW*
6	CenterPoint Solar 2, Suffolk County, 1 MW*
7	CenterPoint Solar 3, Suffolk County, 1 MW*
8	Wood Brothers Road 1, Gloucester County, 1 MW*
9	Wood Brothers Road 2, Gloucester County, 1 MW*
10	Wood Brothers Road 3, Gloucester County, 1 MW*
11	Suffolk, Suffolk County, City of Suffolk, 3 MW*
BrightSuite Solar Projects in operation or under development. Individual project sizes vary.	
1	Gatewood Peep Pre-K, Newport News
2	Ocean Lakes Elementary School, Virginia Beach
3	Thoroughgood Elementary School, Virginia Beach
4	Renaissance Academy, Virginia Beach

* Reflects power purchase agreements executed with Dominion Energy.

Appendix F - References

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"Region 5: Update on Entrepreneurial Trends: Phase II Analysis of Broader Innovation Ecosystem Measures," TEConomy Partners, LLC, September 14, 2021.

"*A Pathway for Maritime Innovation in Hampton Roads,"* TEConomy Partners, LLC, *September* 2021.

"757 Recovery and Resilience Action Framework," Hampton Roads Alliance, Reinvent Hampton Roads, additional Hampton Roads Regional Agencies, March 17, 2021.

"757 One Region: Economic Empowerment and Growth for All," Hampton Roads Alliance, Reinvent Hampton Roads, additional Hampton Roads Regional Agencies, *(Updated 2021)*.

"*Assessment of the Entrepreneurship Eco-System in the Hampton Roads Region,"* TechStars, April 2021.

"*Hampton Roads Demographics Benchmarking Report,"* Hampton Roads Planning District Commission, September 2021.

"Hampton Roads Local Comparison Report," Hampton Roads Planning District Commission, September 2021.

"Hampton Roads Supply Chain Analysis Local Comparison Report," Xodus Group Ltd, August 2021.

"State of the Region Report-2020," Dragas Center for Economic Analysis and Policy, ODU Strome College of Business, October 2020.

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"State of the Region Report-2021," October 2021. Dragas Center for Economic Analysis and Policy, ODU Strome College of Business,

"Moving Hampton Roads Forward: GO VA Region 5 Growth and Diversification Plan," Dr. Larry Filer, ODU; Terry Clower, Mark White, Spencer Shanholtz, GMU Center for Regional Analysis, August 2017.

"GO VA Region 5 Growth and Diversification Plan: Biennial Update 2019," Dragas Center for Economic Analysis and Policy, ODU Strome College of Business, August 1, 2019.

Appendix G - Go Virginia Regions and Localities

Region 1: Southwest	Region 2: West Central	Region 3: Southside	Region 4: South Central	Region 5: Hampton Roads
Bland	Alleghany	Amelia	Charles City (County)	Accomack
Bristol City	Amherst	Brunswick	Chesterfield	Chesapeake City
Buchanan	Appomattox	Buckingham	Colonial Heights City	Franklin City
Carroll	Bedford	Charlotte	Dinwiddie	Hampton City
Dickenson	Botetourt	Cumberland	Emporia City	Isle Of Wight
Galax City	Campbell	Danville City	Goochland	James City (County)
Grayson	Covington City	Halifax	Greensville	Newport News City
Lee	Craig	Henry	Hanover	Norfolk City
Norton City	Floyd	Lunenburg	Henrico	Northampton
Russell	Franklin	Martinsville City	Hopewell City	Poquoson City
Scott	Giles	Mecklenburg	New Kent	Portsmouth City
Smyth	Lynchburg City	Nottoway	Petersburg City	Southampton
Tazewell	Montgomery	Patrick	Powhatan	Suffolk City
Washington	Pulaski	Pittsylvania	Prince George	Virginia Beach City
Wise	Radford City	Prince Edward	Richmond City	Williamsburg City
Wythe	Roanoke City		Surry	York
	Roanoke		Sussex	
	Salem City			

Appendix G - Go Virginia Regions and Localities (Cont.)

Region 6: Eastern	Region 7: Northern	Region 8: Valley	Region 9: Central
Caroline	Alexandria City	Augusta	Albemarle
Essex	Arlington	Bath	Charlottesville City
Fredericksburg City	Fairfax City	Buena Vista City	Culpeper
Gloucester	Fairfax	Clarke	Fauquier
King And Queen	Falls Church City	Frederick	Fluvanna
King George	Loudoun	Harrisonburg City	Greene
King William	Manassas City	Highland	Louisa
Lancaster	Manassas Park City	Lexington City	Madison
Mathews	Prince William	Page	Nelson
Middlesex		Rockbridge	Orange
Northumberland		Rockingham	Rappahannock
Richmond		Shenandoah	
Spotsylvania		Staunton City	
Stafford		Warren	
Westmoreland		Waynesboro City	
		Winchester City	

Appendix H - Go Virginia Region 5 Leadership

Thomas R. Frantz, Chair	**Anne C.H. Conner, Vice Chair**
Mayor Kenneth Alexander, Ph.D.	Jeffrey Holland
Shawn Avery	Robert McKenna
Timothy Bentley, III	Cheryl McLesky
Bruce Bradley	Jerry Miller
John Broderick	J. D. Myers, II
Patrick Coady	John Olson, Ph.D.
Marcia Conston, Ph.D.	Mayor McKinley Price, DDS
William Downey	John Reinhart
Mayor Robert “Bobby” Dyer, Ph.D.	Katherine Rowe, Ph.D.
Jack Ezzell, Jr.	Jeffery Smith, Ph.D.
Mike Gentry	Bryan Stephens
Christen Faatz	Bruce Thompson
Maria Herbert	Thomas Tingle