

Montgomery County Life Sciences Real Estate and Land Use Compatibility Study

FINAL | Date: January 18, 2024

Submitted to Montgomery County Planning Department



This report was produced by ESI under contract with Montgomery Planning.

Executive Summary

Montgomery Planning is in the process of creating the Great Seneca Plan: Connecting Life and Science, which is an update to its 2010 Great Seneca Science Corridor Master Plan. Both plans seek to encourage mixed-use, life-sciences-focused development in the Life Science Center (LSC), the area in the Great Seneca Plan area that serves as the county's premier cluster of private life science activity. The LSC also includes the Universities at Shady Grove, the Adventist Healthcare Medical Center at Shady Grove, and the National Cancer Institute.

The current Great Seneca Plan update seeks to reinforce and catalyze the mixed-use land use and placemaking principles established in the 2010 plan, with an emphasis helping to address the county's housing crisis and make the LSC more competitive as a hub of economic activity.

To inform this plan update as well as the countywide approach to planning for the life science industry more generally, Montgomery Planning engaged Econsult Solutions, Inc. (ESI), a leading economic development firm based in Philadelphia, to provide its expertise regarding economic development best practices for the life science industry. While the report provides background and best practices related life science industry in a broad sense, including topics such as entrepreneurship and workforce development, its main focus is on the real estate needs of the life science industry, how they related to the competitiveness of life science clusters, and the feasibility of co-locating housing on or near sites with existing life sciences or healthcare uses in the LSC and the rest of Montgomery County.

Key Findings

While Montgomery County has a strong concentration in life sciences employment – including major institutional anchors – from a land use and real estate development perspective, the county may struggle to attract new private investment without creating more mixed-use opportunities for life sciences development or co-location of uses near existing mixed-use centers. The county also needs to support a more entrepreneurial economy that leverages and concentrates existing research and development activities to stimulate private sector business opportunities. These types of activities have had demonstrated success in other competitive life sciences regions like Boston, Philadelphia, and Raleigh-Durham in dedicated innovation districts, which the county currently lacks. The strategic recommendations presented in this report build upon the county's strengths and opportunities to increase economic growth and competitiveness.

Key goals for Montgomery County include 1) prioritizing the creation of a world class mixed-use life-sciences district in the LSC, because it is already the region's leading private life sciences hub, 2) updating land use regulations so that they encourage the right kind of mixed-use development that private developers are pursuing nationally, 3) modifying development regulations or creating new ones that allow for and incentivize density and mixes of use in life science and healthcare districts, and 4) creating a place-management organization (such as a BID and/or an Innovation District) to coordinate

the development and placemaking needed to make the areas in and around LSC more competitive and attractive to private investment.

SWOT Analysis

The following strengths, weaknesses, opportunities, and threats (SWOT) were identified to frame opportunities and challenges for life sciences industry growth in Montgomery County and serve as the basis for the strategic recommendations.

Figure ES.1: SWOT Analysis for Montgomery County's Life Sciences Sector

 Strengths	 Weaknesses
- Well-established life sciences cluster - Presence of anchor research institutions - Highly skilled and educated labor force - High levels of cultural diversity - Competitive public school system - Access to regional rail infrastructure - Lower cost of living compared to other East and West Coast markets	- Limited economic and population growth - Lack of major research universities - Limited bicycle and pedestrian connectivity - Less established entrepreneurial ecosystem and culture - Less private sector commercialization of research compared to other competitive markets - Existing life sciences development is less competitive consisting of single-use conventional suburban office park designs
 Opportunities	 Threats
- Leverage publicly owned catalyst sites - Continue promoting housing infill and diversification - Leverage regional research and healthcare institutions - Create life sciences partnerships and coalitions across multiple local, regional, and state organizations - Create mixed-use districts and synergies - Support investments in placemaking, parks, trails, and open space - Grow an innovation-based economy - Build upon and promote the skilled workforce	- Competition from growing life sciences markets - Lack of competitive development/redevelopment sites - Softening life sciences market nationally - Increasing housing costs - Inability to effectively commercialize life sciences R&D

Key Recommendations

As presented in Section 5 of this report, the following strategic recommendations help define the role of the Montgomery Planning in supporting future life sciences development and growth and provide higher-level strategic recommendations to ensure that Montgomery County maintains its regional and national competitiveness as a life sciences hub. While sound land use policy will be pivotal to facilitating the right types of life sciences and complementary real estate development over the next decade, there are also critical elements of the life sciences ecosystem that will require more strategic and intentional involvement from regional institutions, economic development organizations, and the public and private sectors.

The following recommendations highlight the importance of investing in and LSC as the hub of life sciences activity in Montgomery County given the strong concentration of anchor employers in these areas, although these recommendations should be considered for other parts of the county that have clusters of life science activity.

1. Expand and Create New Development Practices and Standards to Encourage the Creation of Intensive, Mixed-Use Life Sciences Districts

The growth and competitiveness of the life sciences industry in Montgomery County will depend on the level of new real estate investment over the next decade. Other competitive markets like Boston, Philadelphia, and Raleigh-Durham continue to attract new life sciences investment with an increasing focus on infill development co-located with complementary uses or within mixed-use developments or districts. While future development will be driven by private investment, the public sector not only plays a crucial role in attracting new development through land use policy and incentives, but it also ensures that development is the right type, value-adding development that provides greater communitywide impacts.

Zoning is one of the most powerful levers Montgomery Planning can use to encourage mixed-use life sciences development. There are numerous potential changes to zoning and land use regulations Montgomery Planning can consider as part of its efforts to create optimal conditions for life sciences mixed-use development, including the incorporation of place-based investments future district planning and allowing for greater density and zoning flexibility.

Key actions:

- Optimize the existing Life Sciences Center (LSC) Zone to ease restrictions on residential, retail, and other non-life sciences uses
- Explore creating a new zoning overlay specific to life sciences mixed-use development
- Encourage higher densities in select commercial nodes
- Identify catalyst sites for potential development and redevelopment
- Strengthen the process for developer selection through Requests for Proposals (RFP)
- Strengthen connections with the real estate development community and other public agencies

- Align land use planning efforts with regional and state economic development entities

2. Create Value-Capture Tools to Encourage Development and Investments in the Public Realm

Value capture funding mechanisms can encourage new development and create sustainable funding streams for site-specific or district-wide improvements. The types and functionality of value capture districts vary depending on state, county, and local legislation, but in the D.C. metro area, Business Improvement Districts (BID), which levy an additional tax to be used towards physical improvements within a defined area, are among the most frequently used value capture tools.

Key actions:

- Explore the creation of a BID in and around LSC and other areas targeted for life sciences development
- Support the use of Tax Increment Financing (TIF) to incentivize development

3. Focus Place-Based Investments In and Around Life Sciences Clusters

As presented in Section 4, the competitiveness of successful innovation districts is supported by investments in the public realm, which require a dedicated place management organization. This type of organization – which will require dedicated funding streams – would help position the areas in and around LSC as an innovation district and create a more marketable environment for private investment. This organization can also serve as the lead for implementing many aspects of these recommendations in a coordinated way.

Key Actions:

- Work to establish a place management organization at the LSC (and any other areas targeted for mixed-use life sciences development)
- Incorporate placemaking/streetscape improvements in areas with concentrations of life sciences employment
- Leverage regional trails, greenway, and bicycle, planning efforts to enhance connectivity to and from current and future life sciences hubs
- Create more opportunities for investments in public spaces and event programming

4. Grow an Entrepreneurial Ecosystem

Innovation is at the core of the life sciences industry, which is constantly evolving through new discoveries and the commercialization of technology. However, applying research and transforming it into business opportunities (also known as tech commercialization) is not always inevitable and requires dedicated programs, resources, and networks. Given the complexities of these endeavors there has been an increasing relevance of physical place and space to not only co-locate innovation and entrepreneurial resources, but to create environments that attract and retain talent. This is why innovation districts continue to evolve from conventional office or tech parks to mixed-use districts. Though Montgomery County has prominent R&D anchors including the National Institutes of Health, AstraZeneca, Walter Reed National Military Medical Center, and Adventist Hospital, there is a need to support an entrepreneurial ecosystem that can broaden the reach of its institutions, attract private investment, and stimulate economic growth.

Key Actions:

- Create a countywide consortium of government agencies, institutions of higher learning, and private employers with a focus on entrepreneurship
- Create more opportunities for step-up space for startups involved at Montgomery County incubators
- Leverage existing startup and life sciences grant programs to encourage new activity in and around LSC

Table of Contents

1.	Introduction	9
1.1.	Purpose of the Report.....	9
1.2.	Life Sciences Ecosystems and Innovation Districts: Why Agglomeration Matters	10
1.3.	About Montgomery County and the Great Seneca Science Corridor	11
1.4.	Organization of the Report	15
2.	Life Sciences in the Context of Economic Development and Regional Growth.....	16
2.1.	National and Regional Trends in Life Sciences.....	17
2.2.	Montgomery County’s Life Sciences Market	20
2.3.	Life Sciences Real Estate Fundamentals	25
2.4.	Life Sciences Real Estate Needs and Costs.....	33
2.5.	Conclusions	36
3.	Land Use and Compatibility Assessment	38
3.1.	Importance of Land Use for Maintaining Economic Competitiveness	38
3.2.	Co-Location of Housing with Life Sciences Development.....	46
3.3.	Co-Location of Housing with Healthcare Facilities	55
3.4.	Key Implications for Montgomery County.....	60
4.	Best Practices for Creating Successful Innovation Districts	62
4.1.	Introduction to Case Studies.....	62
4.2.	Lessons Learned for Montgomery County.....	63
5.	Strategic Recommendations	66
5.1.	Expand and Create New Development Practices and Standards to Encourage the Creation of Intensive, Mixed-Use Life Sciences Districts	67
5.2.	Create Value-Capture Tools to Encourage Development and Investments in the Public Realm.....	72
5.3.	Focus Place-Based Investments In and Around Life Sciences Clusters.....	73
5.4.	Grow an Entrepreneurial Ecosystem	76
	Appendix A – Real Estate Development Requirements.....	78
	Appendix B – Case Studies	78
	Appendix C – Acknowledgements	123
	Appendix D – About Econsult Solutions, Inc.	124

1. Introduction

1.1. Purpose of the Report

Maryland-National Capital Park and Planning Commission's Montgomery County Planning Department (Montgomery Planning) is the state-chartered government agency responsible for county planning initiatives in Montgomery County, Maryland, the most populous county in Maryland and home to the northwest suburbs of the nation's capital, Washington, D.C. In 2010, Montgomery Planning issued the first draft of the *Great Seneca Plan*, an effort to bolster and expand life sciences initiatives in the county through encouraging mixed-use, life-sciences-focused development in specific zones of the county, particularly in an area termed the "Great Seneca Science Corridor" (GSSC), centered around the co-located Universities at Shady Grove and Adventist Hospital campuses on the outskirts of the city of Rockville.

Life sciences activity in Montgomery County has two main physical hubs: (1) Federal research, grant-making, and administrative activities are based at the National Institutes of Health campus in Bethesda, and (2) private life science research and development is centered in the Life Science Center (LSC) and adjacent areas in Rockville and Gaithersburg (see Section 2 and figures 2.5 and 2.6 for a detailed description of the area). The LCS campus features anchor institutions including the Universities at Shady Grove, which includes the Institute for Bioscience and Biotechnology (a partnership between the University of Maryland and the nearby National Institute of Standards and Technology), and the National Cancer Institute's Shady Grove campus.

In 2020, Montgomery Planning endeavored to update the Great Seneca Science Corridor Plan, which focuses on the LSC, to encourage further life sciences development. In pursuit of this update, Montgomery Planning consulted Econsult Solutions, Inc. (ESI), a leading economic development firm based in Philadelphia, to provide its expertise regarding economic development best practices focused on the life sciences industry, with a special eye towards the real estate needs of the life sciences industry and the feasibility of co-locating housing on or near sites with existing life sciences or medical center uses. The report that follows contains the results of ESI's investigation into this matter. ESI's intent is that Montgomery Planning use this information as it works to revise the Great Seneca Science Corridor Plan and encourage increased life sciences development throughout Montgomery County.

1.2. Life Sciences Ecosystems and Innovation Districts: Why Agglomeration Matters

Innovation districts have driven economic development in municipalities, regions, and states across the country. A 2014 Brookings Institution report¹ identified a growing trend of groups of innovative firms and actors intentionally organizing around distinct geographic districts, and often forming their own governance structures, which it called “Innovation Districts.”

Previously, the archetypal innovation destination was a suburban office location like the Bell Labs facility in Park Ridge, New Jersey. By contrast, locations that produce 21st century innovation at scale can be characterized as innovation districts: clusters of activity that are urban in form and anchored by one or more institution. This is increasingly how transformative start-ups are formed, and it amplifies the role of research institutions and of the strategic co-locations of research institutions in attracting the human and financial capital needed to make it all possible.

Suburban research parks, where innovation was the purview of a single actor or small group of actors in a stand-alone setting, were once the primary sites of American innovation. In the 21st century, innovation has shifted to vital mixed-use communities, which provide touchpoints for multiple actors and sectors, and, importantly, are anchored by one or more research institutions. These mixed-use communities with various research actors are known as innovation districts.

The key characteristics that define innovation districts include:²

- Presence of advanced research institutions
- Access to talent
- Start-up culture
- Entrepreneurial support resources
- Collaborative mechanisms
- Partnerships with local government
- Dense urban setting
- Transportation infrastructure
- Amenity-rich environment
- Cost factors

Montgomery Planning can consider the above factors, and others, in gaining an understanding of how to nurture the development of its own life sciences districts.

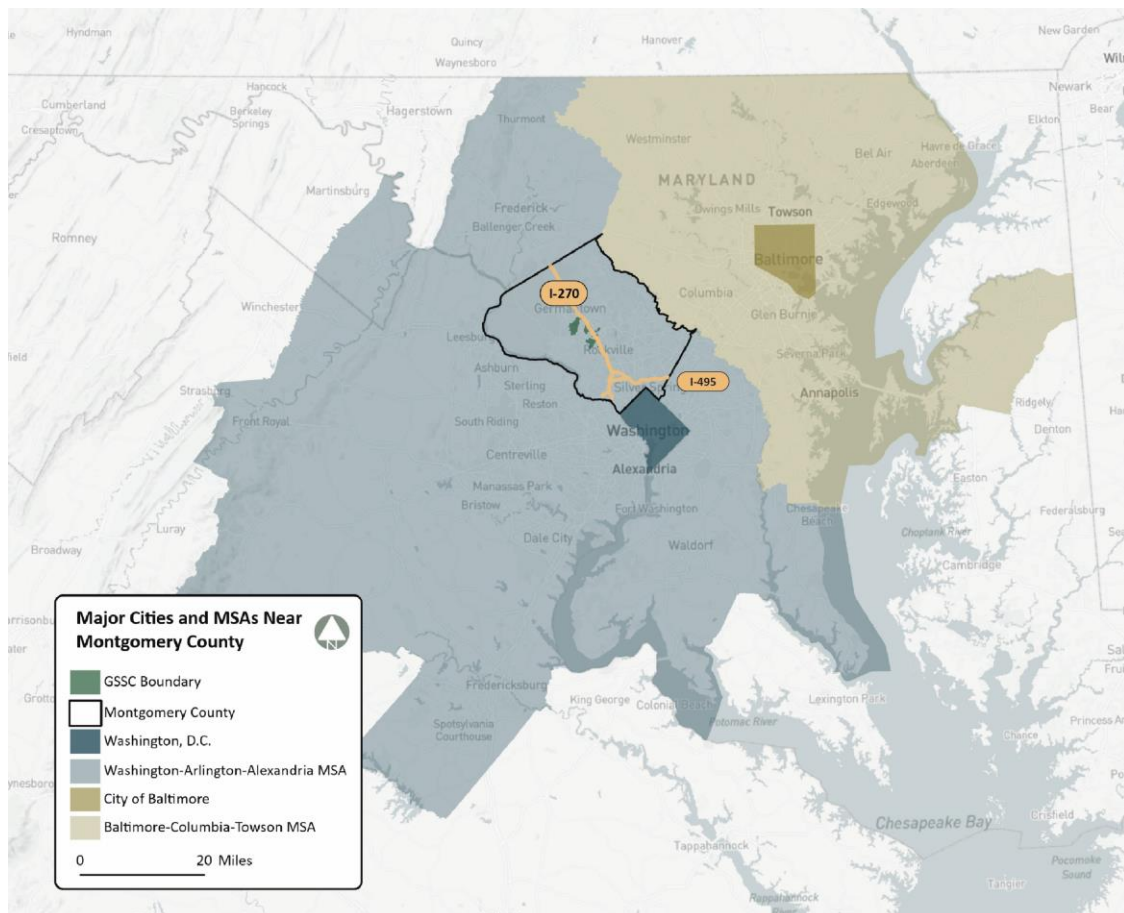
¹ <https://www.brookings.edu/articles/rise-of-innovation-districts/>

² Source: Brookings Institution (2014)

1.3. About Montgomery County and the Great Seneca Science Corridor

Montgomery County is located in suburban Washington, D.C. and shares a direct land border with DC's Northwest side. It is the second-most populous county in Maryland, and the second most-populous county in the Washington, D.C. metropolitan area overall, with a population of 1.1 million.

Figure 1.1: Montgomery County within Washington, D.C. and Baltimore Metropolitan Regions

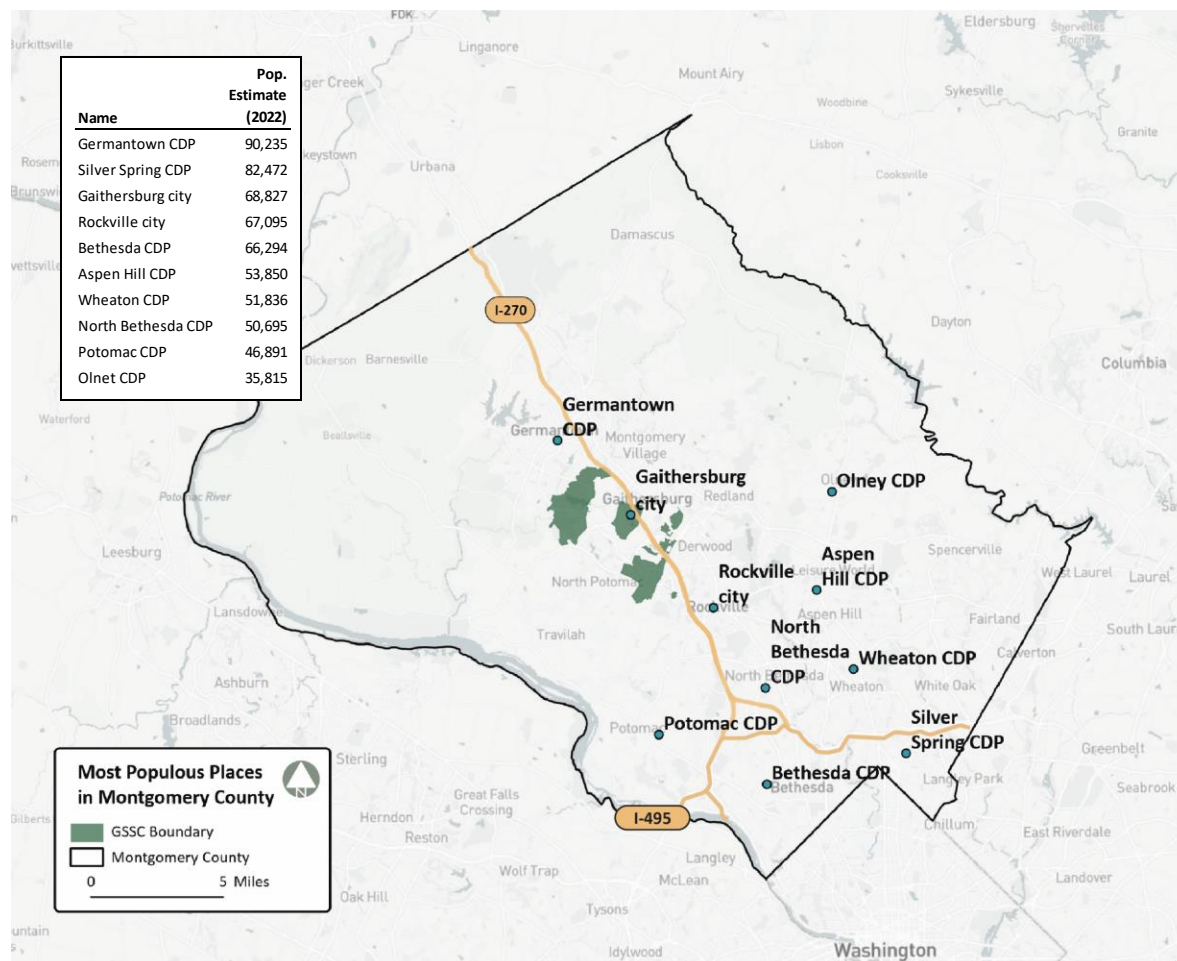


Source: ArcGIS (2023), Mapbox (2023), U.S. Census Bureau (2023), ESI (2023)

The county has a high median household income of \$117,345.⁴ Demographically, the county's population is racially and ethnically diverse.

Gaithersburg and Rockville are the county's most populous cities, but Germantown and Silver Spring are the county's most populous census designated places despite being unincorporated.

Figure 1.2: Top 10 Most Populous Census-Designated Places in Montgomery County, Maryland



Source: ArcGIS (2023), Mapbox (2023), U.S. Census Bureau (2022)

The county is served by major transportation options, including Interstate 270, the D.C. Metro Red Line, (which runs from Rockville, near the LSC, through the core parts of Washington, D.C. to Glenmont), and Maryland Route 119, Great Seneca Highway, for which the Great Seneca Science Corridor is named. The Purple Line, a planned transit route that would connect the urban suburbs of southern Montgomery County and neighboring Prince George's County, is under construction but has faced significant delays.⁶

While Montgomery County does not contain any major university campuses, the University of Maryland's flagship campus is nearby in College Park, about 18 miles southeast of LSC, and nine University of Maryland System universities offer degrees at the Universities of Shady Grove campus in the LSC.

Numerous federal agencies have offices in the county, including: the Food and Drug Administration (FDA), the National Institutes of Health (NIH), the Uniformed Services University of the Health Sciences (USUHS), Walter Reed Army Institute of Research, National Oceanic and Atmospheric Administration (NOAA), Nuclear Regulatory Commission (NRC), U.S. Department of Energy (DOE), the National Institute

of Standards and Technology (NIST), the Walter Reed National Military Medical Center (WRNMMC), and the U.S. Consumer Product Safety Commission (CPSC).

Many large private firms have offices in the area, including: Coventry Health Care, Lockheed Martin, Marriott International, Host Hotels & Resorts, Travel Channel, Ritz-Carlton, Robert Louis Johnson Companies (RLJ Companies), Choice Hotels, TV One, BAE Systems Inc., Hughes Network Systems and GEICO.

Numerous biomedical and healthcare institutions are located in Montgomery County, including the following: Howard Hughes Medical Institute (a nonprofit medical research institution in Chevy Chase, MD), the National Institutes of Health, the Food and Drug Administration (FDA), Walter Reed National Military Medical Center, Uniformed Services University of the Health Sciences, AstraZeneca (with major offices in Gaithersburg, MD), Holy Cross Hospital, and Adventist Healthcare. Many of these are located closer to Washington, DC in the southern part of the county.

About the Great Seneca Plan

The *Great Seneca Science Corridor Master Plan*, named after the Great Seneca Highway (Maryland Rte. 110), was established in 2010 and revised in 2020 by Montgomery County Planning to foster mixed-use, life-sciences-focused “live-work” development in a few districts in northwestern Montgomery County. The plan calls for a Life Sciences Center combining *health care*, *biotechnology*, and *academia*, and a “dynamic live-work community” centered around mixed-use development. When established in 2010, the Plan envisioned a 25 to 35 year development period.³

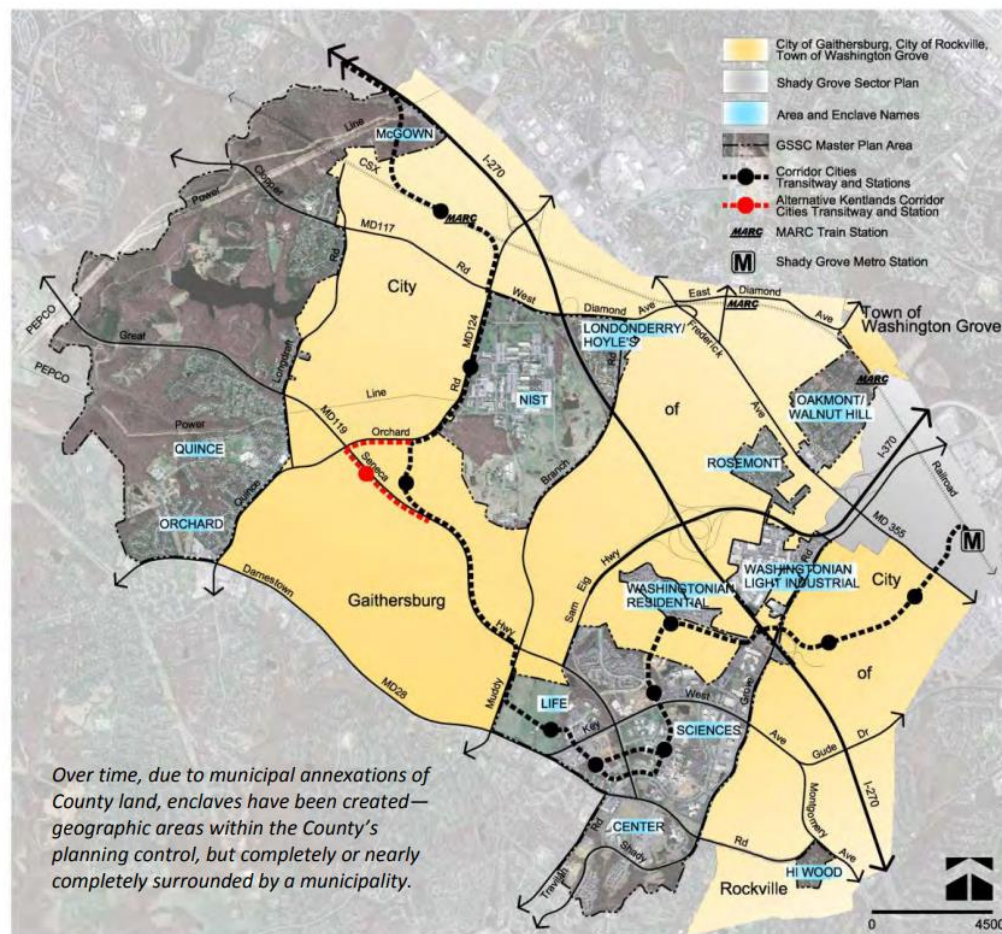
The primary area of concern is the LSC which includes, Adventist HealthCare Shady Grove Medical Center; the Universities at Shady Grove; a major campus of the National Cancer Institute; Rockville Center for Vaccines Research; and more. Johns Hopkins University (the prestigious private university based in Baltimore, MD) previously had a satellite campus at LSC, but it closed in 2020.

A Minor Master Plan Amendment was approved by the County Council in 2021 with an initial focus on changing some of the staging requirements that have limited development in the area. Montgomery Planning is currently conducting a full update of the plan, called *The Great Seneca Plan: Connecting Life and Science*.⁴ This plan seeks to refine and strengthen the vision of the original plan, which is to create a vibrant mixed-use life science center in the LSC.

³ [Great Seneca Science Corridor Plan \(2010\)](#)

⁴ [Great Seneca Science Corridor Plan: Connecting Life and Science](#)

Figure 1.3: Map of the Great Seneca Plan Area



Source: Montgomery Planning, Research and Strategic Projects (2010)

1.4. Organization of the Report

The purpose of this report is to help Montgomery Planning assess the potential for life sciences mixed-use development in the county, as well as the specific accommodations that will make this possible.

The report has four primary chapters:

- **Section 2 - Life Sciences in the Context of Economic Development and Regional Growth:** This section will provide context regarding the situation for life sciences real estate and the broader economy in Montgomery County.
- **Section 3 - Land Use and Compatibility Assessment:** This section will consider the compatibility of Montgomery County with the needs of life sciences developments.
- **Section 4 - Best Practices for Creating Successful Innovation Districts:** This section analyzes a set of case studies for the organizational structure and placemaking aspects of innovation districts, which Montgomery County can apply when considering the creation of its own innovation district.
- **Section 5 - Strategic Recommendations:** This section will issue specific, actionable recommendations Montgomery Planning can take to move towards building life sciences mixed-use developments, both in and around the LSC and in the county at large.

2. Life Sciences in the Context of Economic Development and Regional Growth

Montgomery County's life sciences sector has been foundational to its growth and prosperity for the last several decades. Life sciences accounted for roughly seven percent of Montgomery County's gross domestic product in 2022 and is the county's most innovative and high value-added private exporting industry cluster.⁵ Even the activities of the Federal Government — Montgomery County's largest single employer — are related to life sciences, with the National Institutes of Health and the Food and Drug Administration together employing close to 30,000 people.

The life sciences industry is evolving rapidly. One major evolution in the last several decades is the innovation of "biologic" therapies. While traditional over-the-counter drugs are "small molecules" made from chemical processes, biologics are larger, more complex molecules that are made using living cells or other material.⁶ Biologics require different research and manufacturing processes, and by now, most life sciences activity in Montgomery County is in biologics.

The shift to biologics is just one example of the evolution of the life sciences industry. It is also benefitting from a phenomenon that some have called "convergence" whereby technologies and methods from other fields like computational genomics, imaging technology, nanotechnology, and advanced materials are being shared with and absorbed into each other, leading to new capabilities and discoveries,⁷ and creating new ways to create economic growth and prosperity regionally and nationally.

The growth potential of the Montgomery County life sciences industry will depend on how land use and the built environment evolves to continue to provide development opportunities for new life sciences-focused real estate as well as creating an ecosystem for innovation and entrepreneurship. This also necessitates sound planning and policy to ensure that the right types of housing, transportation, services, amenities, and quality of life elements are incorporated to make the county more attractive to employers and the workforce. It is first important to understand trends and levels of demand within the life sciences industry, the types of real estate that are being delivered in support of the industry, and the barriers and opportunities for new real estate development. This baseline understanding can then inform future land use strategies and policies for facilitating high-quality development and enhancing the economic competitiveness of the overall, which will be addressed in Section 3.

⁵ Lightcast Gross Regional Product data, retrieved and calculated by Montgomery Planning

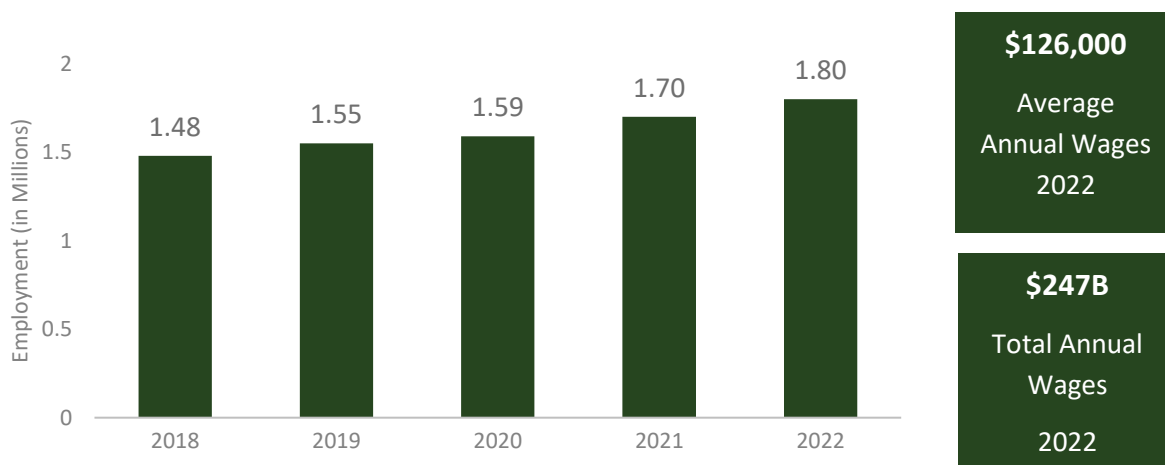
⁶ <https://archive.bio.org/articles/how-do-drugs-and-biologics-differ>

⁷ <http://www.convergencerevolution.net/2016-report/>

2.1. National and Regional Trends in Life Sciences

The life sciences industry encompasses a wide range of fields that fundamentally focus on the study of living organisms, and through innovation and commercialization of research, it primarily interfaces with and supports the healthcare sector, including pharmaceuticals, biotechnology, medical devices, diagnostics, genetics, bioinformatics, and more. The industry is growing as much as it is evolving and recent scientific and technological advancements as well as increase in data availability, such as electronic health records, provide a conducive environment for economic growth.⁸ Nationally, the life sciences industry has added approximately 455,000 jobs over the last 10 years, for a rate of growth of 34 percent, which has exceeded average growth across all sectors.⁹ Even during the height of the COVID-19 pandemic in 2020 and 2021, life sciences employment grew demonstrating its strength and resiliency.

Figure 2.1 : National Employment in the Life Sciences Industry¹⁰



Source: Bureau of Labor Statistics (2023)

Through 2022, the life sciences sector experienced a surge in investment due to a shortage of existing real estate for purchase, high demand, and increased property values.¹¹ The sector attracted over \$10 billion annually from 2018 to 2022. The high investment resulted in significant development with nearly 32 million square feet of space planned or under construction as of year-end 2022, 78 percent of which expected to be completed in the next two years.¹² At the same time, inflation, high interest rates and other uncertainties resulted in a cooling of demand. Despite this drop in demand, the past year has seen nearly \$26 billion in venture capital investments in support of the life sciences industry nationally, higher than any year prior to the COVID-19 pandemic suggesting full recovery of the sector.¹³

⁸ New frontiers of Growth in the Life Sciences Industry, Infosys

⁹ QCEW, BLS, 2023

¹⁰ Private Employment only for the NAICS Codes: 54171,32541,42345,33911

¹¹ Red Hot Life Sciences Real Estate Investment Market Poised for Further Growth, [CBRE](#), 2022

¹² Life Sciences Updated, [Cushman and Wakefield](#), March 2023

¹³ [2023 Life Sciences Industry and Real Estate Perspective](#), 2023

The suburban Maryland life science cluster consistently ranks among the nation's top five to ten in national studies of the industry. While there is no standard methodology to rank these clusters, they generally include several common indicators of life science competitiveness: Research Infrastructure, Human Capital, Innovation Output, Investment Capital, and Value Proposition.¹⁴

Research Infrastructure

A concentration of research infrastructure is one of the most important resources in creating a biomedical innovation hub, primarily in the form of top tier research universities, which serve as the magnet for human capital, research grants, and corporate partnerships. Large-scale universities with significant research expenditures and doctoral programs play the most significant role in making up a solid foundation of research institutions which are present in the region. The Washington, D.C. Metropolitan area has seven doctoral "High or Very High Research Activity" universities" as classified by the Carnegie Classification of Institutions of Higher Education system¹⁵ and the Baltimore area has three more. In the last five years, researchers in the area have received over \$10 billion in funding from the National Institute of Health (NIH) for over 13,000 different projects.¹⁶ The amount of research funding serves as a marker for the potential stream of breakthroughs and new findings that might emerge from fundamental academic research in the years ahead.

Human Capital

The number of recent graduates in science, technology, engineering, and math (STEM) fields is a common indicator of the size of its talent pipeline. In total, more than 27,000 students in the Washington, D.C. Metro Area graduated with STEM designated degrees in 2021.¹⁷ Additionally, the approximately 30,000 employees at the NIH and FDA campuses in Montgomery County make up a pool of candidates with skills and experience that are readily transferrable to private research settings.

Innovation Output

Two important indicators of achievement and growth in the life sciences sector are innovation and production, measured by the level of patent and clinical trial activity. Infrastructure that moves discoveries from lab to market is crucial for any significant life sciences work. Regardless of a focus on research and development, clinical trials indicate the ability of researchers to move their efforts towards the market. Over 5,500 trials have been conducted in the region over the last 10 years indicating a high volume of research activity. Furthermore, biotechnology alone has seen the issuance of more than 2,500 utility patents in the Washington, D.C. region over the past two decades.¹⁸

Some within the real estate development community have indicated Montgomery County is not often perceived as a hub for private sector life sciences companies compared to other parts of the DC region or other East Coast markets. However, regional institutions and their attendant talent provide a significant pipeline of life sciences employment in the county, serving as an opportunity if leveraged

¹⁴ Market trends, especially for large industry clusters, are best understood at the regional level, even when evaluating a specific submarket. While ESI's overall report focuses on Montgomery County, we have highlighted regional metrics to understand the competitive position of the region's life sciences industry.

¹⁵https://carnegieclassifications.acenet.edu/institutions/?inst=&basic2021__du%5B%5D=15&basic2021__du%5B%5D=16&control%5B%5D=1&control__pv%5B%5D=2&stabbr%5B%5D=DC&stabbr%5B%5D=MD&stabbr%5B%5D=VA

¹⁶ Funding, NIH Awards by Location and Organization

¹⁷ Lightcast, STEM designation criteria from DHS STEM Designated Degree Program List.

¹⁸ National Center for Science and Engineering Statistics, 2023

It is important to note that this does not represent the entire count of patents granted in this sector but provides a glimpse into the region's innovation activity.

Investment Capital

Investment activity can come in the form of venture capital (VC), acquisitions, and firm startups as well as relocations. These activities all indicate the private sector's level of confidence in the region as a competitive life science market. People invest money, build labs, and start companies when they feel the risk is worth the reward. In 2021 alone, \$5.7 billion was invested across various life sciences companies in the county.¹⁹ Generally, startup activity is not supported by conventional lending, which is why VC funding has become the primary investment tool for supporting startup businesses with long-term growth potential and total VC investment has become a leading metric for regional innovation and entrepreneurial activity. In 2022, startups and early-stage companies in the Washington, D.C. metro area received nearly \$4 billion in VC funding, of which around \$1 billion supported life sciences and healthcare-related companies. Maryland captured about 30 percent of the region's VC funding overall and nearly 60 percent of the life sciences and healthcare-related funding.²⁰

Value proposition

Each of the life science hubs across the country stands out in one or several of the dimensions of competitiveness listed previously, so costs of living and doing business and quality of life can affect regions' growth potential. In addition to the research and capital needed to become a strong life sciences hub, a successful hub must be attractive for the workforce. A reasonable cost of living can

Although, the County and region have a higher cost of living than the national average, it is lower than major metro regions and life science hubs such as Seattle, San Francisco, and New York.

attract and retain a diverse pool of experts, fostering a vibrant ecosystem of researchers, entrepreneurs, and investors. Compared to other regions, the Washington DC metro area has a high cost of living. The regional price parity is the regional price level for the mix of goods and services consumed including goods, housing, utilities, and other services at the national level. The price parity is based on the average price of \$100 for a basket of goods at the national level. Figure 2.2 shows that the cost of goods is 12 percent more

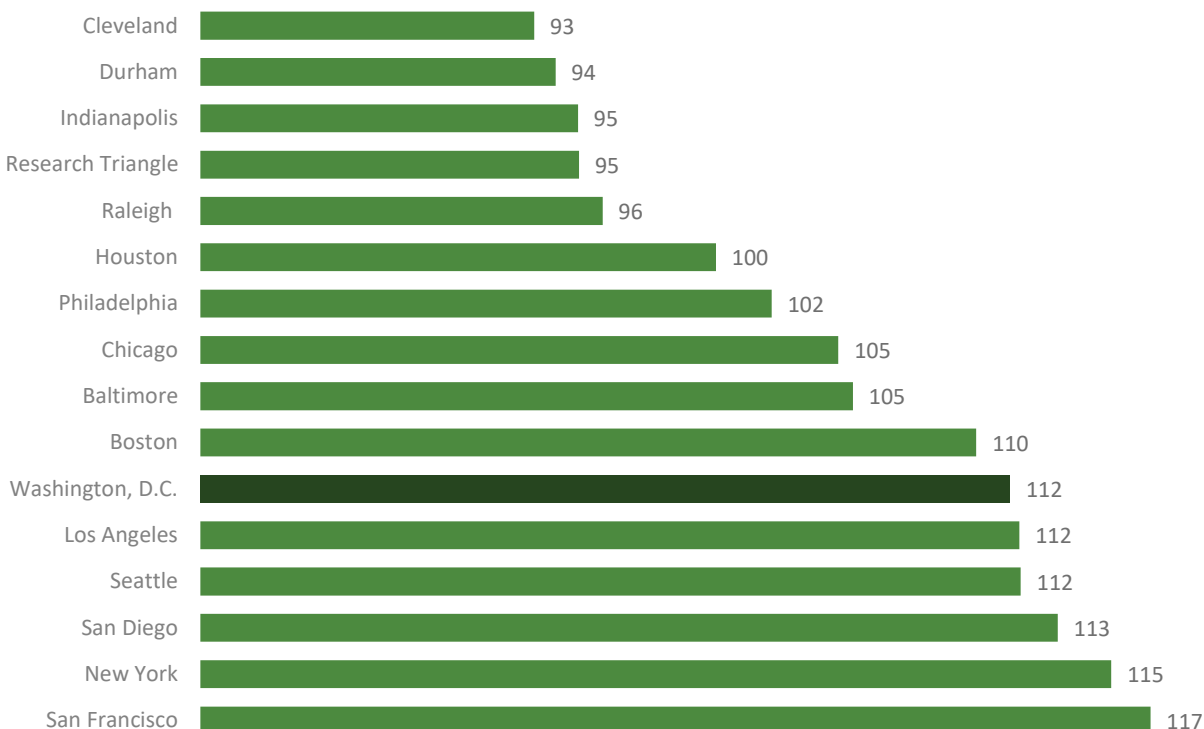
expensive than the national average, indicating a relatively high price parity compared to other regions. Despite this, the region is still more affordable compared to other markets like San Francisco, San Diego, and New York.

Affordability not only ensures a higher quality of life for those working in the life sciences sector but also enhances the overall competitiveness and sustainability of the hub itself, facilitating the continuous advancement of scientific breakthroughs and medical discoveries.

¹⁹ Life Sciences success by the numbers in Maryland's Montgomery County, Washington Business Journal, MCEDC, 2022

²⁰ https://www.ey.com/en_us/growth/tracking-venture-capital-deployment-and-deal-trends-over-time

Figure 2.2 : Regional Price Parity, 2022



Source: BLS (2022)

2.2. Montgomery County's Life Sciences Market

There are currently over 400 life sciences-related establishments in Montgomery County employing over 40,000 public and private sector workers, which accounts for 10 percent of the county's overall employment.²¹ Figures 2.3 and 2.4 provide a snapshot of the life sciences market in Montgomery County. A combination of NAICS codes were used to classify establishments as either Manufacturing, Research and Development (R&D), Wholesale/Distribution or Administration and Support. Seventy-seven percent of life sciences establishments in the county are focused on research and development, accounting for close to 33 million square feet of gross floor area and almost 8,000 employees. The significant concentration of R&D establishments within the county indicates substantial industry presence and the potential for upscaling as the industry becomes more competitive and visible nationally. The presence of almost 30,000 employees in Administration and Support is also supportive of the life sciences industry since they represent employment at several major federal institutions, including the National Institute of Health, the National Institute of Standards and Technology, and the Food and Drug Administration. Many of the employees at these Federal institutions, especially the NIH, are engaged directly in life science research and development. In fact, the NIH employs some of the

²¹ Quarterly Census of Employment and Wages (QCEW), 2021

world's leading experts in various life science fields. However, the available data do not differentiate between types of employment and activities in these institutions.

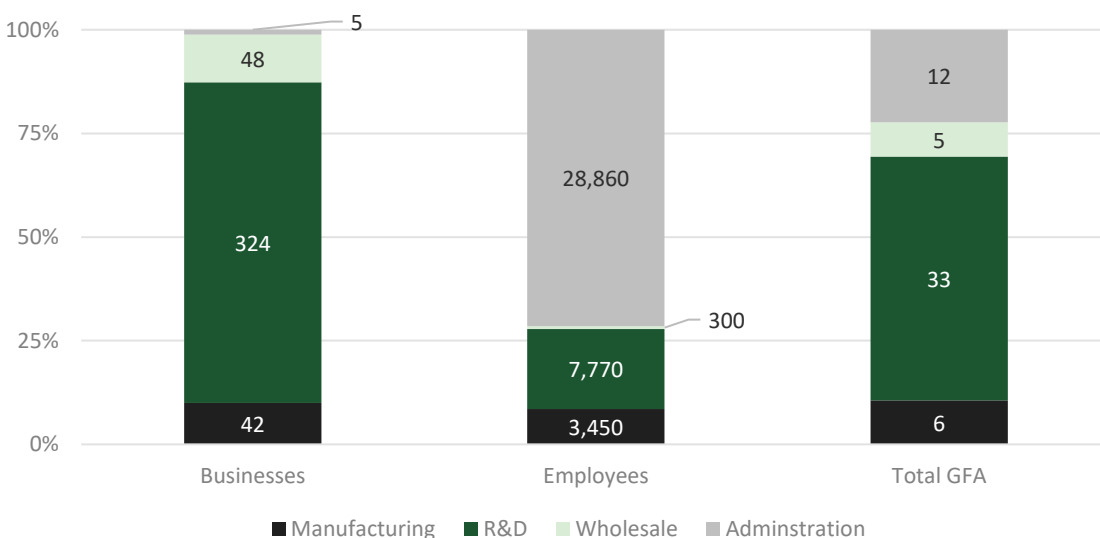
Figure 2.3: Life Sciences Market by Establishment Type in Montgomery County

	Establishment Count	Total Employees	Gross Floor Area (millions SF)	Jobs Density (SF/job)
Manufacturing	42	3,450	5.9	1,710
Research and Development	324	7,770	32.7	4,200
Wholesale/Distribution	48	300	4.6	15,300
Administration and Support	5	28,860	12.4	430
Total	419	40,380	55.6	

Source: QCEW Data, BLS (2021), Montgomery Planning, Research and Strategic Projects (2023)

While R&D occupies the largest physical footprint in the county in terms of gross square footage of real estate, workers classified with Administration and Support represents the largest share of employees in the county occupying conventional office buildings with a higher density of workers per square foot. This is significant since growing the life sciences industry in the county will require a significant allocation of land to support new R&D development.

Figure 2.4: Distribution of Life Sciences Market by Establishment Type in Montgomery County



Source: QCEW Data, BLS (2021), Montgomery Planning, Research and Strategic Projects (2023)

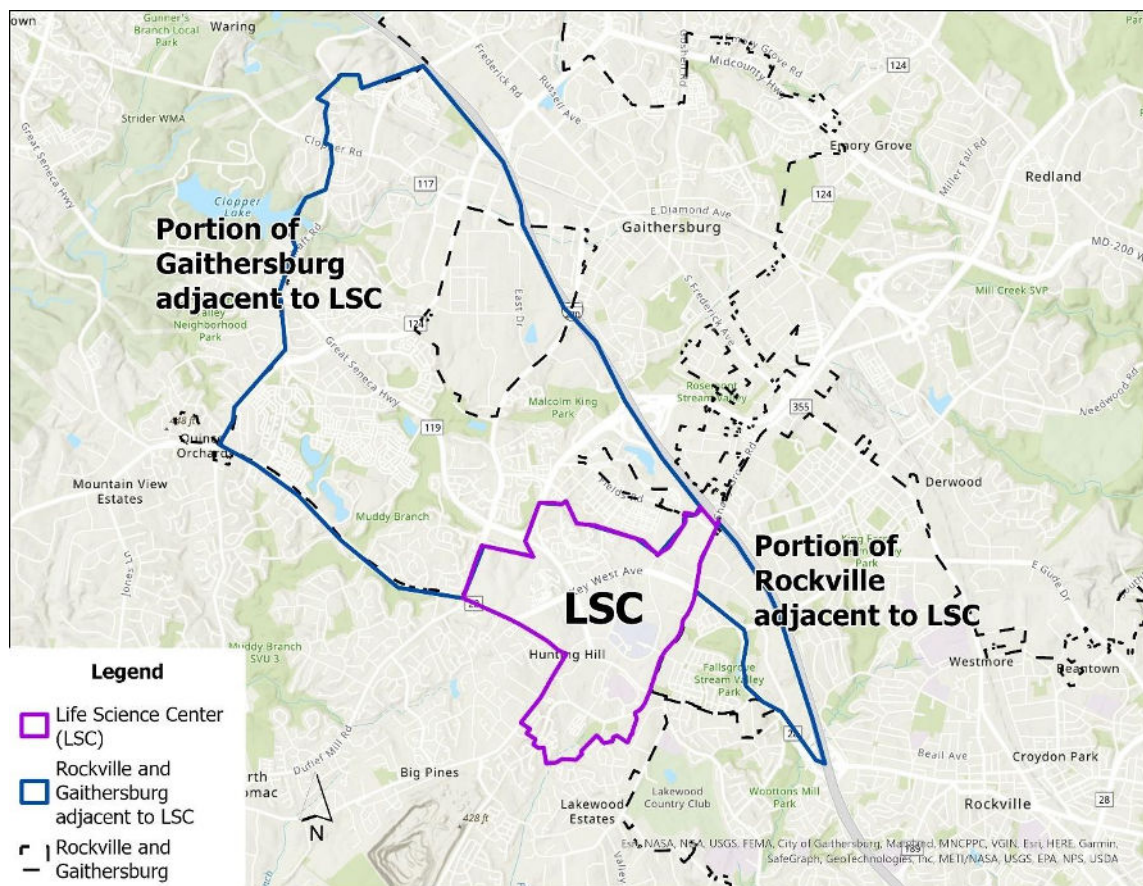
County Context: The Life Science Center as the Hub of Life Science Activity in Montgomery County

While the NIH and FDA campuses account for the most overall life sciences employment in Montgomery County, these are Federal institutions over which Montgomery County has limited influence on strategies and relationship to the private sector. Little private life science activity has emerged in their immediate vicinities.

Instead, the premier hub for private sector life sciences in Montgomery County—and the focus of this section—is the Life Sciences Center (LSC) and adjacent areas in western Gaithersburg and northwestern Rockville.

Although there is no definitive way to classify Montgomery County's life science employment hubs, for the purposes of this report, the Life Sciences Center is the section of unincorporated Montgomery County transected by Key West Avenue, containing the National Cancer Institute, Adventist Healthcare Shady Grove Medical Center and the Universities at Shady Grove. The adjacent areas are those bounded in Gaithersburg by Darnestown Road, Longdraft Road, and I-270, and in Rockville by I-270 and West Montgomery Avenue (see figure 2.4).

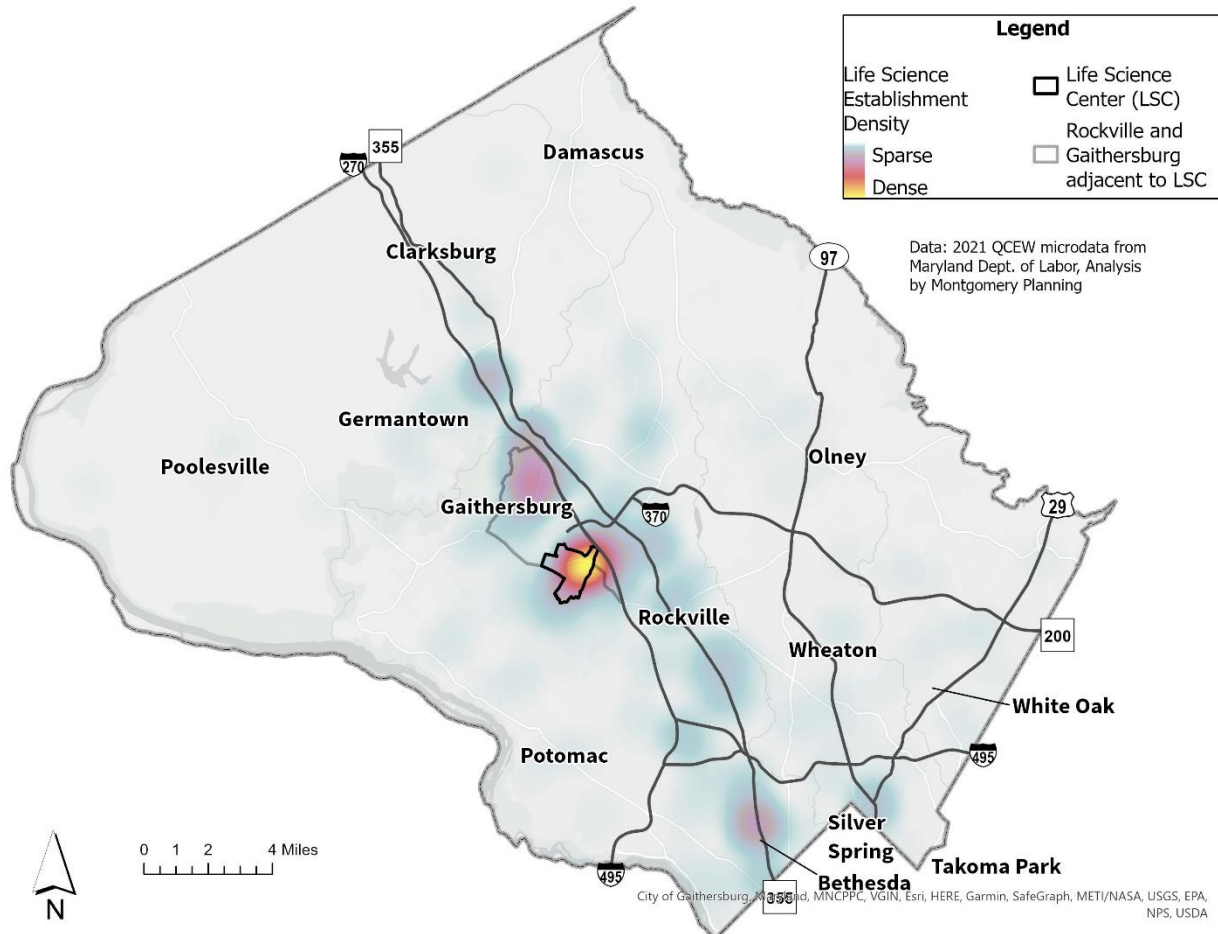
Figure 2.4: Map of Life Science Center and Adjacent Areas in Rockville and Gaithersburg



Source: Montgomery Planning, Research and Strategic Projects (2023)

As of 2021, the LSC and adjacent areas contained 33 percent of the county's private life science establishments and 64 percent of its private life sciences employees. As Figure 2.5 shows, this area is the densest center of life science establishments in the county.

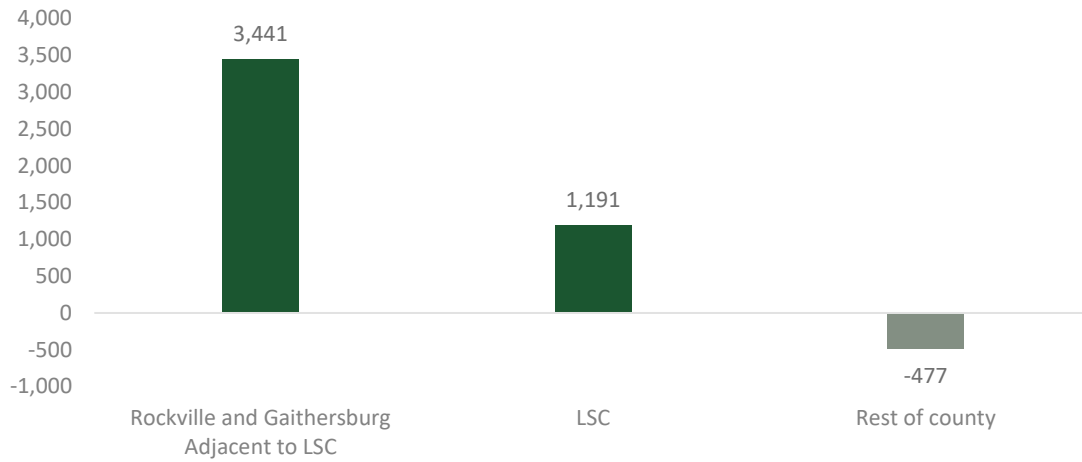
Figure 2.5: Heatmap of Life Science Establishments in Montgomery County



Source: Montgomery Planning, Research and Strategic Projects (2023)

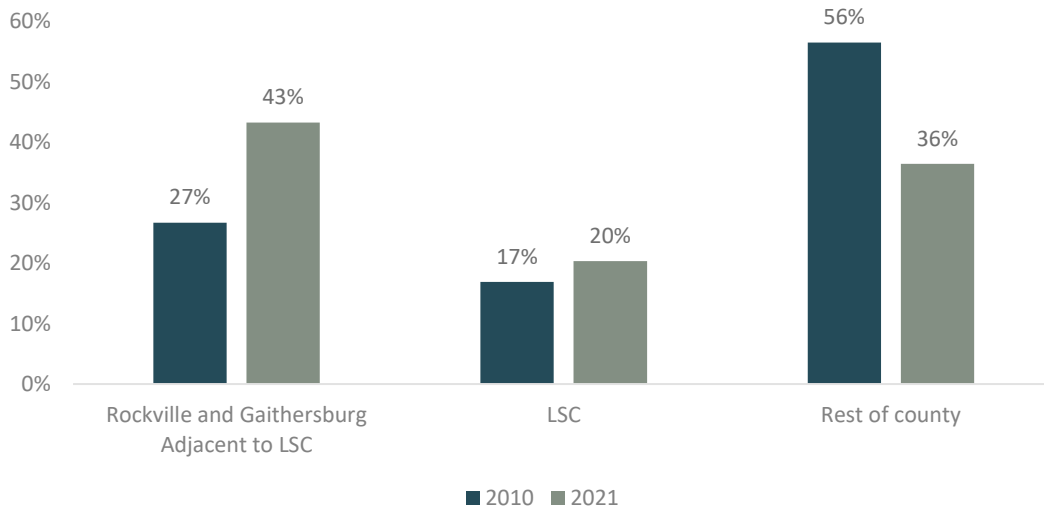
The area's life science dominance is the result of at least a decade of consolidation. From 2010 to 2021, the LSC and adjacent areas added 4,632 private life sciences jobs (3,441 in adjacent areas and 1,191 in the LSC) while the rest of the county *lost* 477 (see Figure 2.7). This consolidation saw the LSC and adjacent areas increase their share of the county's total private life science employment by 20 percentage points. The LSC increased its share of private county life science employment from 17% to 20% and the adjacent areas in Rockville and Gaithersburg increased their share from 27% to 43% (see Figure 2.8).

Figure 2.6: Private Life Science Employment Change, 2010 to 2021



Source: 2021 QCEW microdata from Maryland Dept. of Labor (2021); Montgomery Planning, Research and Strategic Projects (2023)

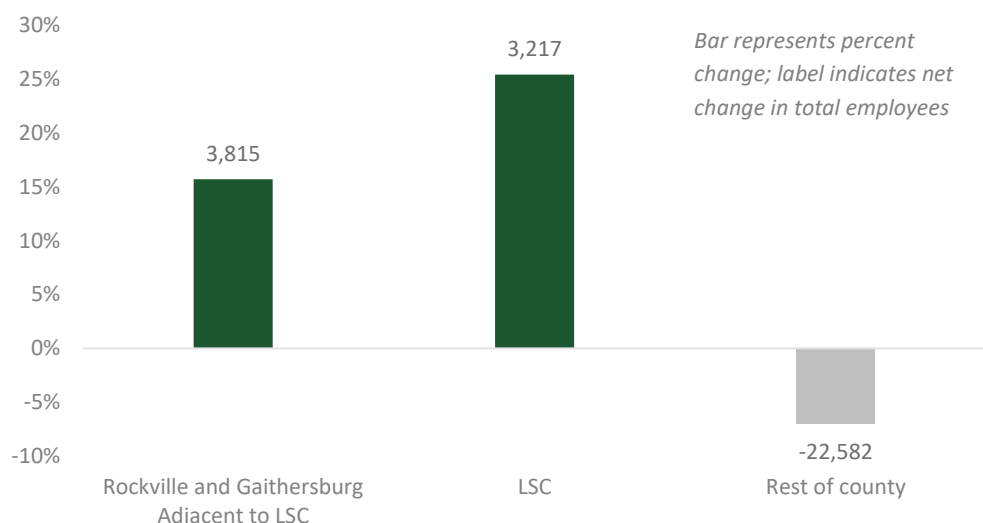
Figure 2.7: Percent of Montgomery County's Private Life Science Employment by Area, 2010 to 2021



Source: 2021 QCEW microdata from Maryland Dept. of Labor (2021); Montgomery Planning, Research and Strategic Projects (2023)

The expansion of the life science industry in this area occurred in tandem with the expansion of overall private employment (see Figure 2.8). Most of the employment growth in the areas adjacent to the LSC in Rockville and Gaithersburg was in the life sciences, but they also added 374 private sector employees for a total of 3,815 new employees from 2010 to 2021 — a 16 percent change. The LSC's growth was more balanced between life sciences and other sectors, adding 2,026 non-life science jobs on top of the 1,191 life science employees for a growth rate of 25 percent over that time. This rapid growth contrasts with the trend in the rest of the county which lost 22,582 total jobs, a 7 percent decline.

Figure 2.8: Private Employment Change, 2010 to 2021



Source: 2021 QCEW microdata from Maryland Dept. of Labor (2021); Montgomery Planning, Research and Strategic Projects (2023)

The LSC appears to have been insulated from Montgomery County’s sluggish overall job growth thanks in part to its strong synergies between the private sector overall and its life science employment base.

The LSC thus functions as a prominent keystone in a larger life sciences ecosystem connected to the I-270 corridor. Other nodes of relative density are visible in Figure 2.6. Also known as the I-270 Technology Corridor, this is a 37-mile stretch of highway in Maryland that stretches across Montgomery and Frederick counties, known for its significant life sciences activity.²²

2.3. Life Sciences Real Estate Fundamentals

ESI worked with Colliers International to provide a more nuanced view of the life sciences market’s fundamentals. Colliers is a real estate services and investment management firm and one of their many services includes commercial real estate brokerage, supporting both landlords and tenants as representatives in leasing transactions and capital markets deals. The Colliers leasing team, supported by a discrete research team, tracks “tenants in the market” to understand potential competition for their tenant clients and opportunities for their landlord clients. Data is collected by on the ground research, primarily through discussions with competitor brokers, existing landlords, and potential tenant clients.²³

Demand Drivers

“Tenants in the market” data provides insight into current demand for life science spaces in Montgomery County, highlighting companies that are looking to either relocate or expand. These potential tenants (or leads) could be existing businesses or inbound demand into the market. Figure 2.9

²² Maryland’s I-270 Biotech Corridor: A Hub Within A Hub, Life Science Leader

²³ Information can be aggregated in a variety of ways. Some examples include a prospective client may be touring buildings that Colliers represents, tenants may have reached out to Colliers specifically, or Colliers may be tracking lease expirations.

outlines information on leads for potential leasing demand in the region. As of July 2023, Colliers indicated that 21 potential life sciences companies have shown initial interest in leasing a total of more than 1.2 million square feet of space in Montgomery County across a wide range of space configurations ranging from 5,000 square feet to as much as 100,000 square feet. Among these leads, more than half were seeking space ranging from around 50,000 to 60,000 square feet indicating a potential niche for properties offering spaces of this size and scale. Assuming an industry standard of one employee per 225 to 250 square feet, this indicates the strongest demand from establishments with around 200 to 250 employees. Colliers also indicated that most tenants were seeking long-term leases of over 10 years indicating confidence in their operations.

Figure 2.9: Tenants In the Market Data, July 2023

Possible Tenants	Square Footage	Geographic focus (if known)
4	100,000	Montgomery County
12	50,000-60,000	Montgomery County / Baltimore County
5	<50,000	Montgomery County / Frederick County
21	1,120,000	

Source: Colliers (2023)

Figure 2.10 on the following page shows the details of a sample of leases that have been executed in Montgomery County from 2017 to 2021. These leases can give perspective on reasonable lease terms for future life sciences tenants in the country. Generally, the larger the space, the longer the lease term: 10 to 15 years is standard for spaces of more than 20,000 square feet, while smaller spaces have terms of around five years or less. This has implications for lease terms for startups and smaller firms, since they are more susceptible to market changes and need flexibility in the short-term for scaling up or down, whereas larger firms are seeking to sustain operations over the long-term. While rents vary, most are generally around \$40 per square foot, and in most cases, tenant improvement allowances are included. Annual rent escalators of 2.5 to 3.0 percent are standard.

Figure 2.10: Summary of Recently Executed Life Sciences Leases in Montgomery County (2017-2021)

	Year Signed	Square Footage	Lease Type	Lease Term	Base Rent (\$)	Tenant Improvement Allowance (\$)	Annual Rent Escalation	Submarket
Lease 1	2020	170,000	New Deal	15Y	33.00	120.00	2.50%	Gaithersburg
Lease 2	2019	85,000	Pre-Lease	15Y	40.00	100.00	2.50%	Rockville
Lease 3	2021	84,264	New	15Y	39.78	140.00	3.00%	Rockville
Lease 4	2019	82,258	New	15Y	19.51	75.00	Stepped	Rockville
Lease 5	2019	37,551	Expansion	15Y	37.50	110.00	2.50%	Rockville
Lease 6	2020	29,890	New Deal	1Y	32.61	As-is	N/A	Rockville
Lease 7	2019	27,100	New	15Y	35.00	110.00	3.00%	Rockville
Lease 8	2021	21,000	Relet	10Y	35.00	20.00	2.75%	Gaithersburg
Lease 9	2020	16,842	Relet	10Y	43.00	175.00	2.75%	Rockville
Lease 10	2020	13,199	Expansion	13Y	34.50	30.00	2.75%	Rockville
Lease 11	2017	11,000	Relet	5Y	37.50	30.00	3.00%	Rockville
Lease 12	2017	11,000	Expansion	3Y	30.00	0.00	3.00%	Rockville
Lease 13	2017	10,833	Extension	1Y	29.83	0.00	None	Rockville
Lease 14	2020	7,643	New	6Y	39.00	Spec	3.00%	Rockville
Lease 15	2020	6,228	New Deal	5Y	37.75	As-is	3.00%	Gaithersburg
Lease 16	2020	4,542	New	11Y	38.75	Spec	3.00%	Rockville
Lease 17	2020	3,995	New	5Y	38.25	Spec	3.00%	Rockville

Source: Colliers (2023)

Supply Factors

The life sciences sector is supported by three primary commercial real estate typologies: 1) research and development (R&D) lab space (a subset of “flex” space), 2) manufacturing space, and 3) conventional office space (although “life sciences” as a real estate asset class primarily refers to lab space). These types of real estate can be incorporated within a single campus or district—and in some cases—larger-scale corporate operations may include a mix of these uses within a single building. For example, R&D facilities often include a mix of lab space and conventional office space for administrative or corporate operations. Therefore, understanding real estate development trends in support of the life sciences industry requires a blended approach by first understand general commercial real estate conditions and then isolating the share of this real estate that serves the industry.

On a national level, the life sciences sector is one of the fastest growing commercial real estate asset classes. According to a 2023 CBRE report, the inventory of lab and R&D space grew by 47 percent since 2018 adding nearly 182 million square feet of space nationally, and as of Q4 2022, there was more than 40 million square feet under construction. According to the same report, the Washington DC metro area had around 1.5 million square feet under construction ranking it 6th among the top 13 metro areas for

life sciences construction (Boston led all markets with 15.3 million square feet under construction followed by San Francisco (9.3 million square feet) and San Diego (5.4 million square feet)).²⁴

Inventory Trends

According to CoStar, there are nearly 76 million square feet of office space in Montgomery County, of which, nearly 19 million square feet, or around 25 percent, are occupied by establishments directly supporting the life sciences sector. Since 2010, office development activity has been relatively consistent between conventional office space uses such as finance and professional services and space occupied by life sciences establishments, with around nine percent of the total existing supply office space delivered since 2010, while 10 percent of the existing office supply occupied by life sciences establishments was delivered since 2010. There has been minimal new development of Flex R&D space with only five percent of the existing 6.1 million square feet of total supply delivered since 2010. Conventional industrial space for logistics, warehousing, and manufacturing has also had limited development activity with only 1.0 million square feet delivered since 2010. This indicates that despite the region's competitive advantage for life sciences, most new operations are occupying space that was built more than 10 years ago and there has not been a major shift with the development of newer space, at least within Montgomery County.

Figure 2.11: Commercial Real Estate Supply Trends, Montgomery County (in millions of SF)

	Office	Office with Life Sciences Tenants	Flex R&D	Light Industrial
Total Inventory	75.8	18.8	6.1	16
Deliveries Since 2010	6.5	2.0	0.3	1
Share of Total Inventory (Since 2010)	9%	10%	5%	6%

Source: CoStar (2023)

Vacancy and Absorption Trends

The vacancy rate for conventional office space is just under 16 percent with a total of 12.8 million square feet of vacant space countywide. From 2010 to 2019, the vacancy rate ranged between around 10 and 13 percent, while post-pandemic, the vacancy rate has increased annually and is now at an all-time high. The performance of conventional office space with life sciences establishments has fared slightly better with total vacancy of 13 percent and net increase of inventory of around 475,000 square feet. This indicates that demand for life science-oriented office space may remain soft in the near term as these types of workers are continuing to telecommute on a full- or part-time basis. Flex R&D space has fared much better with a total vacancy rate of 5 percent and positive, yet modest, net absorption of 155,000 square feet since 2020.

²⁴ 2023 U.S. Life Sciences Outlook, CBRE, April 2023

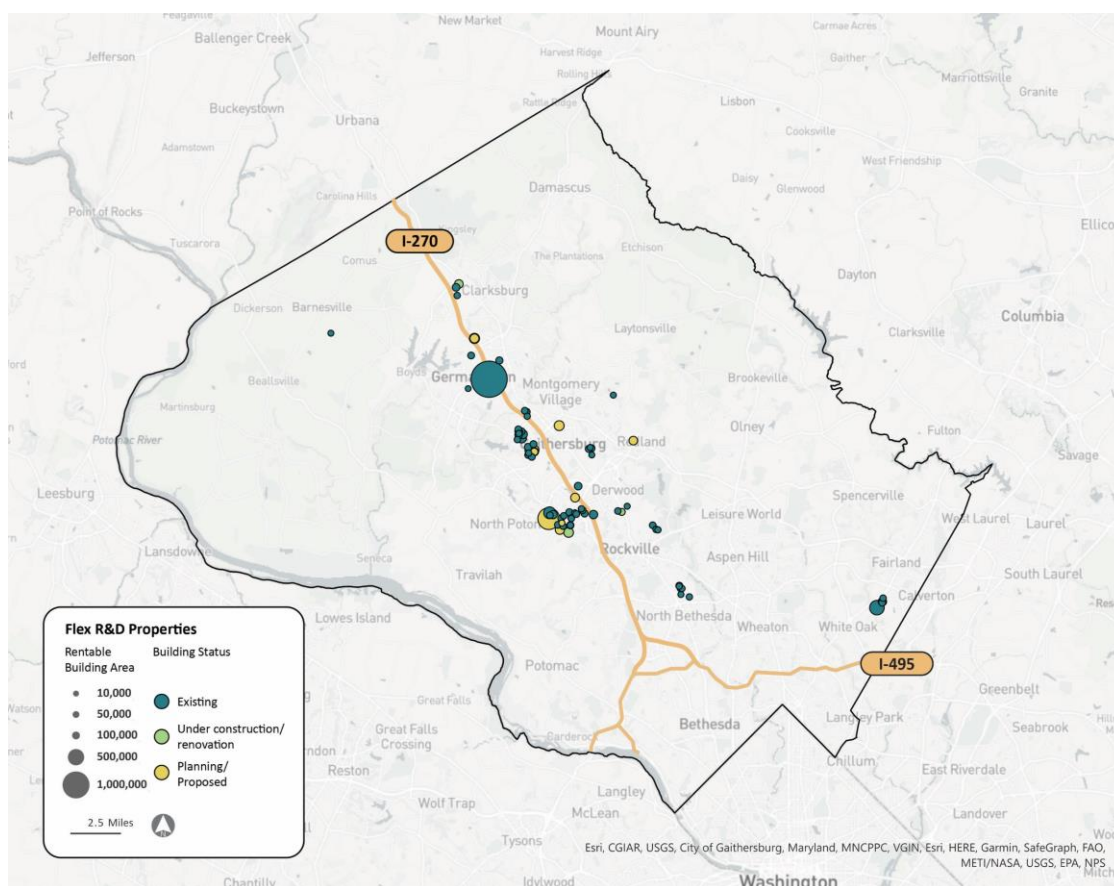
Lease Rates

According to Q2 2023 data from CoStar, conventional office space with life sciences establishments had average lease rates of just over \$32 per square foot, which was comparable to other types of office space with non-life sciences tenants. Flex R&D space also had average lease rates of around \$33 per square foot, although there is considerable variation depending on building age, build out of the space, and end user. Newer spaces generally achieve rents of above \$40 per square foot. According to a CBRE report, the Washington DC metro area has average asking rents significantly below New York (\$108 per square foot) and Boston (\$99 per square foot) and competitive rents with Philadelphia (\$46 per square foot) and Raleigh-Durham (\$36 to \$41 per square foot).

Proposed Development

According to CoStar, there are 716,000 square feet of conventional office space under construction in Montgomery County and with more than 3.0 million square feet of proposed space, although given uncertainties in the office market post-COVID, it is likely that only a portion of this space will be built. There will be continued investment in the flex R&D market with more than 3.7 million square feet proposed in the county. The largest single Flex R&D facility in the county is the U.S. Department of Energy Complex with more than 1.4 million square feet.

Figure 2.12: Flex R&D Properties Built since 2010



Source: DataAxle (2023); Montgomery Planning, Research and Strategic Projects (2023)

Market Competitiveness Factors

Real estate development supporting the life sciences industry is one of the fastest growing commercial asset classes nationally, and as the conventional office market continues to face risk and uncertainty in the post-COVID era, more developers and investors are pursuing life sciences as a means of leveraging strong market conditions and diversifying their portfolios. However, unlike conventional office space, warehousing, or retail space, life sciences development is much more specialized with significantly higher development costs posing significant barriers to entry. It is also an industry that is talent driven where certain markets have competitive advantages in terms of talent development and attraction through local institutions of higher learning, economic opportunity, and quality of life.

Based on interviews with developers in the life sciences space, the following were noted as key marketability factors driving future development opportunities:

Talented Workforce

Access to a skilled workforce and top-tier talent pool is a major factor in life science competitiveness. Proximity to leading educational and research institutions is a significant advantage for a region, because it helps develop this talent. Universities also provide collaboration opportunities in training and research for private industry. Finally, a large life science sector itself provides an advantage for a region because it means that a large talent base is already in place for new and growing companies to draw from. With its private sector combined with nearly 30 thousand Federal employees at the National Institutes of Health and the Food and Drug Authority, Montgomery County is already strong in this regard and can build upon its existing ecosystem.

Market Readiness

From a developer's perspective, prime markets are those that allow for speculative ("spec") development, or development that can be built without an end user in mind, since leasing activity for a particular product type is strong enough to lease the space upon completion within a reasonable absorption period. For example, apartments are always built as spec, since the units are leased by tenants after construction is complete.

Employment-based uses carry higher risks, especially in the post-COVID era and can vary depending on the market. For life sciences development, generally only prime markets such as Boston or San Francisco can support spec development. For the Washington DC regional market, most developers will only take on a project with an end user in mind; therefore, having a pipeline of companies entering the market may increase the attractiveness from a developer and investor standpoint. The co-location of established industry leaders can stimulate innovation, attract complementary businesses, and offer potential collaboration and partnership opportunities, nurturing a dynamic ecosystem of expertise.

Site Control

While a developer may have experience attracting investors, securing financing, and building a successful product, assembling and/acquiring an ideal development site can be costly, time consuming, and risky. This is especially critical in the life sciences industry given the risk and higher development costs. If development sites are not available, developers will seek out opportunities in other growing markets such as Philadelphia or Raleigh-Durham. Therefore, there is a role for the public sector to help facilitate the assembly and marketing of prime development-ready sites.

Depending on the size and scale of the site and availability of infrastructure, transportation, amenities, and services, there are opportunities to create a more comprehensive and intentional mixed-use district through a master developer. In most cases, a developer for a single site is seeking near-term profits to pay off debt and investors and does not necessarily have a vested long-term interest in the community, especially if they are looking to sell in the near term. However, a multi-phased master development creates an environment for a long-term commitment from the master developer, including investments in amenities that do not produce steady revenues such as open space. In some cases, the initial phase of a project may even be a loss-leader that is positioned to enhance the value of future development to maximize profits across the entire development.

Land Use

Land use regulations can be a significant barrier to development when the underlying zoning is too proscriptive and does not allow for use or design flexibility. In some cases, land use regulations can minimize a site's highest and best use. Currently, Montgomery County allows for life sciences development within its Life Sciences Center (LSC) zoning district. The LSC district allows for a mix of uses, and while residential is permitted by Special Exemption (SE), additional regulatory hurdles can discourage mixed-use development plans. This is especially critical given the added risks and barriers to development from financing and site acquisition. Creating more zoning flexibility and efficient and transparent regulatory processes will create a more attractive environment for innovative and value-adding development.

Infrastructure and Built Environment

Proximity to transportation hubs and access to utilities is critical. Convenient transportation options, whether road, rail, or air, are essential for moving goods, and talent efficiently. Adequate utility infrastructure is equally vital to support power-hungry lab equipment and maintain consistent operations. Lastly, investments in the local area, such as infrastructure, amenities, and community engagement, can enhance the site's livability and ensure that employees have a pleasant work-life balance. An ideal life sciences development site, therefore, encompasses these multifaceted elements, creating a nurturing environment for innovation, research, manufacturing, and economic growth.

Macro Trends for Consideration: Inflation, Interest Rates, and Access to Capital

There are several external factors that are generally beyond the control of local and county government that can create barriers to real estate development. While the life sciences sector is very strong regionally and nationally, from a real estate development perspective, the sector carries higher risk given infrastructure needs and substantially higher development costs. This is why many developers focus on products that are cheaper and “easier” to build with high demand and can return a substantial return for investors such as apartments, warehousing, or self-storage. Therefore, even moderate shifts in macro-level factors can limit opportunities for life sciences development and shift real estate investment to more conventional products.

Inflation

Construction costs have increased since the onset of the pandemic, with construction materials costs rising 20 percent from January 2021 to January 2022, following inflation and the global supply chain crisis.²⁵ With materials and labor costs rising, ground up construction—particularly for an asset class with some of the most substantial development costs due to fit out requirements—has become increasingly infeasible from a return perspective.

Interest Rates

Paired with the rising costs to build is the ongoing escalation of interest rates (and uncertainty of whether these rate hikes will continue). Higher interest rates and borrowing costs have reduced the building capacity for developers and made them more selective about which projects to pursue. While demand for life sciences real estate remains strong, the supply-side of the equation has been hampered with highest costs and some developers have shifted to less costly asset classes like residential. Additionally, with very strong supply growth over the last five years, demand will need to catch up with supply and limiting new development in the near term.²⁶

Access to Capital

For life sciences companies that are younger in their maturity the tightening of capital markets and increased interest rates has challenged the existing model that has allowed pre-revenue companies to operate or even expand with low-cost financing. The funding accessibility challenges has also constrained the volume of companies going public through the IPO process—another source of new cash infusions for these companies.²⁷

²⁵ <https://www.agc.org/news/2022/02/15/materials-prices-soar-20-percent-between-january-2021-and-january-2022-contractors-bid-prices>

²⁶ <https://www.wsj.com/articles/life-sciences-property-sector-cools-after-multiyear-winning-streak-737fe1c6>

²⁷ <https://www.biopharmadive.com/news/biotech-startups-venture-series-a-cliff-funding/645883/>

2.4. Life Sciences Real Estate Needs and Costs

The specialized nature of the activities conducted in life science facilities requires a set of unique requirements from a safety and regulatory standpoint. These requirements are designed to create an environment that supports the complex and sensitive work carried out by researchers, scientists, and professionals.

The building requirements for R&D labs and office space encompass various physical characteristics, structural design criteria, code standards, architectural guidelines, and mechanical, electrical, plumbing, and fire suppression specifications. The build out, whether this is a combination of lab and office space within a single building or within separate buildings in a larger development, is very much dependent on the end user. The office component primarily provides space for administrative, information technology, and executive functions generally consistent with conventional office space in terms of design, level of finish, floor plans and infrastructure. On the other hand, the build-out for the lab component follows much more stringent design guidelines and specifications.

R&D and manufacturing facilities – or those solely dedicated to the development of highly designed biomedical or advanced products – are much more specialized and costly compared to conventional manufacturing space given specific code requirements such more robust HVAC systems, energy redundancies, refrigeration and cold storage, and hazardous waste storage and disposal. While building structures are generally comparable to conventional office or light industrial space, additional needs for access, utilities, and other site considerations impact how future land use planning should align with these specifications.

Essentially, there are three major categories for understanding how the specifications for life sciences development differ from conventional office or manufacturing products: Structure, Systems, and Build Out. Figure 2.13 provides a summary of these specifications. A detailed description of these specifications can be found in the Appendix.

Figure 2.13: Comparison of Life Sciences Building Specifications with Conventional Office and Manufacturing Space

	Life Sciences Lab Space	Life Sciences Manufacturing
Site	Similar site plan as conventional office, although a minimum of two loading docks required. A service yard is essential to accommodate critical equipment, serving as the logistical hub of business operations. This impacts placement of entryways/exits for the site.	Significantly larger floor plates although smaller in scale compared to logistics, warehousing, or standard manufacturing space. More loading docks depending on size, which impacts site configuration and access to and from local roadways due to truck traffic.
Building Structure	Similar structural elements (steel frame), although construction type should be of a higher fire protection rating, including fire-rated floor assemblies for control areas on each floor. Direct access to the roof is required for personnel and equipment and adequate service space at the lowest level is required for specific lab systems.	Besides added fire protection, structural elements and layouts are generally consistent with conventional manufacturing space and layouts should be highly customizable given variation in needs for end users.
Systems: Fire Suppression	More robust fire suppression systems are needed given very high temperature requirements for R&D labs, which adds development cost.	Similar systems are needed as with lab space, although the scale may vary depending on the type of manufacturing facility.
Systems: Ventilation	Enhanced ventilation systems to optimize air quality. Air systems are to maintain a 60 percent laboratory space to 40 percent office space ratio, among a range of other requirements.	Similarly, ventilation systems must be optimized with a much greater scale and effectiveness than conventional manufacturing space.
Systems: Plumbing	Enhanced plumbing systems are needed for lab waste and to ensure ample water pressure well-above standards for office.	Enhanced plumbing systems are required to handle large amounts of waste and water requirements. Systems should also be able to handle use for long periods of time.
Systems: Electrical	Electrical requirements stipulated at a wattage per square foot basis, with pad-mounted transformers adhering to specified voltage requirements to meet lab needs, which are at a higher standard than conventional office space. Additional energy generation redundancies are also needed.	Higher electrical wattage per square footage basis due to the likelihood of heavy-duty machinery on site and extended hours of use. Additional energy generation redundancies are also needed.
Build-Out	The mechanical penthouse design should be tailored to withstand a substantial floor load. Any tenant improvements should be compatible with fire suppression, systems, and electrical basis. The costs are significantly higher than conventional office space to allow for proper installation and operation of equipment.	The buildings are anticipated to serve a multifaceted purpose, catering to a range of use groups and tenant improvements should adhere to the safety requirements put in place. Build out specifications are dependent on end user and costs can vary significantly.

Source: Colliers (2023)

Projected Costs

The cost of R&D lab improvements depends on many variables such as the size of the development, ratio of lab to office, fresh air and exhaust requirements, electrical requirements for lab equipment, the number of biosafety cabinets, biosafety levels and required specialty spaces. There are also external factors such as union or non-union labor costs as well as the state and capacity of the existing infrastructure on the site. Therefore, the total cost of cost of improvements can vary significantly depending on site and end user.

According to CBRE, three of the top life sciences markets in the U.S. (Boston, San Diego, and San Francisco) had new building costs (total cost for improvements) ranging from \$675 to \$1,200 per square foot. These costs are for the structure and systems and do not include the average tenant build-out costs ranging from \$300 to \$600 per square foot resulting in total development costs of roughly \$1,000 to \$2,000 per square foot, significantly higher than a conventional office building that had total development costs ranging from \$300 to \$900 depending on height (single-story vs. mid-rise vs. high-rise).²⁸

Figure 2.14 includes a breakdown of hard, soft, and tenant improvement/build-out costs for four life sciences developments in the Philadelphia region. While development costs vary between markets, these should provide order-of-magnitude expectations for future life sciences development in Montgomery County. The costs were provided by the developers who asked that the specific details of the development remained confidential. Depending on site, the developments included a mix of lab, office, and manufacturing space within individual buildings or part of larger master planned development areas. Overall, total costs ranged from \$706 to \$823 per square foot with hard costs ranging from \$431 to \$581 per square foot, soft costs ranging from \$75 to \$140 per square foot, and tenant improvements ranging from \$150 to \$235 per square foot.

Figure 2.14: Actual and Budgeted Per Square Foot Costs for Life Sciences Development, Philadelphia MSA

	<u>Development #1</u>	<u>Development #2</u>	<u>Development #3</u>	<u>Development #4</u>
	Lab Space/Manufacturing ~4.5M SF Built	Lab/Office Space ~200K SF Proposed	Life Sciences Manufacturing ~1.2M SF Proposed	Lab/Office Space ~400K SF Proposed
Hard Costs	\$448	\$435	\$431	\$581
Soft Costs	\$140	\$155	\$75	\$90
Tenant Improvements	\$235	\$175	\$200	\$150
Total	\$823	\$765	\$706	\$821

Source: ESI (2023)

²⁸ <https://www.cbre.com/insights/briefs/despite-the-cost-construction-of-life-sciences-properties-brings-strong-returns>

2.5. Conclusions

The following opportunities and challenges for life sciences real estate development can help inform future land use and master planning in Montgomery County. While the life sciences industry is poised for growth, challenges persist in terms of creating development investment opportunities and new economic opportunities for the county.

Opportunities

- **The life sciences industry is growing** and real estate development supporting the industry has been one of the fastest growing real estate asset classes nationally (although future growth will be slower in the near-term).
- **Montgomery County has a strong and established life sciences sector** representing 10 percent of total employment (including public sector jobs) with the areas in and around the Life Science Center adding over 4,600 private sector life science jobs from 2010 to 2021 for a 19 percent growth rate for the industry in this area.
- **Montgomery County has a pipeline of talent to support the life sciences industries** from regional institutions of higher learning and from federal government operations.
- **Lease rates for R&D space are competitive compared to other top markets** with average lease rates of around \$40 per square foot, which are comparable to emerging markets like Raleigh-Durham and Philadelphia and well-below markets like Boston,
- **There is a relatively high level of interest from prospective life sciences establishments to lease space in the county** with establishments exploring more than one million square feet of space.
- **Low vacancy rates for flex R&D space** of around five percent indicate an opportunity to expand the supply.

Challenges

- **The design specifications and higher cost of life sciences development presents barriers to development**, which is further limited by high interest rates and increased risk in the post-COVID-19 pandemic era.
- **Life sciences development has been relatively modest** with only 300,000 square feet of flex R&D space delivered in the county since 2010 (not including dedicated office space that is home to life sciences establishments), although there is more than three million square feet of proposed or planned space.
- **There is little to no spec market for life sciences development in the region**, limiting new development activity without making linkages between developers and end-users.
- **Inter-regional and intra-regional competition will continue to persist**, although competitive advantages may be lost without identifying key institutional partners and creating catalyst redevelopment opportunities integrated in a more walkable and integrated urban context.

- **Smaller-scale spaces are needed to support startup activity**, although the development community gravitates towards large-scale spaces for large employers with long-term leases. Supporting smaller-scale life sciences space requires an active institutional partner, or partnership among major employers to actively market, lease, and manage space geared towards startups and small businesses.

3. Land Use and Compatibility Assessment

While Montgomery County is recognized as a life sciences industry leader and positioned for new real estate development, there are additional considerations from a land use perspective that will influence the country's overall competitiveness. The following section focuses on opportunities and challenges pertaining to land use, infrastructure, and the built environment and considers what types of development would be successful and where they should be placed. It also considers which land use elements are needed to support the industry, including public space, housing, recreational amenities, and infrastructure. Ultimately, as Montgomery County plans for its future, it needs to consider how life sciences development should be integrated within the existing built environment and how future land use patterns overall could influence the future growth of the industry.

The following section discusses key site selection characteristics that influence life sciences real estate development decision making and opportunities for incorporating housing and other uses.

3.1. Importance of Land Use for Maintaining Economic Competitiveness

Maintaining the status quo of separated uses and an auto-dominated transportation network will impact Montgomery County's overall competitiveness as a life sciences hub. Other competitive markets and innovation hubs are recognizing the need to create more opportunities for the co-location of uses with life sciences development, whether within mixed-use master planned districts, infill development near existing housing and transportation infrastructure, or within mixed-use buildings. There has been a general shift from the perceived need to isolate life sciences uses to a desire to integrate them within an existing urban fabric, or to create mixed-use districts with a stronger focus on placemaking and the pedestrian experience. From a marketability standpoint, accessibility, connectivity, and visibility have become increasingly more valuable.

Regional development patterns are also increasingly being influenced by changing demographics, housing preferences, and affordability. There are growing preferences for housing that is more convenient to places of work, but also with better access to parks and open space, walkable commercial areas, and public transportation. Making land use flexible to better incorporate a mix of uses is both supportive of the life sciences industry, but to enhance the overall quality of life and livability of the county as a whole.

When life sciences employers, research organizations, developers, or other entities are seeking new real estate development opportunities, what are the key aspects of infrastructure, land use, market, and other factors that drive decision making? Why would a developer choose Montgomery County over other parts of the region — or another region altogether — and what does Montgomery County need to encourage future investment? These attributes include transportation, viability of land and/or redevelopment sites, physical infrastructure, land use, human capital, and institutional ecosystem, including the presence and involvement of universities and research institutions.

Development Patterns

Montgomery County is generally defined by three development patterns: denser, older suburbs to the south and east, and medium to low density suburban and exurban development stretching to the north and west followed by expansive rural areas. When considering land use compatibility, development marketability, and the cost and availability of land, larger-scale greenfield development is generally cheaper and easier in the central and northern portions of the county, but substantial investments in infrastructure are needed to unlock development potential. More urbanized areas to the south have the necessary infrastructure and access to labor force, but site control both in terms of parcel size and acquisition costs are the primary barriers to development in addition to regulatory barriers in some areas. Therefore, when considering future development in the Life Science Center and nearby areas, there is a need to facilitate mixed-use development that is supportive of the life sciences industry, while understanding the opportunities and challenges from a land use and site selection perspective.

Site Selection Criteria

Site selection preferences in the life sciences industry have shifted over the last decade, with urban locations gaining development momentum; however, suburban areas remain competitive for several reasons. For one, the disruption of the pandemic encouraged many knowledge workers to shift towards suburban and exurban locations in search of increased personal space, a shift that has in many cases persisted beyond the pandemic years. In addition, as the Millennial generation, which had expressed increased preference to live in urban locations during their young-adult years compared to their parents, enters their 30s and 40s, a new generation of parents may experience the push to move to suburban locations in search of more open space and stronger public-school systems. Montgomery County, with its strong school system, parkland and recreational assets, shopping and dining opportunities, and proximity to a major urban center, are very attractive to this new generation of suburbanites, which in turn can support the human capital needed to be attractive to life science establishments.

At the same time, there is a need to evaluate the county's current inventory of assets from a site selection standpoint and identify potential gaps in the following areas including:

- Transportation
- Site Availability
- Physical Infrastructure
- Land Use Policies
- Human Capital
- Institutional Ecosystem

Transportation

As discussed in Section 2 of this report, Montgomery County's automotive transportation network is comparative to its suburban peers. Where the county stands out from other competitive suburban locations is in its fixed-route public transportation infrastructure — particularly its access to the D.C. Metro's Red Line. While some suburban communities are served by rail transit and other competitive regions like Raleigh-Durham have no fixed-rail service, very few are served by frequent and rapid service like the Red Line, while providing direct access the core areas of Washington, D.C. The Red Line's frequent service is available to a significant portion of Montgomery County, as it runs more than 10 miles northwest of the county line. Access to this service vastly enhances the marketability of and real estate development potential near Red Line stations throughout the county.

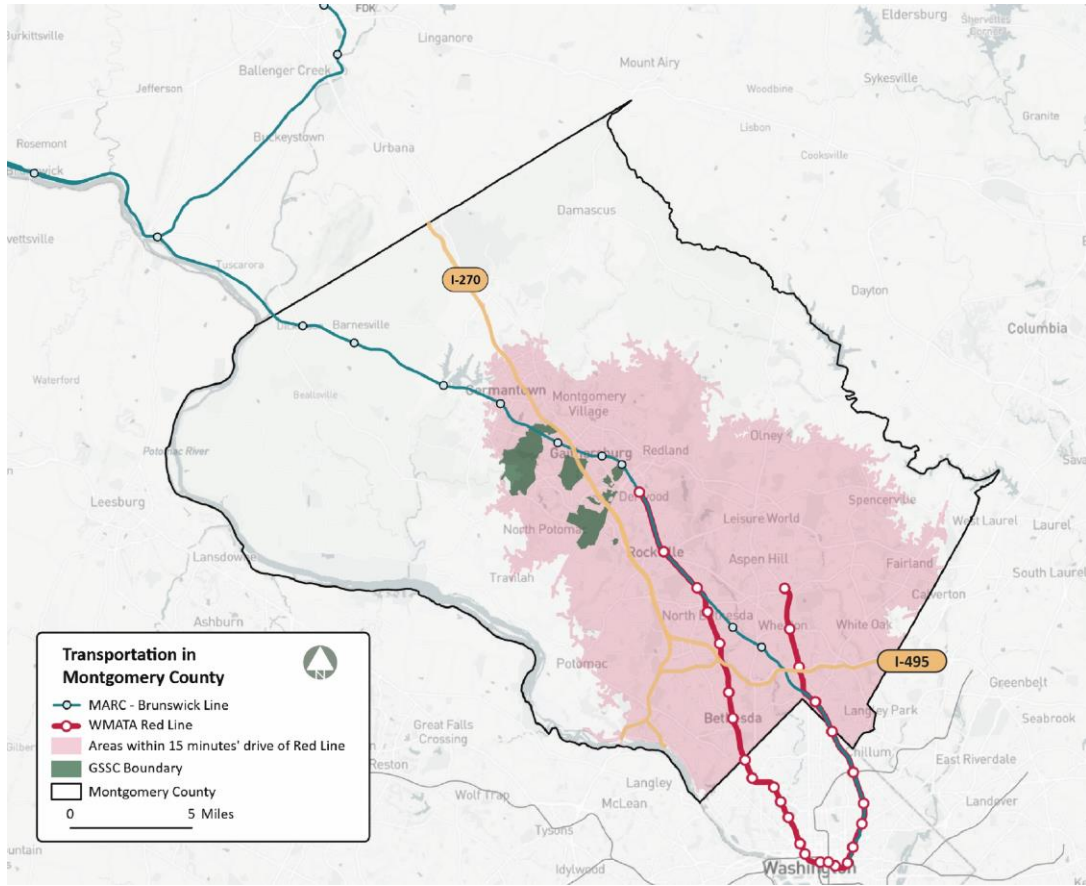
This frequent transit service enables the following qualities attractive to potential life sciences tenants, among others:

- Convenient reverse commuting, enabling suburban companies to recruit urbanite workers;
- Convenient access to Washington, D.C.-based institutions (universities, government, and private firms); and,
- Rapid service to Downtown Washington, D.C. makes any on-site housing developments more attractive to traditional commuters.

The State of Maryland has proposed and authorized the Purple Line project, a new light rail line that will connect Montgomery County to Prince George's County. The line is currently under construction and assuming completion later this decade, Montgomery County will gain additional rail service to other suburban employment, residential, and innovation centers.²⁹ This will have strong implications for creating mixed-use opportunities within proximity to future transit stations. While transit access will add value to future development, site planning will still need to consider parking capacity and drive-times to workforce, housing, and amenities given the automobile-oriented nature of the county. Figure 3.1 provides a map of the D.C. Metro Red Line and vehicular accessibility within a 15-minute drive-time, estimated by Esri. This analysis, conducted by ESI, is to visualize the relative accessibility to rail transit in the central and southeastern areas of the county.

²⁹ <https://www.purplelinemd.com/about-the-project/faqs#how-frequently-will-purple-line-trains-run>

Figure 3.1: Montgomery County Transportation Options, Including Areas Within 15-Minute Drive of Montgomery County Red Line Stations



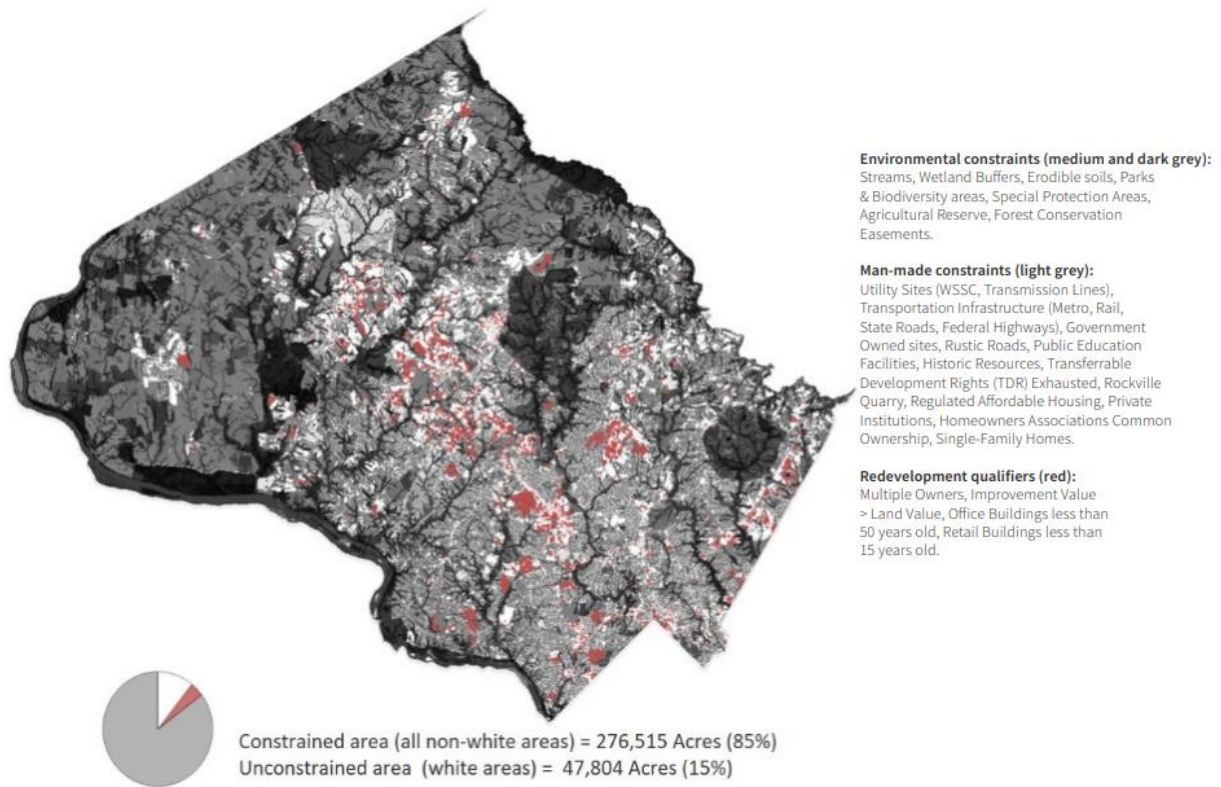
Source: Montgomery Planning, Research and Special Projects (2023), Open Data DC (2023), Esri (2023), U.S Census Bureau (2023), ESI (2023); drive-times estimated by Esri

Site Availability

While Montgomery County has an abundance of undeveloped land, there is limited supply of development-ready sites for commercial development given the lack of utilities or transportation access (major arterials or transit) in the northern and western parts of the county and a large share of the county's undeveloped land is protected as agricultural reserve. According to THRIVE Montgomery 2050, the county's General Plan, 15 percent of county land, or nearly 50,000 acres, is identified as 'unconstrained' for development.³⁰ While this is still ample land to support new real estate demand over the next several decades, a large portion has very limited access to amenities, services, and transportation significantly limiting marketability for employment-based uses.

³⁰ THRIVE Montgomery 2050, approved and adopted plan: [URL](#)

Figure 3.2: Land Available to Accommodate Growth in Montgomery County, 2022



Source: Montgomery Planning, Research and Strategic Projects (2022)

The most marketable sites for life sciences development in Montgomery County are those that are proximate to the I-270 corridor or existing or future Metro stops; therefore, there is a need to unlock infill development or redevelopment opportunities – particularly infill near existing assets that can be integrated into a formalized district. The Shady Grove area that is currently the county’s primary life sciences center serves as an example. There is a concentration of life sciences assets present in the area – from Adventist Hospital to the NIH’s cancer research institute to the Universities at Shady Grove campus. There are several publicly owned parcels near these assets that would be ideal for creating life sciences development opportunities. Outside of the study area, there are other life sciences assets spread throughout the county – some of which are strong candidates to serve as centerpieces of their own life sciences districts.

Physical Infrastructure Needs Specific to Life Sciences

The physical infrastructure needs of life sciences campuses are discussed in detail in Section 2, which included a comparison of standard office and manufacturing campuses with notable differences including:

- Higher fire protection standards
- Enhanced ventilation, plumbing, and electrical systems
- Access and physical proximity to reliable and redundant water and power sources
- Substantial floor load
- Larger floor plates (for manufacturing uses)
- Service yards
- Overall, typically higher costs per square foot

Developers will assess these infrastructural components on a site-by-site basis. Sites may be assessed on the space available for service yards and other necessary infrastructure, as well as on the quality of the power grid in a particular area.

In some cases, the County has programs that address these issues on a countywide basis. For example, the County's *ECOWISE* program, based at Shady Grove, offers hazardous waste drop-off for businesses generating small quantities of hazardous waste.³¹ This is an important advantage for waste collection from smaller operations (small labs, for example) located near Shady Grove.

Montgomery County's strong protections against water pollution can help protect natural resources and build community consensus in favor of life sciences development. Compared to urban locations that frequently struggle with combined sewer overflows and aging infrastructure leading to water system pollution, Montgomery County's separated sewer system that is much younger than those in urban centers would be considered a critical asset by site selectors.

Land Use Policies

Montgomery County's suburban land use patterns present challenges – and benefits – for life sciences development. While there has been considerable momentum within life sciences development in urban locations, suburban areas remain competitive, although they have had to evolve in terms of development typologies and site planning. One of the challenges is that urban areas by nature are mixed-use districts and suburban locations, where the separation of land uses is entrenched, development has followed conventional office park or campus design. At the same time, many suburban areas are approaching site development with an urban lens with a focus on infill development, placemaking, and connectivity with existing walkable neighborhoods and districts.

Montgomery County's life-sciences-specific accommodations in its zoning code – which build in accommodations for mixed-use life sciences developments – are an important asset that can encourage developers to support this type of development. Compared to similar suburban counties, Montgomery

³¹ <https://www.montgomerycountymd.gov/sws/ecowise/>

County has a zoning code with unique accommodations for mixed-use life sciences development. The existence of the “Life Sciences Center” (LSC) zone in the county code is relatively unique among major suburban counties. While other localities may have other methods of accommodating mixed-use life sciences development, Montgomery County building such developments into the zoning code has two benefits: it protects against potential snags in the development process related to unclear regulations, and it demonstrates a commitment to this specific development typology that can be attractive to potential developers.

Still, the zoning accommodations for mixed-use life sciences development can be strengthened. The current code limits other uses in life science zones to certain percentages of mapped floor-to-area ratio; a stronger code would make clearer accommodations for co-locating a wide variety of uses with life sciences developments.

Human Capital

Human capital is a strong asset for Montgomery County because it is one of the most highly educated counties in the nation. Well over half (59.8 percent) of Montgomery County residents aged 25 and over have a bachelor’s degree or higher, putting the county among the 20 most educated counties in the U.S. And about one-third of county residents have a graduate degree or higher – eighth highest among all U.S. counties.³²

In addition, Montgomery County has a strong population of life sciences professionals – and a strong life sciences economy. Maryland is second in the nation in life scientists as a percentage of all occupations.³³ The county has by far the most life sciences jobs of any county in the Washington, D.C. metropolitan statistical area – accounting on its own for more than one quarter of all life sciences jobs in metro area. Moreover, it has more than double the number of life sciences jobs of the District of Columbia itself.³⁴

However, Montgomery County also faces challenges related to life science human capital. First, much of the current life science employment is in Federal institutions including the National Institutes of Health and the Food and Drug Administration and is not readily transferable to the private life sciences sector. Additionally, both Maryland and the DC region lack coherent talent pipelines from the regional universities and community colleges to Montgomery County life science careers.³⁵

Institutional Infrastructure

Perhaps the most important type of infrastructure for establishing a successful life sciences campus is the presence of a major research university nearby. As will be discussed in further detail in Section 4 of this report, most, if not all, of the existing examples of innovation districts center around the presence of a major university.

Montgomery County lacks a major research university campus – a critical component of most innovation districts. However, the county has access to the Universities at Shady Grove — a Rockville-based location which serves as a satellite campus for a consortium of public universities across Maryland. In addition, considering its proximity to Washington, D.C. and Baltimore, the County is proximate to the

³² U.S. Census Bureau American Community Survey, table S1501, 2021 5-Year Estimates.

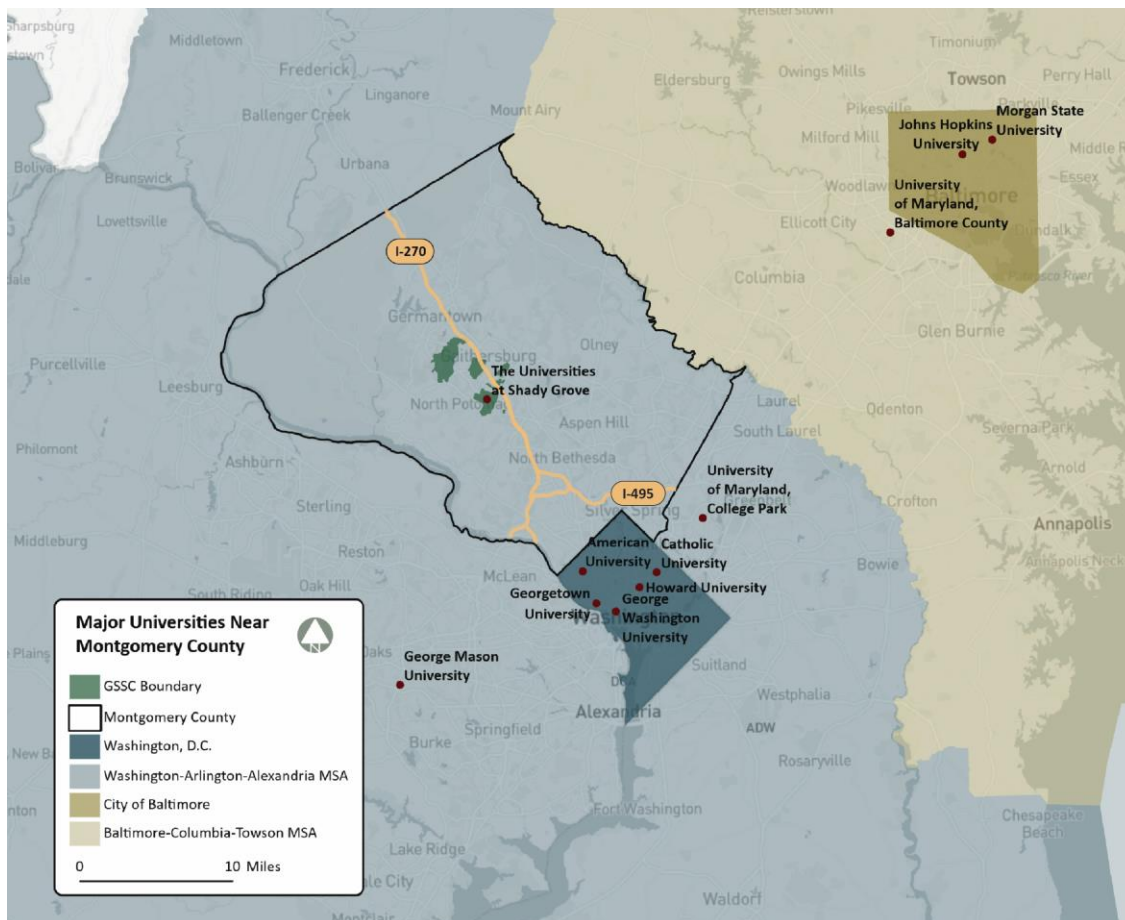
³³ [Life Scientists as a Percentage of All Occupations | State Indicators | National Science Foundation - State Indicators \(nsf.gov\)](#)

³⁴ Lightcast.

³⁵ https://milkeninstitute.org/sites/default/files/2021-10/MI_MD_Life%20Sciences.pdf

numerous major research institutions located in those two urban regions, any of which may be interested in establishing a presence in Montgomery County.

Figure 3.3: Major University Campuses Near Montgomery County³⁶



Source: ESI (2023), U.S. Census Bureau (2023), Carnegie Classifications of Institutions of Higher Education (2021)

Proximity to Washington, D.C. is especially valuable due to the federal research institutions located both in the District itself and in the surrounding Maryland and Virginia suburbs, including Montgomery County. Montgomery County is itself host to the federal research institution most relevant to the life sciences, the National Institutes of Health (NIH). The county plays host to two NIH campuses – the main campus in Bethesda, and the National Cancer Institute in Rockville – that bring significant public-sector research and development activity to the area.

NIH on its own has the size and research prowess comparable to the elite universities around which private-sector innovation economies have developed. It is ranked second in the world among institutions (including universities and research institutes) contributing to biomedical science research.³⁷

³⁶ Based on R1 and R2 universities located in DC and MD, per Carnegie Classification of Institutions of Higher Education, plus universities located in Montgomery County. See [List of research universities in the United States - Wikipedia](#)

³⁷ [The top 10 institutions in biomedical sciences in 2018 | News | Nature Index](#)

However, its nature as a federal research center presents unique challenges to catalyzing private-sector development – connections with the private sector are fewer and farther between.

The state of Maryland has strong research infrastructure that can help make locating in Montgomery County more attractive for potential tenants. The Maryland research ecosystem ranks fifth in research and development spending as a percentage of GDP.³⁸

3.2. Co-Location of Housing with Life Sciences Development

A quality housing stock is essential to any regional economic development strategy. Life sciences as an industry is not necessarily unique in this regard, but as part of the continued growth of Montgomery County's economy as a national and global life sciences hub, there is a need to continue investing in its housing stock and adapt development patterns to attract and retain talent.

Marketability Factors

Access to suitable housing is crucial for attracting and retaining top talent. Having abundant housing and a mix of housing typologies in and near Montgomery County's major life science employment districts expands the pool of current and potential workers that can relocate or build a career in the county. This housing also helps to alleviate traffic by enabling more workers to have shorter commutes, and by supporting more development for retail and entertainment as well as vibrant community life after traditional work hours.

The following factors are most important to market life sciences innovation districts:

- **Affordable and High-Quality Housing:** As with any economic development-focused strategy, a quality housing supply is essential. The availability of housing is a key ingredient to growing the life sciences sector in the region. One of the competitive advantages of Montgomery County compared to other larger markets is cost of living, as shown in Section 2.1. To keep this competitive edge, adequate supply of housing is vital to keep housing prices down and to be prepared for influxes of new workers.
- **Housing Near Employment Centers** Co-locating housing with life sciences provides benefits for workers. When housing is situated near life sciences hubs, employees can significantly reduce their commute times. This not only saves time but also reduces stress and contributes to a better work-life balance.
- **Schools:** High-quality schools are of the utmost importance to professional workers who have young children.
- **Commercial Districts:** Proximity to retail amenities such as grocery stores, restaurants, and shopping centers enhances the convenience of daily life. It saves time and provides easy access to essential goods and services. Retail businesses in the vicinity of life sciences developments can thrive due to the steady influx of professionals and residents, contributing to local economic growth.

³⁸ R&D as a Percentage of Gross Domestic Product | State Indicators | National Science Foundation - State Indicators (nsf.gov)

- **Transportation:** Proximity to life sciences developments can encourage the use of sustainable transportation options, such as walking, cycling, or public transit, reducing the reliance on personal vehicles and creating a market for public transportation in the county
- **Public space and recreational amenities:** These assets can play a vital role in the marketing of innovation districts by fostering a vibrant and attractive environment that appeals to both residents and businesses. By incorporating green spaces, and walking trails, innovation districts can promote a healthy work-life balance, attracting top talent and innovative companies seeking an environment that prioritizes employee well-being and productivity.

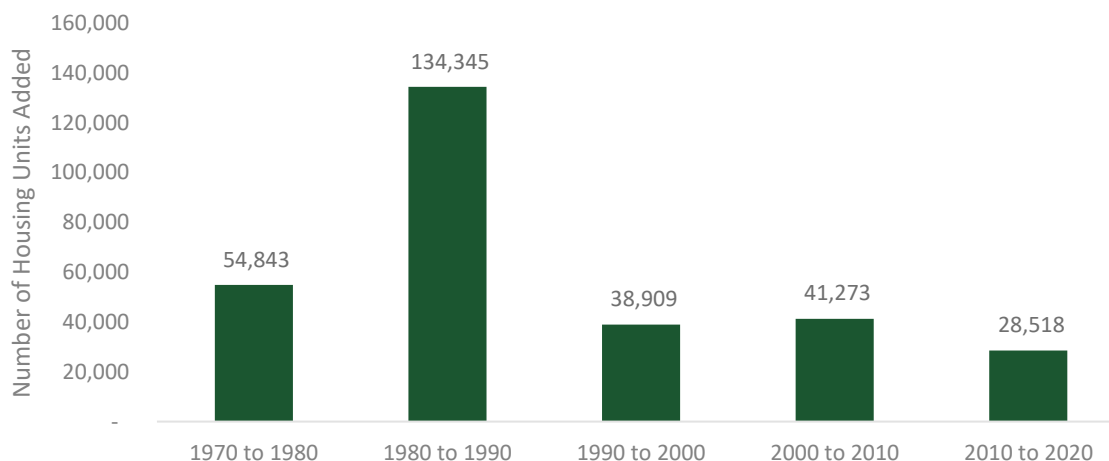
Ongoing Housing Shortage

Housing is one of the main challenges to increasing the competitiveness of the life sciences industry in Montgomery County for the simple reason that this labor force needs a range of affordable and available places to live. Currently, not enough of these places exist.

Like many major metro areas, the Washington, D.C. region is experiencing a severe housing shortage. Montgomery County is one of the jurisdictions in the region where housing is most constrained.

The largest expansion of housing supply in Montgomery County in the last 50 years happened in the 1980s when over 134,000 housing units were added. Since then, housing production has fallen off dramatically. Montgomery County added only 108,700 units in the next three decades combined.

Figure 3.4: Housing Production in Montgomery County by Decade, 1970 to 2020



Source: Decennial Census (2020; Montgomery Planning, Research and Strategic Projects (2023)

In interviews with Montgomery Planning staff, life science and healthcare business owners and executives frequently cite a lack of housing options for employees at all income levels as an impediment to locating or expanding in the County. Montgomery Planning's 2020 Housing Needs Assessment

confirms this shortage, noting that limited new construction in the county has created supply constraints.³⁹

Montgomery County, like other large counties adjacent to major cities that grew rapidly in the 20th century, lacks the land for large-scale single-family tract development to compete with the rapid pace that places in the Southern and Western United States are currently constructing relatively inexpensive single-family housing. It must make up this housing production gap by targeting infill housing, integrating housing into what were previously single-use commercial areas like the Life Science Center, and encouraging larger multi-family units (e.g., three- and four-bedroom units) so that a wider range of families have options to live near major employment areas in the county and region. Significant percentages of these units should continue to be set aside for the lowest-income residents, but construction of market-rate housing for middle- and higher-income residents is still necessary to accommodate an expanding life science and healthcare employment base.

Development Typologies

Historically, life sciences development was generally built within self-contained institutional campuses or office parks and only recently have there been efforts to strategically co-locate housing, retail, public spaces, and other amenities. For example, as presented in Section 4, Research Triangle Park (RTP) developed as a lower-density suburban office park with no retail amenities or housing; however, recognizing the need to remain competitive with other growing tech hubs, especially those in urban areas, the most recent master plan has encouraged more opportunities for housing and mixed-use development. Even Kendall Square in Boston, the national leader in life sciences innovation, has only evolved into a mixed-use district with housing and other amenities in the last 15 years.

There is no ideal model for co-locating housing and life sciences; such developments are really driven by the size and configuration of a site, market conditions, and location. Since life sciences lab/R&D development often have architectural designs much like conventional office space, it can be incorporated within a development site or district in a similar manner. New housing can be added around existing life sciences uses to create an ad hoc innovation district, with placemaking interventions including buffers and landscaping to encourage residents, workers, and visitors to conceptualize the area as a walkable district. However, this product is not necessarily differentiated from town centers or other mixed-use districts. The following examples demonstrate the breadth of possibilities for future life sciences development co-located with housing.

Infill Housing Development Near Existing Life Sciences Development

In some cases, strong life sciences institutions can attract numerous new, independent housing development located within walking distance, building an innovation district bit-by-bit. For just one example, West Philadelphia's University City neighborhood, home to a rising innovation district including numerous major life sciences institutions, is currently experiencing a building boom.⁴⁰ As of 2023 more than 3,500 units of infill housing are planned, all of which are within walking distance of life sciences institutions including University City Science Center, Spark Therapeutics, Children's Hospital of

³⁹ Montgomery County Housing Needs Assessment: <https://montgomeryplanning.org/wp-content/uploads/2020/07/MoCo-HNA-July-2020.pdf>

⁴⁰ Annual UC District Report: [Building boom continues, rent prices increasing | West Philly Local](#)

Pennsylvania, and University of Pennsylvania Hospital.⁴¹ Most of University City's success as a mixed-use district can be attributed to its central location and continued investment throughout the city; the central Philadelphia zip code adjacent to University City saw the city's most construction permits in 2019.⁴² More importantly, strategic placemaking efforts by University City District have minimized the institutional feel of the area making it more attractive for residential development.

Figure 3.5: Aerial View of Part of University City District, Philadelphia



Source: University City District (2024)

⁴¹ [The State of University City 2023 by University City District - Issuu](#)

⁴² [Philly's gentrifying areas set record for construction in 2019 - WHYY](#)

Mixed-Use Infill Development

A development coalition in Boston has recently been approved to build a mixed-use life sciences lab and housing development in the Lower Roxbury neighborhood, approximately two miles southwest of Downtown Boston. The eight-acre development will include five new buildings with a combined 466 housing units, a portion of which are affordable, and 700,000 square feet of life sciences lab space, along with a new headquarters for life-science nonprofit Lab Central Ignite and a museum, gallery, and policy center.⁴³ Though built in an urban area, this demonstrates infill possibilities on a relatively small site in an area without a strong commercial district. Since the site was city-owned, the city was able to develop a vision for the with a mix of uses, including affordable housing units and incorporation of public space was, and then solicited private developers through a city-led RFP process.

Figure 3.6 : Renderings of Proposed Mixed-Use Life Sciences Development in Boston



Source: P3Roxbury (2023)

⁴³ Lab space and affordable housing set to move forward at long-stalled Roxbury site, [Boston.com](https://www.boston.com/news/local/mass/2023/08/23/lab-space-and-affordable-housing-set-to-move-forward-at-long-stalled-roxbury-site/)

Vertical Mixed-Use Development

While only certain parts of Montgomery County have the density to support vertical mixed-use development, recent development in urban areas incorporating life sciences lab and office space with residential units demonstrates that these uses can be complementary, not conflicting uses. Avira in University City, opened in Spring 2023 and includes more than 325 apartments with 9,000 square feet of retail space, and 200,000 square feet of lab space. However, given rapidly shifting market conditions post-pandemic, much of the lab space has not been leased and the developer is primarily marketing the commercial space or conventional office users.

Figure 3.7: Mixed-Use Life Sciences and Residential, Avira Apartments, University City



Source: OCF Realty (2023)

Master Planned Mixed-Use Districts

In other cases – typically cases in which a single actor has control of a large innovation site – mixed-use expansions of innovation districts are planned meticulously. The 1,000-acre Philadelphia Navy Yard (presented in greater detail in Section 4) can serve as an example. This former naval base was originally developed as an office park, which included historic preservation and the new construction of conventional office buildings with limited retail. The Philadelphia Industrial Development Corporation (PIDC), which owns the land, has master-planned the district to incorporate life sciences, housing, and a hotel into the existing district.⁴⁴ Though the Navy Yard is located in the City of Philadelphia, its moderate-density suburban design and surface parking area makes it a useful model for suburban areas like Montgomery County, especially given efforts for maintaining ample public space and walkability within the campus.

Figure 3.8: Renderings from Philadelphia Navy Yard Plan 2022 Update



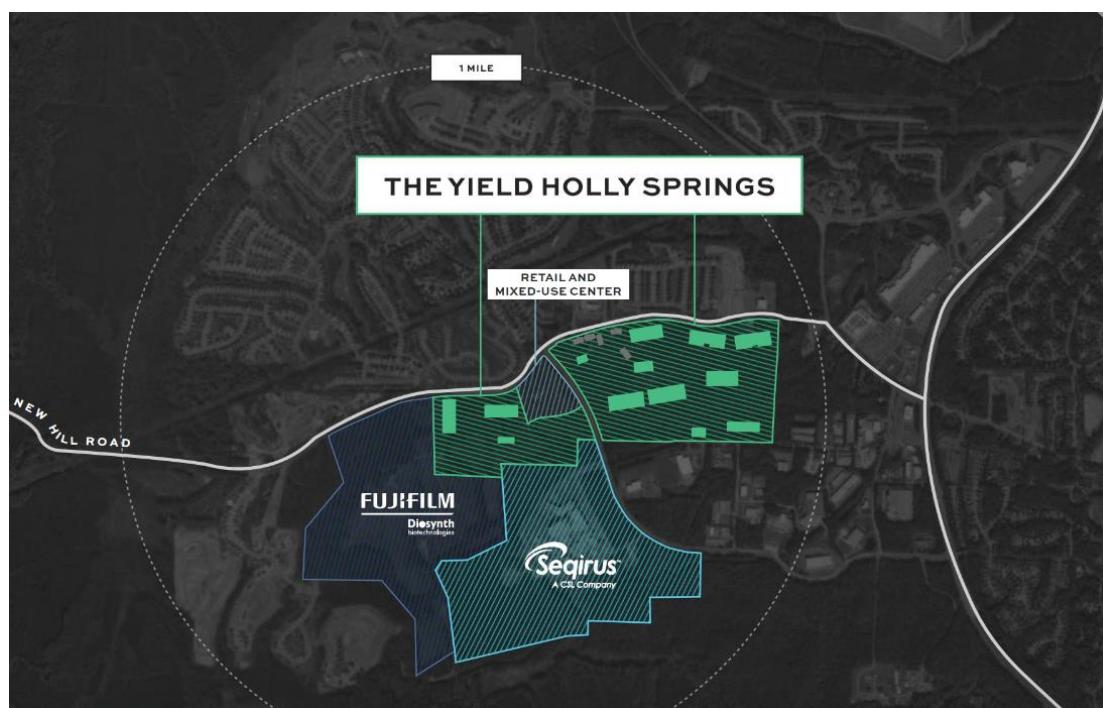
Source: PIDC (2023)

⁴⁴ [Plans for a new neighborhood at Philly's Navy Yard - WHYY](#)

Master Planned Greenfield Development

Montgomery County generally does not have sites large enough for master-planned greenfield development, but even in places where greenfield life science campuses are being developed, mixed-use development is being embraced. Similar districts are abundant, particularly in high-innovation regions like the Research Triangle region in North Carolina. In Holly Springs, NC, one of the fastest-growing innovation hubs within the Research Triangle region, The Yield is a 150-acre life sciences district anchored by two major corporate campuses (Fujifilm Diosynth and Seqirus) that will include a mixed-use retail and hospitality center.⁴⁵ While this particular development does not include housing, it is adjacent to several residential neighborhoods.

Figure 3.9: Site Plan for The Yield Holly Springs



Source: The Yield (2023)

⁴⁵ <https://www.theyieldnc.com/the-yield-holly-springs/>

Mixed-Use Redevelopment

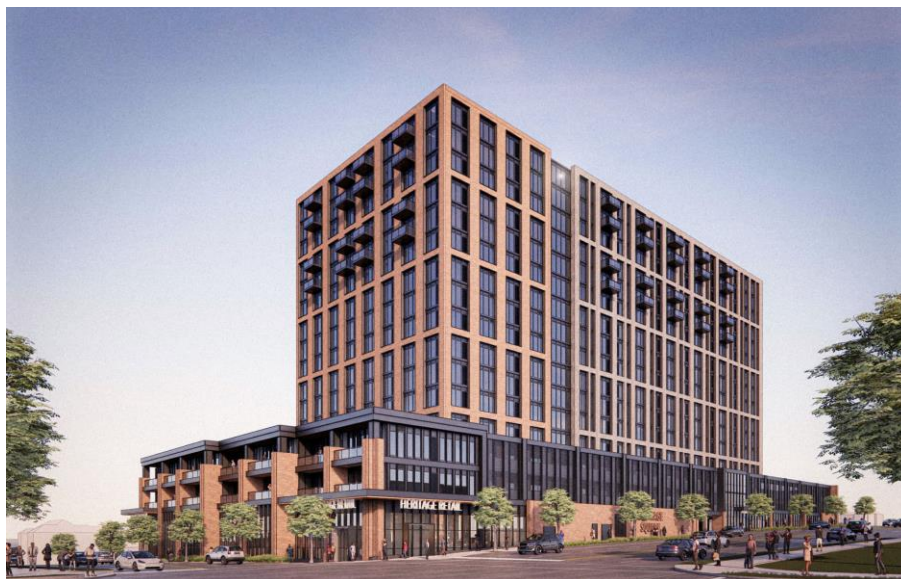
In the historic Hayti neighborhood near Downtown Durham, a former strip mall on a roughly eight-acre site is being redevelopment into a mixed-use development including life sciences office space, apartments, shops, and restaurants.⁴⁶

Figure 3.10: Image of Redevelopment Site for Mixed-Use Life Sciences Development in Durham, NC



Source: The News & Observer (2023)

Figure 3.11: Rendering for Mixed-Use Life Sciences Development in Durham, NC



Source: Sterling Bay (2023)

⁴⁶ [Durham development near 147 to mix life sciences, residential | Raleigh News & Observer \(newsobserver.com\)](https://www.newsobserver.com/news/local/durham/article248888888.html)

3.3. Co-Location of Housing with Healthcare Facilities

Context of Healthcare Facilities

In addition to the prevalence of life science activity, explored in previous sections, Montgomery County hosts a range of hospitals and healthcare facilities. While hospitals and healthcare facilities are not usually part of the life sciences sector, their land use implications are similarly being reconsidered given the concentration of healthcare facilities and employment in and around the LCS, most notably Adventist HealthCare Shady Grove Medical Center and other healthcare facilities along Medical Center Drive.

Healthcare systems are increasingly recognizing the pivotal role that stable housing plays in supporting both the health of their communities and the efficacy of their own operations. One primary driver for this involvement stems from the recognition that securing affordable and stable housing for their workforce is crucial. Attracting and retaining skilled healthcare professionals has become a priority for many healthcare systems, considering the substantial costs associated with recruitment and training. Additionally, given the transient nature of many healthcare positions, communities that offer a quality and highly accessible rental housing stock helps support recruitment efforts. Over time, staff retention efforts are supported by a community's for-sale housing stock as well as quality of life, such as recreational amenities and schools. This approach not only reduces turnover costs but also promotes a culture of commitment and loyalty among employees, consequently bolstering the overall quality of patient care.

Maintaining housing affordability has become a significant challenge nationally and has a direct impact on the successful operations of healthcare centers. Middle-income healthcare workers such as technicians may earn between \$60,000 and \$90,000 but still struggle to find quality attainable housing within a reasonable distance. According to BLS data, more than a third of healthcare occupations have annual wages below \$60,000, which means these workers could generally only afford rents of less than \$1,500 per month. Therefore, many healthcare systems are being more actively engaged with supporting affordable and workforce housing development initiatives.

Figure 3.12: Average Wages for Healthcare Practitioners, Technicians, and Support Occupations, Washington, D.C. MSA, 2022

Average Wage Range	Total Workers	Share
>\$100,000	51,960	27%
\$80,000-\$100,000	58,040	30%
\$60,000-\$80,000	15,510	8%
<\$60,000	67,590	35%

Source: BLS (2023)

Furthermore, healthcare systems are recognizing the integral link between stable housing and community-based investment. By investing in housing initiatives, they can contribute to the revitalization and stability of the neighborhoods they serve, fostering a healthier and more vibrant community. This, in turn, can lead to improved health outcomes, as stable housing is closely associated

with reduced stress and improved access to essential resources, such as education, employment opportunities, and healthy food options. Healthcare systems are increasingly understanding that investing in housing is, in essence, an investment in the well-being of the community at large, aligning with their overarching mission to promote and preserve the health of their populations. While assisted living and retirement communities are self-contained with their own healthcare facilities on site, given the increasing share of older adults, there will be a continued push to better link housing with healthcare facilities, especially when considering placement of affordable senior housing.

How Healthcare Providers Have Supported Housing Development

The integration of housing and healthcare represents a multifaceted approach that encompasses various dimensions, strategies, and collaborative efforts to achieve housing goals. Hospitals do not typically build housing on their campuses, but they can take part in housing with any one of these strategies:

- **Partnerships:** Collaborative partnerships between healthcare providers and housing organizations have led to the development of integrated health and housing programs that offer comprehensive support, including mental health services, and access to healthcare facilities within housing communities. Partnerships can also come in the form of collective funding amongst healthcare providers.
- **Funding:** Healthcare providers often support housing development projects through financial investments, grants, or loans, recognizing that affordable and stable housing can positively impact the overall well-being and health of their patients.
- **Programming:** Healthcare providers may establish social impact programs that prioritize housing stability as a key determinant of health. These programs often involve partnerships with housing organizations to address homelessness, provide transitional housing, or support individuals with complex health needs.

The following case studies show the different ways that healthcare providers can be involved in housing development.⁴⁷

General Development Frameworks

- **Community Health Campus Master Plan Model:** The development of community health campuses involves creating comprehensive healthcare hubs that offer a spectrum of services, including primary care, specialty care, preventive health programs, and wellness initiatives. Integrating these campuses within or near residential areas fosters a collaborative environment where healthcare professionals, social workers, and community organizations work together to address the holistic health needs of residents. These frameworks aim to promote health

⁴⁷ Denver Health: <https://www.denverhousing.org/denver-housing-authority-and-denver-health-collaborate-on-rx-for-unsheltered-patients/>
Portland Hospitals Coalition: <https://www.portland.gov/phb/construction/blackburn-center>
Dignity Health and Lutheran Social Services Funding and Programs: https://www.lssnocal.org/what_we_do/adult_programs/dignity-health.html , <https://shelterforce.org/2019/01/11/hospital-system-helps-housing-partners-unlock-capital/>

education, preventive care, and community engagement, fostering a culture of proactive health management and well-being within the context of residential communities.

- **Healthcare Zoning and Mixed-Use Development:** Creating specific zoning regulations that encourage the colocation of healthcare facilities and housing can foster the development of mixed-use neighborhoods. These frameworks facilitate the seamless integration of healthcare services, such as clinics, urgent care centers, or community health centers, within residential complexes or adjacent to housing developments. By incorporating healthcare services into mixed-use zoning plans, communities can promote easy access to essential medical resources while fostering a sense of community well-being and convenience.

Workforce Housing Development Examples

- Moab Regional Hospital in Utah is in the process of purchasing land to build staff housing. Like other regions, there are housing shortages, and the hospital hopes that its own housing project will help retain current employees but also draw potential recruits to the area.
- The Burlington-based University of Vermont Health System has invested \$6 million in a 120-apartment complex for clinicians and employees including a childcare center. The 61-unit complex is anticipated to open in April 2024.
- The University of Pittsburgh has been developing a "walk-to-work" housing initiative to help its employees live in Oakland, aiming to increase non-student residents in the area and alleviate neighborhood pressures. The program, part of the university's master plan, includes a housing subsidy for employees, prioritizing support for those with lower incomes and offering assistance for both for-sale and for-lease homes.

Healthcare-Supported Housing Development Examples

Denver Health Affordable Housing Renovation

Denver Health is partnering with the Denver Housing Authority to repurpose a building on the hospital campus into affordable senior housing, and apartments designated to help homeless patients transition out of the hospital. Most of the 110 units will provide apartments and services for low-income seniors and people with disabilities, Denver Health will lease 14 specially designed units as transitional housing for patients who need additional healthcare and housing assistance. The renovation will be funded through a blend of tax-credit equity, tax credits for historic preservation (DHA is pursuing historic designation through the National Park Service because of the building's architectural significance) and traditional financing.



Hospital System Supported Projects in Portland, OR

Five major hospitals in Portland, Oregon, and a low-income, nonprofit health plan donated a combined \$21.5 million toward the construction of nearly 400 housing units for the city's homeless population. The buildings provide transition housing, workforce housing, and housing for families that are affected by gentrification. Projects include Charlotte B Rutherford Place, 51 apartments for families displaced by gentrification, Hazel Heights, 153 units of workforce housing, and the Blackburn Building that includes 175 supportive housing units with integrated primary care, substance use disorder treatment and wellness services.



Dignity Health and Lutheran Social Services Funding and Programs in Sacramento, CA

The Housing with Dignity program hosts five transitional apartment units that help individuals experiencing homelessness, access wrap around services. The program provides up to six months of stabilization and supported housing for individuals and provides the foundation necessary to allow patients to remain in housing and achieve long-term stability. The apartments are in proximity to the Lutheran Social Service offices, ensuring easy access to staff members when in need. In addition, the apartments are located close to clinics and urgent care centers in the area. Dignity Health also provides funding assistance to aid in affordable housing development. Through its Community Investment program, Dignity Health provided \$1.2 million to fill a funding gap.



Key Considerations for Co-Locating Housing and Healthcare Uses

There are no examples of market rate housing being developed on hospital campuses, and any relevant examples are generally only proximate in dense urban areas. Part of the challenge is overcoming externalities related to hospital operations as well as regulatory constraints.

Challenges:

- **Zoning and Regulatory Issues:** Co-locating housing and a major hospital may involve complex zoning regulations and land-use restrictions, which could pose challenges during the planning and development stages.
- **Noise:** The presence of a busy hospital can lead to noise and other disturbances that may impact the quality of life for residents in the co-located housing, necessitating careful consideration of design and soundproofing measures.
- **Infrastructure and Traffic Management:** Increased traffic and the need for sufficient infrastructure to support both the hospital and residential community can be challenging. This includes managing parking, road access, and transportation services.
- **Privacy and Security Concerns:** Maintaining privacy and security for both hospital patients and residential community residents can be challenging, requiring careful planning of physical boundaries and security measures.

Opportunities:

- **Leverage vacant or underutilized land:** Underutilized sites can be transformed into multifunctional hubs that serve the dual purpose of providing shelter and promoting holistic well-being. This approach not only optimizes the use of available space but also cultivates a supportive environment where residents can conveniently access essential medical care.
- **Convenient Access to Healthcare Services:** Residents of the co-located housing can benefit from easy access to high-quality healthcare services, emergency care, and specialized treatments available.
- **Employment and Economic Opportunities:** The presence of a major hospital can create job opportunities for residents in the co-located housing, boosting the local economy and fostering a sense of community engagement.
- **Research and Education Initiatives:** The proximity of the housing to the hospital can facilitate research collaborations and educational programs that benefit both the healthcare institution and the residents, promoting a culture of innovation and learning.

3.4. Key Implications for Montgomery County

- **From a site selection perspective, Montgomery County is well-positioned to grow its life sciences industry: it has strong transportation infrastructure, a well-educated workforce, and access to numerous major life sciences research institutions nearby.** In the coming decades, planned investments in rail infrastructure will significantly contribute to the county's competitive positioning. The county also plays host to one of the world's premier life sciences research institutions, and it is located proximate to numerous prominent universities which may have an interest in establishing or growing a presence in Montgomery County. *Montgomery Planning, Montgomery County, and MCEDC can help to highlight and strengthen these assets.*
- **To better support the life sciences industry, Montgomery County needs to build connections between regional research institutions and other regional life sciences districts. It also needs to continue to proactively consider potential sites for life sciences development or redevelopment—**Montgomery Planning should assist with the identification of and/or target potential sites for life sciences development based on an infill approach (e.g., site selection), focusing on building around existing assets. Such an approach would focus on place-based investments and identifying catalyst sites for redevelopment. *By leveraging publicly owned sites and soliciting private developers through an RFP process, Montgomery County can help implement a more cohesive and visionary development that incorporates a mix of uses and public spaces.*
- **Outside of dense urban centers, only recently has there been a shift to incorporate a mix of uses with life sciences development.** Historically, life sciences development has followed conventional suburban-style design and land use patterns akin to lower-density office parks separated from other uses, which is characteristic of most life sciences development in Montgomery County. Recently, there has been a shift to incorporate a mix of uses into life sciences development in suburban locations. *To compete with other leading life sciences regions, such as RTP, Montgomery Planning will need to adapt to this new focus on mixed-use development, which aligns with the preferences of knowledge workers and top firms today.*
- **Given the proliferation of R&D development in dense urban centers like Boston and Philadelphia, such development is less driven by surrounding land use than market conditions, built environment, and infrastructure.** The proliferation of infill development of life sciences buildings in dense urban environments shows that the site requirements of life sciences properties are relatively similar to conventional office buildings. Though there are some slightly different requirements than conventional office properties, there are no site or compatibility constraints to incorporating life sciences development within mixed-used districts or even within a higher-density mixed-use building. *Montgomery Planning is on the right track in seeking to revise its zoning code to make mixed-use life sciences development easier, and case studies underscore the importance of incorporating flexibility into the county zoning code.*

- **There is not a one-size-fits-all approach to life sciences development.** Given the abundance of developable land in the Raleigh-Durham metro area, including Research Triangle Park, new life sciences development has included both suburban-style, campus-like design as well as higher-density mixed-use districts. In many cases, what is developed is site-driven based on size, location, and access to infrastructure. Life science spaces can be developed in a variety of land use contexts, and a variety of land uses can surround life science spaces if the regulatory framework allows for such a mix. *Montgomery Planning should consider and enable a wide variety of mixed-use life science development typologies.*
- **Supporting the life sciences industry requires a district- or community-wide approach that links housing diversification, placemaking, walkability, recreational amenities, and complementary commercial development.** The competitiveness of Montgomery County as a life sciences hub encompasses all facets of community-based investments and quality of life. While expansive growth will be inevitable to accommodate demand, continued investments near transit corridors, creating infill development opportunities, creating better connections, and allowing for higher-density development through zoning flexibility will contribute to the county's positioning as a life sciences hub. *Beyond life-sciences-specific interventions, Montgomery Planning can position for success in developing life sciences innovation districts simply by preparing the county for equitable, mixed-use growth.*

4. Best Practices for Creating Successful Innovation Districts

4.1. Introduction to Case Studies

The innovation district formalizes an idea from economics that has long been observed and empirically verified—that productivity growth and innovation are enhanced by physical proximity and networks. A 2019 report by the Global Institute on Innovation Districts identified 27 innovation districts in the US and another 45 around the world.⁴⁸ This report profiles seven case studies to provide insights into how Montgomery County could structure its own innovation district as a means of supporting and growing the county’s life sciences sector. This includes considering a formalized innovation district in and around the LCS or elsewhere in the county. Innovation districts can vary in terms of their governance structures as well as their approaches to investments in the build environment, placemaking, land use, and real estate development. The innovation district case studies were selected for their relevance to two main themes: 1) Organizational Structures and Functionality, and 2) Land Use, Housing, and Mixed-Use Development.

Organizational Structures and Functionality of Innovation Districts (“Organizational Structures”)

Innovation districts are almost necessarily public-private-nonprofit partnerships which bring together actors from various sectors. Some innovation districts are *institution-led*, which is typically a major research university, some are *nonprofit-led* bringing together a number of independent organizations, corporate entities, or institutions(s), and some are *special district-led* leveraging dedicated revenue streams from local property owners or through economic activity within a dedicated district boundary (e.g., business improvement district or special service district). The viability of these organizational structures – or a combination of all three – are dependent on the existing entities or assets within a given district/community.

Land Use Considerations and Implementation of Housing and a Mixed-Use Development in Innovation Districts (“Land Use Considerations”)

These case studies were selected to demonstrate the evolution of innovation districts from a land use perspective, especially how they continue to explore ways to incorporate housing and a mix of uses. Many of the first innovation districts were originally conceived as single-use research parks or institutional districts consisting of conventional office space, research facilities, or healthcare facilities. However, over the last two decades, there has been a general shift in changing the built environment and pedestrian experience in downtown areas and innovation districts alike with the incorporation of new housing, retail, recreational amenities, and public spaces in both urban and suburban contexts. It is now recognized that the long-term competitiveness of districts supporting a knowledge-based economy—and their ability to attract talent, employers, and new investment—is dependent on their continued evolution as places to live, work, and play and their physical connections to and from other parts of their respective communities. This is even more critical in the post-COVID era as employers

⁴⁸ <https://www.giid.org/the-evolution-of-innovation-districts/>

continue to explore ways to encourage workers to come back to the workplace with higher frequency and support collaborative environments, which are critical for an innovation-based economy.

The case studies provide detailed information about how each innovation district has approached the two thematic areas. Because of their length and detail, they were placed in Appendix B at the end of the report, where readers can browse or read specific cases as needed. Section 4.2 synthesizes the case studies into a holistic set of "lessons learned" in each of the thematic areas.

Some innovation districts are included as case studies for both organizational structure and land use considerations because they provide important lessons for each. Table 4.1 shows which innovation districts are used as case studies for the two thematic areas. For example, RTP was used as a case study for both organizational structure and land use, but UCD was only used as an organizational structure case.

Figure 4.1 Selected Case Studies by Topic Area

Case Study	Location	Organizational Structures	Land Use Considerations
Research Triangle Park (RTP)	Raleigh-Durham, NC	X	X
Texas Medical Center (TMC)	Houston, TX	X	X
University City District (UCD)	Philadelphia, PA	X	
Winston-Salem Innovation Quarter (IQ)	Winston-Salem, NC	X	
Kendal Square	Cambridge, MA	X	X
Mission Bay	San Francisco, CA		X
The Philadelphia Navy Yard	Philadelphia, PA		X

4.2. Lessons Learned for Montgomery County

Organizational Structure and Governance

- There is no one-size-fits-all innovation district governance structure — innovation districts are often initiated by a lead anchor institution, but an anchor institution is not a prerequisite.**
 While MIT's presence is important for the Kendall Square Association, the organization itself is small and funded by an assessment on local businesses. It thrives on relationships and trust built up over time with member businesses. RTP and TMC were established more than 50 years ago with a green field, institutional campus development approach, which were successful by leveraging local institutions, while creating independent organizations to handle master developer duties. In dense urban areas requiring remediation, site acquisition, and redevelopment, Kendall Square and Mission Bay leveraged a redevelopment authority to facilitate a long-range redevelopment plan. University City's approach has been much more incremental with a focus on placemaking to make the area more attractive for private investment.
- Leveraging institutional partners can take a regional approach:** For RTP, the main campuses for the three anchor institutions are at least 15 miles away (UNC-Chapel Hill, NC State, Duke). Wake Forests' main campus is three miles from IQ and it is further supported by regional institutions

located throughout the Triad. TMC also follows a regional consortium approach by creating opportunities for a physical presence by regional institutions, although apart from Rice University, the main campuses by partner institutions are located throughout the Houston region, and in some cases, other parts of Texas.

- **Creating an innovation district is not always market driven, needs to be intentional with a lead organization, and takes patience:** the public sector can be convening place-based management organization, but a successful innovation district needs institutional partners with patient capital—investments that do not need to return profits in the near-term—to ensure that future investment is strategic and proactive and not reactive to market conditions. RTP created a foundational structure with its institutional partners that over time created incremental opportunities to attract private investment (and the build-out of RTP has occurred over six decades and continues to this day). Some of the limitations of IQ have been its inability to attract substantial private investment and has generally functioned as a satellite university campus and research center, as opposed to an innovation district.
- **While institutions can provide resources, governance, and convening power, successful innovation districts are driven by private sector investment.** While institutions typically lead research activity and attract and develop talent, the private sector drives the innovation economy through the attraction of venture capital, tech commercialization, and physical development. While institutions like the National Institute of Health provide well-paid, stable jobs, they are not necessarily creating spin-off activity that drives employment and economic growth. Therefore, a successful innovation district needs support from the private sector—leadership, advocacy, and investment—to develop property and start and grow businesses.

Land Use Planning and Development

- **Incorporating housing, placemaking elements, and retail amenities within an innovation district is a relatively new evolution.** The recognition of an innovation district needing a mix of uses and focusing on more of a pedestrian experience is a relatively new concept. While urban areas are at their core mixed-use areas, some of the more suburbanized innovation districts like RTP or TMC are now focusing efforts on higher-density mixed-use development with an emphasis on public spaces and placemaking. Kendall Square was primarily an institutional employment hub until the incorporation of mixed-use development in the late 2000s. Best on lessons learned and best practices, the future of innovation districts in urban or suburban contexts will need to have a mix of uses to remain competitive.
- **Even successful tech and innovation parks, like RTP or even Kendall Square, need to adapt to remain competitive.** A mix of uses, including housing, retail, parks, trails, and public space is what both employers, and highly skilled and mobile workers are seeking. Absent these elements, employers may struggle to compete for talent or incentivize their existing employees to return to the workplace in the post-COVID-19 pandemic era.
- **Updating the zoning of a district or area is just one of the steps for facilitating mixed-use development.** The development community needs to be an active partner and development

sites need to be assembled, planned, and solicited. A master planning process—which typically results in a blend of strategic urban design, market, economic development, and policy interventions—is often needed to encourage and facilitate future investment. RTP’s 2011 Master Plan supported zoning changes and set a foundation for the implementation of recreational amenities (e.g., trails, open space), but also helped identify catalyst sites for larger-scale mixed-use development.

- **The creation of an innovation district or campus can be loosely defined geographically.** In the manner of RTP and TCM, each having campuses covering more than 1,000 acres, once a brand and mission is established, development can take a more expansive approach. TMC’s proposed BioPort campus is located five miles from the main campus, but it will be governed by TMC and carry its brand. RTP’s proposed Hub RTP is located within the RTP district boundaries, but will have its own unique design, design, and site configuration, which will create its own sub-district. UCD and Kendall Square were established as more of a neighborhood concept and incorporated existing uses as opposed to building out a dedicated campus. These districts have used branding, engagement, partnerships, and place-based investments to attract private investment.

Innovation and Entrepreneurship

- **Innovation districts have shifted from a tech park model to being more intentional about supporting an entrepreneurial ecosystem.** While Kendall Square benefited from the creation of Cambridge Innovation Center in the late 1990s, its formalized entrepreneurial ecosystem is still relatively new. Most innovation districts began as employment centers for government and institutional activities and corporate operations, but now they are actively creating and/or promoting key entrepreneurial support resources such as business incubators and co-working spaces. RTP created its own place-based management organization to oversee these activities (Council for Entrepreneurial Development). TMC hosts two accelerators (one focused on health tech and another on cancer therapeutics), offers mentorship and networking support to founders through its Biodesign program, and offers dedicated co-working space, including hot desk, dedicated desk, and private office options. TMC also has a subsidiary venture capital arm, TMC Venture Fund.
- **Supporting innovation and entrepreneurship should also have a community-focused approach.** UCD’s West Philadelphia Skills Initiative is a great example of a community-focused approach that connects neighborhood residents with local jobs, including at the major anchor institutions. The local community becomes an active participant in the innovation ecosystem creating pathway for upward mobility, but also this program serves the institutions, startups, and employers themselves with a skilled and accessible workforce. There is a misperception that life sciences industries are only supported by those with advanced degrees, but there is a wide range of occupations that support the industry, many of which do not require a college degree, but some level of technical training.

5. Strategic Recommendations

The following section is intended to help define the role of the Montgomery Planning in supporting future life sciences development and ensure that Montgomery County maintains and expands its regional and national competitiveness as a life sciences hub, especially in and around the Life Sciences Center (LSC) given its existing concentration of life sciences employment. While sound land use policy will be pivotal to facilitating the right types of life sciences and complementary real estate development over the next decade, there are also critical elements of the life sciences ecosystem that will require more strategic and intentional involvement from regional institutions, economic development organizations, and the public and private sectors. As demonstrated by successful life sciences hubs and innovation districts across the country, collaboration, partnerships, and dedicated organizational structures with strong institutional involvement are necessary to guide innovation, investment, development, and growth. While many of these activities are beyond the mandate to Montgomery Planning, as an organization it can serve as an advocate and convener and should strive to initiate these activities, while broadening its role in the ecosystem.

Key Challenges for Life Sciences Development and Growth

As presented in this report, while Montgomery County has a strong life sciences cluster, the growth of the industry faces challenges. The county has a strong institutional presence of life sciences anchors, but unlike other competitive markets like Boston, Philadelphia, and Raleigh-Durham, private sector growth within the industry has been limited by the built environment, real estate market conditions, lack of an academic anchor institution, and lack of formalized innovation and entrepreneurial ecosystem.

The strategic recommendations are intended to address the following challenges:

1. Limited infill development opportunities for life sciences uses;
2. Limited tools to influence the use and form of future life sciences development that support mixed-use synergies;
3. Lack of zoning flexibility to support higher-density, mixed-use life sciences development and/or districts;
4. Lack of connectivity to, from, and within areas with concentrations of life sciences employers;
5. Limited marketability of the built environment – many areas with life sciences concentrations consist of conventional suburban-style office park development with limited curb appeal;
6. Lack of funding mechanisms to support place-based investment; and,
7. Lack of strategically aligned resources to support an entrepreneurial ecosystem.

5.1. Expand and Create New Development Practices and Standards to Encourage the Creation of Intensive, Mixed-Use Life Sciences Districts

The growth and competitiveness of the life sciences industry in Montgomery County will depend on the level of new real estate investment over the next decade. Other competitive markets like Boston, Philadelphia, and Raleigh-Durham continue to attract new life sciences investment with an increasing focus on infill development co-located with complementary uses or within mixed-use developments or districts. While future development will be driven by private investment, the public sector not only plays a crucial role in attracting new development through land use policy and incentives, but it also ensures that development is the right type, value-adding development that provides greater communitywide impacts. There are several steps to support future development either led by the Montgomery Planning or through key partnerships.

Zoning is one of the most powerful levers Montgomery Planning can use to encourage mixed-use life sciences development. There are numerous potential changes to zoning and land use regulations Montgomery Planning can consider as part of its efforts to create optimal conditions for life sciences mixed-use development.

Optimize the Existing Life Sciences Center (LSC) Zone to Ease Restrictions on Residential, Retail, and Other Non-Life Sciences Uses

Montgomery County is ahead of many competitive jurisdictions with its LSC zone, which is specific to life sciences development and allows for some level of mixed-use development. Still, the limited allowances for residential and retail development in LSC (as it currently exists) limit the possibilities for robust mixed-use life sciences development that is occurring in other competitive regions like Raleigh-Durham or Philadelphia. This will require one of two changes: either amending the existing LSC zone to increase accommodations for non-life-sciences uses adjacent to life sciences development, or developing a new zoning overlay specific to life sciences mixed-use developments in select areas (leaving the existing zone for use in life sciences developments with more modest ambitions for mixing uses).

Explore Creating a New Zoning Overlay Specific to Life Sciences Mixed-Use Development

While the county has no current examples of *life sciences mixed-use development*, there are examples of both *life sciences uses* and *mixed-use development*. The zoning code can be amended to enable development of the other where one exists. Currently, higher density mixed-use districts in the county (such as areas near existing or proposed metro stops, or town center development) typically do not incorporate life sciences uses. At the same time, major life sciences areas such as the National Institutes of Health headquarters near Bethesda, or AstraZeneca's headquarters in Gaithersburg are typically not incorporated in mixed-use, walkable areas.

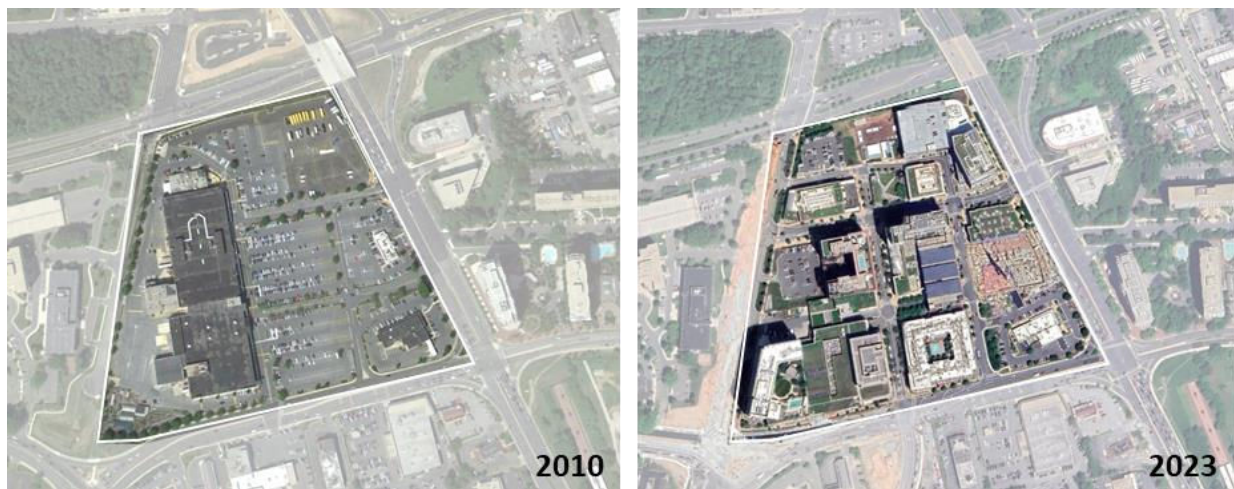
Given the limited availability of development sites in the LSC for the development of a larger-scale mixed-use district, the zoning code should allow for and encourage infill development that can create a more comprehensive mixed-use district over the long term. For example, this may include either amending existing commercial zones to allow for more life sciences development or adding overlay

districts that promote higher-density mixed-use development in areas with large concentrations of existing life sciences uses.

Encourage Higher Densities in Select Commercial Nodes

Montgomery Planning will need to consider increasing the density of residential, office, retail, and civic uses that are complementary to life sciences development. For suburban mixed-use developments, following the example of town center developments that have proliferated in Montgomery County. As an example, the successful Pike & Rose development in North Bethesda: 300,000 square feet of retail space, 422,000 square feet of office space, 765 residential units, and 177 hotel rooms, all on a 24-acre site.⁴⁹ In practice, this means a walkable district including roughly a dozen buildings, including a mix of low-rise, mid-rise (three to five stories) and high-rises (six or more stories). The Pike and Rose development features not only a mix of uses, but a mix of densities amidst a pedestrian-friendly environment with transit access as well as public space. This is a critical aspect of a successful suburban town center—different uses and different densities create the diversity that is most attractive to visitors, residents, and office tenants alike. This is an argument that can help pitch the addition of life sciences to existing mixed-use corridors—it can add diversity that can make a district more vibrant.

Figure 5.1: Aerial Image of Pike & Rose Development, 2010 and 2023



Source: Google Earth (2023)

⁴⁹ CoStar, November 2023

Figure 5.2: Street View of Pike & Rose Development



Source: Visit Montgomery (2024)

Mixed-use innovation districts can be built at different densities. Some, such as the Sterling Bay development in urban Durham (discussed in further detail in Section 3 of this report) and the Texas Medical Center’s upcoming Helix Park (see Section 4) nearly mirror the density of the Pike & Rose. In contrast, the Research Triangle Park’s Innovation Hub (also discussed in Section 4) displays a relatively low density. Still, even lower-density development can have a significant impact on the walkability and vibrancy of a formerly auto-centric suburban office park when development is concentrated and there is public space and pedestrian infrastructure linking areas within the district.

Figure 5.3: Development Densities of Innovation Districts

	Pike & Rose	TMC Helix	RTP Hub	Durham Sterling Bay
Location	North Bethesda, MD	Houston, TX	Durham and Wake Counties, NC	Durham city, NC
FAR	3.8	3.1	0.7	4.0
Context	Suburban Town Center	Urban Research Park	Suburban Research Park	Urban Infill

Source: Paladino & Co., Texas Medical Center, Research Triangle Park, The News & Observer, Lodging Magazine, ESI (2023)

Figure 5.4: Rendering of Research Triangle Park HUB at Full Build-Out



Source: HUB RTP (2023)

Identify Catalyst Sites for Potential Development and Redevelopment

As presented previously in this report, one of the fundamental barriers to new real estate development is land assembly and site control, especially for infill redevelopment sites. Privately owned sites that may be ideal for life science development run the risk of remaining vacant or redeveloping into non-life science uses if owners and developers judge other uses to be more profitable. Publicly owned land, however, has a much greater potential for future uses that are both strategic, community-supported, and value-additive. Montgomery Planning should identify and target publicly owned sites both within LSC and throughout the county with the greatest life sciences development or redevelopment potential.

Strengthen the Process for Developer Selection through Requests for Proposals (RFP)

While land use policy can help shape the future use and density of a site, the public sector has less control over the development program, timeframe, site design, including the incorporation of public space or other placemaking elements. Through an RFP process for publicly owned land, the developer must meet the established development program and strategic criteria for the site. While the Montgomery County Executive's office would issue an RFP, Montgomery Planning can use its master plan process to establish key criteria for life sciences development, including a mix of uses and public space on select publicly owned catalyst sites, and ensure that the selected developer meets the development program and site plan criteria. This process should also include negotiations for reduced land acquisition costs to enhance feasibility for additional community uses such as public space and streetscape improvements.

Strengthen Connections with the Real Estate Development Community and Other Public Agencies

Depending on the availability and scale of publicly owned redevelopment sites, the redevelopment of privately owned sites will also be critical. Montgomery Planning can help facilitate future development by coordinating engagement with property owners, business owners, and regional real estate development community through community tours, networking events, and partnerships with real estate organizations. Montgomery Planning should align land use planning efforts with current engagement activities by the Montgomery County Economic Development Corporation (MCEDC) and Office of the County Executive.

One example of how to strengthen connections is from the BioReady Communities program in Massachusetts, which requires a jurisdiction to designate a point of contact within the government to assist with biotech projects.⁵⁰ Because life science projects have specialized requirements and conditions, ensuring that one or several staff members are already knowledgeable about them eliminates the extra time it may take during the development process for education about these requirements. These staff members can be any or all county offices and agencies involved in development and can be existing employees who have or are willing to learn about life science development and construction.

Align Land Use Planning Efforts with Regional and State Economic Development Entities

Linking countywide master planning efforts with regional economic development organizations that are tasked with attracting new life sciences investment in the county and region, can broaden awareness and the market for new investment in the county, and especially LSC given its existing life sciences cluster. Additionally, ensuring that key development sites are included on the Maryland Department of Commerce inventory development sites will also help increase the potential for development activity. Other key organizations to support future development in LSC and throughout the county include MCEDC that has life sciences and biotech as a target cluster, Rockville Economic Development, Inc., and the Maryland Life Sciences (MDLS) division of Maryland Tech Council (MTC). There is also an opportunity to market and leverage existing life sciences-focused incentive programs, including Biotechnology Investment Incentive Tax Credit, Research and Development Tax Credit, and Maryland Innovation Investment Tax Credit.

⁵⁰ <https://www.massbio.org/initiatives/bioready-communities/>

5.2. Create Value-Capture Tools to Encourage Development and Investments in the Public Realm

Value capture funding mechanisms can encourage new development and create sustainable funding streams for site-specific or district-wide improvements. The types and functionality of value capture districts vary depending on state, county, and local legislation, but in the D.C. metro area, Business Improvement Districts (BID), which levy an additional tax to be used towards physical improvements within a defined area, are among the most frequently used value capture tools. Recent legislation makes it easier to form BIDs in Montgomery County, requiring approval from just 51 percent of property owners rather than the 80 percent rate required in the rest of Maryland.⁵¹ The value of a BID is not only to create dedicated revenue streams to investment the district, but to create a governance structure that can manage and advocate for the district itself.

Tax Increment Financing (TIF), enabled by state legislation, allows local and county governments to use incremental property tax within a designated area over a set period time to fund site, infrastructure, and public improvements to enhance the feasibility of development. This minimizes up-front costs by the developer, which in many cases makes the overall development infeasible. Therefore, the TIF allows the community to leverage future tax revenues for a development that otherwise would not have been built, and over time, these incentives create longer-term fiscal benefits and economic growth for the community.

Explore the Creation of a BID in the LSC and Other Areas Targeted for Life Sciences Development

Given the presence and scale of tax-exempt institutions in the LSC, a BID would need to capture areas with significant private redevelopment potential, including vacant land or larger-scale redevelopment sites, to fund the BID over the long term. Montgomery Planning should support this process by identifying areas with the greatest development potential, conducting outreach with property owners, and overseeing the BID application process. The BID would enable the implementation of valued-adding place-based investments for supporting new real estate development and economic growth.

Support the use of Tax Increment Financing (TIF) to Incentivize Development

TIF is a valuable tool to support and incentivize private development. By providing developers with additional up-front capital and incentivizing them to maximize long-term sustainability of a development, it can lead to developers creating more opportunities for public spaces or other public realm improvements as part of the development plan. TIF can often face public scrutiny since incremental tax revenues are dedicated to the development as opposed to the general fund or other taxing jurisdictions, such as the school district, it is critical that the use of TIF is effectively communicated to the community both in terms of near term tax revenue dedication to the project, but more importantly the long-term fiscal and economic benefits to the community after the TIF expires (typically after 10 or 15 years). Montgomery Planning should work closely with MCEDC and the County

⁵¹ https://mgaleg.maryland.gov/2022RS/Chapters_noln/CH_283_hb1340t.pdf

Executive's Office to advocate for the use of TIF to encourage new life sciences development in and around LSC and other strategic sites near life sciences uses in the county.

5.3. Focus Place-Based Investments In and Around Life Sciences Clusters

As presented in Section 4, the competitiveness of successful innovation districts is supported by investments in the public realm, which require a dedicated place management organization. This type of organization – which will require dedicated funding streams – would help position the areas in and around LSC as an innovation district and create a more marketable environment for private investment. Investments in the public realm not only enhance the marketability of life sciences uses, but also housing and other commercial uses.

Work to Establish a Place Management Organization at the LSC (and any other Areas Targeted for Mixed-Use Life Sciences Development)

As presented in Section 4, innovation districts can take many forms, but are intended to concentrate institutional and private sector research and development activities and create opportunities for entrepreneurship and private sector employment growth. These synergies are the most successful in districts that create an environment for collaboration through a mix of land uses, vibrant public spaces, and a pedestrian-focused built environment. At their core, successful innovation districts have strong institutional involvement since they attract and develop talent on a regional level and provide potential avenues for tech commercialization through R&D activities. While there are walkable mixed-use districts in Montgomery County, they do not incorporate life sciences uses or have the presence of key institutional anchors or entrepreneurial resources. Conversely, LSC has institutional anchors, but the built environment lacks character and the attributes that are supportive of talent attraction, collaboration, inspiration, and innovation. Growing an innovation-based economy in and around LSC will require a dedicated organization that can advocate for the district and align institutional and private sector interests. An organization is also needed to plan and implement a place-based strategy to catalyze new mixed-use development. While value-capture models create dedicated revenue streams, establishing an organization to lead innovation efforts will require some level of institutional financial support. Montgomery County Planning can take the lead in these efforts to convene institutions, private employers, and public sector stakeholders.

Incorporate Placemaking/Streetscape Improvements in Areas With Concentrations of Life Sciences Employment

Montgomery Planning can encourage development of green infrastructure, street furniture, traffic calming, public art, and other measures intended to make areas less institutional feeling and enhance the pedestrian experience. Kendall Square, which was historically a light industrial and institutional district, has intentionally become more of a “place” over the last decade. Investments in the public realm have now become a critical component to enhancing marketability and developers are seeking these valued-added amenities when evaluating future development. Without place-based investments, the county stands to lose competitive positioning over its peers.

Figure 5.5: Landscaped Green Space at Kendall Square



Source: ArchDaily (2023)

Leverage Regional Trails, Greenway, and Bicycle, Planning Efforts to Enhance Connectivity to and from Current and Future Life Sciences Hubs

Efforts to link regional trails, greenways, and other pedestrian planning efforts with life sciences districts can help encourage active transportation and walkability, but also enhance connectivity to and from life sciences employment hubs, residential neighborhoods, and commercial districts. This is especially critical for creating better linkages to existing and planned transit stops.

University City District benefits greatly from its adjacency to the Schuylkill River Trail, Philadelphia's premier trail system that connects the city's urban core with the Valley Forge nature preserve some 30 miles to the northwest. A *USA Today* reader's poll named it "the best urban trail in the U.S."⁵² and its connections to University City have an important impact on regional talent attraction—enabling both recreation and active transportation and connectivity to residential neighborhoods throughout the city and region.

⁵² [Schuylkill River Trail Named Best Urban Trail in the Nation \(phillymag.com\)](https://www.phillymag.com/news/2019/08/20/schuylkill-river-trail-named-best-urban-trail-in-the-nation/)

Figure 5.6: Schuylkill River Trail, located adjacent to University City District



Source: Rails to Trails (2023)

Create More Opportunities for Investments in Public Spaces and Event Programming

Successful innovation districts continue to place a greater emphasis on creating vibrancy by activating public spaces. Consider, for example, the Research Triangle Park's Frontier RTP and Boxyard RTP, indoor and outdoor event spaces, which host diverse events including dining options, social events, fitness and art classes, and live music.⁵³ These types of programmed activities are now becoming more common as ways to energize conventional office park and institutional environments into mixed-use destinations appealing to employers, employees, residents, and visitors.

⁵³ [Calendar | Frontier RTP](#); [Calendar | Boxyard RTP](#)

Figure 5.7: Boxyard RTP Outdoor Event Space



Source: Surface 678 (2023)

5.4. Grow an Entrepreneurial Ecosystem

Innovation is at the core of the life sciences industry, which is constantly evolving through new discoveries and the commercialization of technology. However, applying research and transforming it into business opportunities (aka tech commercialization) is not always inevitable and requires dedicated programs, resources, and networks. In most cases, researchers within an institution are not intuitively entrepreneurial and need to make connections with those with business acumen – as well as those with financial resources – to make new business opportunities. Given the complexities of these endeavors there has been an increasing relevance of physical place and space to not only co-locate innovation and entrepreneurial resources, but to create environments that attract and retain talent. This is why innovation districts continue to evolve from conventional office or tech parks to mixed-use districts. Though Montgomery County has prominent R&D anchors including the National Institutes of Health, AstraZeneca, Walter Reed National Medical Center, and Adventist Hospital, there is a need to support an entrepreneurial ecosystem that can broaden the reach of its institutions, attract private investment, and stimulate economic growth.

Create a Countywide Consortium of Government Agencies, Institutions of Higher Learning, and Private Employers with a Focus on Entrepreneurship

A successful innovation district needs dedicated participation from institutional partners. While Montgomery County and the region have several organizations supporting startups and life sciences companies such as BioHealth Capital, there is not an organization or partnership focused on place-based innovation and entrepreneurship. Montgomery Planning, MCEDC, and Montgomery County should actively engage with the following entities during the initial exploration process: National Institutes of

Health, Walter Reed National Military Medical Center, Adventist Hospital, AstraZeneca, The Universities at Shady Grove, Regional Universities (University of Maryland - College Park, American University, Georgetown University, George Washington University, among others), University of Maryland's upcoming Health Computing Institute in North Bethesda, and Johnson and Johnson JLABs.⁵⁴ As presented in Section 4, successful innovation districts like RTP and Texas Medical Center have taken a regional approach with partner organization located 15 or more miles away from the actual district.

Create More Opportunities for Step-Up Space for Startups Involved at Montgomery County Incubators

Montgomery County has several business incubators serving life sciences, biotech, and healthcare-related startup companies, including the Germantown Innovation Center and Rockville Innovation Center. Given these existing resources, future efforts should focus on continued bolstering and expansion of the entrepreneurial ecosystem with real estate and funding opportunities that complement, not compete with, these entities. A key focus area is creating smaller-scale "step-up" space that will allow the county to retain incubator graduates and provide opportunities for continued growth. Incentive programs for developers to build more flexible step-up space should be explored, including more flexibility with a mix of uses within single developments or districts.

Leverage Existing Startup and Life Sciences Grant Programs to Encourage New Activity in and around LSC

Access to funding is critical for supporting startup and small business activity. While some communities have had to create dedicated grant programs for tech-related startups, Montgomery County is fortunate to have multiple sources and programs, most notably Maryland Technology Development Corporation's Life Science Investment Fund that is for companies in the process of developing a technology for a product for human health that requires approval from the United States Food and Drug Administration prior to market as well as the BioHealth Capital Fund serving startups in the Washington, D.C. metro area. Maryland Tech Council is also a resource for assisting startups and existing businesses to access these funds. As this pertains to LSC, Montgomery County could serve as a liaison with applicants and/or recipients of this funding to locate and/or expand operations in the district.

⁵⁴ While JLABs is located in Washington, D.C., it is still a regional asset that could support future life sciences growth in Montgomery County, including spin-off entrepreneurial activities.

Appendix A – Real Estate Development Requirements

Research and Development Lab and Office Core and Shell Specifications⁵⁵

Summary of R&D Lab and Office Space Requirements

- Structurally, loading docks and a service yard are critical for operations.
- Fire suppression systems are more robust and designed to handle lab fires.
- Plumbing requirements are more robust to ensure proper disposal of lab waste.
- Lab air handling unit requirements are designed to meet air intake and ventilation needs.

Site and Structural Requirements

Life sciences buildings are generally similar to conventional office space in terms of structure and materiality, which has enabled existing conventional office space to be converted to lab space in some markets. However, sciences code design criteria stipulate several additional requirements. The building construction type should be 1A Non-Combustible, Fully Protected, requiring fire-rated floor assemblies for Control Areas on each floor and direct access to the roof is required for personnel and equipment and adequate service space at the lowest level is required for specific lab systems.

It is critical that the property feature a minimum of two loading dock locations to facilitate the seamless flow of goods and materials for lab needs, although this is often a feature of convention office space depending on the size of the building. One unique feature is a service yard that is essential to accommodate critical equipment, including generators, bulk lab gas tanks, hazardous storage units, and waste storage, serving as the logistical hub of business operations.

Systems Requirements

Fire suppression: Life sciences buildings follow specific building code requirements, including robust fire suppression systems given very high temperature requirements for R&D labs. To meet code standards, a combination system of standpipes and automatic sprinkler systems should be implemented, and there are opportunities for customization with concealed sprinkler heads designated for the main building lobby, while upright heads need to be strategically positioned within tenant spaces to maximize coverage. An element that can increase costs is water pressure from the local water supply and a fire pump may be needed to maintain adequate pressure. To facilitate the efficient operation of the system, a sprinkler riser should be incorporated, enhancing the building's overall fire safety measures.

Ventilation Systems: The comprehensive design specifications for life sciences ventilation systems also add significant costs compared to conventional office buildings. To optimize air quality, air systems are to maintain a 60 percent laboratory space to 40 percent office space ratio, with lab areas requiring eight to ten air changes per hour and a ventilation rate of 1.6 cubic feet per minute per square foot (CFM/SF), while office and common areas should adhere to four to six air changes per hour and a ventilation rate

⁵⁵ Colliers, 2023

of 1.0 CFM/SF. Air-cooled chillers should be strategically positioned on the roof, to ensure efficient cooling.

Electrical Systems: For electrical needs, a design accommodating 10 watts per square foot is mandated, with pad-mounted transformers adhering to specified voltage requirements. Submetering on each floor should track tenant power usage, while energy-efficient LED temporary lighting should be implemented. Safety measures should include life safety devices and fire alarm systems in compliance with code standards, as well as the installation of a perimeter grounding and lightning protection system. Lastly, a standby/life safety generator needs to be on hand to provide 2 watts per square foot of tenant standby loads, ensuring operational continuity.

Plumbing Systems: In terms of plumbing requirements, a 6-inch water service and a 6-inch sanitary line are mandated to provide ample supply and efficient waste management. To further segregate functionality, separate sanitary waste risers for laboratory and general are required, optimizing system performance. Additionally, the incorporation of a high-pressure gas service is essential to cater to the building's specialized needs. To manage rainwater effectively, internal roof drains with secondary drainage systems should be put in place, ensuring the integrity of the building's plumbing infrastructure.

Build Out

The mechanical penthouse design should be tailored to withstand a substantial floor load, precisely set at 150 pounds per square foot. These criteria underscore the critical structural considerations that will underpin the robust and functional design of lab space. Vibration criteria should be met, with 6000 MIPS specified in selective locations, and 2000 MIPS for sensitive lab equipment.

The laboratory air handling units (AHUs) should be in the penthouse, with a 50 percent outdoor air intake to meet ventilation needs. Office recirculating direct expansion (DX) units should also be located on the roof for optimal performance. Moreover, laboratory exhaust fans need to be installed on the roof, and the heating system needs to rely on gas-fired hot water boilers and recirculating pumps. Laboratory AHUs should incorporate humidification steam generators.

These comprehensive building requirements ensure that the R&D space is designed and constructed to meet the specific needs of this specialized field, including structural integrity, ventilation, safety, and code compliance.

Good Manufacturing Practices Core and Shell Specifications

Good Manufacturing Practices (GMP) are a set of guidelines and principles that ensure the quality and safety of pharmaceuticals, food, and other regulated products during their production, processing, packaging, and storage⁵⁶. These guidelines are typically referred to as Good Manufacturing Practices for various industries, and in the pharmaceutical sector, they are often denoted as "GMPc," where the "c" stands for "current," emphasizing the need for compliance with the most up-to-date standards.

Summary of Manufacturing Space Requirements

- The site and structural design criteria include considerations for loading docks, service yard, column bay spacing, load specifications, roof design, vibration criteria, and floor heights to meet various functional, structural, and sustainability requirements for the facility.
- Systems requirements include mechanical, electrical, plumbing, and fire suppression aspects.

Site and Structural Requirements

The site features and structural design criteria are essential components that will shape functionality and overall structure. On-site parking may be required, designed to accommodate operations spanning two shifts, ensuring seamless accessibility for employees and visitors. In addition, four loading dock locations are mandated to facilitate efficient logistics and material handling. To cater to a diverse range of facility needs, a dedicated service yard is a must, providing space for crucial equipment such as generators, bulk lab gas tanks, hazardous storage units, and waste storage.

On the structural front, meticulous planning is required. Column bay spacing should be at a minimum of 30ft x 40ft, with a preference for the more spacious 40ft x 50ft option. Load specifications are rigorously defined, with Level 1 requiring a robust 250 pounds per square foot (PSF), Level 2 (Office/Lab) at 125 PSF, and the Mech Mezzanine demanding another 250 PSF. The roof design not only adheres to typical roof loads but also takes into account hanging loads beneath the roof to support essential elements like ductwork and piping. The Mech Mezzanine's roof area is versatile, accommodating various miscellaneous loads and roof screening. To ensure the structural integrity, vibration criteria have been set at 6000 MIPS, underscoring the importance of precision in design and construction.

The architectural design criteria should encompass several key elements. There should be a floor height of 16 feet from Level 1 to Level 2, facilitating functional space utilization. Additionally, the floor height from Level 1 to the Mech Mezzanine is set at 22 feet, providing ample vertical space for various operational needs. Ensuring smooth vertical mobility, a single service elevator with a robust 5,000-pound capacity is mandated to serve Level 1, Level 2, and the Mech Mezzanine. Furthermore, the roof should offer direct access for both personnel and equipment, enhancing its utility. In line with sustainability goals, the base building core and shell design should aim for a minimum LEED Silver certification, underscoring a commitment to eco-friendly and energy-efficient construction practices.

⁵⁶ Facts about the current Good Manufacturing Practices, [US FDA](#)

Systems Requirements

In addressing the mechanical, electrical, and plumbing aspects, several critical considerations are at play. To ensure efficient shell heating, electric unit heaters should be strategically installed. Furthermore, all HVAC equipment needs to be meticulously designed and selected to precisely match the unique needs of the tenant, emphasizing tailored functionality.

Fire suppression: a fire pump may be considered for installation, bolstering fire safety measures. Additionally, a sprinkler riser is essential, serving as a critical component of the building's fire suppression system. These comprehensive mechanical, electrical, plumbing, and fire suppression considerations collectively contribute to functionality and safety.

Electrical Systems: the design should accommodate a robust 30 watts per square foot, catering to various power requirements. The installation of pad-mounted transformers with specific voltage requirements is imperative for seamless electrical distribution. Energy-efficient LED high bay temporary lighting should be employed, aligning with sustainable practices. Safety measures are paramount, with life safety devices and fire alarm systems in compliance with established codes. The project should also feature a perimeter grounding and lightning protection system, enhancing overall safety. To ensure operational continuity, a standby/life safety generator needs to be thoughtfully designed and selected as part of the tenant fit-out.

Plumbing Systems: an 8-inch water service and an 8-inch sanitary line should be installed to meet the water supply and waste management needs. To cater to specialized requirements, high-pressure gas service should be introduced to the building. Additionally, the plumbing design should incorporate internal roof drains with secondary drainage systems, optimizing rainwater management.

Build Out

The proposed building is anticipated to serve a multifaceted purpose, catering to a range of Use Groups including B (Business), F-1/F-2 (Industrial), and S-1/S-2 (Storage). Its structural integrity aligns with a designated construction type, specifically classified as 2B Non-Combustible and Unprotected. Ensuring the utmost safety, the building should be fully equipped with an approved automatic sprinkler system, with a potential necessity for ESFR or in-rack sprinkler systems in designated warehouse areas, emphasizing the commitment to fire protection and safety standards throughout the facility.

Appendix B – Case Studies

Case Studies on Organizational Structures and Functionality of Innovation Districts

Innovation districts are almost necessarily public-private-nonprofit partnerships which bring together actors from various sectors, but these can be structured in a variety of ways. Here are several organizational structures possible for innovation districts:

- **Institution-Led:** Some innovation districts are primarily the project of a major institution, which is the primary landowner, landlord, and/or organizational presence in the area. This is typically a major research university. Some of these districts operate as subsidiaries of the institution, whereas others may have a dominant institution as well as a less powerful nonprofit with a small budget and staff that acts as a liaison between the large institution and other players in the district.
- **Strong Nonprofit-Led:** Some innovation districts, typically those which bring together significant numbers of disparate actors, are led by strong nonprofits with large budgets and typically relatively large staffs of a few dozen members. While major institutions with a presence and/or interest in the business district may have a significant influence on these nonprofits, the nonprofits are usually relatively independent.
- **Special District:** Some innovation district nonprofits receive legally mandated dedicated funding from their member businesses. These also often operate as nonprofits, but with a special funding stream that comes from member businesses. Types of special districts include:
 - **Business Improvement Districts** are districts in which a special tax is levied against businesses to go towards the well-being of the business district⁵⁷.
 - **Special Services Districts and Neighborhood Improvement Districts** operate similarly, with some differences depending on the municipality or state.

⁵⁷ Current BIDs in the county are part of the county government.

Research Triangle Park (RTP)

Regional Context

Research Triangle Park (RTP) is a 7,000-acre innovation district located in portions of Durham and Wake counties within the Raleigh-Durham Metropolitan Statistical Area and is among the oldest and largest centrally planned innovation districts in the United States, along with Silicon Valley (California) and Route 128 (Boston).⁵⁸ RTP is at the center of what is today a sprawling region of suburban research parks which benefit from the “Research Triangle” name, which has come to be a moniker for the entire Raleigh-Durham region. RTP itself is centrally located in-between three of the largest research universities in the state of North Carolina: the University of North Carolina-Chapel Hill, about ten miles to the west in Chapel Hill; Duke University, about ten miles to the northwest in Durham; and North Carolina State University, about fifteen miles to the southeast in the state capital, Raleigh. Notably, the Research Triangle Park is not located in any municipality. Although the area uses Durham mailing addresses, the facilities themselves are located within an unincorporated area.⁵⁹

History and Establishment

Research Triangle Foundation was established in 1959 through a consortium of civic and business leaders and major regional research institutions, including Duke University, North Carolina State University (“NC State”), and University of North Carolina at Chapel Hill (“UNC-Chapel Hill”). Its mission—which continues to this day—was to oversee the development of the 4,400-acre RTP as a means of growing a knowledge-based economy and diversifying the statewide economy beyond its historic base of agriculture, furniture, and textile production. RTF’s mission statement declares the organization’s intent to “promote university, academic, industry, and government collaboration.”^{60 61}

RTP was originally conceived as a traditional suburban business park with basic infrastructure and low-density development patterns catalyzed by the attraction of IBM that built a 600,000 square foot

Research Triangle Park At-A-Glance

Founded in 1959

Located in a suburban area between Durham and Raleigh North Carolina

The area has similar land use patterns as Montgomery County, MD

RTP covers approximately 7,000 acres (11 square miles)

Strong institutional involvement with board representation, but RTP management, operations, and development led by independent not-for-profit place based management organization (Research Triangle Foundation).

Within 15 miles of UNC-Chapel Hill, Duke University, NC State University, so RTP is within their spheres of influence, but the distance from the campuses allows for greater independence in district management, planning, and development.

Tenants include a blend of institutional, public sector, and private sector establishments, although there is not a single anchor employer.

⁵⁸ <https://www.ncbi.nlm.nih.gov/books/NBK158811/>

⁵⁹ <https://www.thevegadurham.com/updates/all-about-the-research-triangle-park>

⁶⁰ <https://pdf.guidestar.org/PDF/Images/2021/560/853/2021-560853674-202202249349302625-9O.pdf>

⁶¹ <https://www.ncpedia.org/research-triangle-park>

research facility in 1965. The National Environment Health Service Center of the U.S. Department of Health, Education, and Welfare (now the U.S. Department of Health and Human Services) was also a key partner in its early development.⁶² By the late-1970s, around 40 public and private entities had built facilities in RTP, including a major 1.2 million square foot EPA facility.⁶³

Governance and Organizational Structure

Research Triangle Foundation's 22-member Board of Directors includes representatives from the following sectors: 10 from Universities (three from NC State University, two from Duke University, three from UNC-Chapel Hill, and two from the statewide UNC System); two from the nonprofit sector (Blue Cross Blue Shield, RTI International); and 10 from the Private Sector (Martin Marietta, Fidelity Investments, Brooks Bell, TD Bank, Asociar, Netapp, Sift Media, The Francis Law Firm PLLC, York Properties, Biltmore Farms). The board chair is Jud Bowman, founder, and CEO of Sift Media.⁶⁴

Research Triangle Foundation has a staff of 28, including an executive team, and internal teams dedicated to the following areas: Administration, Programming & Placemaking, Marketing & Communications, Planning & Project Management, Accounting, IT & Digital Systems, and Property Management & Facilities Maintenance.⁶⁵ The staff is led by CEO and President Scott Levitan, who holds degrees in urban design, conservation studies, and architecture, and has a background working in innovation industries.⁶⁶

Core Functions

RTF are owners and developers of RTP.⁶⁷ RTF is a large organization for an innovation district and its geography and functions are expansive: it manages real estate development, conducts property management, attracts and retains businesses, and handles master planning duties. Master planning the Park is among the core functions of RTF. RTF employs a Senior Director of Planning, and its CEO & President is an urban designer. Master planning of RTP is among the Foundation's core activities. The last master plan issued by RTF was in 2011, and roughly marked the fiftieth anniversary of the founding of the Park.⁶⁸

⁶² <https://northcarolinahistory.org/encyclopedia/research-triangle-park/>

⁶³ <https://northcarolinahistory.org/encyclopedia/research-triangle-park/>

⁶⁴ <https://www.rtp.org/the-foundation/board/>

⁶⁵ <https://www.rtp.org/the-foundation/staff/>

⁶⁶ <https://www.rtp.org/bio/scott-levitan/>

⁶⁷ <https://scholarship.law.campbell.edu/cgi/viewcontent.cgi?article=1659&context=clr>

⁶⁸ <https://files.rtp.org/wp-content/uploads/2014/08/CONCISE-MASTER-PLAN.pdf>; <https://ced.sog.unc.edu/2014/07/re-visioning-the-research-triangle-park-how-innovation-districts-are-inspiring-new-approaches-to-local-economic-development/>

Funding

Given RTF's land and real estate portfolio, it generates most of its revenue from the sales of securities and other assets as well as through its leasing program.

Appendix 1: Research Triangle Foundation Revenue Sources, FY 2021

Revenue Source (FY 2021)	Revenue
Leasing Program	\$8,989,583
Shared Expense Reimbursement	\$740,616
Conference Income	\$8,482
Investment Income	\$620,950
Net amount from sales of securities and other assets	\$29,631,739
Miscellaneous	\$98,434
Total	\$40,089,804

Source: ProPublica (2023), Research Triangle Foundation (2021)⁶⁹

The Triangle is funded by private entities and the three universities that reside within the area. Delta Airlines and EDGE have invested in the growth of the area, and Duke University, University of North Carolina (UNC) Chapel Hill, and North Carolina (NC) State financially support a significant amount of the area's activity.

Key Tenants

The three major universities in the area (Duke, UNC-Chapel Hill, and NC State) have a physical presence at the park through the Triangle Universities Center for Advanced Studies Inc. (TUCASI).⁷⁰ The closely associated nonprofit research firm Research Triangle Institute International (RTI International) was co-founded by the three universities, along with private sector support, and is based at the Park.⁷¹

Nonprofit organizations that work within the Research Triangle Park today include Armstrong McGuire, Code the Dream, International Union of Pure & Applied Chemistry, MCNC, National Humanities Center, NC Healthcare Information and Communications Alliance, North Carolina Biotechnology Center, Research Triangle Foundation of North Carolina, Stop Soldier Suicide LLC, The Council for Entrepreneurial Development, The Dash Alliance, Triangle Community Foundation, United Way of the Greater Triangle, and Yes Us LLC.⁷² Major corporations located at the park include Fidelity, GSK, IBM, Apple, and Cisco, with the NIH's National Institute of Environmental Health Sciences also located on site.

⁶⁹ <https://projects.propublica.org/nonprofits/organizations/560853674/202202249349302625/full>

⁷⁰ <https://www.rtp.org/tucasi/>

⁷¹ https://en.wikipedia.org/wiki/RTI_International

⁷² https://www.rtp.org/directory-map/?fwp_company_types=nonprofit&fwp_paged=2

Support for Innovation and Inclusion

RTF thrives on its access to major research institutions and talent. UNC-Chapel Hill is about ten miles to the west in Chapel Hill, Duke University is about ten miles to the northwest in Durham, and NC State, about fifteen miles to the southeast in Raleigh, which is also the state capital. Historically, this institutional presence has benefited the private sector through the commercialization of university research, but recently, through the 2011 Master Plan, there have been strategic efforts to create more of an entrepreneurial startup ecosystem and culture through programs, services, and the built environment. RTP now has 16 prominent startup incubators, more than two million square feet of coworking space as well as companies like LaunchLabs and Hangar6 to provide office space, shared equipment, and startup services to entrepreneurs. RTP has also established the Council for Entrepreneurial Development to connect entrepreneurs to these resources.⁷³

Additionally, a long-established and robust workforce development infrastructure exists both in and around RTP, due in a large part to partnerships with colleges and universities. For example, NC State created the Biomanufacturing Training and Education Center (BTEC) to provide a talent stream as the region shifted from traditional pharmaceuticals to biotechnology and biomanufacturing.⁷⁴ NC State created two programs within NCBiotech to provide opportunities for youth and veterans to find employment in the RTP biotech space.⁷⁵ Moreover, Durham Technical Community College recently created a workforce development center in RTP to train pharmacy, life science, and tech employees.⁷⁶ The Research Triangle Foundation has also partnered with The Diversity Movement to help improve equity and workplace culture for existing employees. Companies in the RTP now have access to DEI trainings, educational events, and resources.⁷⁷

⁷³ <https://www.rtp.org/company/ced/>

⁷⁴ <https://nicholalowe.web.unc.edu/wp-content/uploads/sites/9703/2015/06/30-Working-Region-RS.pdf>

⁷⁵ <https://biobuzz.io/ncbiotech-backed-workforce-development-programs-provide-avenues-for-employment-in-rtp/>

⁷⁶ <https://www.newsobserver.com/news/local/education/article269975267.html>

⁷⁷ <https://www.rtp.org/2022/02/the-diversity-movement-and-rtp-dei-collective-create-a-partnership-to-drive-dei-programming-across-americas-innovative-hub/>

Texas Medical Center

Regional Context

The Texas Medical Center (TMC), located about five miles southwest of Downtown Houston and immediately south of Rice University's main campus, is the largest medical campus in the world. The TMC is an extensive network of three (soon to be four) campuses with more than 60 medical institutions, 20 universities, more than 120,000 employees, and 300+ labs occupying over 70 million square feet of development space.⁷⁸ TMC serves as a regional hub for direct patient treatment, as well as a national and global hub for

research and development in life science and healthcare. The scale of TMC is somewhat unique given the number institutions with a physical presence within the campus and only one major institution with its main campus within proximity (Rice University).

The four TMC campuses, which are all part of the broader master campus, include the Medical Campus, which offers patient care and research across more than 60 co-located institutions, the Innovation Factory, a healthcare company incubator and center, backed by a \$50 million Venture Fund, the Helix Park, a new research arm of TMC with \$3 billion projected investment, including a 350-unit residential tower, which is currently under construction with Phase One opening fall 2023, and the BioPort, a life science manufacturing hub that would span 500 acres and create 100,000 new jobs.

History and Establishment

The TMC began in the 1940s as a public-private partnership between the M.D. Anderson Foundation and the University of Texas. The M.D. Anderson Foundation had been commissioned to lead development of a new University of Texas hospital to be focused on cancer research (secondary to the main University of Texas hospital in Galveston.) The 40-acre parcel of land where the initial campus was built—just three miles outside central Houston, and adjacent to Hermann Hospital and the Rice Institute, later Rice University—had originally been pitched to the University of Texas for the relocation of its main hospital in Galveston, but the location was “considered too far outside of Houston to be valuable to the University of Texas.” However, the M.D. Anderson Foundation saw the value in the land, and they purchased it as the site of their medical center. Shortly afterwards, Baylor University College of Medicine joined the medical campus, and the medical campus truly began to take shape.⁷⁹

Governance and Organizational Structure

The Texas Medical Center Corporation is the umbrella nonprofit organization that coordinates the Texas Medical Center campuses. The nonprofit was established to manage the medical center in 1945, while

Texas Medical Center At-A-Glance

Located in Houston, TX

It is adjacent to Rice University

Original 130-acre campus founded in 1940 and has now expanded to include more than 1,300 acres.

Regional hub for direct patient treatment, as well as a national and global hub for research and development.

Operated by Texas Medical Center Corporation and serves as Master Developer with annual revenues of around \$100 million.

⁷⁸ [Texas Medical Center](#)

⁷⁹ <https://www.tmc.edu/news/2014/08/building-a-city-of-medicine-the-history-of-the-texas-medical-center/>

ensuring that the institutions on campus remained “absolutely autonomous.” Three additional hospitals opened on-site in the 1950s, after which the district developed rapidly. TMC gifts and/or leases land from its original property to medical institutions at low cost, and to date has gifted and/or leased more than 113 acres.⁸⁰

The Texas Medical Center has a 13-member Board of Directors, chaired by Dr. Bernard Harris, Jr., a venture capitalist, medical doctor, and former NASA astronaut.⁸¹ Broadly, the board is comprised of members with significant experience in business professions, such as law, real estate, finance, and investing. In addition, many members have experience in nonprofit leadership.

The TMC is led by an executive team of 11, including a standard C-suite as well as vice presidents of marketing, business analytics, campus planning, real estate development, and legal. In addition to its executive team, the Texas Medical Center has established departments of real estate, legal, business analytics, marketing, and campus planning. Campus planning staff are central to the development of the area as an innovation district, as they focus on coordinating campus initiatives between members/tenants, implementing TMC capital projects, and maintaining the competitiveness of the campus in general. The business analytics department guides the strategic development of the campus. This department runs the TMC Venture Fund and conducts analyses on the growth of the campus.

Core Functions

TMC serves as the district manager for the Texas Medical Center campus, including property management, real estate development, master planning, business incubation, and business attraction and retention and serves as a convening body for all of the major institutions and employers. TMC is both a property owner and master developer and is tasked with leasing and general property management duties, setting architectural standards for new development, and operates a dedicated security force, although the City of Houston provides essential services and maintains infrastructure and utilities, including roads, water, sewage services. TMC’s master planning and rental activities are exemplified by the plans for the upcoming Helix Park development, which will include a 37-acre, 5-million-square-foot development adding lab and retail spaces as well as public open space.⁸²

⁸⁰ <https://www.tmc.edu/news/2014/08/building-a-city-of-medicine-the-history-of-the-texas-medical-center/>

⁸¹ <https://www.tmc.edu/about-tmc/leadership/>

⁸² [Helix Park - Texas Medical Center \(tmc.edu\)](#)

Funding

TMC revenue totaled just over \$100 million in FY 2021, and primarily comes from “business services”, according to the organization’s mandatory financial statements. TMC’s governing nonprofit reports that the complex is the eighth-largest business district in the world.⁸³

Appendix 2: Texas Medical Center Revenue Sources, FY 2021

Revenue Source (FY 2021)	Revenue
Contributions, Gifts, and Grants	\$10,588
Program Service Revenue: Business Services	\$80,961,388
Program Service Revenue: Campus	\$4,270,919
Investment Income	\$12,102,389
Net gain from sales of securities	\$4,039,258
Other operating revenue	\$1,973,750
Total	\$103,358,292

Source: ProPublica (2023), Texas Medical Center (2021)⁸⁴

Key Tenants

TMC member institutions include 20 universities, including Rice, Baylor, Texas A&M, and University of Texas-Houston; 21 hospitals and eight specialty institutions, eight academic and research institutions, four medical schools, seven nursing schools, three public health organizations, two pharmacy schools and a dental school; the United States Department of Veteran’s Affairs, which operates a Veterans Affairs hospital on-site; and the Cancer Prevention and Research Institute of Texas, a state-level organization.

Support for Innovation and Inclusion

Supporting clinical research and entrepreneurship is among the core focuses of TMC. TMC hosts two accelerators (one focused on health tech and another on cancer therapeutics), offers mentorship and networking support to founders through its Biodesign program, and offers dedicated co-working space, including hot desk, dedicated desk, and private office options. TMC also has a subsidiary venture capital arm, TMC Venture Fund.⁸⁵ A separate but related initiative is the TMC Clinical Research Institute, which coordinates research operations across organizations.⁸⁶

The constituent institutions of TMC have their own approaches to diversity, equity, and inclusion. Here are just a few examples: University of Houston, one of the members of the Texas Medical Center, has created a university-wide ‘UH Population Health’ initiative focused on health equity.⁸⁷ Houston Methodist hosts a DEI grant program which awarded nearly \$5 million in grants in 2023.⁸⁸ The Texas

⁸³ <https://projects.propublica.org/nonprofits/organizations/741030788>; <https://www.tmc.edu/about-tmc/>

⁸⁴ [TEXAS MEDICAL CENTER - Full Filing- Nonprofit Explorer - ProPublica](#)

⁸⁵ [TMC Innovation | Texas Medical Center | Houston](#)

⁸⁶ <https://www.tmc.edu/innovation/>

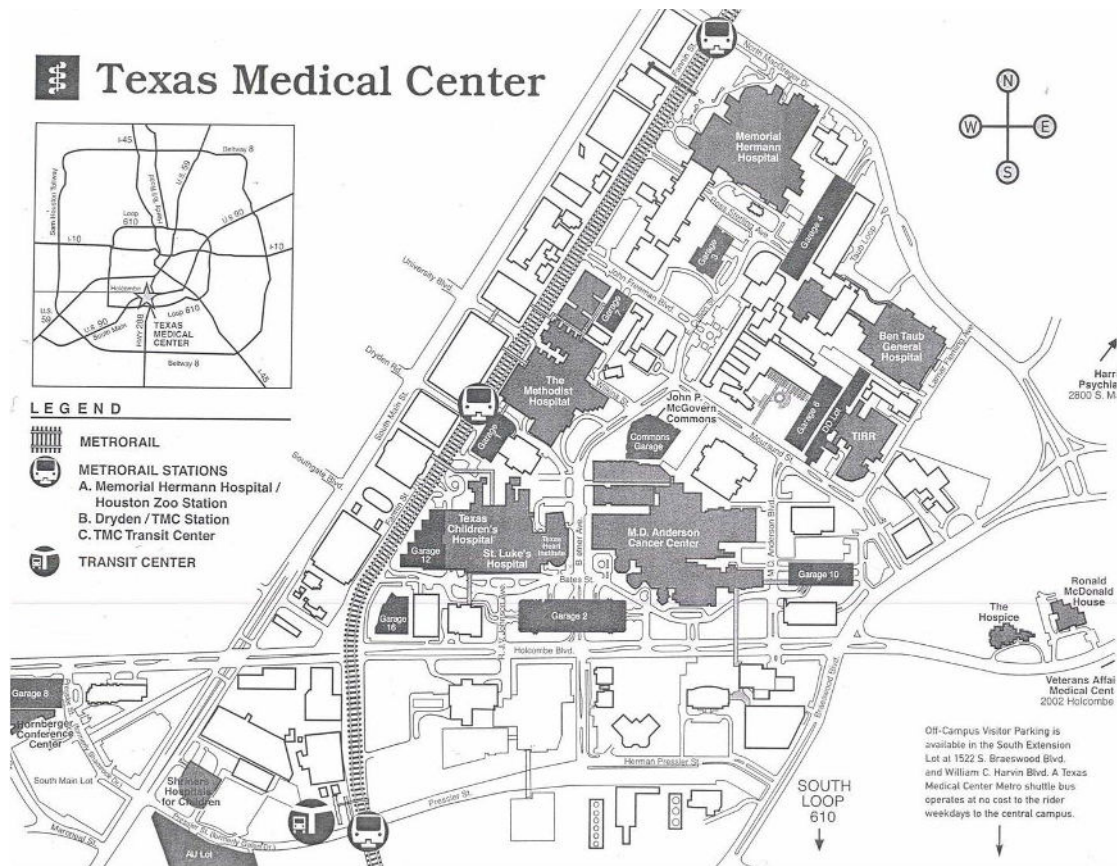
⁸⁷ [University of Houston Creates ‘UH Population Health’ to Advance Health Equity - Texas Medical Center \(tmc.edu\)](#)

⁸⁸ [Houston Methodist awards \\$4.8 million through its Diversity, Equity & Inclusion Grant Program - Texas Medical Center \(tmc.edu\)](#)

Children's Pavilion for Women was awarded for Excellence in Pursuit of Healthcare Equity in 2022 or their efforts to close racial gaps in maternal mortality.⁸⁹

TMC benefits from extensive proximity and connection with research hospitals and universities. As part of the city of Houston, TMC has access to a substantial workforce, and the district's ecosystem currently includes over 375,000 jobs in all of its campuses and members.⁹⁰ Taking advantage of this intellectual and human capital, TMC fosters collaboration and provides resources for entrepreneurs through various programs. For example, the TMC Biodesign program is a paid program for entrepreneurs to workshop their healthcare-related startup ideas.⁹¹ TMC Innovation runs co-working spaces geared towards people in healthcare and science fields. Their TMCxi program has created industry workspaces like conference rooms and board rooms that accelerator companies can use.⁹²

Appendix 3: Map of Texas Medical Center



Source: Texas State Historical Association⁹³

⁸⁹ [Texas Children's Pavilion for Women recognized as a 2022 Bernard J. Tyson National Award for Excellence in Pursuit of Healthcare Equity recipient by The Joint Commission, Kaiser Permanente - Texas Medical Center \(tmc.edu\)](https://www.tmc.edu/ecosystem/)

⁹⁰ <https://www.tmc.edu/ecosystem/>

⁹¹ <https://www.tmc.edu/innovation/biodesign/>

⁹² <https://www.tmc.edu/innovation/innovation-programs/tmcxi/>

⁹³ <https://www.tshaonline.org/handbook/entries/texas-medical-center>

University City District

Regional Context

University City District (“UCD”) is a special services district in the University City neighborhood of West Philadelphia that encompasses the campuses of the University of Pennsylvania (“Penn”) and Drexel University, Hospital of the University of Pennsylvania, and the Children’s Hospital of Philadelphia (“CHOP”)⁹⁴ as well as medium- to higher- density commercial and residential areas. UCD is just west of Center City Philadelphia, the region’s primary employment, cultural, and historical hub.

University City attracts a diverse range of people—more than 53,000 residents and 54,000 students across five colleges, and about 80,000 jobs. The area is home to a bustling commercial development market, especially within the life sciences and research industry. In 2022, the value of completed real estate projects was \$366 million, and office occupancy remained healthy at 90 percent. Currently, 1.5 million square feet of development is under construction, with another 32 million square feet expected to be developed in the coming years. The area also has 1.9 million square feet of laboratory space, and \$23 billion in total research and development investment.⁹⁵

History and Establishment

University City District serves a dual purpose as a community organization and a governing body for Philadelphia’s largest innovation district. The roots of the UCD are linked with neighborhood revitalization efforts in the late 1990s, associated primarily with Penn, as well as Drexel, CHOP, and city agencies including the Philadelphia Redevelopment Authority.⁹⁶ A critical catalyzing force for private-sector innovation in the area was the establishment of the University City Science Center, an institution dedicated to bringing scientific research and development activity to West Philadelphia. Over the years, the University City Science Center transformed into “the nation’s first small business incubator in science and technology”, with remarkable success: 105 hosted organizations, 6,000 employees, and \$90 million in capital investment by 1988.⁹⁷

University City District At-A-Glance

Located in the West Philadelphia section of Philadelphia, PA

It encompasses the Drexel University and University of Pennsylvania campuses

Formed in 1997

Special service district with no dedicated funding stream beyond public, private, and institutional contributions

Functions like a business improvement district with a focus on safety, sanitation and placemaking

Also provides small business and workforce development services

Innovation activity generated by local institutions

⁹⁴ <https://collaborativehistory.gse.upenn.edu/stories/west-philadelphia-initiatives>

⁹⁵ [The State of University City 2023 web 0.pdf](https://collaborativehistory.gse.upenn.edu/stories/west-philadelphia-initiatives)

⁹⁶ <https://collaborativehistory.gse.upenn.edu/stories/west-philadelphia-initiatives>

⁹⁷ <https://philadelphiaencyclopedia.org/essays/university-city-science-center/>

Today, the University City innovation district is further advanced by Wexford Science and Technology's multi-phased uCity Square development, a major, mixed-use, innovation-focused development—a micro-innovation district within an innovation district—located between the Drexel and Penn campuses.

Governance and Organizational Structure

University City District (UCD) is a Special Services District, with organizations and businesses making voluntary contributions to support its annual operating expenditures (for example, there is no dedicated revenue stream generated from incremental property tax or sales tax). To this day, UCD is primarily supported through the district's anchor institutions, particularly Penn and Drexel. However, UCD receives substantial support from many organizations, hospitals, and businesses within the district, such as Brandywine Realty Trust and CHOP.

UCD's operational model includes a Board of Directors,⁹⁸ which aims to be representative of the community it is serving, with all 29 members working and/or living in University City. Craig Carnaroli, Senior Executive Vice President of Penn, serves as the chairman of the board. Other members of the UCD board include C-suite members of major institutions of UCD. For example, the board's vice chair is the David Adelman, President and CEO of Campus Apartments. The treasurer is the CFO of the nonprofit biomedical research organization Wistar Institute. There is also representation from University City's surrounding neighborhood organizations.

A staff of 27 members runs the day-to-day operations of the organization.⁹⁹ The staff is led by President Matt Berghaiser, who has been with UCD since 2009 and studied at Penn's Wharton School of Business.¹⁰⁰ UCD has numerous fully staffed departments: economic development/analysis, public safety, community outreach, public space maintenance, design, and homeless outreach services. Furthermore, some staff members work specifically for the three subsidiaries of UCD described below.

Core Functions

University City District's functions fall into five categories: (1) Placemaking; (2) Event Planning; (3) Workforce Development (via the *West Philadelphia Skills Initiative*); (4) Economic Development; and (5) Maintaining Clean and Safe Streets. Placemaking efforts include beautification and infrastructure installation at key locations, such as 30th Street Amtrak station, as well as running a landscaping venture, creating parklets and pedestrian plaza, and leading streetscape improvements.¹⁰¹ UCD hosts numerous intended to promote local businesses, as well as networking events and an annual "movies in the park" series.

UCD's workforce development initiative, the West Philadelphia Skills Initiative, helps connect West Philadelphia residents with jobs in University City.¹⁰² Economic development initiatives are varied, and range from data and research to support for small businesses, property owners, and landlords.¹⁰³

⁹⁸ [Board | University City District](#)

⁹⁹ [Staff Bios | University City District](#)

¹⁰⁰ <https://www.universitycity.org/mattberghaiser>

¹⁰¹ [Transforming Public Spaces | University City District](#)

¹⁰² [About WPSI | University City District](#)

¹⁰³ [Economic Development | University City District](#)

The Clean and Safe program includes neighborhood cleaning initiatives, public safety ambassadors, and transportation planning services; this includes two dedicated bus routes serving the major institutions in the district, known as the LUCY (“Loop through University City”) Green and Gold routes.¹⁰⁴

Funding

University City District’s revenue primarily comes from board contributions, fee-for-service income, and grant support and tax credits, in that order. The organization had roughly \$11.6 million in revenue in FY 2022.

Appendix 4: University City District Income Sources, FY 2022

University City District FY22 Income Sources	Amount(\$M)
Board Contributions	\$4.8
Fee-for-Service Income	\$3.40
Grant Support and Tax Credits	\$2.82
Community Contributions and Sponsorships	\$0.41
Interest Earned	\$0.06
In-Kind Contributions	\$0.03
Total FY22 Income (\$M)	\$11.52

Source: UCD (2022)

It spent the largest proportion of this revenue on the West Philadelphia Skills Initiative.

Appendix 5: University City District Expenditures, FY 2022

University City District FY22 Expenditures	Amount (\$M)
Clean and Safe	\$4.08
West Philadelphia Skills Initiative	\$2.45
Green City Works	\$1.67
Events, Marketing, and Communications	\$1.59
Planning and Economic Development	\$0.51
LUCY Transit Services	\$0.46
Administration	\$0.73
Development	\$0.10
Total FY22 Expenditures (\$M)	\$11.59

Source: UCD (2022)

Key Employers

While UCD as an organization is not explicitly focused on life sciences, there is significant activity in the UCD area that contributes to its development as an innovation district. The University City Science Center and surrounding biotech firms are continuously growing, such as through Spark Therapeutics’

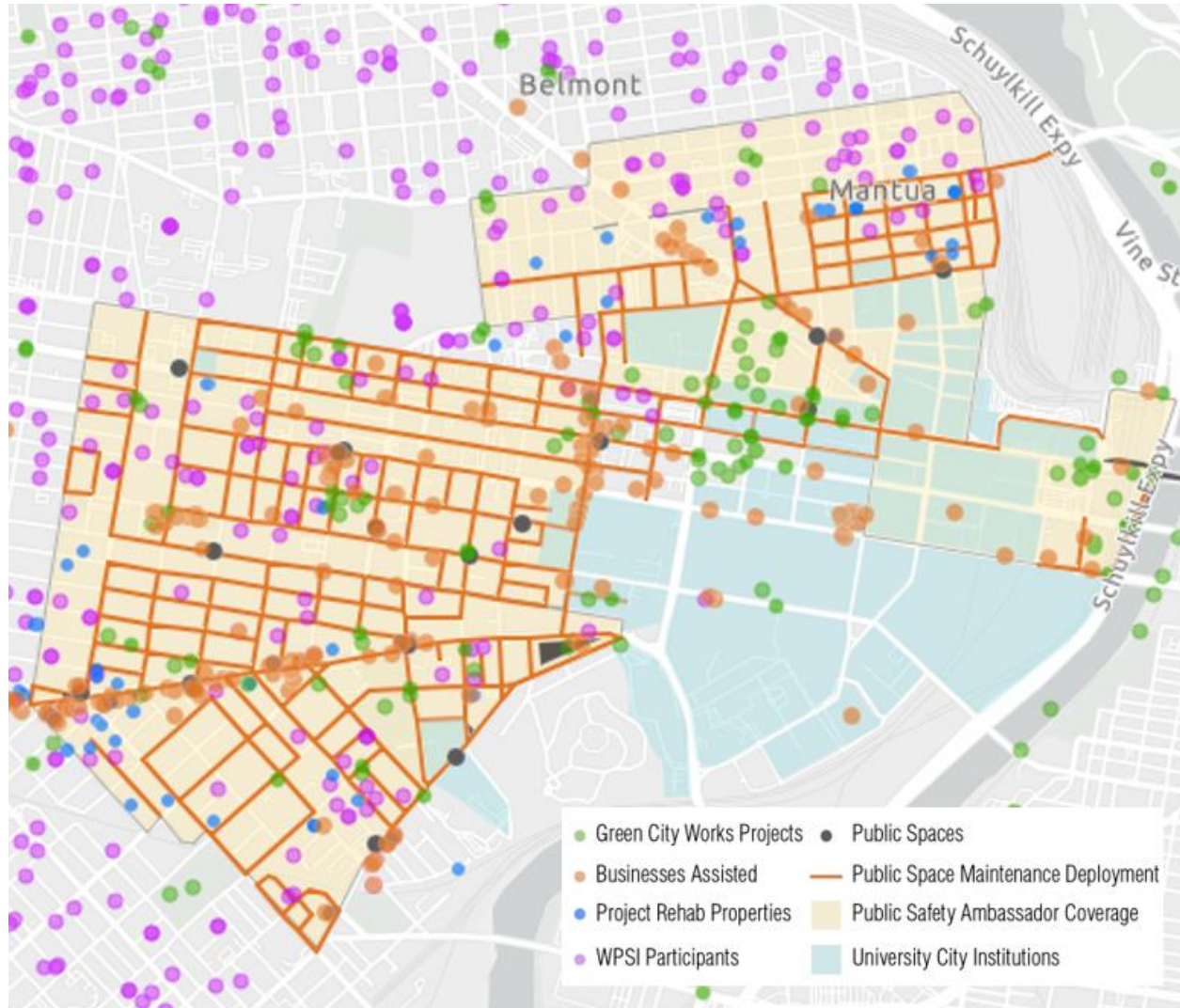
¹⁰⁴ [Maintaining Clean and Safe Streets | University City District](#)

\$575 million gene therapy center, and the area benefits from the presence of groundbreaking private corporations, startups, venture capital firms, and more. UCD also benefits from extensive transportation infrastructure, including Amtrak's 30th Street Station (Philadelphia's primary interurban rail station), Philadelphia's highest-ridership transit service, the Market-Frankford Line metro train, as well as five distinct trolley routes and numerous bus routes. In addition, the district is located walking-distance from Center City Philadelphia, the traditional business center of the city. Amtrak, which owns a significant plot of land near the 30th Street Station, has been a major player in developing the area in recent years, as it has played a leading role in the planning of a large, in-progress development called Schuylkill Yards. If completed in full, the development would build a "second downtown" for Philadelphia in University City, further attracting companies and workers to the area.

Support for Innovation and Inclusion

Gentrification and equity have always been a focus of conversation and controversy in West Philadelphia, and in response to this, equitable growth is a major part of UCD's mission. This is primarily achieved through the West Philadelphia Skills Initiative, which connects neighborhood residents with local jobs, including at the major anchor institutions. The Initiative engages in an intensive process to source "high-quality, career-ladder, entry-level jobs" that do not require college degrees. The Initiative runs a cohort-based training program for prospective employees, preparing them to apply for specific jobs. They are working with the CEO Council for Growth to help expand access to jobs that those with only on-the-job training can excel in. Overall, the initiative boasts a 95% job placement rate post-graduation and has helped over 1,000 people since 2011.

Appendix 6: University City District Impact Map



Source: University City District¹⁰⁵

¹⁰⁵ UCD Impact Map | University City District

Winston-Salem Innovation Quarter

Regional Context

Innovation Quarter (IQ) is located on the eastern edge of Downtown Winston-Salem, about three miles southeast of Wake Forest University's main campus. Wake Forest University is a private research university with enrollment of around 9,000 students. Winston-Salem is part of the Piedmont Triad (or Triad) comprised of the Greensboro, High Point, and Winston-Salem markets with a combined population of around 1.7 million. Historically, the region was a hub for textiles, tobacco, and furniture manufacturing, but over the last two decades has been diversifying its economy by investing in its technology and biotechnology ecosystem. As part of this strategy, the creation of IQ began with, and still carries, a life science focus, but has expanded to include other entrepreneurial industries, including information technology and material sciences.

Winston-Salem Innovation Quarter At-A-Glance

Founded in 2000s by Wake Forest University and Wake Forest Baptist Medical Center

Managed and controlled by a single institution (Wake Forest School of Medicine).

Developed as redevelopment opportunity adjacent to Downtown Winston-Salem

Has been able to concentrate university-led biomedical research activities, but private spin-off activity has been limited

Winston-Salem Innovation Quarter has struggled to attract and retain major private employers.

History and Establishment

IQ was established as a collaborative effort between the public and private sectors to revitalize Downtown Winston-Salem and create a hub for innovation and entrepreneurship. The initiative to form the Innovation Quarter began in the early 2000s when local leaders and stakeholders recognized the potential to transform the former tobacco district into a dynamic center for research, education, and economic development. Through partnerships between Wake Forest Baptist Medical Center, Wake Forest University, and other key institutions, the project gained momentum. The city's rich history in tobacco manufacturing and its subsequent decline provided the impetus to repurpose the area and focus on emerging industries such as biotechnology, healthcare, and technology. Over the years, the Winston-Salem Innovation Quarter has become a bustling ecosystem that fosters collaboration, research, and the development of innovative solutions, attracting businesses, startups, and talent to the region.

IQ is operated by the Atrium Health Wake Forest Baptist Medical Center and the Wake Forest School of Medicine.¹⁰⁶ While two nonprofit organizations exist associated with the site (the Wake Forest Innovation Quarter Management Company and the Wake Forest Innovation Quarter CDC), the Innovation Quarter is still based in Wake Forest School of Medicine.

Governance and Organizational Structure

IQ is officially managed and controlled by Wake Forest's School of Medicine, although it is organizationally different than many other examples of innovation districts. Wake Forest School of

¹⁰⁶ https://journalnow.com/business/wake-forest-to-be-dropped-from-name-of-innovation-quarter/article_04a0a8b8-a84d-52e0-8370-837b470de85d.html

Medicine, Atrium Health Wake Forest Baptist medical center, and Innovation Quarter are all ultimately intertwined organizationally. Three staff members of Wake Forest School of Medicine who have other, non-Innovation Quarter duties are responsible for activities at Innovation Quarter: Dr. Julie A. Freischlag, Dean of Wake Forest School of Medicine and CEO of Atrium Health Wake Forest Baptist, has ultimate responsibility for Innovation Quarter; Terry Hales Jr., Executive Vice Dean of Wake Forest School of Medicine also plays a significant role,¹⁰⁷ and; Jason Kaplan, whose primary role is as Wake Forest School of Medicine's academic resource support to faculty, staff, and students, also serves as leader of Innovation Quarter's operations team. IQ does have three dedicated staff positions: Director of Marketing and Communications, Head of Life Sciences and Biotech Ecosystem Development, and Director of Community Relations.

As a subsidiary of Wake Forest, not an independent organization, IQ does not have a traditional Board of Directors. However, IQ's level of independence from the university has grown over time, as other private-sector firms have grown their presence on the campus.¹⁰⁸ Three additional universities also have a presence: Forsyth Technical Community College, Winston-Salem State University, and UNC School of the Arts.

Core Functions

As Innovation Quarter is a subsidiary of Wake Forest School of Medicine, any development in the district is primarily financed by Wake Forest, a private university. The Winston-Salem Innovation Quarter serves as a dynamic hub for research, education, and fostering collaboration and innovation in various fields. It is primarily focused on promoting and supporting the growth of industries such as biotechnology, healthcare, technology, and other emerging sectors.

When it comes to design and placemaking, IQ has been widely heralded as an exemplary innovation district. IQ was among the first nine innovation districts recognized by the Global Institute on Innovation Districts.¹⁰⁹ Its mixed-use design, incorporating housing, offices, a trail, a large park, education, and dining, seems to exemplify best practices for innovation district. In building out the initial IQ, Wake Forest chose an industry-leading developer, Wexford Science & Technology, which is among the leading developers of life sciences innovation districts across the U.S. Wexford contributed six buildings, as well as the IQ centerpiece Bailey Park, to the development.¹¹⁰

IQ's economic impact has been estimated at \$1.66 billion.¹¹¹ Its successes are exemplified by ReMDO, a Wake Forest-affiliated nonprofit focused on translational research in regenerative medicine, which has established the 'RegenMed Hub' and recruited private firms to conduct research at IQ.¹¹² Wake Forest has planned a 2.7 million sf, 28-acre expansion to IQ dubbed *Phase II*, with Wexford once again the anticipated developer.¹¹³

¹⁰⁷ [About the Innovation Quarter - Innovation Quarter](#)

¹⁰⁸ <https://school.wakehealth.edu/about-the-school/alumni-relations/catalyst/catalyst-winter-2021/innovation-quarter>

¹⁰⁹ <https://school.wakehealth.edu/about-the-school/alumni-relations/catalyst/catalyst-winter-2021/innovation-quarter>

¹¹⁰ <https://wexfordscitech.com/community/innovation-quarter/>

¹¹¹ [Economic impact of Innovation Quarter reaches \\$1.66 billion](#)

¹¹² https://journalnow.com/news/local/innovation-quarter-officials-ready-to-hit-restart-button-on-planned-phase-ii/article_d3dd322c-4be2-11ed-9593-3f6156cf1777.html; [MiMedx Joins the iQ's RegenMed Hub - Innovation Quarter](#)

¹¹³ [Innovation Quarter announces master plan for phase II of innovation district development](#)

Funding

As of 2022, \$876 million that has been invested in the Innovation Quarter, with \$650.8 million from private investment, \$157.1 million from federal, state, and local governments, and \$68.1 million from developers building on adjacent land.¹¹⁴

Built on the site of a former tobacco processing plant, the development of IQ benefited from historic rehabilitation tax credits.¹¹⁵

Key Employers

IQ has faced some challenges in recent years, especially in the post-pandemic era. Despite the wide variety of businesses located in IQ, roughly one-quarter of employment at the site was concentrated at the data platform company Inmar Intelligence, which chose to downsize its physical office presence and leave IQ during the pandemic. Inmar was the largest employer at IQ, with nearly 1,000 employees. Its departure left Wake Forest itself as IQ's largest employer.¹¹⁶

Though there were still dozens of businesses in IQ after Inmar's departure, as well as the strong institutional presence of Wake Forest, the departure of Inmar left a hole in the existing IQ; at the same time, broader economic fluctuations presented roadblocks for Wake Forest's ambitious plans for IQ Phase II.¹¹⁷ Additionally at the same time, IQ lost the executive who had been described as its "driving force." This was a critical loss, considering the innovation district is led by a small team of six, several of whom have their time split between IQ and other concerns.¹¹⁸

Support for Innovation and Inclusion

IQ has responded to these challenges by doubling down on two areas: incubating startup businesses and building a vibrant recreational district. In 2021, IQ established the Sparq program to support startup businesses, with offerings including networking events, office hours with attorneys, pitch practices with local investors, and more.¹¹⁹ This has the twin benefits of helping expand and support the startup economy in Winston-Salem and helping attract businesses to IQ itself. Sparq pairs with the RegenMed Hub to make supporting North Carolina's startup economy a significant strength for IQ, and one it can potentially use to build a foundation of homegrown anchor businesses for the long-term. In addition, IQ's vibrant dining district has continued to add new restaurants.¹²⁰ IQ has also continued to host community-building events on its grounds and in its facilities.¹²¹ IQ has said that it still plans to move forward with Phase II once necessary infrastructure work is complete (which is anticipated to occur by the end of 2023.)¹²²

¹¹⁴ <https://www.innovationquarter.com/press-releases/iq-economic-impact/#:~:text=Innovation%20Quarter%20economic%20impact%20reaches%20%241.66%20billion%20in%202022>

¹¹⁵ https://journalnow.com/news/local/innovation-quarter-officials-ready-to-hit-restart-button-on-planned-phase-ii/article_d3dd322c-4be2-11ed-9593-3f6156cf1777.html

¹¹⁶ https://journalnow.com/business/wake-forest-to-be-dropped-from-name-of-innovation-quarter/article_04a0a8b8-a84d-52e0-8370-837b470de85d.html; https://journalnow.com/news/local/innovation-quarter-officials-ready-to-hit-restart-button-on-planned-phase-ii/article_d3dd322c-4be2-11ed-9593-3f6156cf1777.html

¹¹⁷ https://journalnow.com/news/local/innovation-quarter-officials-ready-to-hit-restart-button-on-planned-phase-ii/article_d3dd322c-4be2-11ed-9593-3f6156cf1777.html

¹¹⁸ [Graydon Pleasants plans to retire from IQ after 20 years \(journalnow.com\)](https://journalnow.com/news/local/graydon-pleasants-plans-to-retire-from-iq-after-20-years); [About the Innovation Quarter - Innovation Quarter](https://journalnow.com/news/local/about-the-innovation-quarter)

¹¹⁹ [Sparq Winston-Salem - Innovation Quarter](https://journalnow.com/news/local/sparq-winston-salem)

¹²⁰ [Eat and Drink - Innovation Quarter](https://journalnow.com/news/local/eat-and-drink-innovation-quarter)

¹²¹ [Meet the Entrepreneurs Behind Innovation Quarter Signature Events - Innovation Quarter](https://journalnow.com/news/local/meet-the-entrepreneurs-behind-innovation-quarter-signature-events)

¹²² [IQ forms partnership to secure minority business suppliers \(journalnow.com\)](https://journalnow.com/news/local/iq-forms-partnership-to-secure-minority-business-suppliers)

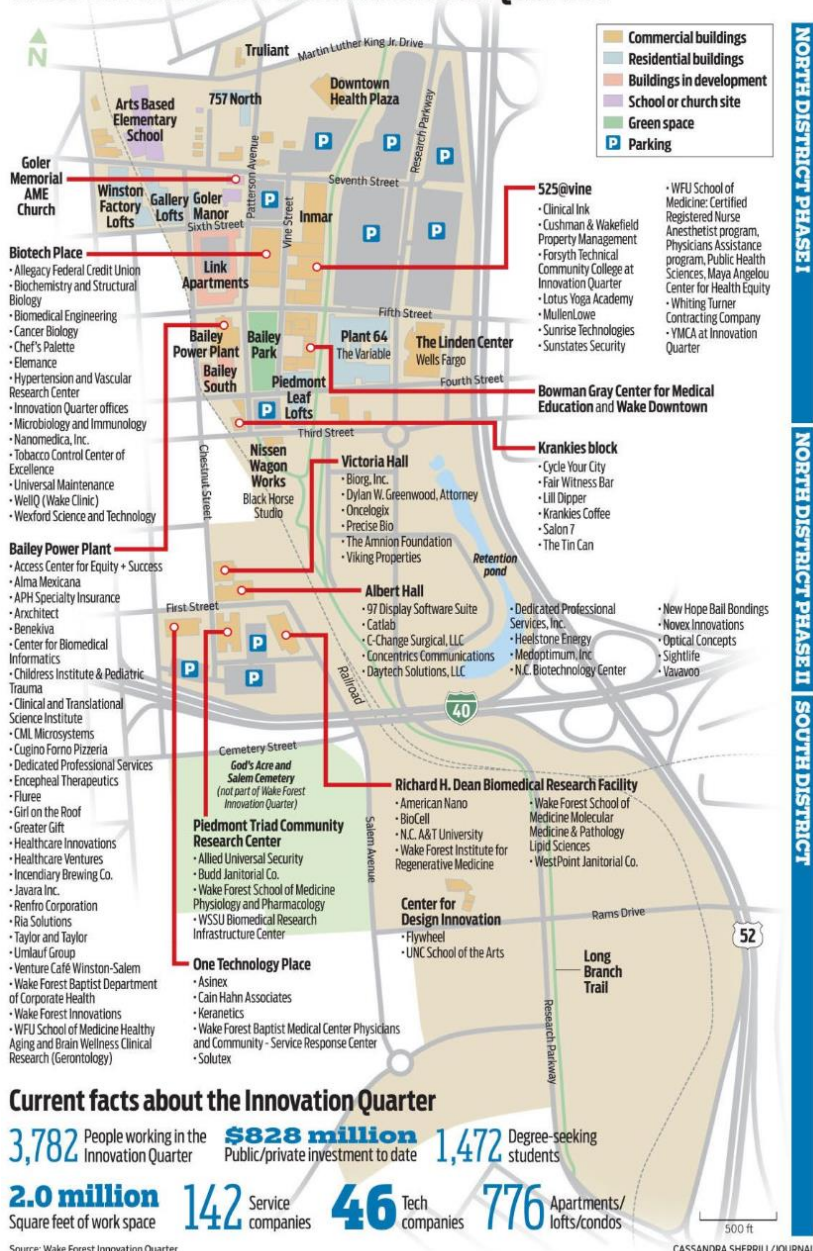
Much like University City District, IQ is situated on land that has a long and controversial history regarding racial equity. The neighborhood where IQ is located was once a predominantly Black, working-class neighborhood. Today, the downtown area to the west is affluent and predominantly White, while the East Winston-Salem area to the east is predominantly Black and low-income. The construction of U.S. Highway 52, located just east of IQ, divided these two communities.¹²³

IQ has made a public commitment to recruiting organizations and individuals that uphold values of diversity and inclusion. IQ's SciTech Institute is a youth STEM program run in conjunction with Winston-Salem State University. The multi-use Long Branch Trail can be seen as an attempt to reconnect the city in the wake of the division wrought by I-52. The trail is a partnership between Innovation Quarter, the City, and the North Carolina Department of Transportation.

¹²³ [Our Commitment to Inclusion and Diversity - Innovation Quarter](#)

Appendix 7: Innovation Quarter Map as of 2019

What's in the Wake Forest Innovation Quarter?



Source: Wake Forest Journal, Global Institute for Innovation Districts¹²⁴

¹²⁴ <https://www.giid.org/wp-content/uploads/2019/11/Winston-Salem-Journal.pdf>

Kendall Square

Regional Context

Kendall Square, which has become the leading example of a successful urban innovation district, is a waterfront neighborhood in Cambridge, Massachusetts, located just across the Charles River from central Boston. It is immediately northeast of the Massachusetts Institute of Technology (MIT) campus and less than two miles east of Harvard University's main campus. By leveraging the vast research activity, talent, and resources from these anchor institutions as well as others throughout the region, Kendall Square's growth and impact has transformed the Boston region into the leading innovation and technology hub on the East Coast, rivaling Silicon Valley as the leading life sciences hub nationally and internationally.¹²⁵

History and Establishment

Kendall Square as an innovation district emerged from an urban renewal project from the 1960s. At this time, Kendall Square was in decline, a formerly industrial center that was both polluted and emptying out. Unlike the many other urban industrial communities that were experiencing decline around the same time, Kendall Square had a powerful anchor institution in the form of the Massachusetts Institute of Technology (MIT), which has its main campus in the Kendall

Square neighborhood. With a vested interest in stemming the neighborhood's decline, the Cambridge city government called on MIT president James Killian to contribute to urban renewal efforts; he obliged by purchasing a former soap factory and converting it into a suburban-style office park—which found early success. A federal government agency, NASA, was attracted to the development as an anchor,—only to pull out mid-construction following federal budget cuts.¹²⁶

The Secretary of Transportation at the time, John Volpe, was a former governor of Massachusetts; he arranged for the U.S. Department of Transportation to take over some of NASA's development. It was from there that Kendall Square slowly began to blossom, redesigning a former urban industry hub as a suburban-style office park conveniently located in the heart of the city: in the words of the *MIT*

Kendall Square At-A-Glance

Located in Cambridge, MA adjacent to MIT and two miles east of Harvard University

Kendall Square was a former riverfront industrial area that emerged as an innovation district from a 1960s urban renewal project

Grew as an employment hub through major R&D activities from federal government and MIT

Its evolution as an innovation district occurred organically through startup tech activity in the 2000s.

Kendall Square does not have a formal governance structure; Kendall Square Association is a community-based advocacy organization and MIT serves as the de facto district manager through its own real estate investments

The area only started intentionally incorporating housing, retail, and amenities in the late 2000s.

¹²⁵ CBRE Analysis, [CBRE](#)

Textbox - <http://bostonvoyager.com/interview/meet-kendall-square-association-kendall-square/>

¹²⁶

<https://static1.squarespace.com/static/51f173a6e4b04fc573b07c0c/t/5231142de4b0359b56292129/1378948141594/Background+of+the+Kendall+Square+Urban+Renewal+District.pdf>; <https://www.technologyreview.com/2015/08/18/10816/the-past-and-future-of-kendall-square/>

Technology Review, Kendall Square's office park reinvention was designed so that "workers could drive in, park, and never have to leave the building".¹²⁷

As MIT's reputation in both biotechnology and computer science strengthened, a startup economy in both industries blossomed in Kendall Square around the park. An MIT alumnus, working out of space rented from the university, eventually took action to harness this startup energy by establishing the Cambridge Innovation Center, among the leading startup incubators in the nation (which has now extends far from its origins in Cambridge, to four other locations in the U.S., two in Europe, and one in Asia). As Kendall Square exploded, major pharmaceutical and technology firms soon followed the innovators to the neighborhood.

While the business community at Kendall Square took off, there was still a deficit when it came to placemaking. Kendall Square's design had been purposely created to resemble the Baby Boom-era suburban ideal, and in the 21st century, what had once been an attractive feature became a detriment as young knowledge workers came to prefer mixed-use urban environments.¹²⁸ The founding of the Kendall Square Association in 2009 was part of the solution. Today, Kendall Square is a vibrant community with a growing dining scene and increased street life.¹²⁹ Upcoming placemaking investments by MIT and the U.S. Department of Transportation will only help bring Kendall Square's urban design up to speed with the latest and greatest in innovation districts.

Governance and Organizational Structure

The Kendall Square Association exists as a nonprofit institution tasked with convening relevant stakeholders to oversee the growth of Kendall Square by managing events, establishing strategic partnerships, advocating for public policy issues, and hosting community meetings.¹³⁰ Kendall Square Association has a staff of six, led by Beth O'Neill Maloney, a former lawyer and experienced nonprofit executive. Other staff include a VP of Strategy and Operations, a Director of Communications, an Operations and Programming Associate, a Program Associate, and a Membership Associate. KSA also has an executive committee of five (three of whom are MIT-affiliated) and a board of 22 (none of whom are MIT-affiliated).¹³¹

The Kendall Square Association is neither landlord nor property manager nor developer nor planner; it is primarily an advocacy organization and convener of relevant stakeholders. MIT can be considered the true driving force behind most activity and development in Kendall Square. Specifically, MITIMCo (the university's subsidiary investment management company), the university's real estate and planning teams, and its C-suite are all players in Kendall Square development. Faculty at the university's renowned urban planning and architecture schools may also play a role.¹³²

¹²⁷ <https://www.technologyreview.com/2015/08/18/10816/the-past-and-future-of-kendall-square/>

¹²⁸ <https://www.technologyreview.com/2015/08/18/10816/the-past-and-future-of-kendall-square/>

¹²⁹ ['Ready for a bit of a break' after 4.5 years, Covid, Kendall Square leader C.A. Webb will step down - Cambridge Day;](http://bostonvoyager.com/interview/meet-kendall-square-association-kendall-square/)
<http://bostonvoyager.com/interview/meet-kendall-square-association-kendall-square/>

¹³⁰ <https://kendallsquare.org/about/>

¹³¹ <https://kendallsquare.org/board-of-directors/>

¹³² <https://kendallsquare.mit.edu/planning/governance>

Core Functions

Master planning in Kendall Square falls largely to MIT as well as to the City of Cambridge, and MIT is the primary force in real estate development and property management in the neighborhood (with other private developers also playing a role.) Take, for example, the *Kendall Square Initiative*, MIT's major plan to transform Kendall Square into a vibrant, mixed-use development, by developing parking lots in the neighborhood into mixed-use developments.¹³³ (*Renderings of the Initiative are available [here](#).*) The Initiative began with a planning process including community outreach and research.¹³⁴ The City of Cambridge also conducted a Kendall Square plan in the early 2010s.¹³⁵

MIT has also taken an active role in placemaking in Kendall Square in other ways; for example, it helped lure the neighborhood's first grocer to a location on the ground floor of One Broadway (the same tower that houses the Cambridge Innovation Center).¹³⁶

Even when it is not directly in charge, MIT looms large over all activities at Kendall Square. MIT's main campus is located on the edge of Kendall Square, and the university is intertwined with the innovation district. The Cambridge Innovation Center, another major anchor, is located on the edge of the MIT campus, in a building owned by the university. MIT recently led efforts to establish a new campus for the Volpe Transportation Center, the DOT facility that has been at Kendall Square since 1970.¹³⁷ Volpe eventually won approval, and its new campus will be complete in 2023.¹³⁸

Still, Kendall Square Association plays an important role in placemaking in the district. Placemaking is a primary part of the Kendall Square Association's purpose, and it has played a role as a convener and event organizer in this regard. However, the driving force in placemaking in Kendall Square appears to be MIT. MIT, having substantial land holdings in the neighborhood—including its main campus—holds the power to make transformative changes.

Funding

KSA's budget is relatively small, just over \$1 million. Its funding comes primarily from membership fees.

Appendix 8: Kendall Square Association Revenues, FY 2021

Revenue Source (FY 2021)	Revenue
Membership Dues	\$700,416
Other contributions, gifts, grants, etc.	\$705,388
Total	\$1,405,804

Source: ProPublica (2023), Kendall Square Association (2021)¹³⁹

¹³³ <https://news.mit.edu/2017/mit-one-broadway-building-brothers-marketplace-1214>

¹³⁴ <http://kendallsquare.mit.edu>

¹³⁵ [k2c2_kendall_final_report.pdf \(cambridgema.gov\)](#)

¹³⁶ <https://news.mit.edu/2017/mit-one-broadway-building-brothers-marketplace-1214>

¹³⁷ <https://volpe.mit.edu>

¹³⁸ <https://www.volpe.dot.gov/news/coming-fall-2023-new-era-transportation-innovation>

¹³⁹ [KENDALL SQUARE ASSOCIATION - Full Filing- Nonprofit Explorer - ProPublica](#)

While MIT has led development, Harvard University has also played a role, as have several major corporations like Microsoft, Facebook, Google, Pfizer, and many venture capital firms. Some of these firms have made direct investments in expansion projects, while others have indirectly attracted business and economic activity by locating in the area.^{140 141} Public entities such as the City of Cambridge and the Cambridge Redevelopment Authority have funded redevelopment projects, and Kendall Square has received grants from the Cambridge Community Foundation.¹⁴² Private developers have invested in the area as well, as Boston Properties funded a \$6 million transit improvement project.¹⁴³

Still, the story of Kendall Square is one that is driven largely by the efforts of a major, prestigious research university.

Key Employers

Kendall Square is home to a wide variety of world-renowned institutions as well as startups. Key tenants in Kendall Square include MIT, Novartis Institutes for BioMedical Research, Biogen, and Pfizer. The combination of tenants requires either wet or dry labs, or a combination of both. These institutions are also unique in terms of their goals and are focused on either pharmaceuticals, research and development, or biosafety.

Nonprofit organizations in Kendall Square are BioBuilder, Bridges Homeward, Cambridge School Volunteers, Cambridge Volunteer Clearinghouse, CASPAR, Catalyst Conversations, Charles River Conservancy, Charles River Transportation Management Association, Community Art Center, East End House, Food For Free, Global Arts Live, InnerCity Weightlifting, Just-A-Start Corporation, Kids in Tech, Life Science Cares, Margaret Fuller Neighborhood House, MassEcon, New England Jazz Collaborative, Science Club for Girls, The Loop Lap, Transportation for Massachusetts, Tutoring Plus of Cambridge, Young People's Project.

Support for Innovation and Inclusion

Kendall Square has a substantial amount of housing. As part of the latest revision to the Kendall Square Urban Renewal Plan (KSURP), 25% of this housing is below market rate and available for low- and middle-income families.¹⁴⁴ More affordable housing units have been added after the initial completion of the KSURP. For example, 165 Main Street, a recent development project funded by MIT, added 300 new residential units to the Square, of which 54 are affordable units. In addition to supporting affordable housing, Kendall Square is actively supporting affordable innovation. The KSURP allocated 25% of the Innovation Space in Kendall Square for subsidized entrepreneur programs. 165 Main Street has built on this initiative by adding 36 innovation units.¹⁴⁵

The Cambridge Redevelopment Authority led the development of an Opportunity Space, a workforce development space dedicated to strengthening connections between local job seekers and opportunities in Kendall Square. This space hosts technical trainings, career development experiences,

¹⁴⁰ <https://www.bostonglobe.com/2022/05/26/business/google-keeps-growing-its-presence-kendall-square/>

¹⁴¹ <https://ihq.mit.edu/2022/02/05/mit-technology-review-the-past-and-future-of-kendall-square-2015/>

¹⁴² <https://www.causeiq.com/organizations/kendall-square-association,264036848/#funding>

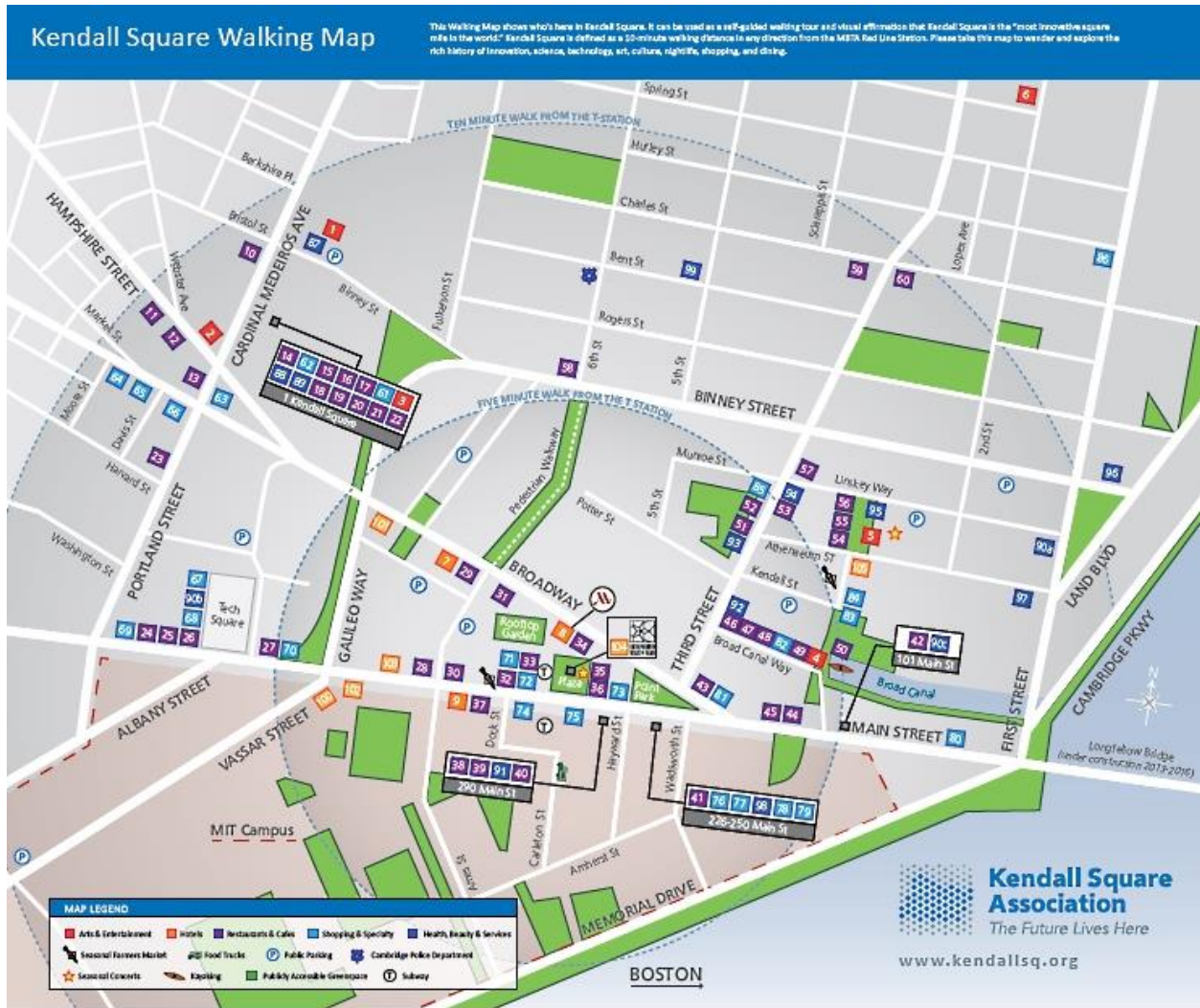
¹⁴³ <https://www.cambridgeredevelopment.org/kendall-square-3>

¹⁴⁴ <https://courbanize.com/projects/kendall-sq-urban-renewal/information>

¹⁴⁵ <https://capitalprojects.mit.edu/projects/kendall-square-site-1>

and recruitment events.¹⁴⁶ The Kendall Square Associate also working to provide access to inclusive workforce training to provide pathways for individuals to find advanced learning and employment opportunities in Kendall Square. They maintain a database of training, internship, and enrichment opportunities for people of all ages called Pathways to Kendall to accomplish this goal.¹⁴⁷

Appendix 9: Kendall Square Map



Source: Kendall Square Association, Cambridge Redevelopment Authority¹⁴⁸

¹⁴⁶ <https://www.cambridgeredevelopment.org/workforce-development>

¹⁴⁷ <https://kendallsquare.org/pathways-to-kendall/>

¹⁴⁸ <https://www.cambridgeredevelopment.org/maps>

Land Use Considerations and Implementation of Housing and a Mixed-Use Development in Innovation Districts

While the previous section provided five examples of innovation districts with a focus on their governance structures, key functions, tenanting, and programming, the following section is intended to demonstrate the evolution of innovation districts from a land use perspective, especially how they continue to explore ways to incorporate housing and a mix of uses. Many of the first innovation districts such as RTP or Texas Medical Center were originally conceived as single-use research parks or institutional districts consisting of conventional office space, research facilities, or healthcare facilities. However, over the last two decades, there has been a general shift in changing the built environment and pedestrian experience in downtown areas and innovation districts alike with the incorporation of new housing, retail, recreational amenities, and public spaces in both urban and suburban contexts. It is now recognized that the long-term competitiveness of districts supporting a knowledge-based economy—and their ability to attract talent, employers, and new investment—is dependent on their continued evolution as places to live, work, and play and their physical connections to and from other parts of their respective communities. This is even more critical in the post-COVID era as employers continue to explore ways to encourage workers to come back to the workplace with higher frequency and support collaborative environments, which are critical for an innovation-based economy.

Three of the case studies provided, Research Triangle Park, Kendall Square, and Texas Medical Center, focus on how they supported housing and other mixed-use development despite their original conception as single-use office and institutional districts. Mission Bay (San Francisco) and The Navy Yard (Philadelphia) are also included because they represent mixed-use urban districts that have developed with more of a ground-up approach through a publicly led master planning process. While these two districts are not institutionally led innovation districts like RTP or Kendall Square, they are still recognized as innovation hubs given their concentration of life sciences and tech uses co-located with housing, retail, and recreation amenities.

Research Triangle Park

Land Use and Development History

With the rapid economic growth of the Triangle Region (Raleigh, Durham, Chapel Hill) over the last several decades, the changing lifestyle preferences for a knowledge-based workforce, and goals to support an entrepreneurial ecosystem, the Research Triangle Foundation released a new Master Plan in 2011 that better incorporated placemaking, transportation, public spaces, housing, and retail within its now 7,000-acre area.¹⁴⁹

Among the outcomes of the 2011 Master Plan process was the declaration of the need for a mixed-use center of development. One of the primary challenges the Park faces is its suburban-style design, which was considered progressive during its initial conception, but changing employer and workforce preferences have pressured developers to better incorporate a mix of uses and natural amenities to maintain competitiveness. RTF recognized this challenge as early as 2011, describing in its 2011 Master Plan: “Many of today’s knowledge workers expect amenities and opportunities to connect and share ideas in a socially dynamic setting. The independent campuses at RTP, mostly hidden behind trees, do not reflect this trend. There is no central, defining place that represents the heart of the Park—that nurtures and reveals the dynamic, world-class research community made up of RTP’s over 170 companies and entrepreneurs.”

Later in the 2010s, and following plans laid out in its master planning process, RTF set out to create such a central meeting space. Today, this area—known as *Hub RTP*—is already a mixed-use space including coworking space, private office, and wet-lab space, as well as activities and dining. Eventually, the site is planned to become a mixed-use campus with roughly a dozen buildings, including residential developments with ground-floor retail.¹⁵⁰¹⁵¹

While much of the site is currently under development, two major anchors are currently operating: *Frontier RTP* and *Boxyard RTP*. *Frontier RTP* is a co-working space opened in 2015 on the site of a former IBM campus, with access to coworking spaces as well as rentable private offices and wet lab spaces.¹⁵² *Boxyard RTP* is an 18,000 square foot dining hall and event space, so named because it is made of

Research Triangle Park At-A-Glance

Research Triangle Foundation serves as Master Developer and solicits Requests for Proposals (RFPs) from private developers for select sites or development areas

Since its inception, RTP has developed as a low-density, suburban-style office park with very few retail amenities and no housing or hotels within its boundary

The 2011 Master Plan was developed to incorporate housing, retail, and recreational amenities—previous zoning only allowed for office, flex, industrial or other employment-based uses.

The \$1 billion HUB RTP will consist of a mixed-use district with 1,200 housing units, 1 million square feet of office and lab space, 75,000 square feet of retail, and 425 hotel rooms with public space and other amenities.

¹⁴⁹ <https://files.rtp.org/wp-content/uploads/2014/08/CONCISE-MASTER-PLAN.pdf>

¹⁵⁰ <https://hub.rtp.org/>

¹⁵¹ <https://www.rtp.org/2023/05/hub-rtp-gains-momentum-with-topping-out-of-horseshoe/>

¹⁵² <https://frontier.rtp.org/about/>

repurposed shipping containers.¹⁵³ It opened in 2021¹⁵⁴, and hosts regular events, including lectures and musical performances.¹⁵⁵ RTF is the owner and manager of both *Frontier RTP* and *Boxyard RTP*, and employs a placemaking staff of four who work specifically with the *Hub* spaces.

Existing and Proposed Real Estate Development

According to CoStar, RTP primarily consists of employment-based uses with approximately 11.4 million square feet of office space, 2.6 million of flex R&D space, and 2.4 million of industrial in addition to several million square feet of space for institutional or government operations. Development has been steady in recent years with more than 3.1 million square feet of space added since 2010. According to RTF, the Park has around 375 establishments with a workforce of 60,000.

While there is retail and residential development adjacent to the Park, previous zoning had restricted these uses within the RTP boundaries. However, the 2011 Master Plan was developed to facilitate a greater mix of uses, including the recently developed RTP Boxyard, an 18,000 square foot shipping container park with vendors and a performance stage for events (these types of temporary uses typically do not appear in CoStar's database).

Appendix 10: Total Commercial Real Estate Inventory, Research Triangle Park

Land Use	Total Supply	Built Since 2010	% of Supply Built Since 2010
Office	11.4 million SF	1.7 million SF	15%
Flex R&D	2.6 million SF	730K SF	28%
Industrial	2.4 million SF	700K SF	29%
Retail	40K SF	4K SF	11%
Multifamily	N/A	N/A	N/A
Hospitality	N/A	N/A	N/A

Source: CoStar (2023)

¹⁵³ <https://abc11.com/boxyard-trp-research-triangle-park-things-to-do-in-raleigh-live-music/10704338/>

¹⁵⁴ <https://wraltechwire.com/2021/11/18/boxyard-rtp-grand-opening-begins-with-events-all-weekend/>

¹⁵⁵ <https://abc11.com/boxyard-trp-research-triangle-park-things-to-do-in-raleigh-live-music/10704338/>

To meet changing preferences for employers and workforce and to remain more competitive with other employment centers in the Triangle, the \$1 billion mixed-use HUB RTP is currently under development and will include around one million square feet of office and lab space, 1,200 multifamily units, 75,000 square feet of retail, and 425 hotel units.¹⁵⁶ Additionally, Apple recently announced plans for a 700,000 SF office complex¹⁵⁷

Appendix 11: Proposed HUB RTP



Source: Triangle Business Journal

Incorporation of Mixed-Use Development and Housing

While RTP had been successful in attracting larger-scale companies and government entities to develop space and operate within the park, there has been a push to enhance its character, design, and offerings to enable it to be a more comprehensive—and competitive—mixed-use innovation district.

RTP is a special tax district with zoning across two development areas—Research Applications District within the Wake County portion and Scientific Research Park within the Durham County portion. Consistent with the original vision for the park, historically these designations only allowed for lower-density office, research, or scientific facilities; however, as part of the implementation of the 2011 Master Plan, these designations have been revised to allow for a mix of uses across a variety of densities in addition to providing more public space and community amenities. Specifically, the Wake County Board of Commissioners approved revisions to the Unified Development District to allow for more “flexibility and increase development potential,” although the changes primarily addressed density, setbacks, and design and did not expand uses.¹⁵⁸ Durham County updated its Comprehensive Plan to better address development patterns within RTP and later created a new zoning designation within its UDO to allow for one or more commercial nodes with a mix of uses that is walkable and served by transit and bicycle facilities.¹⁵⁹ This zoning change has allowed for the planning and development of Hub RTP.

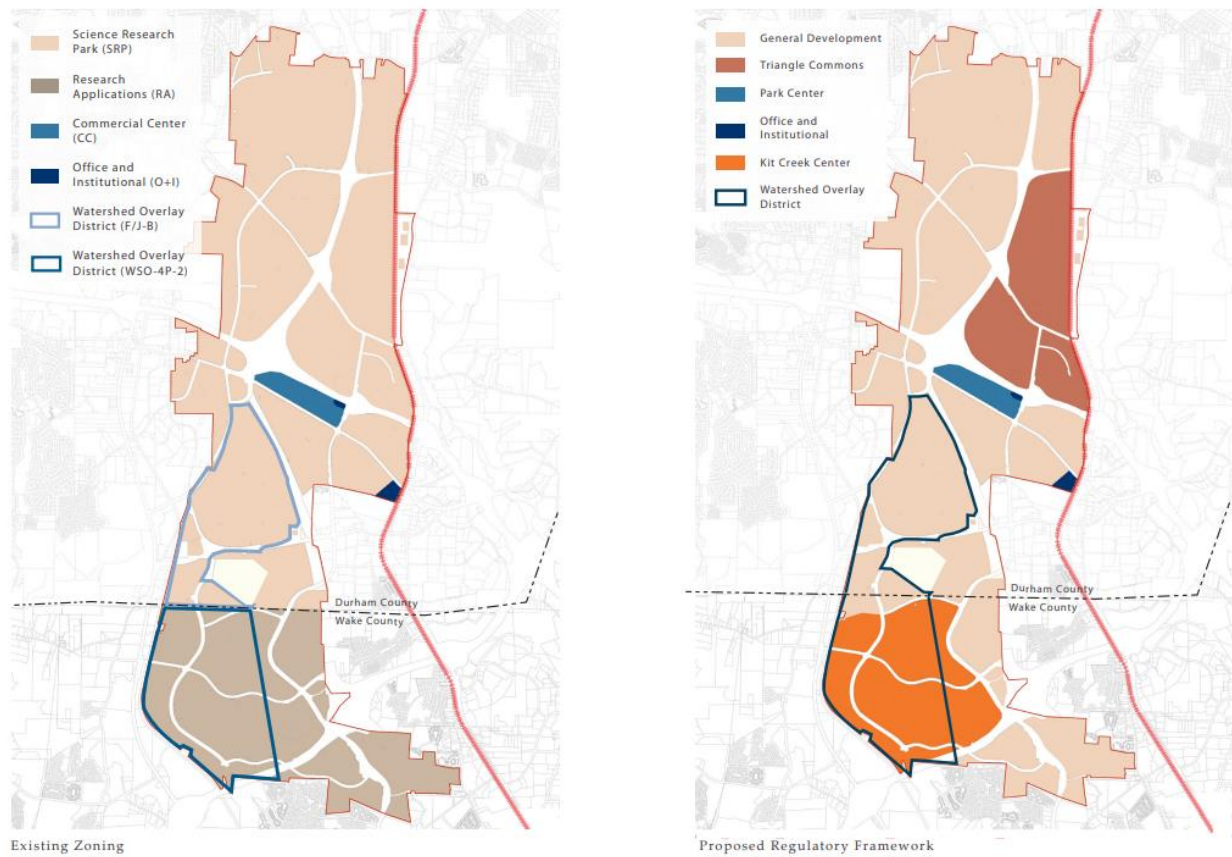
¹⁵⁶ <https://hub.rtp.org/>

¹⁵⁷ <https://appleinsider.com/articles/23/06/30/apples-north-carolina-research-triangle-park-campus-will-be-enormous>

¹⁵⁸ <https://archive.ph/20130415225733/http://thertpblog.org/2012/10/03/master-plan-update-zoning-gives-room-to-grow/>

¹⁵⁹ <https://bullcityrising.typepad.com/files/boc-memo-a1500007.pdf>

Appendix 12: Research Triangle Park Master Plan Proposed Zoning Updates



Texas Medical Center

Land Use and Development History

The origin of Texas Medical Center dates back to 1942, when the State of Texas authorized a state cancer research hospital and provided \$500,000 of funding to support its development (approximately \$9.4 million adjusted for inflation). This original facility was located three miles outside of Houston's downtown in undeveloped park land near Rice University. It was at this time that Baylor University collaborated with the trustees of the MD Anderson Foundation, the organization overseeing the project, to bring the Baylor University College of Medicine to the new location. In 1945, the Texas Medical Center was chartered as a non-profit corporation.

The Texas Medical Center Corporation continues to play a key coordination and oversight role, having transferred or leased more than 113 acres to various member institutions for little-to-no cost. Institutions generally remain autonomous within the district except for pre-established land use agreements.

The Texas Medical Center was established in 1945, in part by funds endowed to the M.D. Anderson Foundation. Over the next four decades, several campuses opened, growing the Center's footprint. Eventually, Texas Medical Center purchased and integrated more land into its overall system, beginning with the 2001 purchase of the former Nabisco Cookie Factory, which would become home for TMC's dedicated life science and innovation hub. TMC continues to increase its footprint today, culminating in a new TMC BioPort campus intended for manufacturing. Given the lack of developable land around TMC's main campus, TMC BioPort is about five miles southwest.

Building on decades of breakthroughs in science and technology, in 2014 TMC launched its Innovation Institute, creating an ecosystem to support innovation and collaboration across the many research institutions, agencies, corporations, and incubators located in the district. Amidst other initiatives, this included the founding of TMCx, an accelerator run by the Texas Medical Center Corporation offering early-stage companies resources and space to work.

Existing and Planned Real Estate Development

Texas Medical Center Corporation serves as Master developer and recently has engaged with Beacon Capital Partners, Braidwell, Majestic Realty, and Transwestern Development. Since its inception in the 1940s, the district has grown from 134 acres to nearly 1,350 acres with over 50 million developed square feet primarily consisting of hospitals, research facilities, university facilities, parking structures, and office space. Of the commercial real estate supply, there is around 5.8 million square feet of office space with around 151,000 square feet of retail space and nearly 2,000 hotel rooms, as presented in the

Texas Medical Center At-A-Glance

Founded in the 1940s and developed as an institutional medical campus

Texas Medical Center Corporation serves as Master developer

Only recently has TCM focused on investments in placemaking, public space, and enhancing the pedestrian experience.

Given the lack of development sites near the main TMC campus, a new biomedical campus (BioPort), about five miles southwest, is planned to include a mix of uses and focus on life sciences innovation and employment

following figure. As a primarily institutional district, there is a very limited supply of housing with only 376 apartments. Additionally, since TMC’s evolution as an innovation center has only been a focus in the last 10 years, there is no privately developed flex R&D space.

Appendix 13: Total Commercial Real Estate Inventory, Texas Medical Center

Land Use	Total Supply	Built Since 2010	% of Supply Built Since 2010
Office	5.8 million SF	240K SF	4%
Flex R&D	N/A	N/A	N/A
Industrial	N/A	N/A	N/A
Retail	151K SF	0	0%
Multifamily	376	376	100%
Hospitality	1,980	350	18%

Source: CoStar (2023)

Helix Park is currently undergoing a series of projects amounting to \$3 billion. Phase 1 of the development is the TMC3 Collaborative Building, scheduled to open in 2023.¹⁶⁰ This phase includes several key components: a 250,000 square feet collaborative building, a 700,000 square feet industry research building, a 521-room hotel, a 65,000 square feet conference center, a 350-unit residential building, six research buildings, and seven acres of public space, including six parks. In addition to Helix Park, there are plans for the construction of BioPort, a life science manufacturing hub that is expected to cover 500 acres of land. This ambitious project is anticipated to generate approximately 100,000 new job opportunities, with construction set to commence as early as 2025.

Incorporation of Mixed-Use and Housing

Despite the long-standing presence of Texas Medical Center as a hub for innovation in life science and medicine, efforts to create a mixed-use space that integrates residential, retail, public parks, and hotel space are more recent. Texas Medical Center adheres to a set of Architectural Standards, last revised in September 2021, that seeks to ensure the campus is accessible and adheres to the coordination goals of its Master Plans.¹⁶¹

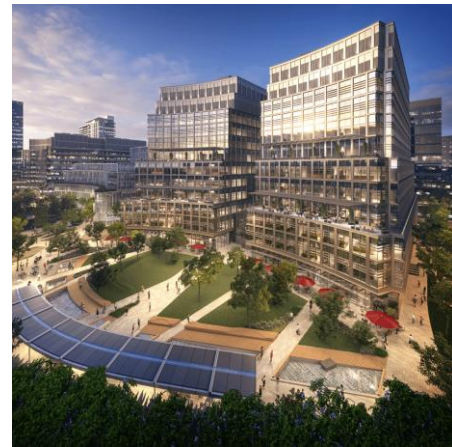
TMC began construction of a new “Helix Park” section of the district in December 2020, implementing a master plan developed by lead architect David Manfredi that covers 37 acres of development. Integrated into this plan is a 350-unit residential tower and 18.7 acres of public park space. Beacon Capital is partnering with TMC to lead development for multiple components of this project. Additionally, Texas A&M is constructing approximately 600 new units within the TMC, providing student-focused residential opportunity within the district as well.¹⁶²

¹⁶⁰ <https://www.tmc.edu/news/2021/08/texas-medical-center-launches-worlds-largest-life-science-campus/>

¹⁶¹ https://www.tmc.edu/wp-content/uploads/2021/10/TMC-Arch-Standards_091321_BOD_FINAL.pdf

¹⁶² <https://today.tamu.edu/2020/02/20/texas-am-system-invests-half-billion-dollars-in-texas-medical-center/>

Appendix 14: Texas Medical Center Helix Park Renderings; TMC³ project (left), Center Dynamic One project (right)



Source: Texas Medical Center (2023)

A major transportation study was conducted for TMC in 2014 that determined the area needed more parking access, better road network mobility, less vehicle traffic, better safety mechanisms, and better pedestrian connectivity. The district now has its own police force and security team that help maintain safe transportation systems, including its own shuttle service.¹⁶³

¹⁶³ tmc.edu/parking/shuttle-services/

Kendall Square

Land Use and Development History

Located just east of the Massachusetts Institute of Technology (“MIT”) campus, historically, the 200-acre Kendall Square was an industrial area that over the last several decades has transformed into one of the leading research and innovation districts globally. Its prominence as an innovation hub occurred somewhat organically with efforts beginning in 1960s with the creation of the Cambridge Redevelopment Authority (CRA) and 1978 East Cambridge Riverfront Plan. The CRA facilitated the delivery of more than a million square feet of office space throughout

the 1980s attracting several biotechnology firms.¹⁶⁴ A major shift occurred in the 1990s as the rise of information technology changed the trajectory of high-growth startup culture—companies could be successful in smaller spaces with talent as the primary driver. The launch of Cambridge Innovation Center (CIC) in 1999 pioneered this shift by creating a flexible, low rent co-work model that attracted tech entrepreneurs and billions of venture capital investment. While attractive to entrepreneurs, the area did not become a mixed-use innovation district until then MIT president Susan Hockfield spearheaded a strategic planning effort through MIT Investment Management Corporation (MITIMCo) in 2008. As part of the plan’s implementation, the city of Cambridge supported zoning changes to allow for more higher-density, mixed-use development and thousands of new housing units in addition to retail, hotels, and community amenities.¹⁶⁵

Existing and Planned Real Estate Development

Dating back to the late 19th and early 20th centuries, Kendall Square was primarily characterized by its industrial landscape, hosting various manufacturing and industrial facilities that contributed to the area's economic growth and prominence. Industries such as textile mills, soap factories, and glassworks were prevalent during this period, with Kendall Square serving as a hub for production and manufacturing activities. With the emergence of technology and biotechnology industries in the latter part of the 20th century, Kendall Square experienced a revitalization, becoming a focal point for research and development activities.

The development of Kendall Square involves various developers and institutions, including MIT, Harvard University, the City of Cambridge, the Cambridge Redevelopment Authority (CRA), the Kendall Square Association (KSA), and Boston Properties (BXP) as the Master Developer. The current development program has resulted in the creation of a substantial 17.7 million square feet of office and research and

Kendall Square At-A-Glance

The formation of the Cambridge Redevelopment Authority (CRA) and 1978 East Cambridge Riverfront Plan catalyzed future activity in Kendall Square

MIT Investment Management Corporation (MITIMCo), part of MIT, led efforts plans for a mixed-use development

Boston Properties (BXP) is the main developer with several area universities as important partners

Rezoning was approved in 2010, allowing for more office and innovation space.

¹⁶⁴ <https://www.cambridgeredevelopment.org/redevelopment-history-of-kendall>

¹⁶⁵ <https://www.technologyreview.com/2015/08/18/10816/the-past-and-future-of-kendall-square/>

development space, 3,660 residential units, 3.8 million square feet for governmental and institutional use, and 900,000 square feet dedicated to retail.

Looking ahead, the development pipeline outlines further growth with plans for an additional 6.0 million square feet for office and R&D purposes and 1,891,465 square feet for residential and mixed-use retail spaces.

Appendix 15: Total Commercial Real Estate Inventory, Kendall Square

Land Use	Total Supply	Built Since 2010	% of Supply Built Since 2010
Office	17.4 million SF	5.1 million SF	29%
Flex R&D	346K SF	0	0%
Industrial	161K SF	0	0%
Retail	1.1M SF	10K SF	1%
Multifamily	2,730	1,300	48%
Hospitality	1,400	0	0%

Source: CoStar (2023)

Incorporation of Mixed-Use and Housing

Until the 2010s, Kendall Square was primarily an employment center—originally an industrial area and most recently a hub for research and development operations, life sciences and technology firms, and knowledge-based workers. The original 1965 Kendall Square Redevelopment Plan (KSURP) has evolved over the last several decades and has been recently amended to provide a greater mix of uses, especially residential development. The area now has a supply of more than 3,600 housing units that were primarily built over the last decade. Kendall Square is almost entirely built out with very few larger-scale redevelopment opportunities remaining, which led to a MXD District rezoning and KSURP Amendment and well as the Infill Development Concept Plan (IDCP) approved by Cambridge City Council in 2021 to increase density in select areas allowing for more office and innovation space and 425 mixed-income housing units.¹⁶⁶

¹⁶⁶ <https://www.cambridgeredevelopment.org/kendallredevelopmentoverview>

Mission Bay

Land Use and Development History

The redevelopment of the 300-acre Mission Bay can be attributed to its Master Plan was adopted in 1998 and implemented through public-private partnerships between the former San Francisco Redevelopment Authority, the University of California San Francisco, the Mission Bay Development Group, and other parties. Prior to the Master Plan, Mission Bay was largely an industrial district and home to a railyard owned by Southern Pacific Railroad and other multi-modal shipping facilities and infrastructure. Portions of the area were brownfield sites that required remediation. Given its location less than two miles from San Francisco's Central Business District, Mission Bay was targeted as a critical redevelopment area for the city for new housing, employment, and recreational opportunities.

The objectives and policies of the master plan were built around land use, urban design, neighborhood environment, recreation and open space, commerce and industry, and transportation. University of California San Francisco was one of the major players in the implementation of the master plan.

To attract and catalyze investment in the development of Mission Bay San Francisco, the primary approach involved rewriting the vision for Mission Bay into a biotech-focused area. This new vision aimed to combine life science research with life science companies and a hospital. One of the key steps was bringing UCSF to the table and working extensively with the city and residents to foster consensus. The Redevelopment Agency of the City and County of San Francisco¹⁶⁷ partitioned a portion of the plan area to the University. UCSF was exempt from local planning, zoning, and redevelopment regulations, reducing some of the barriers to implementing the plan.¹⁶⁸ Additionally, special biotech zoning was established, and a block-by-block plan with 28 percent affordable housing was approved in 1998.

Mission Bay Development Group serves as the Master Developer and has provided a critical and overarching role through the decades-long process, supporting design, permitting, approval processes, financing, and implementation. Financing was sourced from many locations, including private capital, tax increment bonds, environmental remediation funds, infrastructure and affordable housing grants, and stimulus funds.¹⁶⁹

Mission Bay At-A-Glance

300-acre former industrial area and railyard that underwent significant remediation to create a start-from-scratch redevelopment site with new street grid and infrastructure

Public-private partnerships between the former San Francisco Redevelopment Authority, the University of California San Francisco, the Mission Bay Development Group

Mission Bay Development Group serves as Master Developer with specific design guidelines for future development

Design guidelines promote pedestrian-focused development by establishing an urban street grid more conducive to the intended mix of uses, maintaining views of the bay and San Francisco, and broadly encouraging an active pedestrian environment

¹⁶⁷ Now known as the Office of Community Investment and Infrastructure

¹⁶⁸ REDEVELOPMENT PLAN FOR THE MISSION BAY SOUTH REDEVELOPMENT PROJECT, [QCI](#)

¹⁶⁹ <https://www.mbaydevelopment.com/mission-bay-case-study->

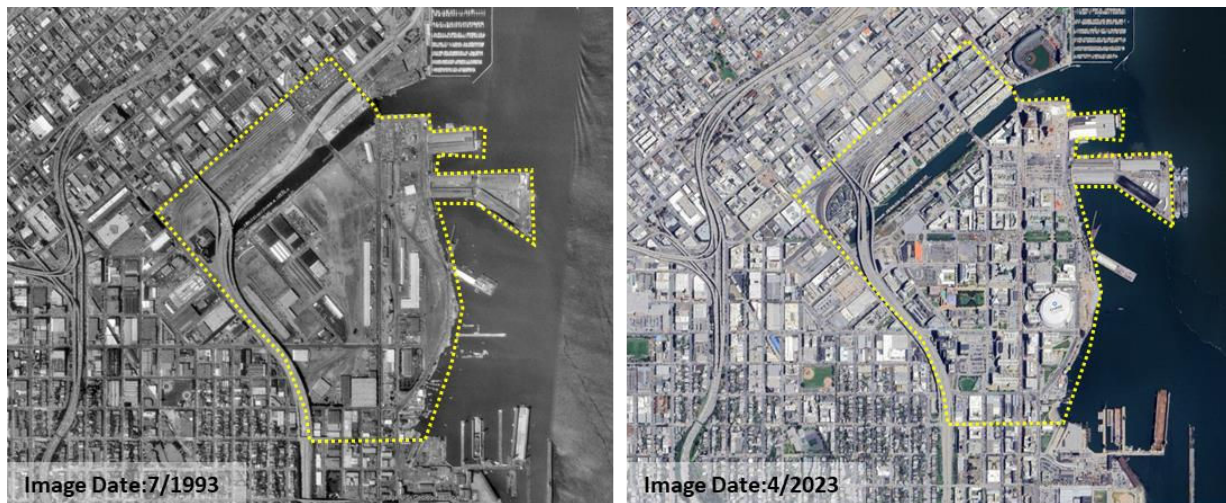
Existing and Proposed Real Estate Development

Mission Bay provided a unique redevelopment opportunity effectively allowing for a start-from-scratch approach with a new street grid and demolition of nearly all existing structures. The first housing built and occupied in Mission Bay was Rich Sorro Commons on Berry Street, built by Mission Housing Development Corporation for low-income families.¹⁷⁰ Redevelopment efforts had created a new neighborhood in South Beach, with over 2,800 units springing up in 20 years. UCSF opened its research campus in Mission Bay, marking a pivotal moment in the area's transformation into a hub for biomedical research and healthcare. Mission Bay continued to evolve with the addition of more residential complexes, retail spaces, and recreational amenities, further solidifying its status as a vibrant and dynamic neighborhood in San Francisco.

According to CoStar, Mission Bay primarily consists of employment-based uses with approximately 5.8 million square feet of office space and 566,000 square feet of flex R&D space as well as residential with 4,100 multi-family housing units, 349,000 square feet of retail space, and 300 hotel rooms. More than half of the commercial real estate in Mission Bay has been built since 2010.

Since the area has been mostly built-out, and given market challenges post-COVID, development will slow considerably over the next decade, although 254 apartments are currently under construction along with the 212,000 square foot Alexandria Center for Science and Technology that will include office and lab space.

Appendix 16: Mission Bay Aerial Image, 1993 and 2023



Source: Google Earth Pro (2023)

¹⁷⁰ Spur – [From Railyard to Neighborhood](#)

Appendix 17: Total Commercial Real Estate Inventory, Mission Bay

Land Use	Total Supply	Built Since 2010	% of Supply Built Since 2010
Office	5.1 million SF	2.8 million SF	55%
Flex R&D	566K SF	311K SF	55%
Industrial	N/A	N/A	N/A
Retail	349K SF	27K SF	8%
Multifamily	4,100	2,400	59%
Hospitality	300	300	100%

Source: CoStar (2023)

Incorporation of Mixed-Use Development and Housing

Mission Bay has embraced a mixed-use approach since its inception, planning for over 6,400 residential units, about 1,900 of which are designated as affordable housing, alongside retail, commercial office, open public space, University campus space, and more. Current zoning codes break Mission Bay into 11 different district types, three of which are exclusively residential, though housing can also be incorporated into some other district types. Mission Bay Development Group targets \$700 million of investment for improved infrastructure and parks, building on the master plan's original objectives and policies focused on creating pedestrian-friendly environment that contributes to San Francisco's existing open space networks. Design guidelines simultaneously seek to promote pedestrian-focused development by establishing an urban street grid more conducive to the intended mix of uses, maintaining views of the bay and San Francisco, and broadly encouraging an active pedestrian environment. A 49-acre public open space is also planned.

Located in the City of San Francisco, public transportation options exist with multiple metro rail stops within the district. To create a resilient transportation environment given overcrowding on public transportation and the potential for earthquakes and other disruptions, the Port of San Francisco and the Water Emergency Transit Authority are leading development of a Mission Bay Ferry Landing to providing regional ferry service to and from the neighborhood.¹⁷¹

¹⁷¹ <https://sfport.com/projects-programs/mission-bay-ferry-landing>

Appendix 18: Mission Bay Land Use Map



Source: City and County of San Francisco (2021)

The Philadelphia Navy Yard

Land Use and Development History

Originally established as a Naval Base and shipyard in the 1870s, the Philadelphia Naval Shipyard (later referred to as The Navy Yard) remained in operation until the 1990s when the Base Realignment and Closure Commission (BRAC) chose to close the base and the land was deeded to the city of Philadelphia. In 2000, the Philadelphia Industrial Development Corporation (PIDC), a public-private economic development organization that manages real estate and finances economic development on the city's behalf, took control of the 1,200-acre site and supported more than \$150 million in infrastructure improvements to attract private investment. Over the last two decades, the Navy Yard has attracted more than \$750 million in new private investment and is home to 15,000 employees across 150 companies occupying 7.5 million square feet of office, industrial, and research and development space, including the headquarters of URBAN, Aker Philadelphia Shipyard, U.S. Navy's Naval Ship Systems Engineering Station (NAVSES), and several biomedical and investment firms.¹⁷²

The Navy Yard is currently implementing a renewed Master Plan after PIDC sought a long-term development contract through a rigorous RFP process, ultimately awarding the joint venture team of Ensemble Real Estate Investments and Mosaic Development.

Existing and Planned Real Estate Development

The development of the project involves a collaboration between various key stakeholders including the PIDC, which operates as the Master Developer, and Ensemble/Mosaic, serving as the primary developer. The Development Program, implemented thus far, has resulted in the creation of a substantial 8 million square feet of space, encompassing a diverse array of property types such as office, retail, industrial, R&D, and institutional spaces. This development has attracted a total of 150 companies, fostering a vibrant business community. Presently, the development sustains a workforce of 15,000 individuals, with an anticipated increase to 30,000 employees upon completion. Furthermore, the project has dedicated significant resources to the establishment of five parks, spanning across 20 acres of green space, and has also integrated 6.3 miles of scenic waterfront, enhancing the overall appeal of the area.

The development pipeline encompasses plans for an additional 8.9 million square feet of both commercial and residential space at full buildout, of which 4.3 million square feet are dedicated to Life Sciences. Among the proposed additions are a new hotel, along with the integration of 4,000 residential units, including affordable housing options. The blueprint also entails the inclusion of 265,000 square

The Philadelphia Navy Yard At-A-Glance

Ownership of the Navy Yard transferred to PIDC, the Master Developer in 2000.

The 1,200-acre site has supported more than \$150 million in infrastructure improvements. Over the last two decades, the Navy Yard has attracted more than \$750 million.

Ensemble Real Estate Investments and Mosaic Development are the developers of current development plans. The development pipeline encompasses plans for an additional 8.9 million square feet.

Current plans prioritize open space.

¹⁷² <http://navyyard.org/about/history/>

feet of retail and restaurant space to enhance the community's amenities. To promote a vibrant and inclusive environment, 1.6 million square feet of outdoor and open space have been designated, aiming to foster a balanced and inviting urban landscape.

Appendix 19: Total Commercial Real Estate Inventory, Navy Yard

Land Use	Total Supply	Built Since 2010	% of Supply Built Since 2010
Office	2.1 million SF	948K SF	45%
Flex R&D	365K SF	290K SF	79%
Industrial	3.9 million SF	0	0%
Retail	10K SF	0	1%
Multifamily	N/A	N/A	N/A
Hospitality	212	212	100%

Source: CoStar (2023)

Incorporation of Mixed-Use and Housing

Though the Navy Yard has been successful creating a diverse employment hub, the 2022 Navy Yard Plan recognized the need to create a more comprehensive mix of uses, most notably multifamily housing, in addition to retail, hotels, commercial space, and significant investments in placemaking improvements and public space. In 2022, PIDC selected Ensemble and Mosaic as co-developers to oversee development of 109 acres over the next 20 years with a focus on equitable growth, inclusion, and accessibility. The plan includes nearly 3,900 residential units with a 15 percent affordable set-aside and 235,000 square feet of retail space with a 25 percent set-aside for minority and women-owned firms.

Appendix 20: Proposed Residential Development in The Philadelphia Navy Yard



Source: PIDC

Appendix C – Acknowledgements

The following individuals and organizations supported the research, analysis, and conclusions of this report:

Montgomery Planning

Ali Bilal
Maren Hill
Benjamin Kraft
Caroline McCarthy
Jessica McVary

Stakeholder and Subject Matter Expert Outreach

Jay Brinson, Federal Realty
Judith Costello, Office of the Montgomery County Executive
Kelsey Edelen, Ensemble Development
Eric Goldstein, King of Prussia Business District
Caroline Moore, Wexford Science + Technology
C.J. Overly, Boston Properties
Mark Seltzer, Ensemble Development
Natalie Shieh, Brandywine Realty
Brad Stewart, Montgomery County Economic Development Corporation
Bill Tomkins, Montgomery County Economic Development Corporation
Julie Wagner, Global Institute of Innovation Districts
Larry Walker, Adventist Health

Econsult Solutions, Inc.

Rebecca DeJoseph
John LaVaccare
Gina Lavery
Brian Licari
Trevor Marimbire
Cameron Miller

Appendix D – About Econsult Solutions, Inc.

About Econsult Solutions, Inc.

This report was produced by Econsult Solutions, Inc. (“ESI”). ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate economics, transportation, public infrastructure, development, public policy and finance, community and neighborhood development, planning, as well as expert witness services for litigation support. Its principals are nationally recognized experts in urban development, real estate, government and public policy, planning, transportation, non-profit management, business strategy and administration, as well as litigation and commercial damages. Staff members have outstanding professional and academic credentials, including active positions at the university level, wide experience at the highest levels of the public policy process and extensive consulting experience.



economics | strategy | insight

1435 WALNUT STREET, 4TH FLOOR, PHILADELPHIA, PA 19102
ECONSULTSOLUTIONS.COM | 215-717-2777