# 2019 Growth Management Report

NOVEMBER 12, 2019

# Contents

# Introduction

## How Albemarle Grows

For decades, Albemarle County's Comprehensive Plan has implemented a Growth Management policy directing development into specified Development (Growth) Areas while maintaining the remainder of the County as rural land use patterns. The Growth Management policy is implemented through a number of land use and fiscal tools, such as the Zoning Ordinance, the Capital Investment Program, and tax and financial incentives for landowners.

Chapter 8 of the Comprehensive Plan, which focuses on the County's Development Areas, includes a series of policy objectives including Objective 4, "Use Development Area land efficiently to prevent premature expansion of the Development Areas". This objective is a fundamental component of the County's Growth Management policy, acknowledging the need to accommodate projected growth by providing sufficient land area and use recommendations. To implement this objective, the identified Strategies 4a and 4b include monitoring building activity in the Development Areas and Rural Areas, and updating a capacity analysis every two years to ensure adequate residential land exists to meet new housing needs.

## About This Report

This Growth Management Report builds on long-standing efforts, combining information on development activity and the 2019 Capacity Analysis results. Acknowledging the County's ongoing efforts to address its housing and capital needs and plan for its aging suburbs, this report aims to provide additional context to where and how Albemarle County is growing.

This report was produced by County staff during Summer 2019. Sources used include building permit information from the County's development tracking system (CountyView), historic population estimates and building activity reports, and demographic information from the Census Bureau and Weldon Cooper Center for Public Service.

The Capacity Analysis was conducted by County staff using a model informed by a variety of geographic datasets and planning & development information, and refined by staff through a careful review of the identified candidate parcels. Technical information about the model, which extensively utilized ESRI ArcGIS 10.3, R, and Python to ensure consistency in calculations, can be found in the Appendix. This analysis provides information on theoretical buildout, which may not be achievable due to environmental and economic constraints.
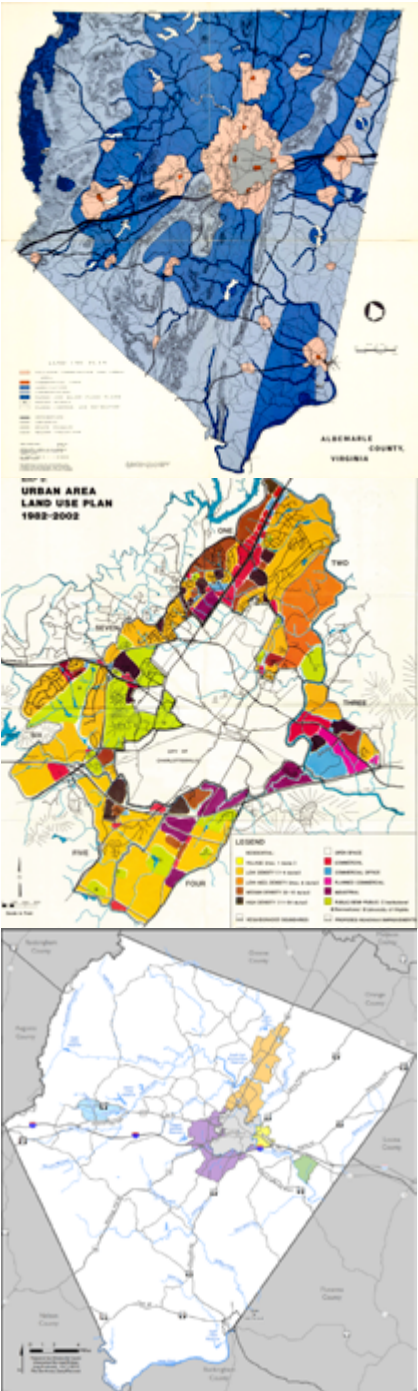


The County's Growth Management Policy has existed in various forms over the years - from the 1971 Comprehensive Plan (top), the 1982 Comprehensive Plan (middle), and the 2015 Comprehensive Plan (bottom).

# Where We've Been

## Early Suburbanization

While a rural county for much of its history, Albemarle took its first major steps as an urbanizing, high-growth community in the 1960s. Since the adoption of zoning in 1969 and the first Comprehensive Plan in 1971, the County has adopted a philosophy of growth management to accommodate the pressures of increased population while conserving its valued resources and providing services in a fiscally responsible manner.

The 1970s were a period of rapid development activity, culminating in the formation of the modern growth management policy and the adoption of the current Zoning Ordinance on December 10, 1980. Since 1980, County land use decisions have sought to direct new development into the designated Development Areas.

Over time, the Development Area boundaries have been adjusted to respond to new development and concerns about watershed protection and infrastructure feasibility. Today, the Development Areas include Urban Neighborhoods 1-7 (established in the 1977 Comprehensive Plan), the communities of Crozet, Hollymead, and Piney Mountain, and the Village of Rivanna. The relative stability of the boundaries has allowed them to also serve as statistical areas for development activity tracking and longitudinal study.
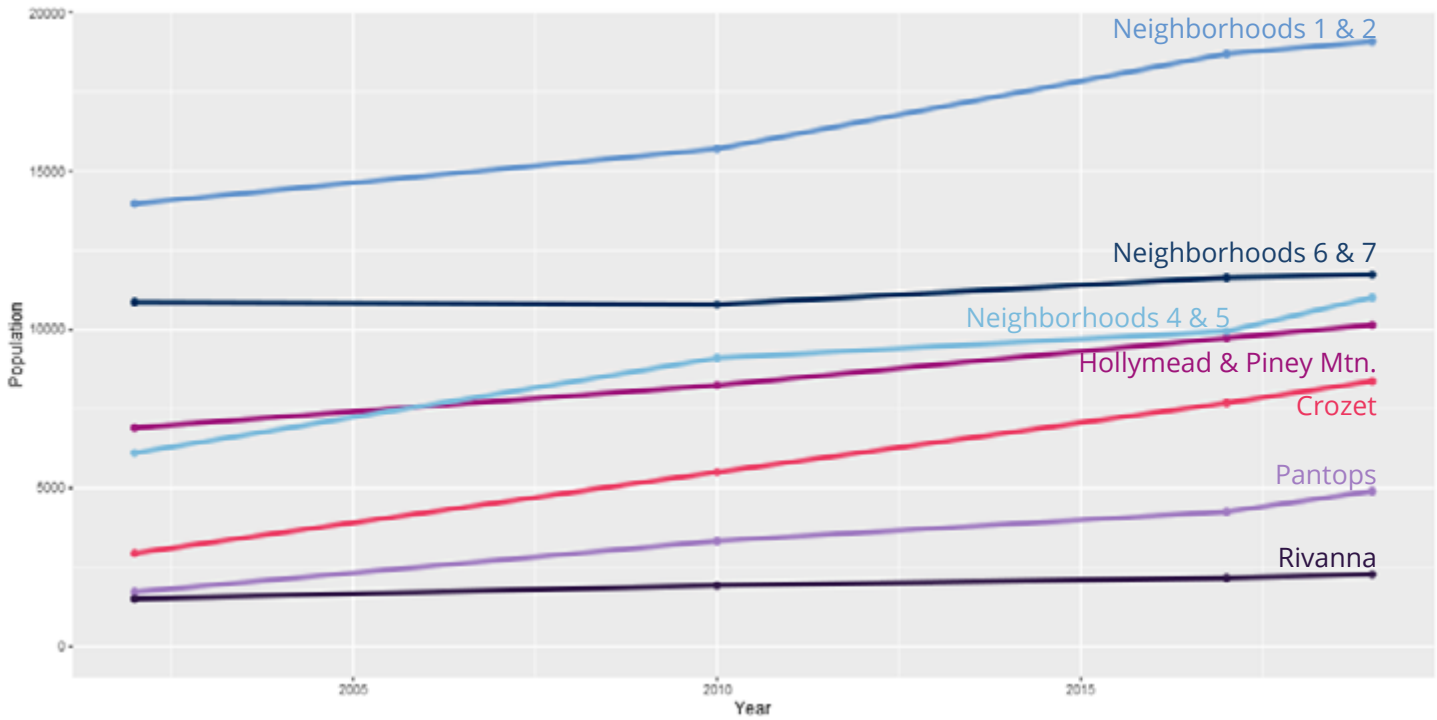
## The Neighborhood Model & Master Planning

In the late 1990s, as a response to continued growth in a low-density, suburban development form and pressures to expand the Development Areas, the Development Initiative Steering Commitee (DISC) was convened to study how Development Area land could accommodate new development more efficiently. The outcome of DISC's work was the Neighborhood Model, a series of 12 site design principles intended to create high-quality urban neighborhoods. The Neighborhood Model is implemented by a series of Master Plans for each Development Area that provide recommendations for land uses, transportation network improvements, and area-specific design strategies.

As the urban ring builds out and greenfield (vacant) development sites become more scarce, the County has begun to shift its focus to strategies to revitalize its aging urban neighborhoods and implement the Neighborhood Model's tenets within suburban landscapes. The Rio29 Small Area Plan (2018) and the Pantops Master Plan (2019) set out a vision for the future redevelopment of suburban strip settings, connection of existing neighborhoods and centers with bicycle, pedestrian, and transit access, and enhanced opportunities for recreation within the urban areas.

## Development Trends Since 2000

The County has seen steady and continued growth since 2000, with Crozet and the urban neighborhoods of Pantops, Neighborhood 2 (Rio Road East area), and Neighborhood 5 (5th Street Extended / Old Lynchburg Road area) seeing the greatest growth during this time.

## Development Areas vs. Rural Areas

From the early 2000s through the start of the Great Recession, the County saw single-family construction occurring in a roughly 50-50 balance between the Development Areas and the Rural Areas. Although the balance shifted more heavily towards the Rural Areas during the period of lower building activity leading up to and during the Great Recession, since 2009 the majority of new single-family construction has occurred within the Development Areas.

*Residential Development "Hot Spots", 2008-2018*



*Development Area Population Estimates, 2002-2019*
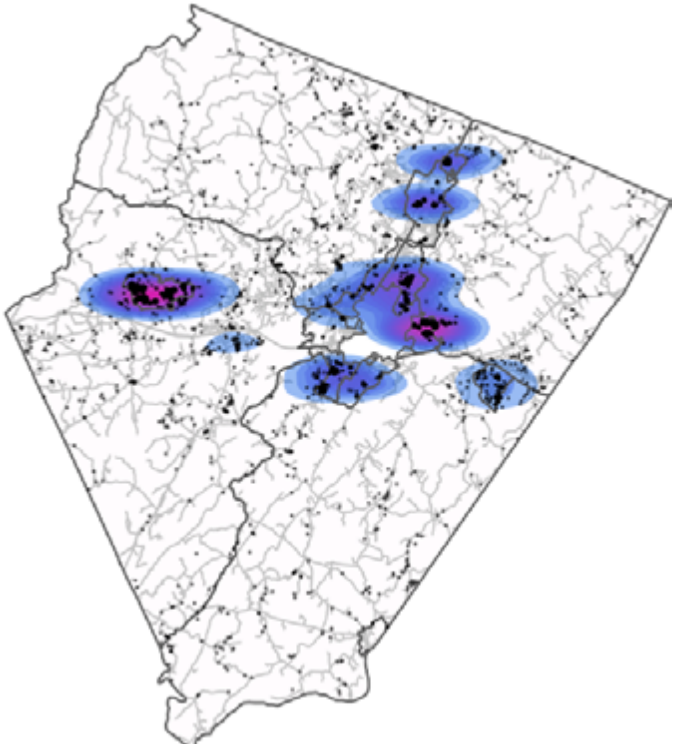


*Single-Family Detached Building Permit Activity, 2000-2018*
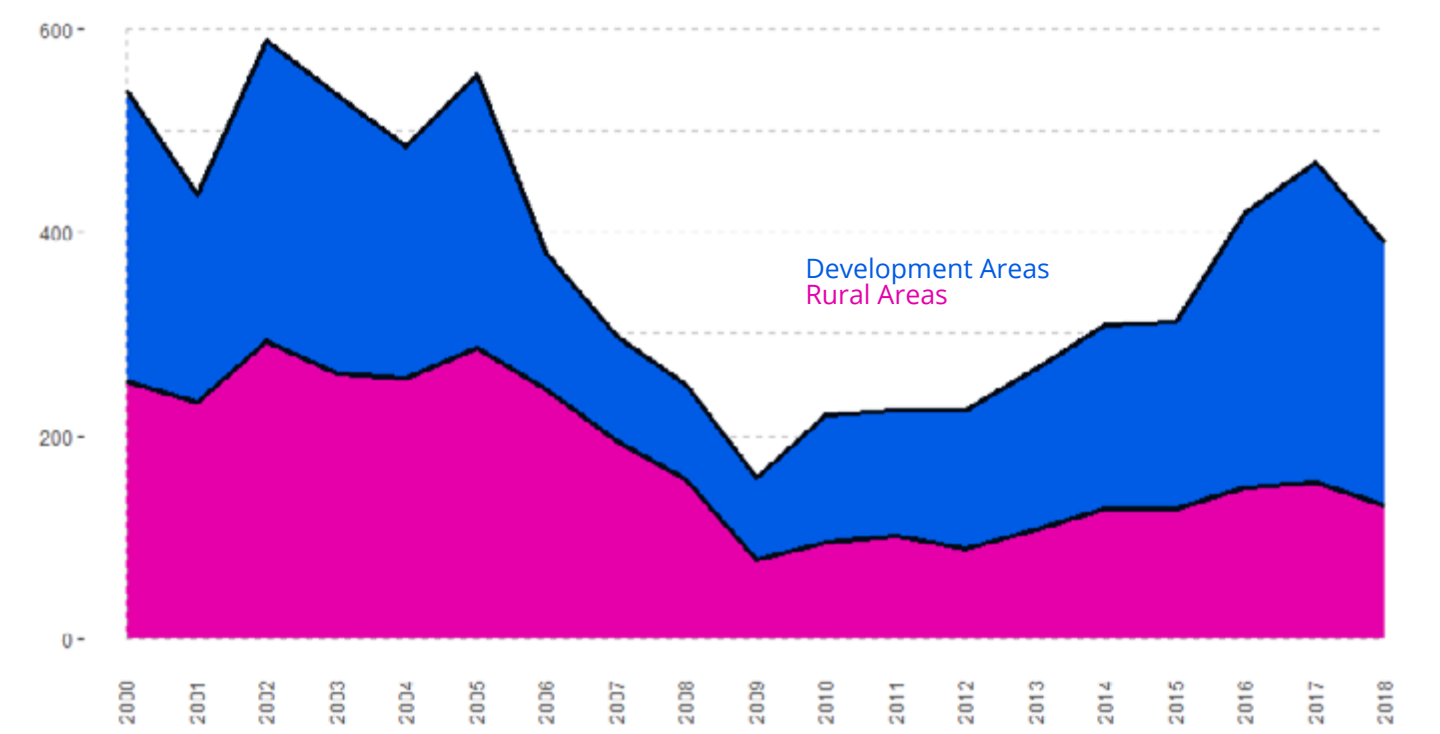
# Current Housing Trends

**What Factors Impact Housing Costs?**

The costs and affordability of new housing construction are impacted by a number of factors, including land values, construction material costs & labor markets, infrastructure & regulatory requirements such as water & sewer, off-street parking, and amenities, and transportation costs. Additional demand and competition for housing driven by University of Virginia students, retirees, and second-home buyers also exerts upwards pressure on sale prices and rents.

One of the primary drivers of rising housing costs (and property assessments) is the cost of land, particularly within the Development Areas. Housing types that consume greater quantities of developable land (such as single-family homes on large lots) are inherently more expensive due to their lot sizes, which are often driven by density or minimum lot size requirements. Although these housing types may have been relatively affordable in a less urbanized Albemarle County, continued demand combined with a decreased supply of developable land have placed significant pressure on land values. The Comprehensive Regional Housing Study and Needs Analysis for Virginia Planning District 10 prepared by Partners for Economic Solutions and dated March 22, 2019 cites a figure for a single-family lot in the urban ring that once cost $30,000-$50,000 in the 1990s now being closer to $160,000.

This graph (right) shows the relative cost of the bottom third of Albemarle County's housing stock (as measured by Zillow's Home Value Index) compared to the top third. The red line shows this proportion. Its rise since 2014 may indicate that costs for the bottom third of the housing stock are rising more quickly than those in the upper third of the housing stock. The black dots show fluctuations in median sales prices. Data in this visual was obtained from Zillow.

## Housing Choice & Mix

The County has generally seen a mix of housing types produced within the Development Areas each year during the past decade. However, since 2014, single-family detached housing has generally been the dominant housing type being constructed in Albemarle County, consistently outpacing construction of single-family attached housing.

Attached and townhouse unit types were generally the second-largest housing type being constructed during the past decade.

Due to the limited number of multifamily projects, the large number of dwelling units included in a single multifamily permit, and the longer time involved in multifamily construction, it is more difficult to establish a trend for multifamily housing construction.

## What's Being Built - And Where?

Although the graphs (right) appear to indicate that single-family is the primary housing type being built across the entire County, the reality is that not all of the County's Development Areas share the same mix of housing types or number of dwelling units being constructed. While over 33% of all single-family detached dwelling units being built in the Development Areas were built in Crozet, roughly 75% of all attached, townhome, or multifamily dwelling units built in the Development Areas were located in the Urban Neighborhoods surrounding the City of Charlottesville.

The quantity of construction may reflect the amount of vacant land available with appropriate residential zoning designations or designated for residential uses in the Comprehensive Plan. For example, a significant amount of land zoned R1 Residential was developed in Crozet during this period.
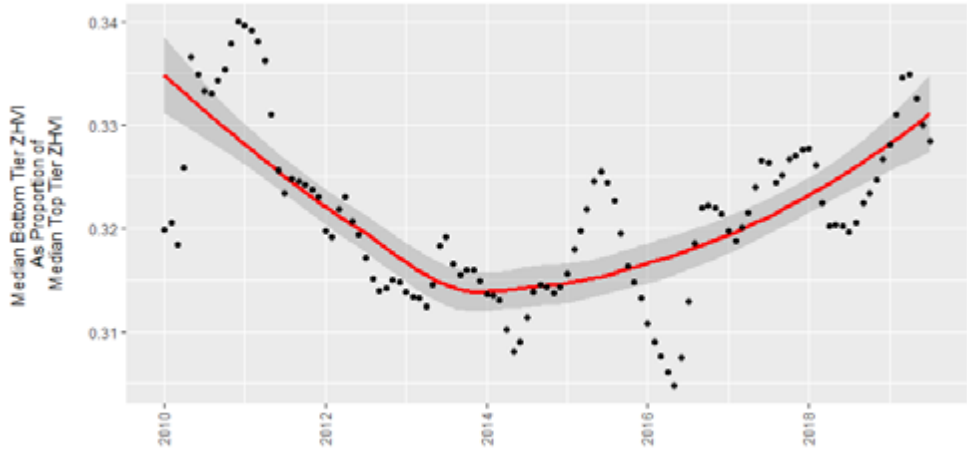


Dwelling Units Built by Quarter, 2009-2018
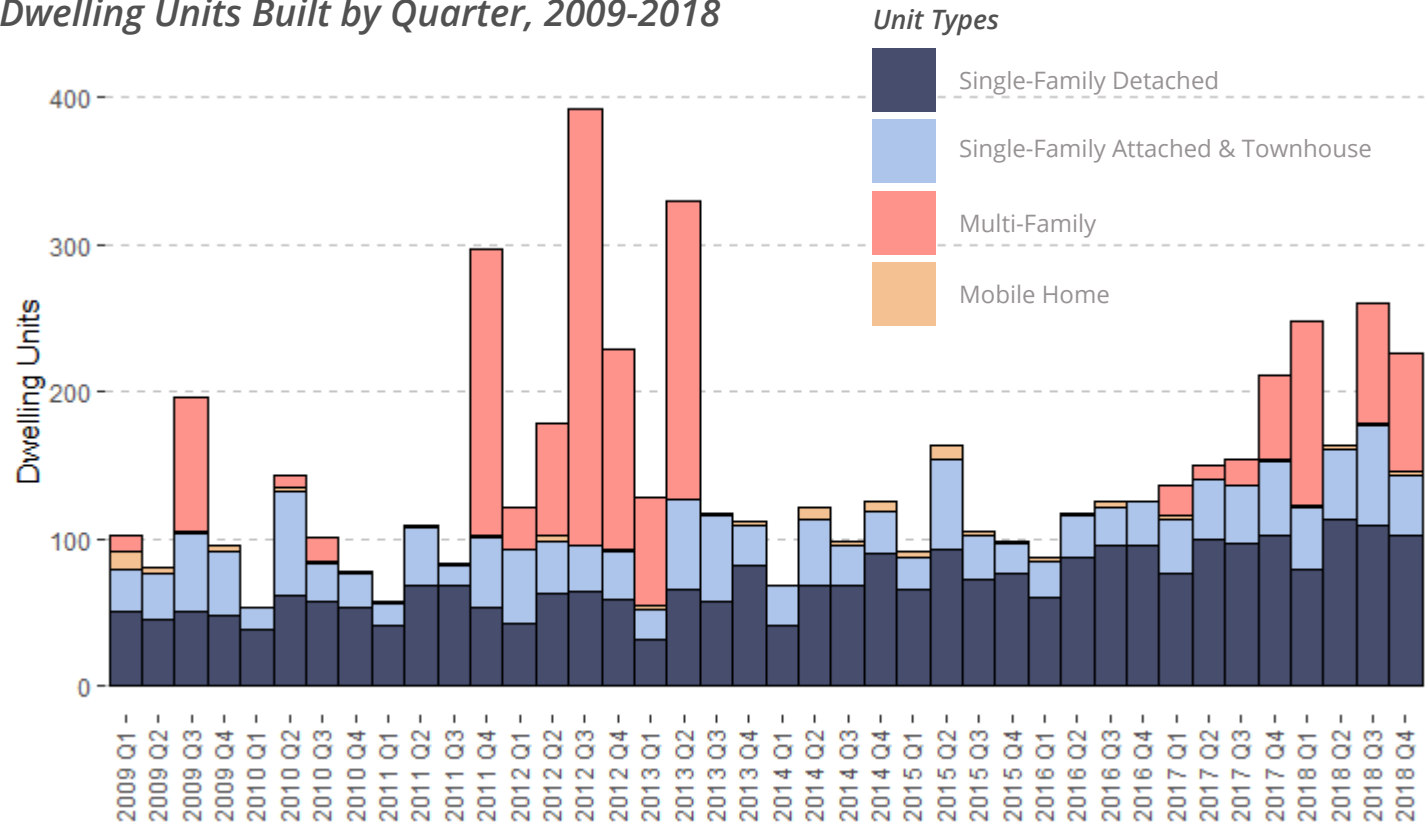


Housing Mix: Unit Types as Percentage of All New Housing, 2009-2018
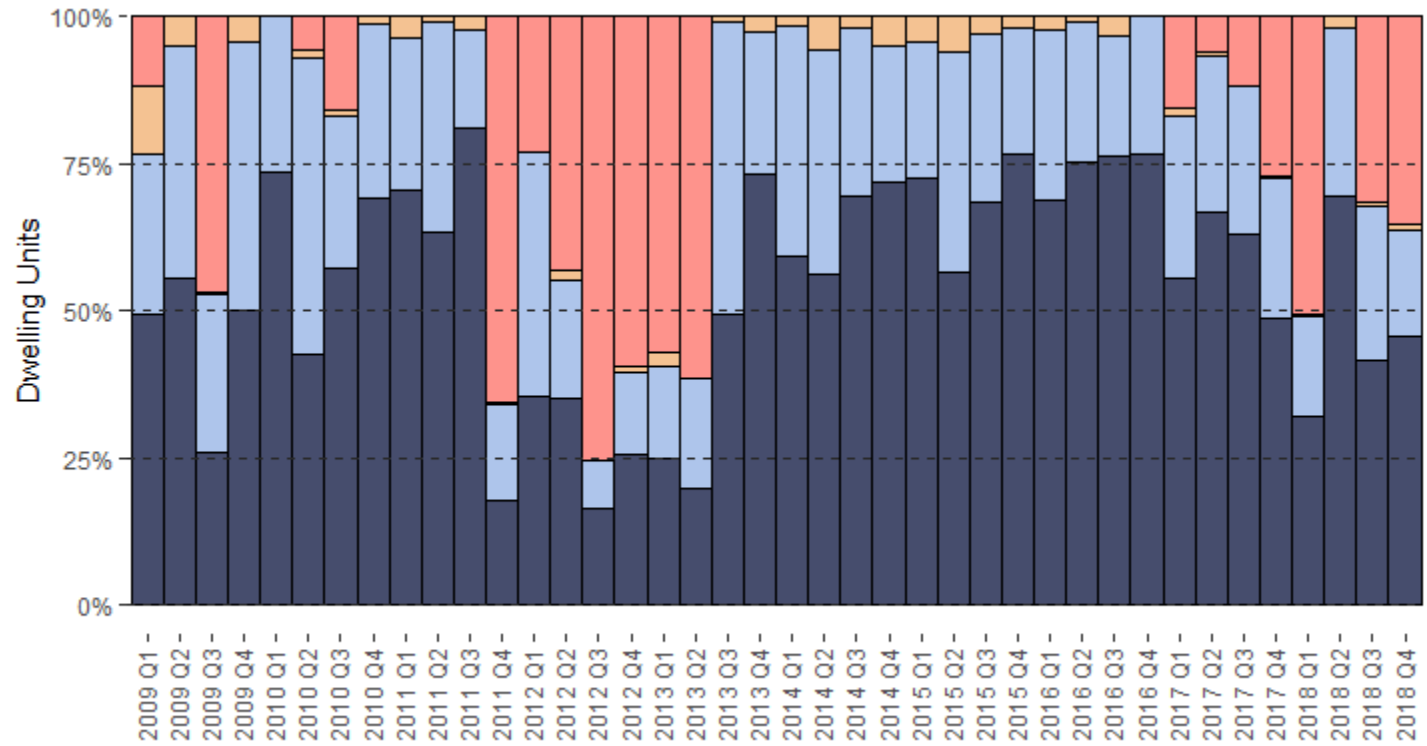
# What's In The Pipeline?

## What Is The Development "Pipeline"?

The "pipeline" refers to the development projects currently under review, approved, or under construction in Albemarle County. These projects are initiated by landowners and developers, as the County does not solicit new development. However, a major function of the County's Community Development Department is to review projects and proposals for their consistency with applicable regulations.

## How Does A Project Move Through The Pipeline?

The complexity and unique nature of development projects means there is no single path through Albemarle County's site development review process. Before a site is graded, streets laid down, and foundations for homes poured, a developer must obtain County approvals for their plans. The review process safeguards the County's resources and the community's interests, encouraging developments that are high-quality and livable.

A site's zoning dictates what a landowner or developer can do with their property today. If a site has the appropriate zoning for its intended use, a developer can submit plans to the County for review. If the plans meet the standards outlined in the County Code, they are approved administratively by staff. A project developed under its existing zoning is sometimes referred to as having developed "by-right".

When a site does not have the appropriate zoning for its planned use or if special permission is required under the current zoning, the developer may petition the Board of Supervisors to change the zoning - "rezone" the property - or to grant a Special Use Permit. This process is called "legislative review" because the action must be taken by the Board of Supervisors (the County's legislative body) and the decision is discretionary in nature. In making their decision, the Board considers factors including the proposal's consistency with the Comprehensive Plan and how the project will impact the public health, safety, and welfare. If this petition is approved, a project will then go through the same site design review process as a "by-right" project.

## When Does The Pipeline Build Out?

Site design approvals are typically valid for a short period after approval to ensure that the plans submitted are consistent with the most recent regulations, although this time period can be extended by other entities including the General Assembly.

Rezonings typically feature more uncertainty in timing due to the longer review process, which introduces additional risk and uncertainty regarding financing and market conditions. These projects often ask for greater units than will actually be built, and sometimes can wait for years before beginning construction. For example, a number of large rezonings approved in the early 2000s have developed later (or less) than expected due to the "Great Recession" of 2007-2009.
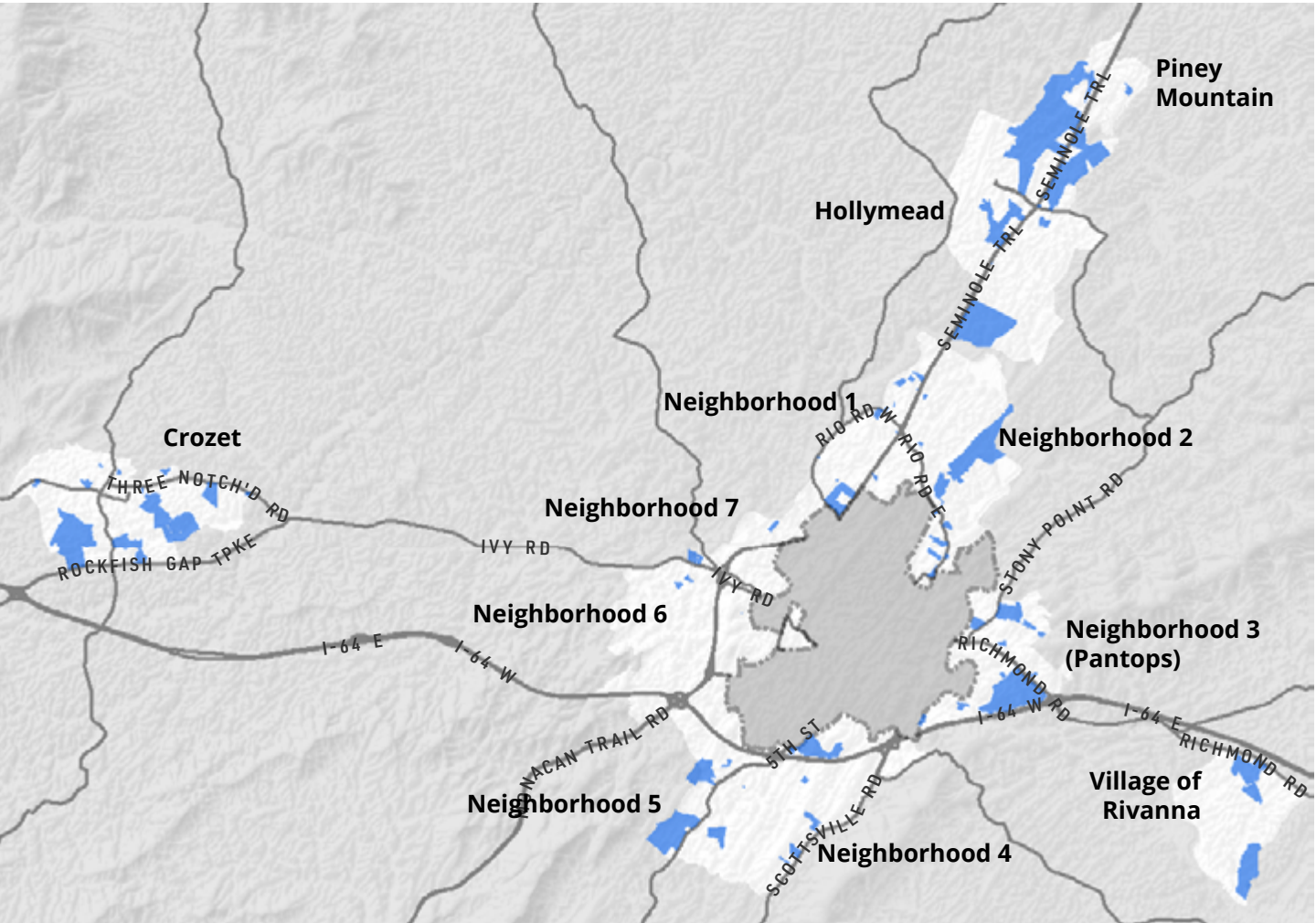
## What Projects Are In The Pipeline?

A full list of pipeline projects can be found in Appendix B. The map on page 9 shows the general location of all projects that have been approved.

## What Gets Counted In The Pipeline?

Unbuilt units in Zoning Map Amendments, Special Use Permits, Final Site Plans, and Final Subdivision Plats that were approved as of July 1, 2019 are included. Projects that have not received legislative approval or final administrative approval (for by-right projects) are not included.

Accessory apartments, carriage houses, and other accessory dwelling units are not counted as "Units Built" in this report, as they are not counted towards density standards in the Zoning Ordinance. Accessory apartment building permit types are only counted in Planned Developments if they are explicitly identified as counting towards density in a project's Code of Development.

## How Does Development Happen?
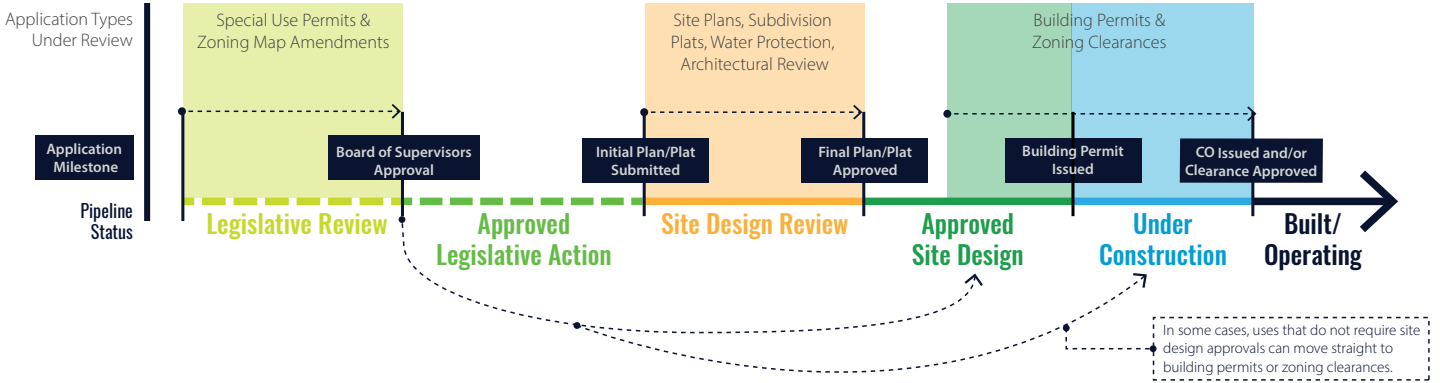




This visualization shows the approximate locations of projects that are considered to be in the "Pipeline" in blue. This includes projects that have been approved or are under construction and does not include projects that have finished construction or "built out" to their maximum approved capacity.

# How Do We Grow?

## How Much Room Do We Have To Grow?

A significant portion of the Development Areas has existing approvals for new development. Every 2 years, the County conducts a "capacity analysis" of the vacant and underdeveloped land within the Development Areas in order to ensure that there is adequate land with appropriate zoning and land use designations to accommodate its growing population over the next twenty years. Like any analysis, it depends on a series of assumptions and careful validation to produce a potential estimate.

## How Do We Determine Where We Have Capacity?

For this analysis, each parcel in the Development Areas is evaluated for its development potential, which is broadly defined to include economic parameters and environmental suitability. Parcels with existing development approvals, in existing platted (and named) subdivisions, and owned by tax-exempt organizations (such as governments, charitable organizations, and religious institutions) are removed from the analysis. Although it is possible that some parcels in platted/named subdivisions may be redeveloped, for the purposes of this analysis they are considered unlikely to redevelop due to the presence of property owners associations and covenants, conditions, and restrictions in deeds. Tax-exempt organizations are also insulated from increasing assessments caused by rising land values, which are an indicator of development attractiveness of a parcel and can create pressure for redevelopment.

In addition to vacant parcels, developed parcels are considered where redevelopment or infill might make economic sense. For example, a parcel with a very low improvement value and large acreage would be considered for redevelopment, as much of the value is "in the land" as development potential. Parcels with improvement values under $25,000 were considered to be vacant, and residential parcels with enough land for at least two additional dwellings were considered as redevelopment/infill candidates. Redevelopment or infill parcels were analyzed for the number of additional units that could be constructed on the parcel.

## How Is Capacity Calculated?

Candidate parcels are analyzed under three different scenarios: under current zoning using a "gross" density calculation (the whole parcel), under current zoning with a "net" density calculation (excluding critical environmental features), and under the Comprehensive Plan's future land use designations. For each parcel and each scenario, low and high estimates were calculated.

The Zoning Ordinance includes density ranges measured in dwelling units per acre, with a gross density at "standard level" comprising the low end of the range and a gross density at "bonus level" comprising the high end of the range. A 1-acre parcel zoned R-6 would have a theoretical capacity between 6 and 9 dwelling units. However, zoning bonus densities cannot be granted in excess of the density shown in the Comprehensive Plan, so the high end may be overestimated on parcels where zoning conflicts with the Master Plan's recommendations. The Comprehensive Plan does not consider bonuses, so the low and high ends of the density ranges are used.

### 16.3 AREA AND BULK REGULATIONS

Area and bulk regulations within the R-6, Residential, district are as follows:

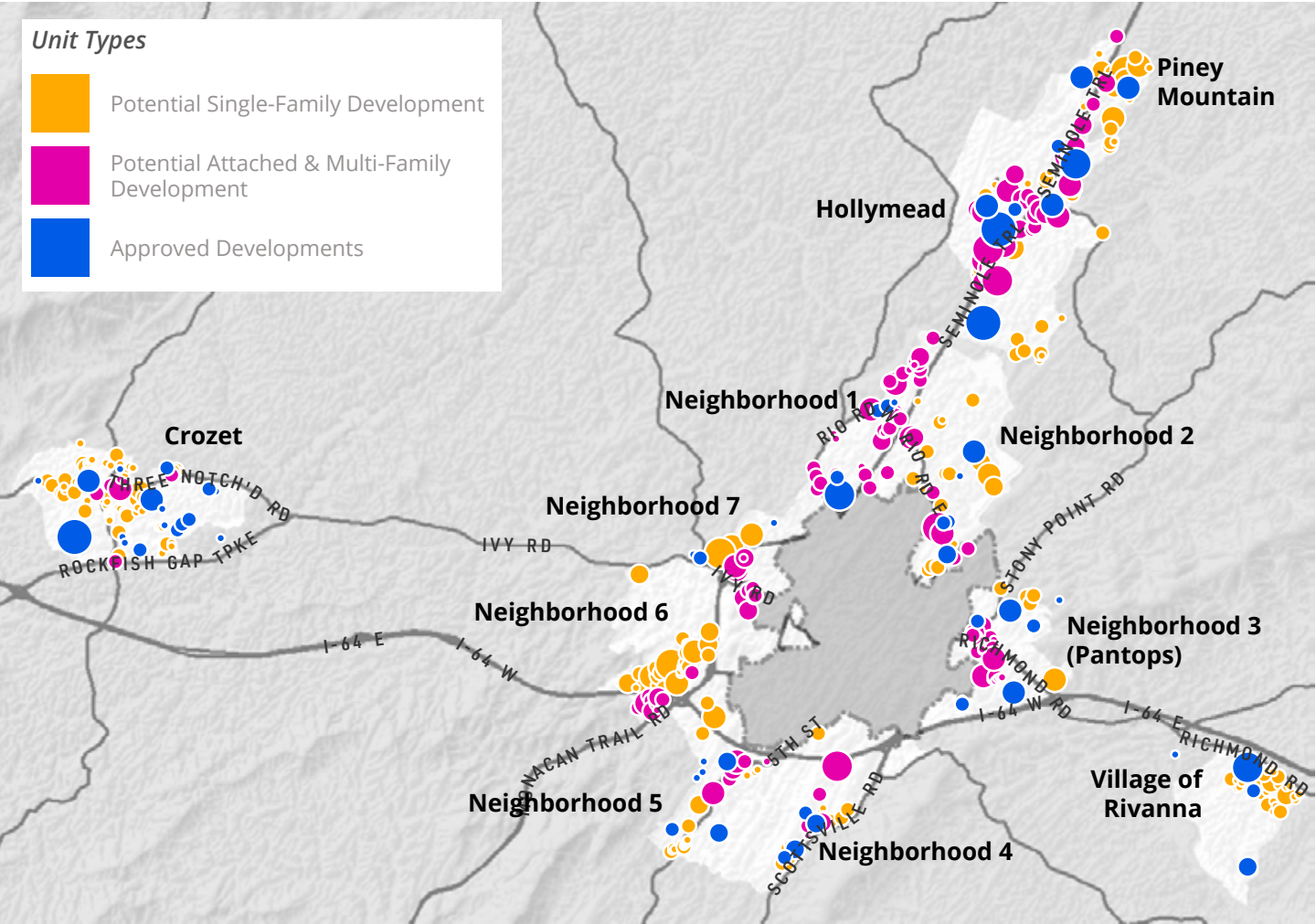| REQUIREMENTS | STANDARD LEVEL | | BONUS LEVEL | |
| --- | --- | --- | --- | --- |
| | CONVENTIONAL DEVELOPMENT | CLUSTER DEVELOPMENT | CONVENTIONAL DEVELOPMENT | CLUSTER DEVELOPMENT |
| Gross density | 6 du/acre | 6 du/acre | 9 du/acre | 9du/acre |
| Minimum Lot Size (Added 7-17-85) | 7,260 sq ft | N/A | 4,840 sq ft. | N/A |
| The minimum and maximum yards, including those for garages, shall be as provided in section 4.19. (Amended 1-1-83, 6-11-08) | | | | |
| Maximum Structure height | 35 feet | 35 feet | 35 feet | 35 feet |

This excerpt from the Zoning Ordinance shows the density and lot size requirements for the R-6 Residential zoning district.



This visualization shows the approximate locations of parcels that could theoretically support additional development when developing in conformity with the County's Comprehensive Plan. The size of the bubble is correlated with the number of possible dwelling units: the larger bubble indicates greater development potential. Blue bubbles show approved development projects, pink bubbles show potential multifamily or attached/townhouse development, and the yellow bubbles show potential single-family development. Maps for each scenario and Development Area are included in this document in the following pages.

## Capacity Scenario Overviews

| Scenario | Zoning (Gross) | Zoning (Net) | Comprehensive Plan |
| --- | --- | --- | --- |
| Description | This scenario uses the density ranges from the Zoning Ordinance and includes areas with undevelopable critical resources, consistent with current regulations. | This scenario uses the density ranges from the Zoning Ordinance, but excludes areas with undevelopable critical resources. | This scenario utilizes the density ranges from the Comprehensive Plan's Land Use Plans and excludes additional areas designated for preservation. |
| Source Density Calculations | Current Zoning Designations | Current Zoning Designations | Comprehensive Plan Land Use Designations |
| Includes areas with undevelopable critical resources (preserved steep slopes, floodplain, stream buffers) in density calculation? | Yes | No | No |

# Do We Have Room To Grow?

## How Much Capacity Is Needed?

The "needed capacity" estimate attempts to translate a 20-year population projection into a housing development policy. In June 2019, the Demographics Research Group of the Weldon Cooper Center for Public Service projected that Albemarle County will have a population of 138,485 in 2040, down from a March 2017 projection of 141,221.

The Weldon Cooper Center's latest population Estimate published January 28, 2019 estimated a population of 108,639 on July 1, 2018, and a July 1, 2019 internal population estimate utilizing a housing unit method estimated a current population of 109,146. Considering Weldon Cooper's projected population increase and an average of 2.54 persons per dwelling unit, an estimated 11,750 additional dwelling units will be needed by 2040. Although it is acknowledged that some new population growth will occur in the Rural Areas, this analysis considers whether the Development Areas have sufficient land area and units in the pipeline to accommodate all of the County's expected growth.

Providing an adequate and affordable housing supply is a crucial component of the County's planning policy, acknowledging that an inadequate housing supply combined with increased demand and competition for housing can have negative impacts on both long-term and new residents. Driving new residential growth into surrounding localities can exacerbate local traffic issues and greenhouse gas emissions from increased commuting, and high housing prices can lower quality of life due to reduced spending power and lead to displacement of existing residents. Although many people may work in the region's urbanized area and choose to live in the Rural Areas or in outlying areas due to lifestyle preferences, the Development Areas also offer better access to services including public transportation which are vital for low-income residents.

## Pipeline & Capacity

An estimated 8,843 dwelling units are currently in the development "pipeline", with about 44% of these units located within the Community of Hollymead in large planned developments such as Hollymead Town Center, North Pointe, and Brookhill.

As mentioned earlier in the report, a common occurrence for larger rezonings in the pipeline is to not use all of the original approved capacity. Examples

include Old Trail Village, which was approved for a maximum of 2,200 units but has since amended its plan to reduce its minimum to 1,000; Cascadia, which will complete construction 64 units under its approved maximum; and Stonefield, which built out with a more commercial orientation and is expected to build out under its approved maximum. Developments that have all phases approved and have unapplied/unused capacity remaining had their pipeline estimates reduced; however, ongoing projects such as Old Trail and Stonefield still have their full capacity counted in the pipeline. The pipeline figure included likely overestimates the actual capacity.

## Redevelopment & Infill

When compared to past analyses, the 2019 analysis may overestimate the potential for redevelopment/infill where a single-family home may currently exist. In the past, the practice has been to remove a 1 acre home site for the existing residence. However, rising land costs and recent trends indicate that it is more likely that the house will be torn down instead to enable full utilization of the site. This is most evident in high-density development scenarios.

The economic filters used in the redevelopment and infill scenarios for existing commercial spaces provided for limited redevelopment of existing suburban commercial areas. While significant redevelopment of these sites is anticipated in the future, their redevelopment potential is significantly underestimated in this analysis due to the existing economic hurdles for redevelopment. Ongoing implementation and economic development efforts acknowledge that appropriate incentives and land use policies will be necessary to utilize this potential capacity.

## Institutional Landowners

As mentioned earlier, a number of tax-exempt organizations and institutions own significant amounts of land within Albemarle County. While these properties were exempted from the analysis, it is worth noting that they could theoretically be developed in the future under existing zoning or land use designations.

A significant owner of Development Area land is the University of Virginia Foundation (UVAF), which includes a holdings in Neighborhoods 4, 6, and 7 designated for institutional and residential uses. The Foundation's residentially designated properties were evaluated for their development potential. However, properties with institutional designations were not included.

## Do We Have Capacity For Future Growth?

In theory, there appears to be sufficient capacity to accommodate future population growth within the Development Areas. However, when considering the likely overestimation of units in the pipeline and variability in redevelopment/infill potential, the answer becomes less clear. Removing 1,000 units from the current pipeline (accounting for Old Trail and Stonefield alone) and the University of Virginia Foundation's residentially designated holdings from the potential capacity pool reveals that the low ends of the density ranges may not be sufficient to accommodate new residential growth.

Beyond the overall theoretical buildout, improved visualization and applied economic considerations in this version of the analysis highlighted site-specific conflicts between zoning and comprehensive plan recommendations that may frustrate implementation of the Comprehensive Plan. Development potential under current zoning that exceeds the Comprehensive Plan's recommendations may be a factor leading to by-right development that is inconsistent with the Comprehensive Plan and prevents the usage of proffers that act as a value capture tool for the County to help ensure concurrency of infrastructure. Conversely, development under current zoning often results in densities below the Comprehensive Plan's recommendations prevents Development Area land from being used effectively and also creates implementation challenges.

Without proactive efforts to align the Zoning Ordinance with planning efforts, land use designations in Master Plans should carefully consider what is possible under current zoning and what would be permitted if the site were to develop in accordance with the Master Plan. In the future, the County should initiate an update to the zoning ordinance and map to match the Comprehensive Plan's recommendations, and any interim zoning text amendments should consider impacts on residential capacity.

Development potential should be considered in future capital planning efforts. Many Master Plans include recommendations for the timing of infrastructure projects and development, and the availability of infrastructure to support new development is a crucial consideration in making capacity available for development.

### *Buildout Scenarios & Potential 2040 Population*

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Vacant/Infill: Dev. Area Low Buildout Scenario | Vacant/Infill: Dev. Area High Buildout Scenario | Est. Total Units: Pipeline + Dev. Area Buildout | | Estimated County Population at Dev. Area Buildout | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Low | High | Low | High |
| | A | B | C | D | E | F = C+D | G = C+E | A + (F*2.54) | A + (G*2.54) |
| Zoning (Gross) | | | | 5,035 | 7,604 | 13,879 | 16,448 | 144,399 | 150,924 |
| Zoning (Net) | 108,639 | 66,823 | 8,844 | 3,653 | 5,578 | 12,497 | 14,422 | 140,888 | 145,778 |
| Comp. Plan | | | | 4,924 | 15,787 | 13,768 | 24,631 | 144,117 | 171,709 |

### *Comparison of Potential 2040 Population to Expected Need*

| Scenario | Estimated Current Population | Estimated Current Units | Projected 2040 Population | Projected Units Needed by 2040 | Estimated Additional Units at Dev. Area Buildout | | Units in Excess (or Needed) for 2040 Population | | Units Adjusted for Pipeline (-1,000) and UVAF | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Low | High | Low | High | Low | High |
| | A | B | C | D = (C-A) / 2.54 | E | F | G = E-D | H = F-D | G (adj.) | H (adj.) |
| Zoning (Gross) | | | | | 13,879 | 16,448 | 2,129 | 4,698 | 701 | 3,058 |
| Zoning (Net) | 108,639 | 66,823 | 138,485 | 11,750 | 12,497 | 14,422 | 747 | 2,672 | (617) | 1,127 |
| Comp. Plan | | | | | 13,768 | 24,631 | 2,018 | 12,881 | 260 | 10,327 |

# Neighborhood 1

## Summary

Stonefield remains the largest active development in this area. Although it is unlikely to build out to its maximum approved density, capacity still remains for development of multifamily and lodging projects.

The Rio29 Small Area Plan, which was adopted in December 2018, anticipates future growth and redevelopment in the vicinity of Rio Road and Route 29.

The northern portion of this area between Berkmar Drive and Woodburn Road includes a number of parcels with discrepancies between R6 and R15 Residential zoning designations and an Office/ R&D/Flex/Light Industrial comprehensive plan designation, resulting in some variability between zoning and comprehensive plan capacity scenarios. As the few remaining vacant parcels build out, development and redevelopment is expected to be primarily higher-density attached or multifamily development, as has been seen in recent years.
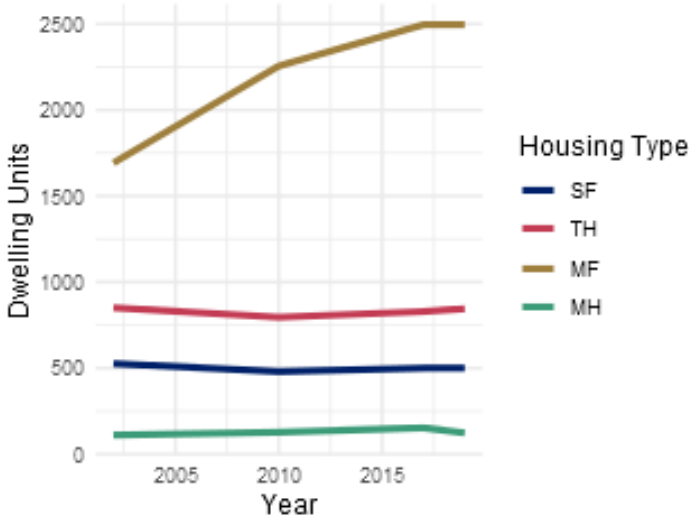


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

### Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Stonefield | 529 |
| Greenfield Terrace | 33 |
| Oakleigh | 22 |
| Woodbrook Station | 8 |
| Berkmar Overlook | 71 |
| Commonwealth Apartments | 22 |

For pipeline project information, see Appendix B.

### Unit Mix Constructed, 2009-2018

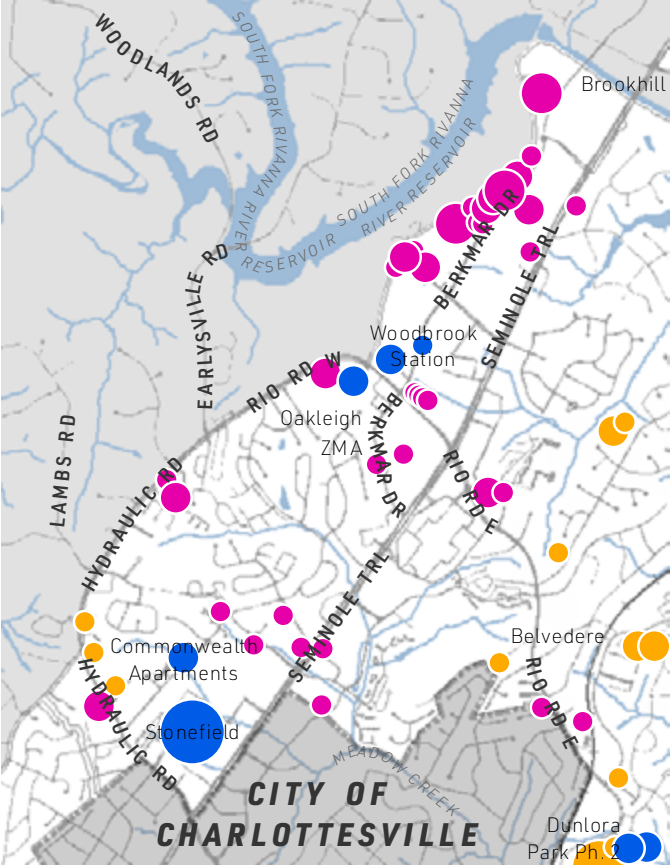| | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| N'hood 1 | 1 | 343 | 0.3% |

### Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
| | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | | | | 320 | 60 | 457 | 86 | 994 | 1,157 | 10,632 | 11,046 |
| Zoning (Net) | 8,107 | 3,964 | 614 | 283 | 60 | 408 | 86 | 957 | 1,108 | 10,538 | 10,921 |
| Comp. Plan | | | | 185 | 35 | 846 | 204 | 834 | 1,664 | 10,225 | 12,334 |

**Zoning (Gross Density)**
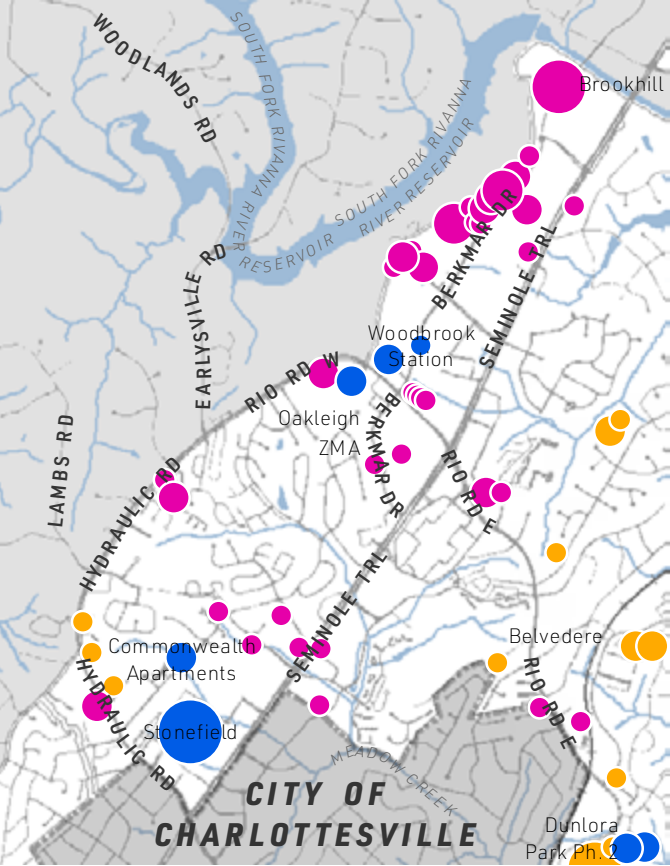


**Zoning (Net Density)**



**Comprehensive Plan**



### Legend

**Number of Potential Units**

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

**Unit Types**
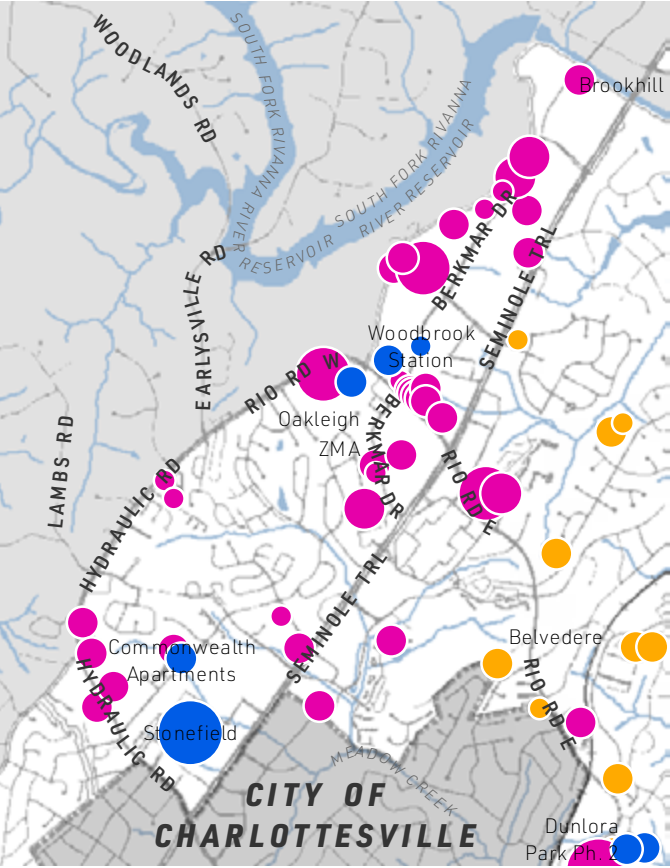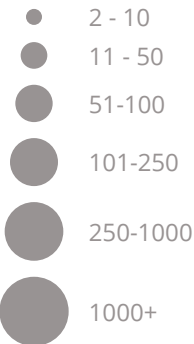
- Potential Single-Family Development
- Potential Attached & Multi-Family Development
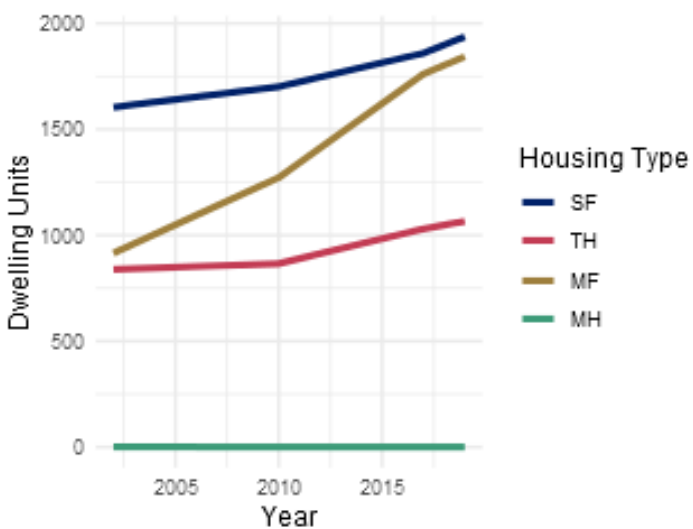- Approved Developments
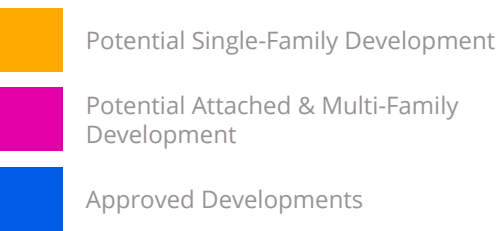
# Neighborhood 2

## Summary

This area has seen continued growth since 2009, with a number of multi-family units constructed near Route 29 at Arden Place and a mix of single-family and multi-family units in Belvedere. The East Rio Road corridor has seen continued growth, potentially spurred by the availability of R4 Residential-zoned land and the completion of the John Warner Parkway.

Though a limited number of developable parcels remain in the area, those that do are typically large acreages. A large parcel designated for Urban Density Residential / Neighborhood Service Center use at the corner of John Warner Parkway and Rio Road East represents one of the largest remaining development sites in the County's Urban Ring. A number of large parcels also exist between the Belvedere/Dunlora developments and the Rivanna River, though their development potential may be limited by access needs and extensive floodplain.

The Rio29 Small Area Plan, which was adopted in December 2018, anticipates future growth and redevelopment in the vicinity of Rio Road and Route 29.



This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

## Unit Mix Constructed, 2009-2018

| | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| N'hood 2 | 295 | 1,082 | 27.3% |

## Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Belvedere | 244 |
| The Lofts at Meadow Creek | 65 |
| Dunlora Park Ph. 1 | 17 |
| Dunlora Park Ph. 2 | 14 |
| Free State Run | 2 |
| Stonewater | 1 |

For pipeline project information, see Appendix B.

## Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
| | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | 10,966 | 4,846 | 343 | 290 | 745 | 433 | 1,120 | 1,378 | 1,896 | 14,466 | 15,782 |
| Zoning (Net) | | | | 243 | 245 | 366 | 372 | 831 | 1,081 | 13,077 | 13,712 |
| Comp. Plan | | | | 314 | 187 | 1,288 | 380 | 844 | 2,011 | 13,110 | 16,074 |

**Zoning (Gross Density)**
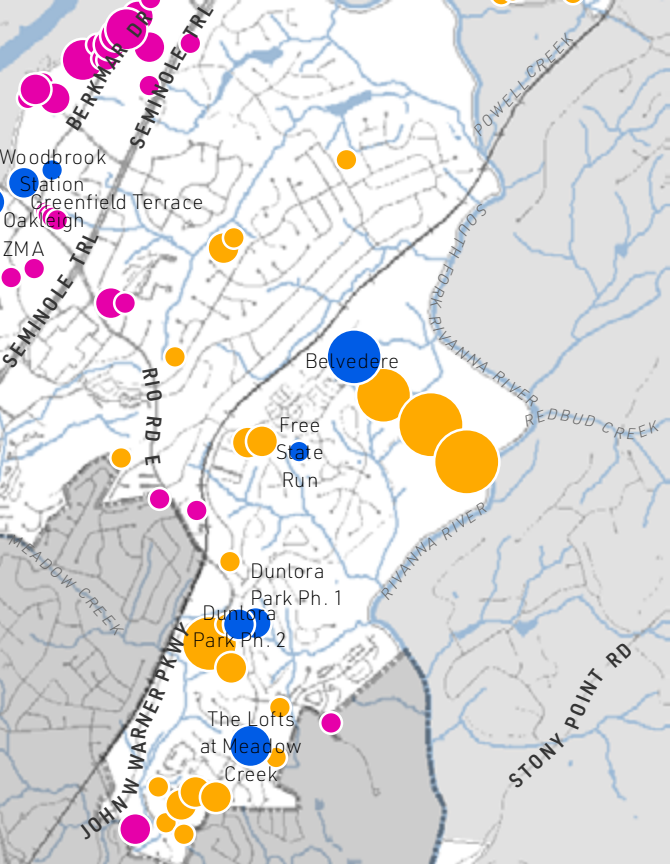


**Zoning (Net Density)**



**Comprehensive Plan**



## Legend

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*
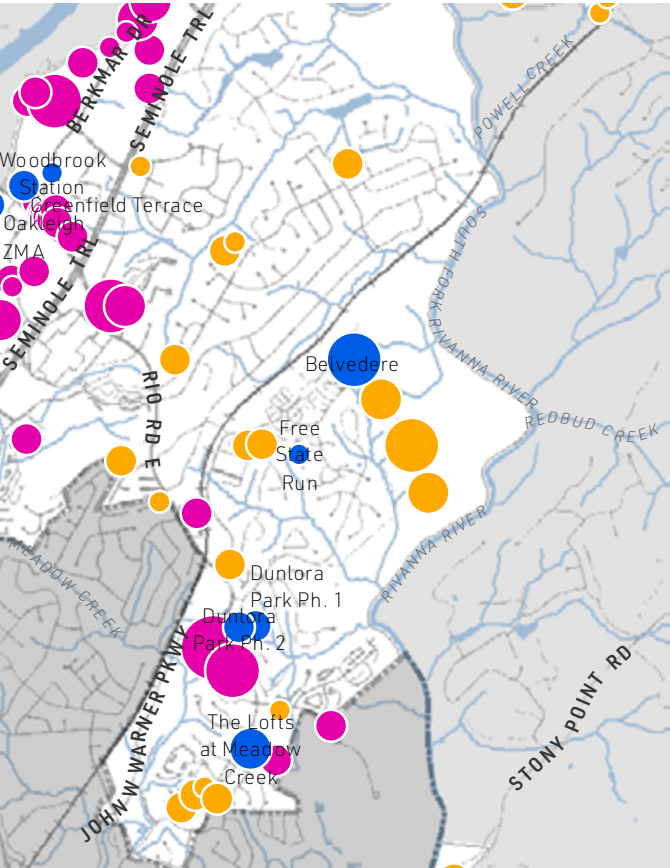
- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments
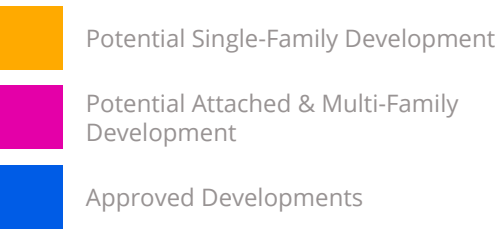
# Neighborhood 3 (Pantops)

## Summary

Pantops continues to see growth with ongoing construction in Cascadia and Riverside Village as well as Hyland Park (Fontana 4C). Since 2009, every residential Certificate of Occupancy issued has been in areas north of Route 250.

The Pantops Master Plan, which was updated in June 2019, anticipates future growth and redevelopment in suburban commercial centers along Route 250. Although many of these areas were not identified as redevelopment candidates in this analysis, they may add additional capacity in the future.

Most of the development potential in Pantops comes in the form of multifamily infill or redevelopment of existing commercial areas. Hilly topography and the Rivanna's floodplain creates variation in development scenarios and density ranges, depending on if a net or gross development scenario is used. Single-family capacity exists along the northern and eastern edges of the Development Area, although access issues may limit development potential in the near-term.
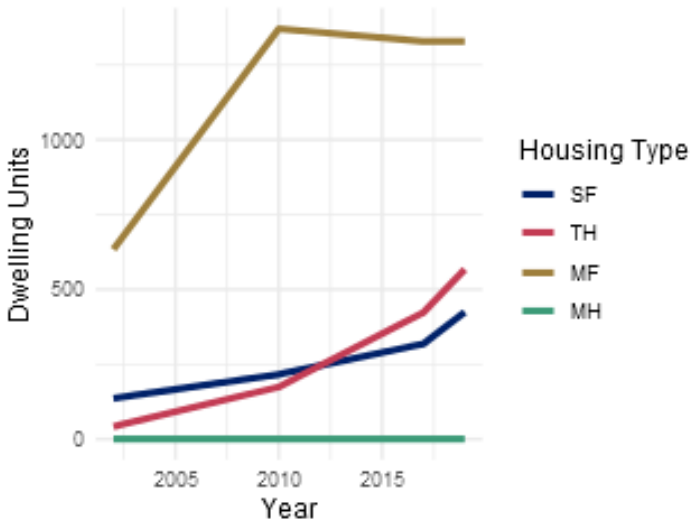


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

### Unit Mix Constructed, 2009-2018

|  | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| Pantops | 188 | 719 | 26.1% |

### Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Cascadia | 69* |
| Fontana 4C (Hyland Park) | 34 |
| Peter Jefferson Place | 250 |
| Riverside Village | 28* |

For pipeline project information, see Appendix B.
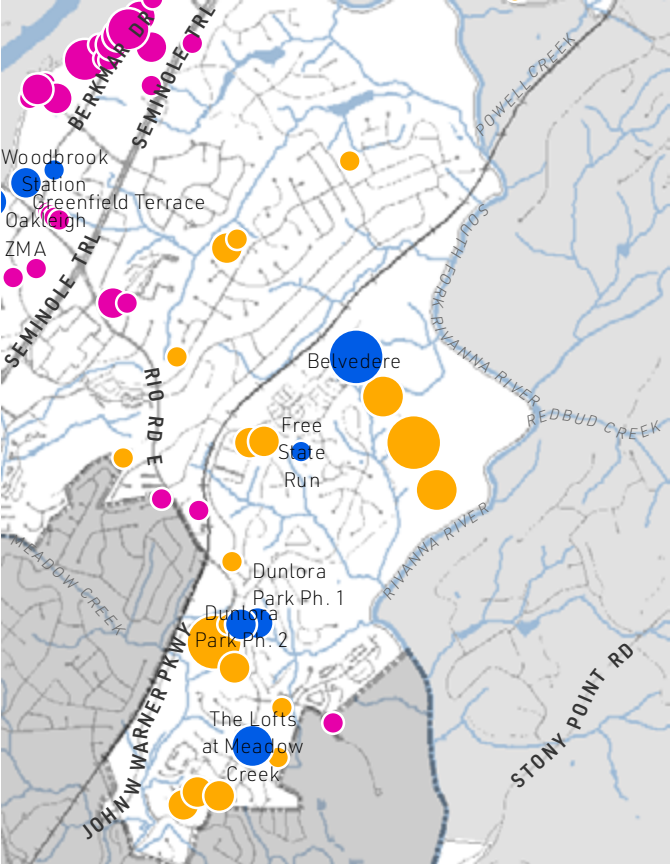* - Adjusted figure used.

### Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
|  | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | F = $C+(D_1+D_2)$ | G = $C+(E_1+E_2)$ | A + (F*2.54) | A + (G*2.54) |
| Zoning (Gross) | 4,904 | 2,320 | 381 | 377 | 5 | 505 | 6 | 763 | 892 | 6,842 | 7,170 |
| Zoning (Net) |  |  |  | 181 | 3 | 242 | 4 | 565 | 627 | 6,339 | 6,497 |
| Comp. Plan |  |  |  | 186 | 32 | 779 | 109 | 599 | 1,269 | 6,425 | 8,127 |

**Zoning (Gross Density)**
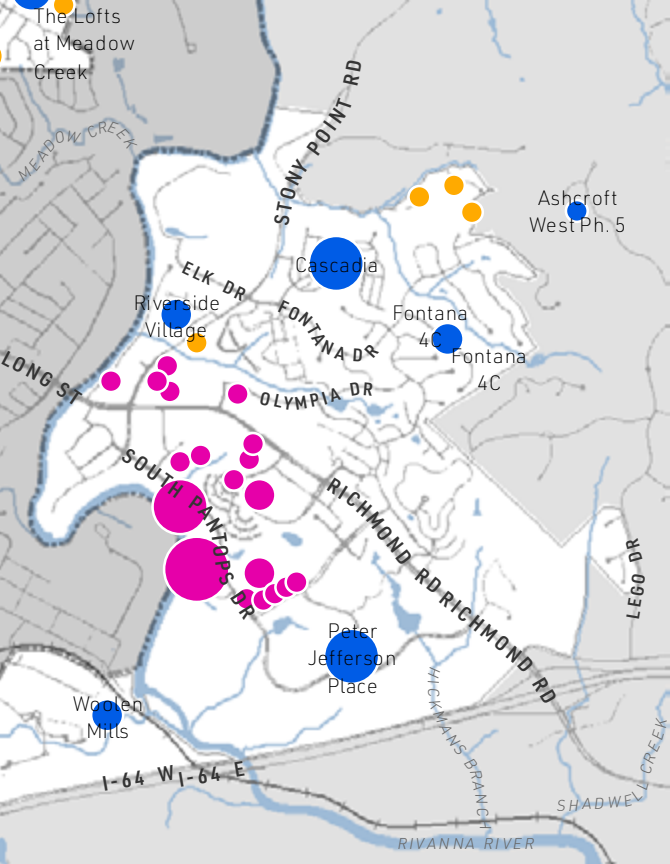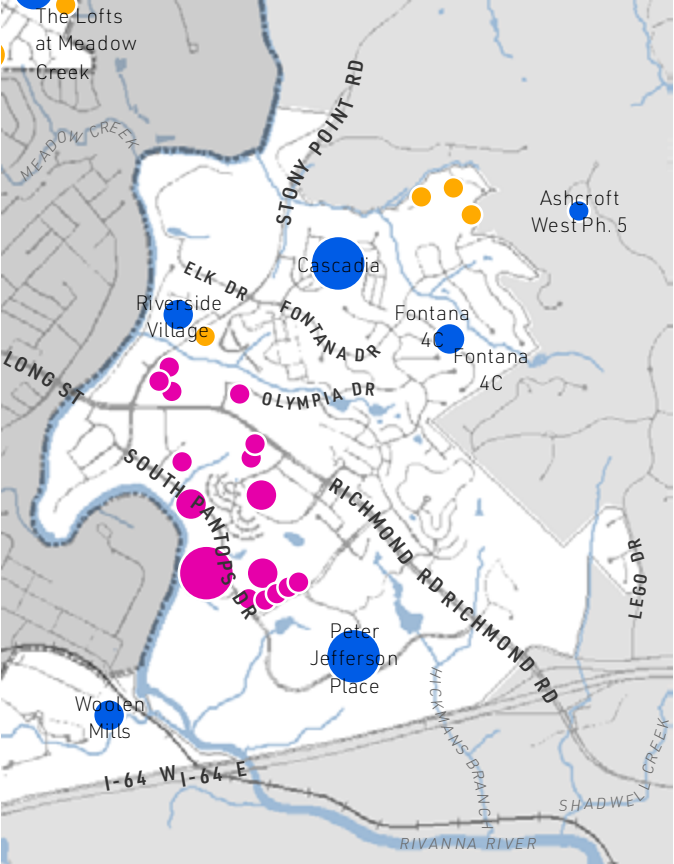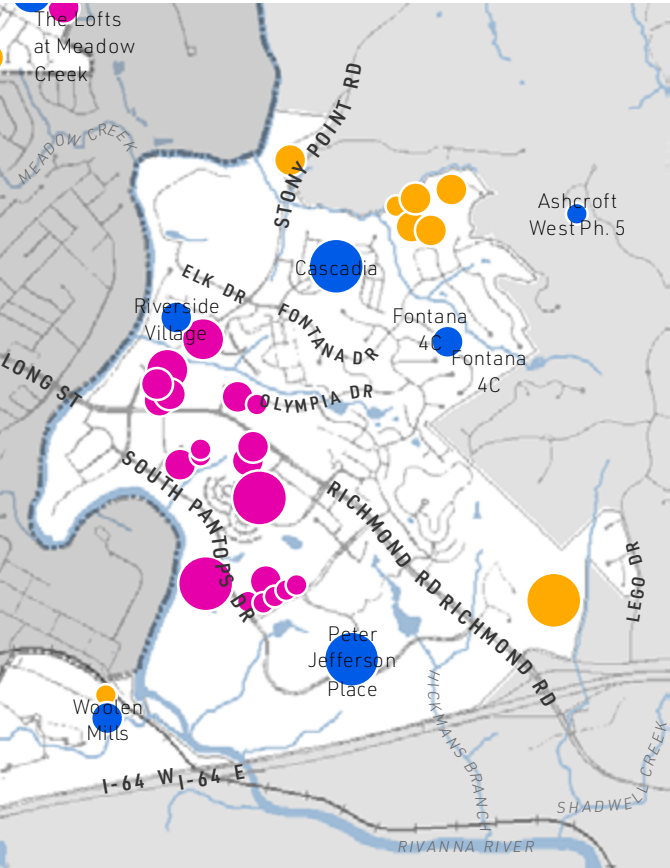


**Zoning (Net Density)**



**Comprehensive Plan**



**Legend**

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*

- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

# Neighborhood 4

## Summary

The Avon Street Extended corridor has seen the most growth in this area, with a number of townhouse/attached developments constructed in the preceding 10 years and more to come with the approved Avinity Estates and Spring Hill Village developments.

A number of pockets exist with opportunities for either single-family or denser townhouse or multifamily development between Avon Street Extended and Scottsville Road south of Mill Creek Drive, though they are somewhat scattered between existing institutional and industrial users and consist of smaller parcels.

Near Mill Creek Drive and to the north are a number of institutional landowners including the County and Piedmont Virginia Community College (PVCC). Although the County property along Mill Creek Drive has not been programmed for future use, the PVCC property's frontage along Avon Street Extended has the potential to support a large multifamily development.
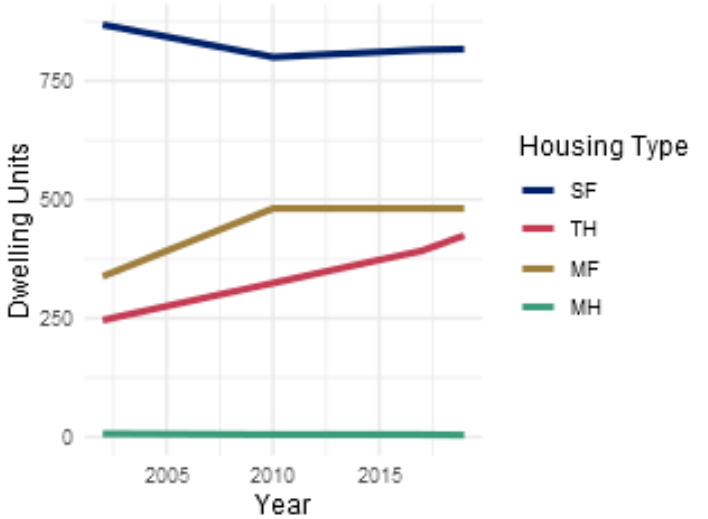


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

## Unit Mix Constructed, 2009-2018

| Scenario | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| N'hood 4 | 23 | 126 | 18.3% |

## Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Avinity | 2* |
| Avinity Estates | 93 |
| Avon Park II | 31 |
| 2511 Avinity Drive | 24 |
| Spring Hill Village | 100 |

For pipeline project information, see Appendix B.
* - Adjusted figure used.

## Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
| | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | 4,480 | 1,726 | 250 | 54 | 17 | 84 | 29 | 321 | 363 | 5,295 | 5,402 |
| Zoning (Net) | | | | 51 | 14 | 81 | 25 | 315 | 356 | 5,280 | 5,384 |
| Comp. Plan | | | | 160 | 42 | 700 | 108 | 452 | 1,058 | 5,628 | 7,167 |

**Zoning (Gross Density)**
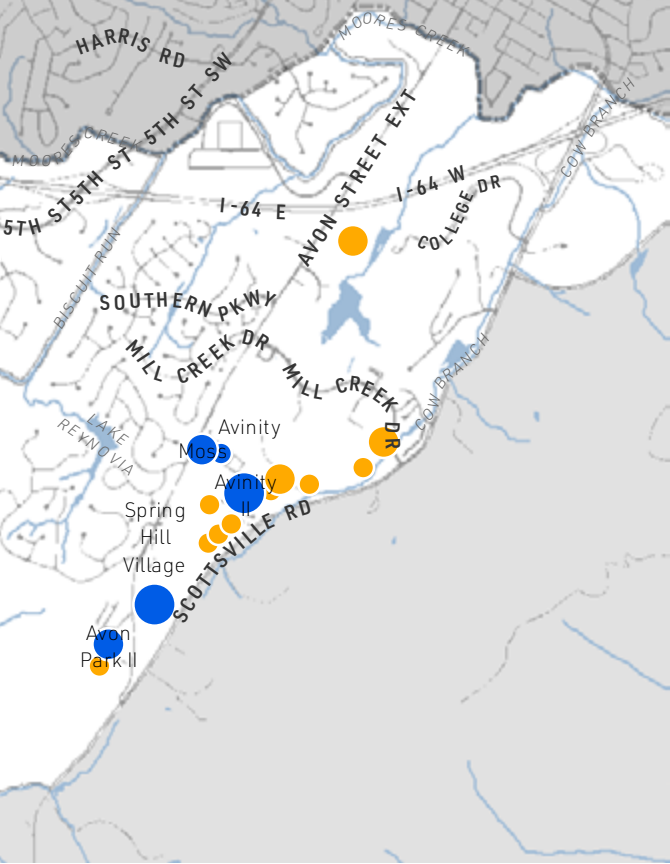


**Zoning (Net Density)**



**Comprehensive Plan**



## Legend

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*
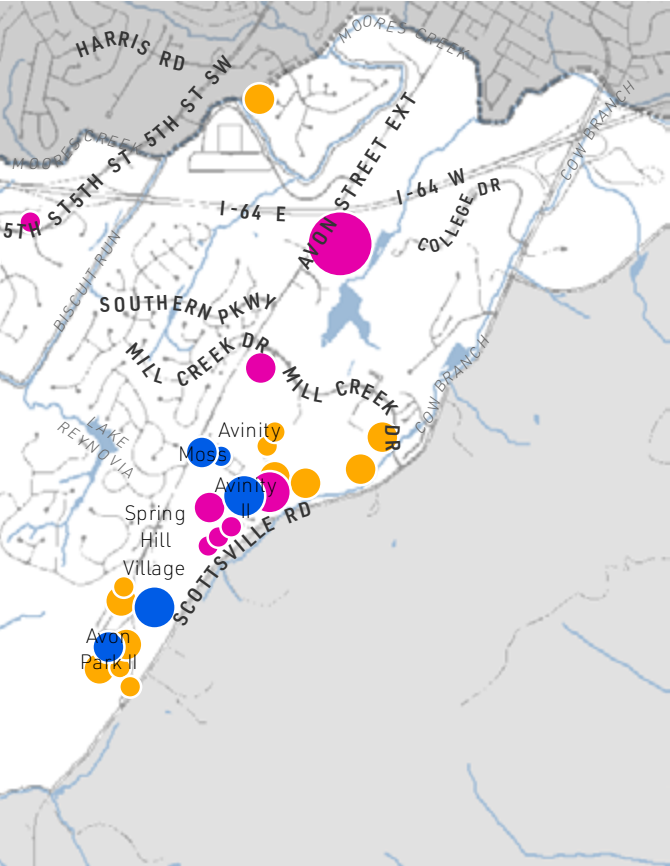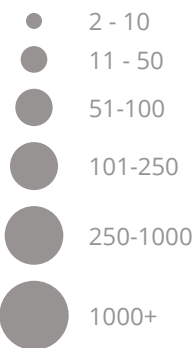
- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments
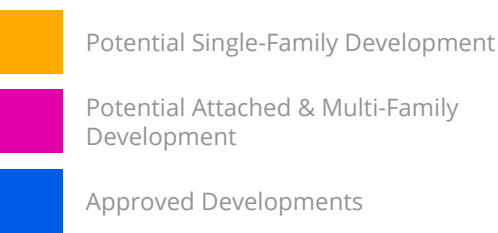
# Neighborhood 5

## Summary

The 5th Street / Old Lynchburg Road corridor has seen significant growth over the past 10 years, with a number of large multifamily developments constructed near Interstate 64 and large-lot single-family developments such as Oak Hill (Wintergreen) Farm and Whittington. Much of the development along this corridor has happened by-right.

A number of properties with Urban Density Residential and Community Mixed Use designations are located along this corridor and provide opportunities for residential infill and some commercial development along this largely residential corridor. Planning for the redevelopment of the Southwood Mobile Home Park is underway.

West of Sunset Avenue Extended are large land holdings near Interstate 64 with development potential that is currently restricted by access and utility issues. The Granger property, located between Sunset Avenue Extended and Fontaine Avenue, is designated Neighborhood Density Residential. The southwest quadrant of the Interstate 64/Route 29 interchange is designated Regional Mixed Use and also has significant development potential, though terrain and access issues will pose challenges.

This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

## Unit Mix Constructed, 2009-2018

|  | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| N'hood 5 | 157 | 570 | 27.5% |

## Approved Pipeline Projects

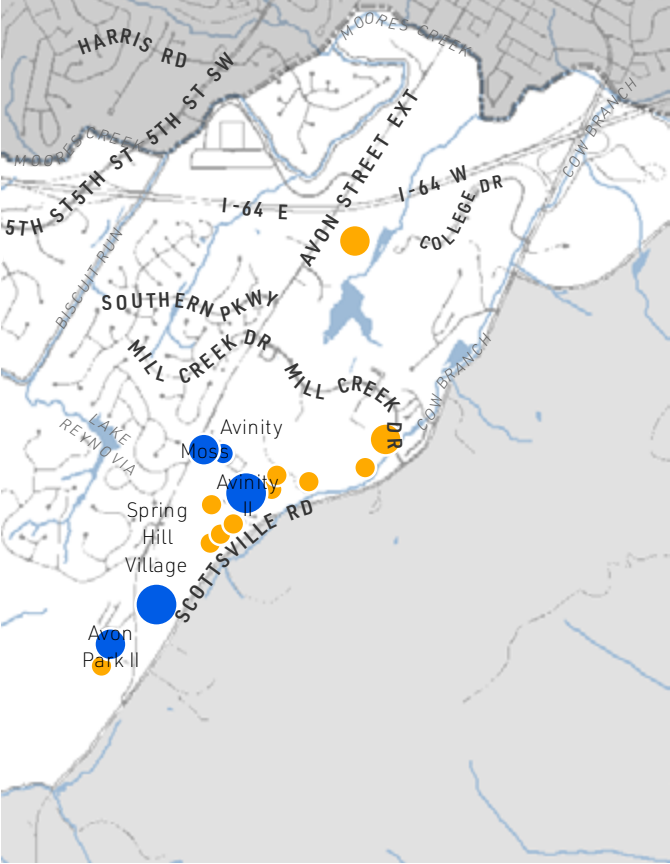| Project Name | Units Remaining |
|---|---|
| Biscuit Run Remainder | 100 |
| Whittington | 28 |
| Brookdale | 96 |
| Oak Hill (Wintergreen) Farm Ph. 1 | 8 |
| Oak Hill (Wintergreen) Farm Ph. 2A | 1 |
| Oak Hill (Wintergreen) Farm Ph. 2B | 3 |
| Oak Hill (Wintergreen) Farm Ph. 3 | 4 |

For pipeline project information, see Appendix B.

## Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
| | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | 6,527 | 2,984 | 240 | 172 | 121 | 256 | 182 | 533 | 678 | 7,881 | 8,249 |
| Zoning (Net) | | | | 142 | 88 | 209 | 136 | 470 | 585 | 7,721 | 8,013 |
| Comp. Plan | | | | 216 | 138 | 959 | 412 | 594 | 1,611 | 8,036 | 10,619 |

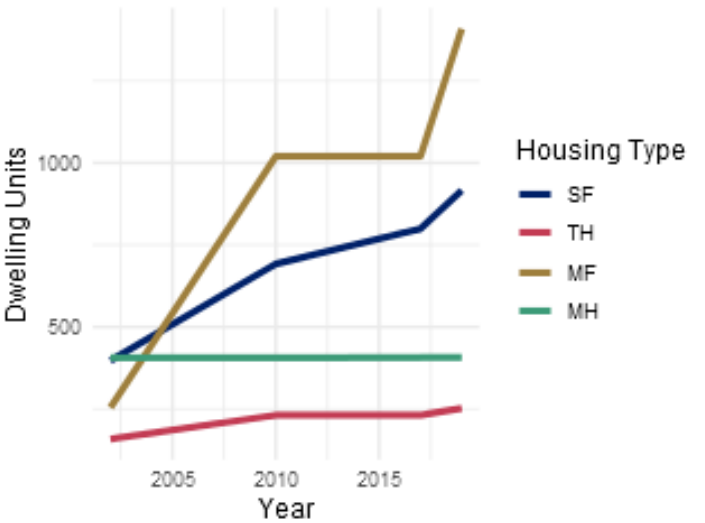**Zoning (Gross Density)**

**Zoning (Net Density)**

**Comprehensive Plan**

**Legend**

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*

- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

# Neighborhood 6

## Summary

Recent development in this area has been limited to small infill and the Poplar Glen development, and no projects are currently in the pipeline.

Redevelopment and infill opportunities exist along the Ivy Road corridor, south of Ivy Road and east of the Route 29 Bypass, where there is currently a small number of vacant parcels and single-family homes.

The greatest potential for future development in this area exists in the Reservoir Road area, south of the Bellair and Liberty Hills subdivisions. Many of these parcels have larger acreages, though hilly topography may limit development potential.

However, a significant number of these parcels and about half of the theoretical capacity in this area is under the control of the University of Virginia Foundation. Uncertainty about future plans for these properties and conditions along Reservoir Road may limit future development. Additionally, the Birdwood property is identified in the Southern & Western Urban Neighborhoods Master Plan as having potential for mixed-use or residential development. However, this will require consideration and redesignation in future planning efforts.
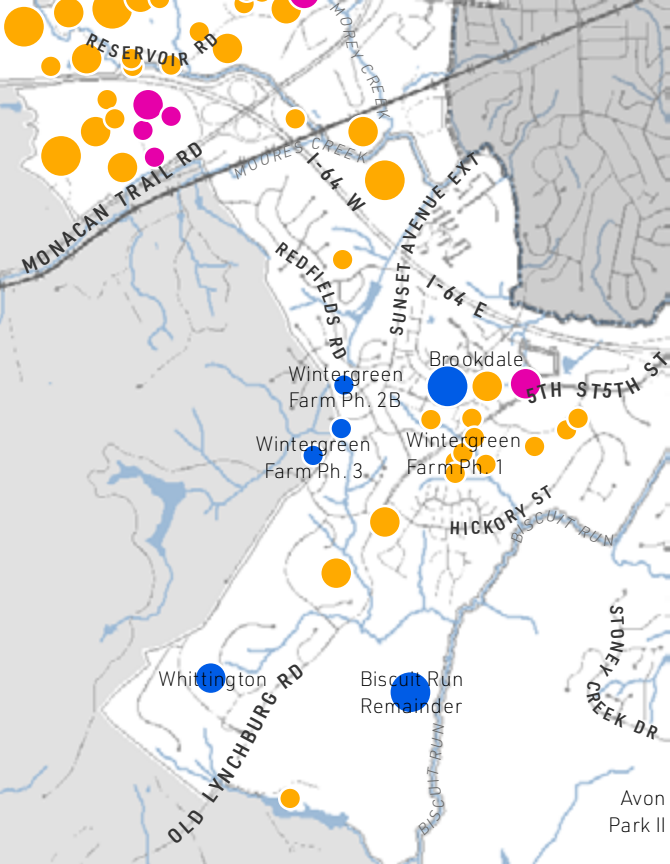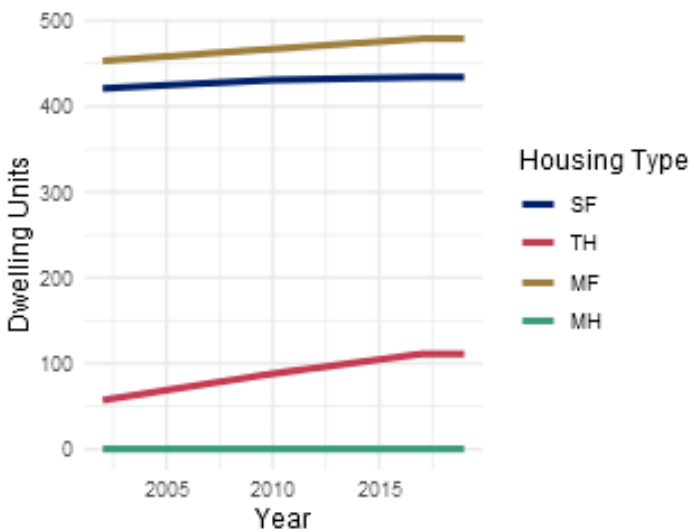


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.
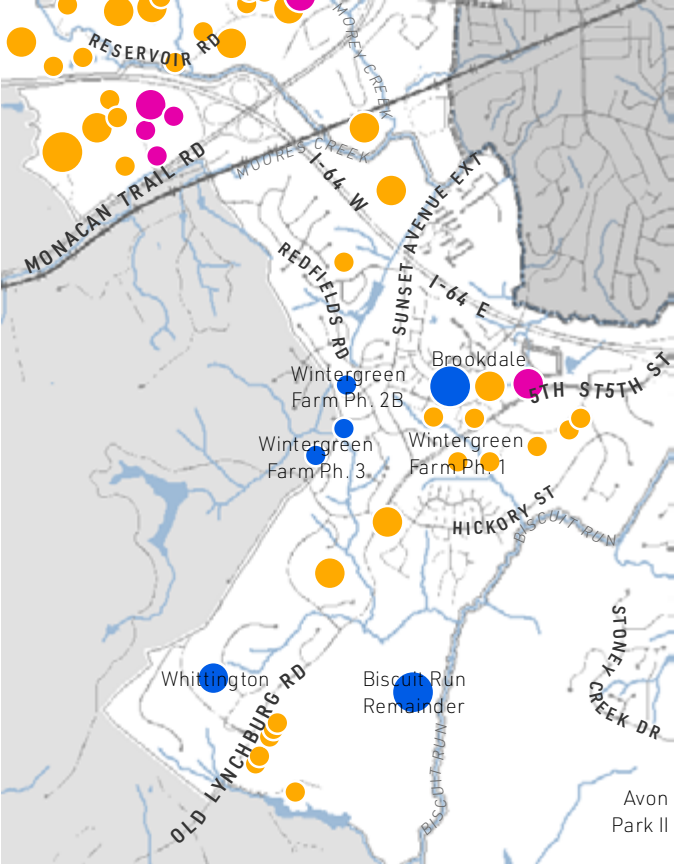
## Unit Mix Constructed, 2009-2018

|  | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| N'hood 6 | 9 | 45 | 20.0% |

## Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
|  | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | 7,850 | 1,024 | 0 | 361 | 240 | 530 | 351 | 601 | 881 | 9,377 | 10,088 |
| Zoning (Net) |  |  |  | 193 | 179 | 288 | 261 | 372 | 549 | 8,795 | 9,244 |
| Comp. Plan |  |  |  | 448 | 398 | 989 | 890 | 846 | 1,879 | 9,999 | 12,623 |
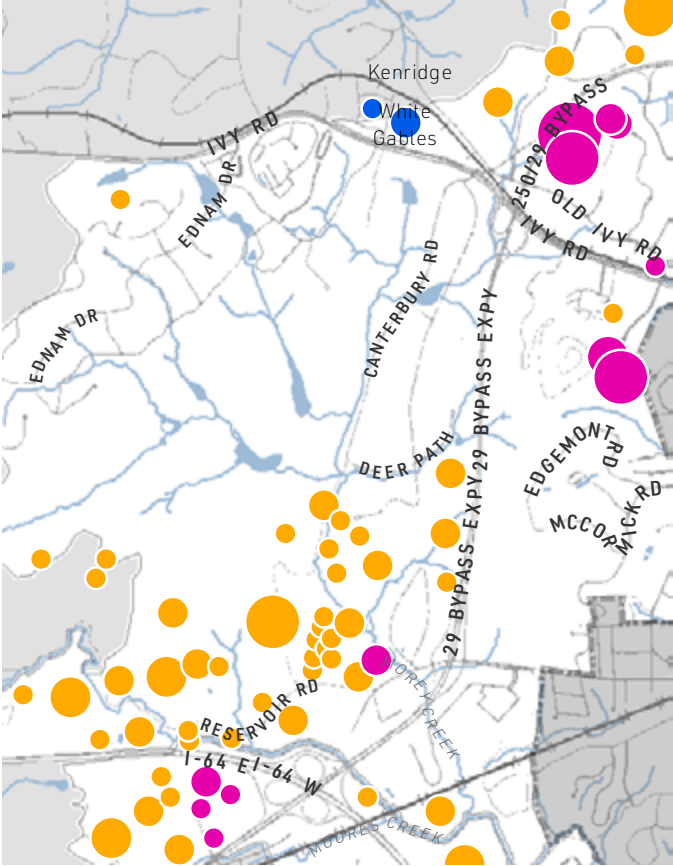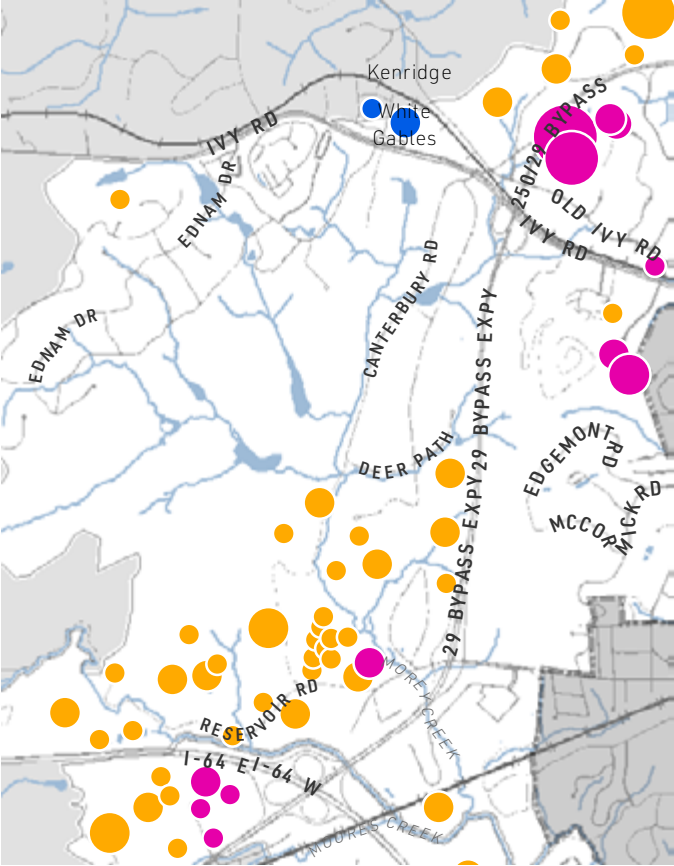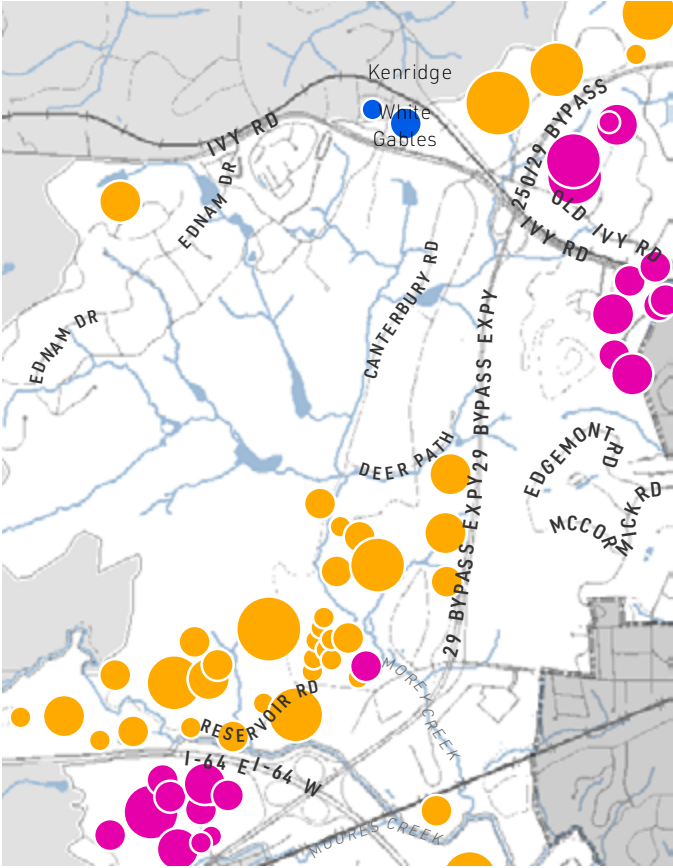


Comprehensive Plan



### Legend

**Number of Potential Units**

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

**Unit Types**

- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

# Neighborhood 7

## Summary

Recent development in this area has been limited to the Out of Bounds development on Barracks Road, which is finishing construction, and the Kenridge development on Ivy Road.

Much of the capacity in this area is located in properties on Old Ivy Road, which could provide opportunities for multi-family development, though transportation improvements will likely be necessary in this corridor. A significant amount of capacity also exists in the Westover property on the edge of the Development Area west of the Route 29 Bypass, which is also owned by the University of Virginia Foundation.
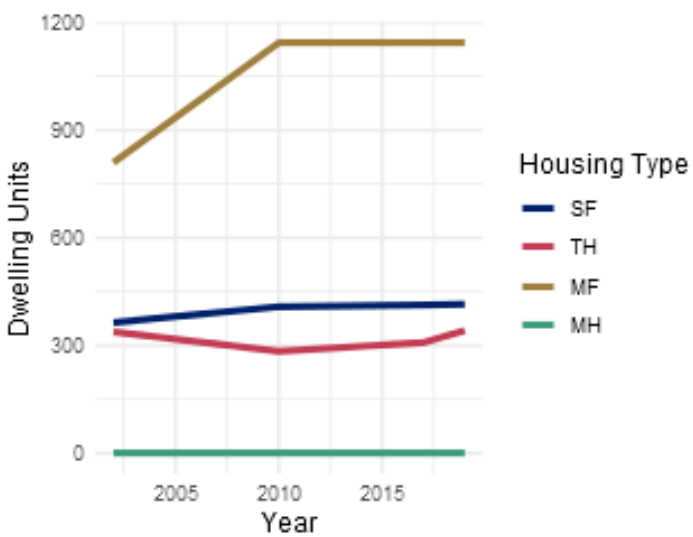


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

### Unit Mix Constructed, 2009-2018

| | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| N'hood 7 | 7 | 47 | 14.9% |

### Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Kenridge | 8 |
| Out of Bounds | 1* |
| White Gables | 46 |

For pipeline project information, see Appendix B.
* - Adjusted figure used.

### Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
| | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | | | | 559 | 56 | 777 | 77 | 670 | 909 | 5,583 | 6,190 |
| Zoning (Net) | 3,881 | 1,901 | 55 | 511 | 39 | 712 | 51 | 605 | 818 | 5,418 | 5,959 |
| Comp. Plan | | | | 152 | 219 | 476 | 526 | 426 | 1,057 | 4,963 | 6,566 |

**Zoning (Gross Density)**
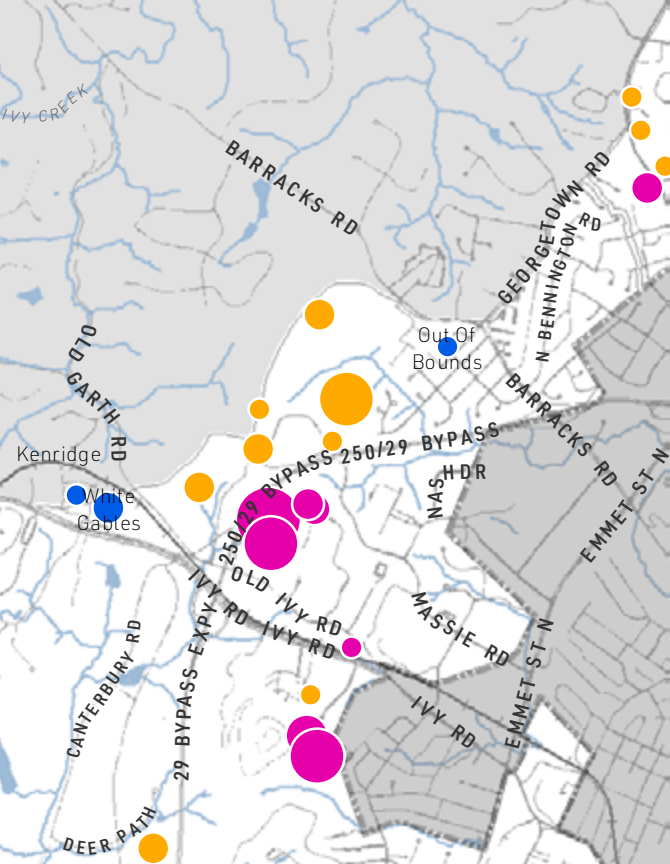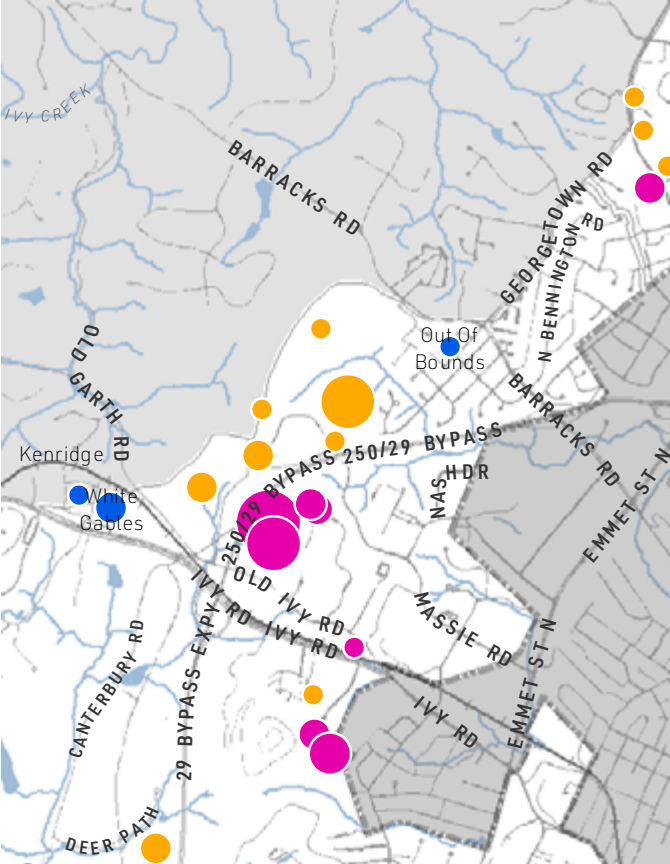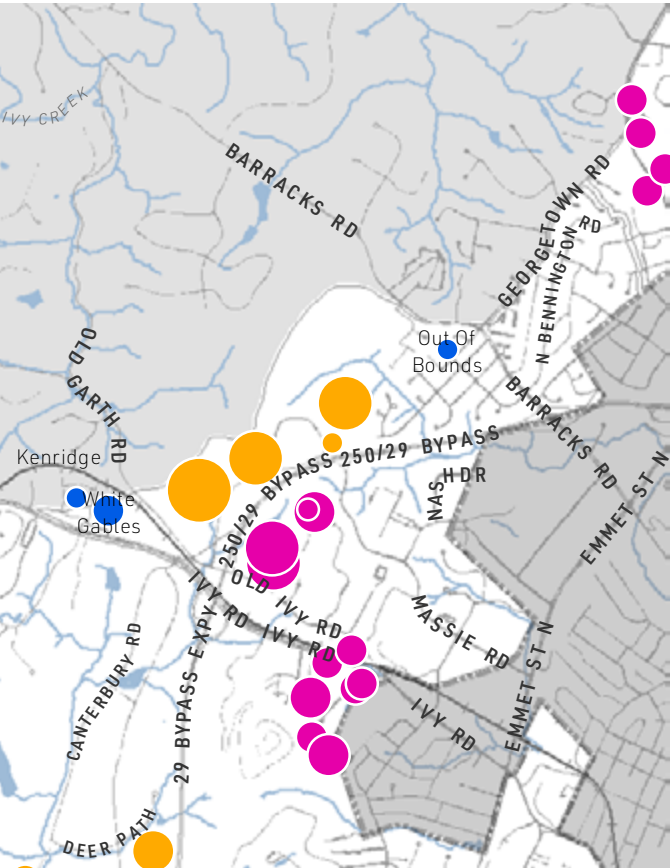


**Zoning (Net Density)**



**Comprehensive Plan**



**Legend**

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*

- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

# Crozet

## Summary

The Community of Crozet has experienced significant growth in recent years. In addition to projects approved via rezoning in Old Trail Village, Blue Ridge Cohousing (Emerson Commons), and Wickham Pond, by-right development has continued east of Crozet Avenue on (formerly) vacant parcels with vacant R-1 and R-2 residential zoning designations, including portions of the Foothill Crossing, Chesterfield Landing, Westlake Hills, and Sparrow Hill developments. Areas with existing R-6 zoning west of Downtown and north of Jarman's Gap Road provide opportunity for by-right development and additional housing mix. Old Trail Village, was approved for 1,000-2,200 units and is expected to build out near 1,200 total units.

Discrepancies exist between development potential under the current zoning and the Crozet Master Plan's land use designations due to extensive environmental features (such as stream buffers and floodplain areas) and additional areas designated for open space in the Master Plan. Examples of this are evident along the southern edge of the Development Area.

Few large parcels remain without development approvals or applications in site design review. Infill of existing areas may become a more significant portion of future housing development in Crozet.

This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

### Unit Mix Constructed, 2009-2018

|  | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| Crozet | 705 | 1,179 | 59.8% |

## Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
|  | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | A + (F*2.54) | A + (G*2.54) |
| Zoning (Gross) | 8,370 | 3,146 | 2,308 | 452 | 286 | 722 | 439 | 3,046 | 3,469 | 16,107 | 17,181 |
| Zoning (Net) |  |  |  | 321 | 213 | 514 | 324 | 2,842 | 3,146 | 15,589 | 16,361 |
| Comp. Plan |  |  |  | 223 | 212 | 602 | 457 | 2,743 | 3,367 | 15,337 | 16,922 |

## Residential Capacity Estimate (Adjusted for Old Trail Village 1,200 Unit Buildout)

| Scenario | Estimated Current Population | Estimated Current Units | Adjusted Pipeline | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|
|  |  |  |  | Low | High | Low | High |
| Zoning (Gross) | 8,370 | 3,146 | 1,308 | 2,046 | 2,469 | 13,567 | 14,641 |
| Zoning (Net) |  |  |  | 1,842 | 2,146 | 13,049 | 13,821 |
| Comp. Plan |  |  |  | 1,743 | 2,367 | 12,797 | 14,382 |

**Zoning (Gross Density)**

**Zoning (Net Density)**

**Comprehensive Plan**

## Legend

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*

- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

## Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Blue Ridge Cohousing/ Emerson Commons | 19 |
| Old Trail Village | 1,816[1] |
| St. George Properties | 3 |
| The Vue | 126 |
| Westlake Hills Ph. 1 | 5 |
| Westlake Hills Ph. 2 | 12 |
| Westlake Hills Ph. 3 | 16 |
| Westlake Hills Ph. 4 | 45 |
| Chesterfield Landing | 5 |
| Chesterfield Landing II | 7 |
| Glenbrook at Foothills | 168 |
| Wickham Pond I | 2 |
| Wickham Pond II | 50 |
| Creekside III, Phase 3D | 2 |
| Foothill Crossing Phases 4 & 5 | 2 |
| Sparrow Hill | 28 |

For pipeline project information, see Appendix B.
[1] The Old Trail Village number shown assumes 2,200 unit buildout.

# Hollymead

## Summary

The Community of Hollymead is one of Albemarle County's largest Development Areas and has significant residential capacity in approved developments, including Hollymead Town Center, Brookhill, and North Pointe. These three developments alone currently have over 3,500 dwelling units in approved capacity that could be constructed after requisite site development plan approvals.

Large portions of the Development Area include parcels zoned Rural Areas that could potentially support denser residential development under the Urban Density Residential land use designations.
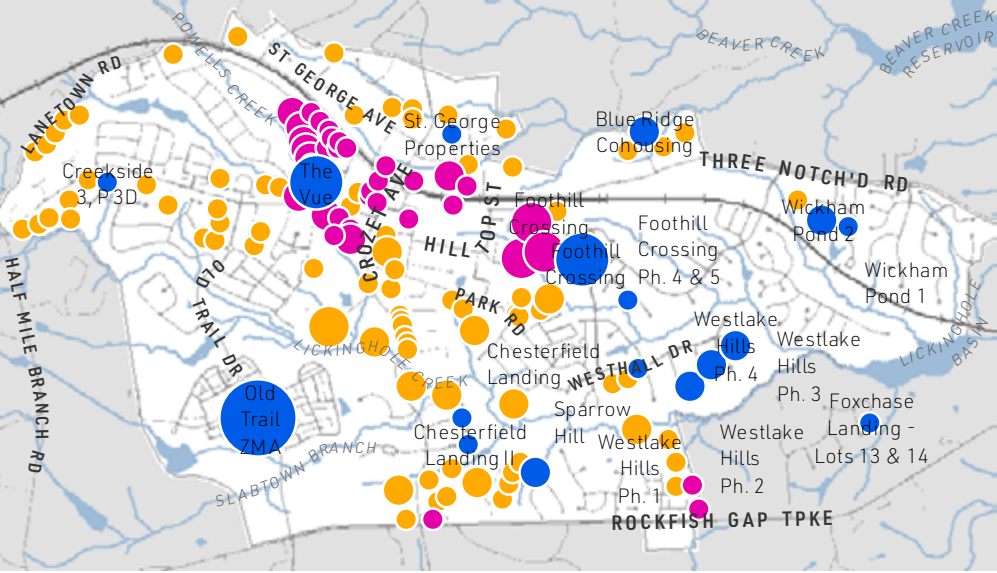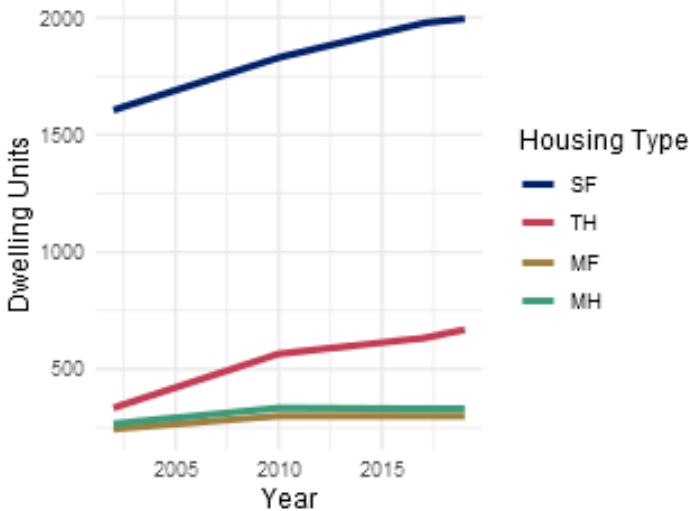


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.
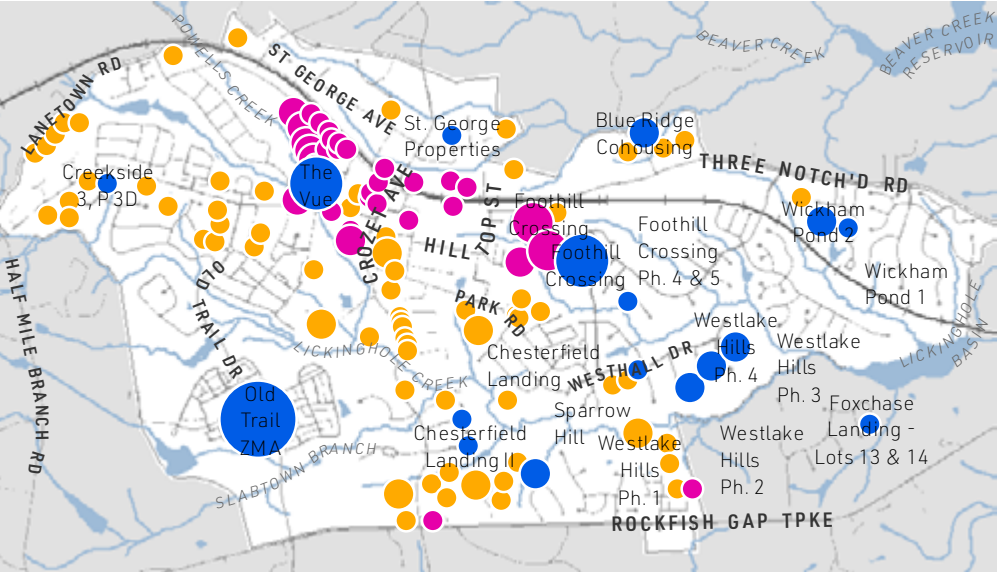
### Approved Pipeline Projects

| Project Name | Units Remaining |
| --- | --- |
| Brookhill | 1,550 |
| North Pointe | 893 |
| Willow Glen | 202 |
| Cedar Hill Mobile Home Park | 32 |
| Hollymead Town Center A2 | 1,222 |
| Hollymead Town Center C | 38 |
| 3223 Proffit Road | 109 |

For pipeline project information, see Appendix B.

### Unit Mix Constructed, 2009-2018

| | # Single-Family Detached | Total | % SFD |
| --- | --- | --- | --- |
| Hollymead | 103 | 268 | 38.4% |

### Residential Capacity Estimate

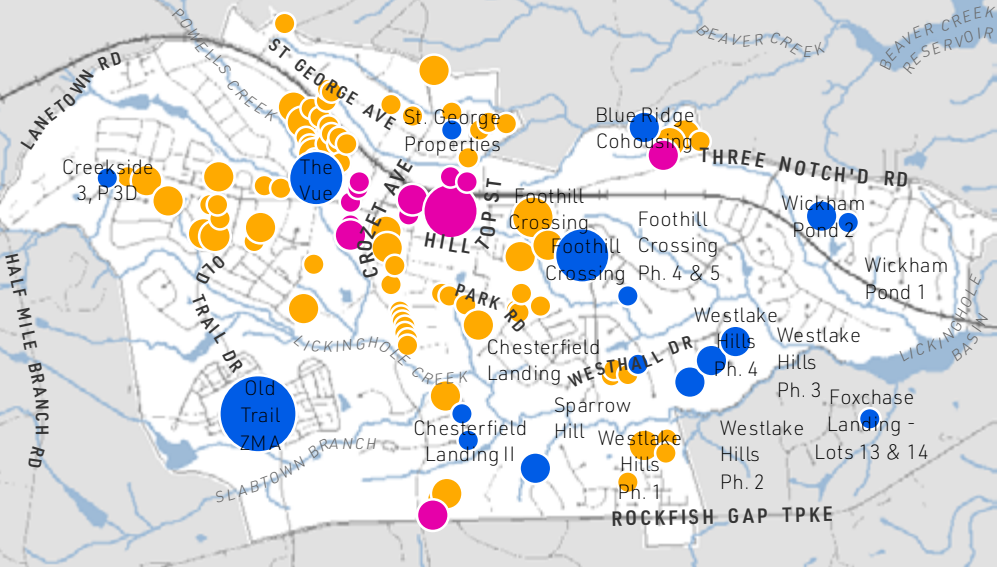| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
| | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | | | | 633 | 173 | 845 | 229 | 4,743 | 5,011 | 20,464 | 21,145 |
| Zoning (Net) | 8,417 | 3,294 | 3,937 | 603 | 170 | 800 | 223 | 4,710 | 4,960 | 20,380 | 21,015 |
| Comp. Plan | | | | 590 | 337 | 2,776 | 1,661 | 4,864 | 8,374 | 20,772 | 29,687 |

**Zoning (Gross Density)**
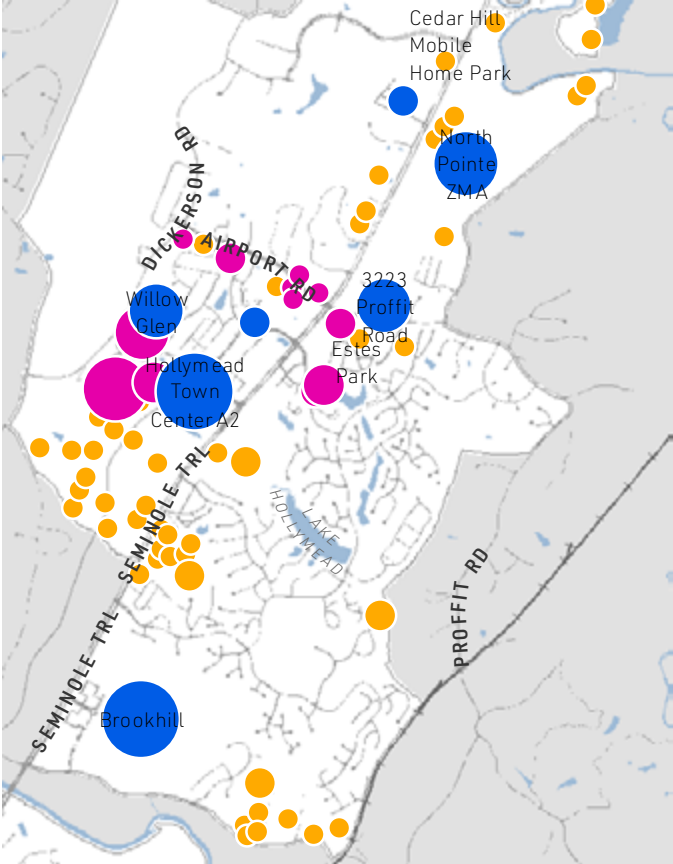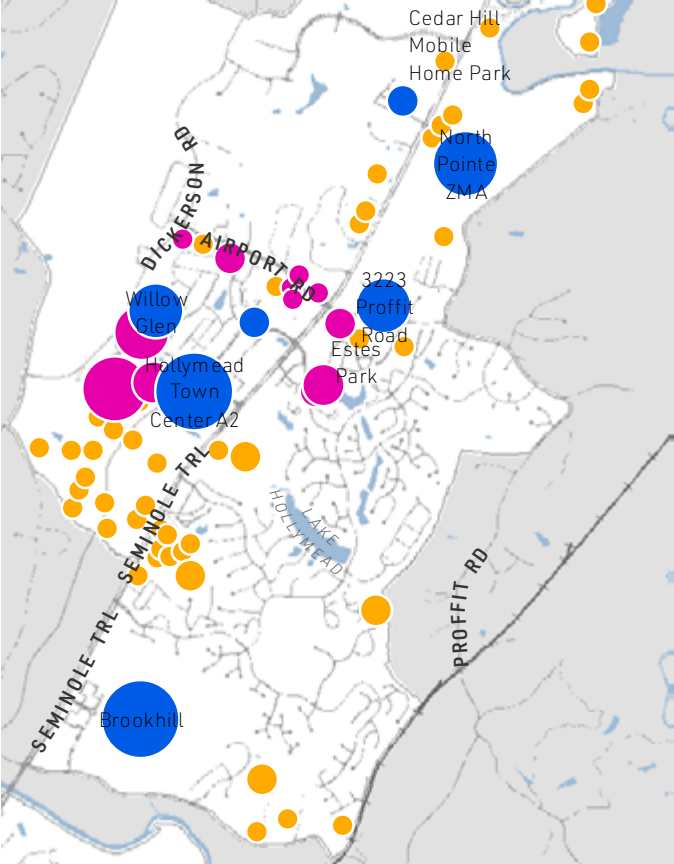


**Zoning (Net Density)**



**Comprehensive Plan**



**Legend**

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*

- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

# Piney Mountain

## Summary

The largest active development in Piney Mountain is Briarwood, which contains a mix of single-family detached and attached homes. A legislative approval was issued for residential units located east of Route 29 along Boulders Road near the National Ground Intelligence Center/Rivanna Station, but no development has occurred at this time.

The majority of vacant parcels located on the east side of Route 29 are currently zoned Rural Areas, limiting by-right development potential. An approval dating to the 1970s for 350 senior units (ZMA197700019 Rivanna Estates) still exists with Planned Residential Development zoning. While this development is not expected to occur, the allowed density was counted in the high zoning buildout scenarios. It was not considered in the Comprehensive Plan buildout scenario.
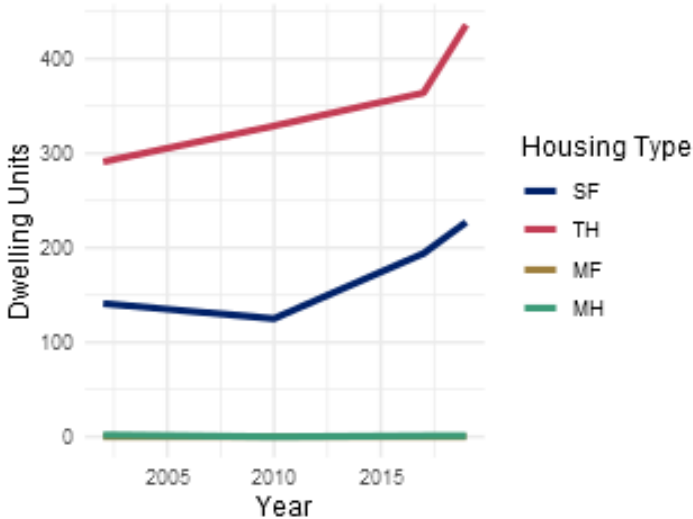


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.

## Unit Mix Constructed, 2009-2018

|  | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| Piney Mountain | 95 | 183 | 51.9% |

## Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Briarwood | 121 |
| NGIC Residential | 120 |

For pipeline project information, see Appendix B.

## Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
|  | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | $A + (F*2.54)$ | $A + (G*2.54)$ |
| Zoning (Gross) | 1,727 | 664 | 241 | 64 | 5 | 426* | 5 | 310 | 672 | 2,514 | 3,434 |
| Zoning (Net) |  |  |  | 64 | 5 | 426* | 5 | 310 | 672 | 2,514 | 3,434 |
| Comp. Plan |  |  |  | 577 | 0 | 1,247 | 0 | 818 | 1,488 | 3,805 | 5,507 |
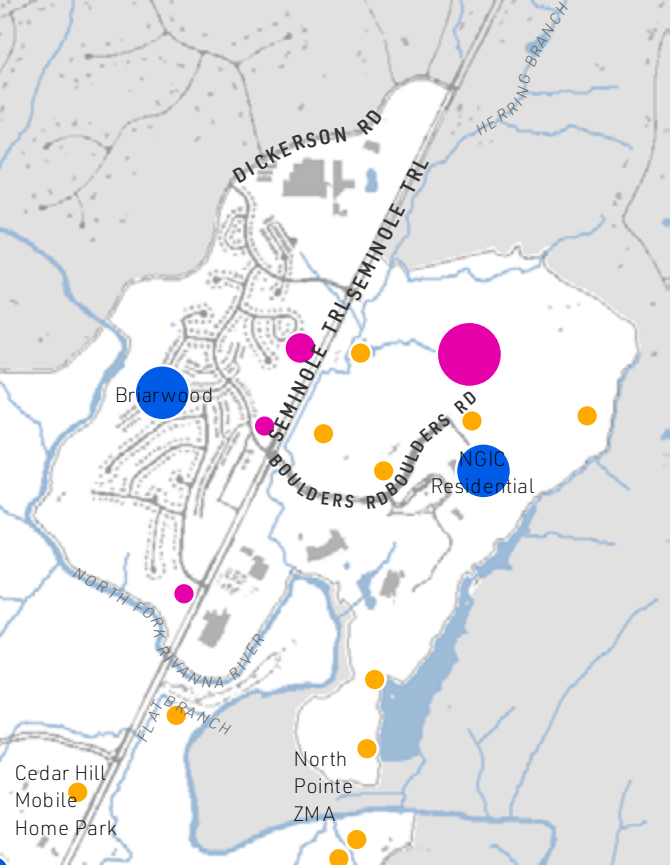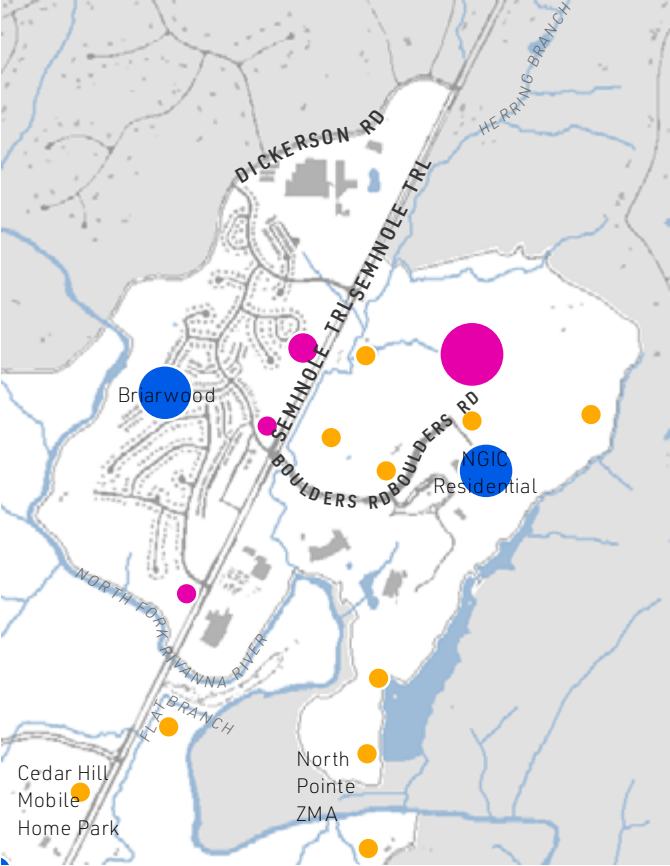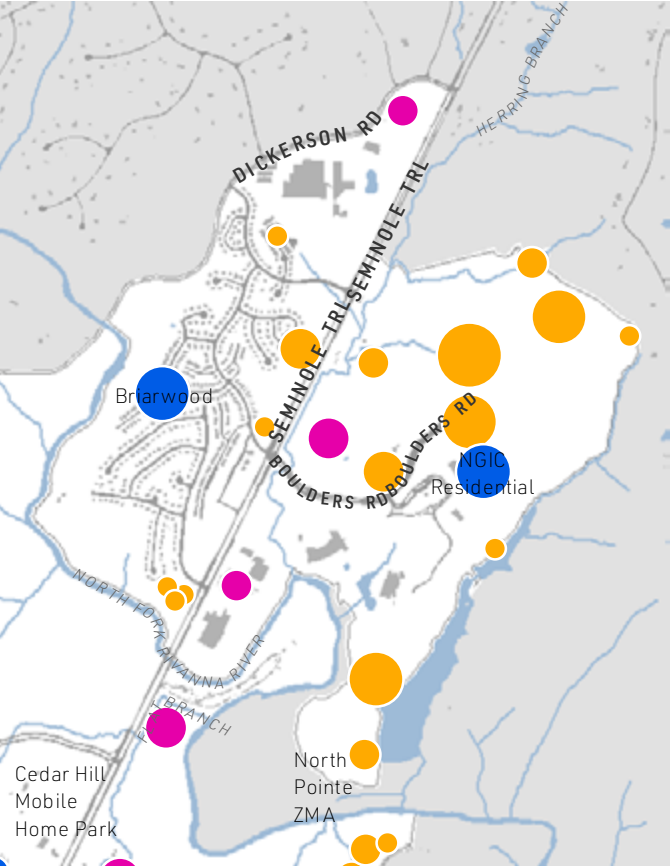
**Comprehensive Plan**



**Legend**

*Number of Potential Units*

- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*

- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

# Village of Rivanna

## Summary

Glenmore (Leake and Livengood sections) continues to build out and Rivanna Village has begun construction on its initial phases, which will add an increased mix of housing types.

Outside of approved developments, all vacant and infill-capable parcels within the Development Area are currently zoned Rural Areas, limiting by-right development potential. These parcels are designated for Neighborhood Density Residential and Neighborhood Density Residential - Low land uses in the Village of Rivanna Master Plan, which includes recommendations for future development and infrastructure needs.
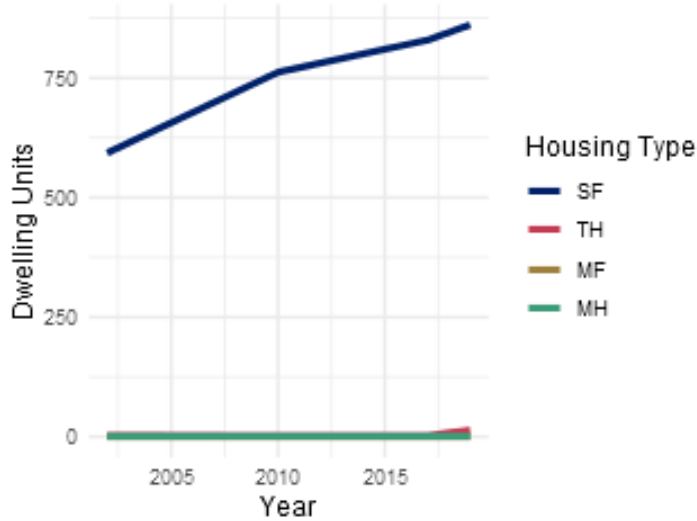


This visual shows estimated housing stock growth over time, as sorted by type. The data sources are 2002, 2010, 2017, and 2019 internal population estimates. These estimates were calculated using parcel data in Albemarle County's Development Tracking System, CountyView. This data is manually entered and is not guaranteed to be accurate.
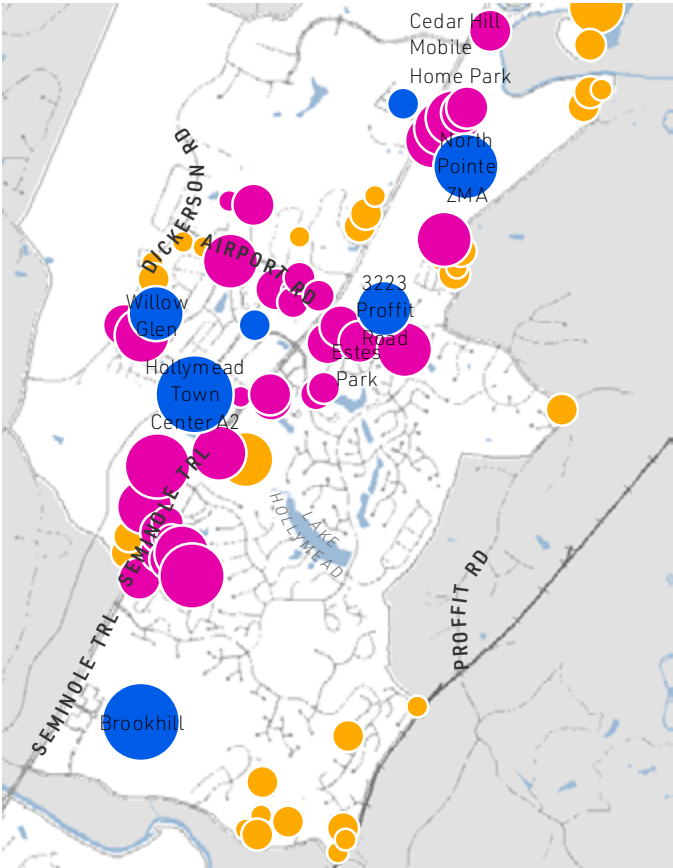
### Zoning (Gross Density)



### Zoning (Net Density)



### Comprehensive Plan



### Legend

*Number of Potential Units*
- 2 - 10
- 11 - 50
- 51-100
- 101-250
- 250-1000
- 1000+

*Unit Types*
- Potential Single-Family Development
- Potential Attached & Multi-Family Development
- Approved Developments

## Unit Mix Constructed, 2009-2018

|  | # Single-Family Detached | Total | % SFD |
|---|---|---|---|
| Village of Rivanna | 114 | 114 | 100.0% |

## Approved Pipeline Projects

| Project Name | Units Remaining |
|---|---|
| Glenmore - Leake | 79 |
| Glenmore - Livengood | 14 |
| Rivanna Village | 382 |

For pipeline project information, see Appendix B.

## Residential Capacity Estimate

| Scenario | Estimated Current Population | Estimated Current Units | Approved Units in Pipeline | Low Buildout Scenario | | High Buildout Scenario | | Pipeline Units + Full Buildout | | Estimated Population at Full Buildout | |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Vacant | Infill | Vacant | Infill | Low | High | Low | High |
|  | A | B | C | $D_1$ | $D_2$ | $E_1$ | $E_2$ | $F = C+(D_1+D_2)$ | $G = C+(E_1+E_2)$ | A + (F*2.54) | A + (G*2.54) |
| Zoning (Gross) |  |  |  | 27 | 18 | 27 | 18 | 520 | 520 | 3,599 | 3,599 |
| Zoning (Net) | 2,278 | 876 | 475 | 27 | 18 | 27 | 18 | 520 | 520 | 3,599 | 3,599 |
| Comp. Plan |  |  |  | 160 | 113 | 180 | 198 | 748 | 853 | 4,178 | 4,445 |
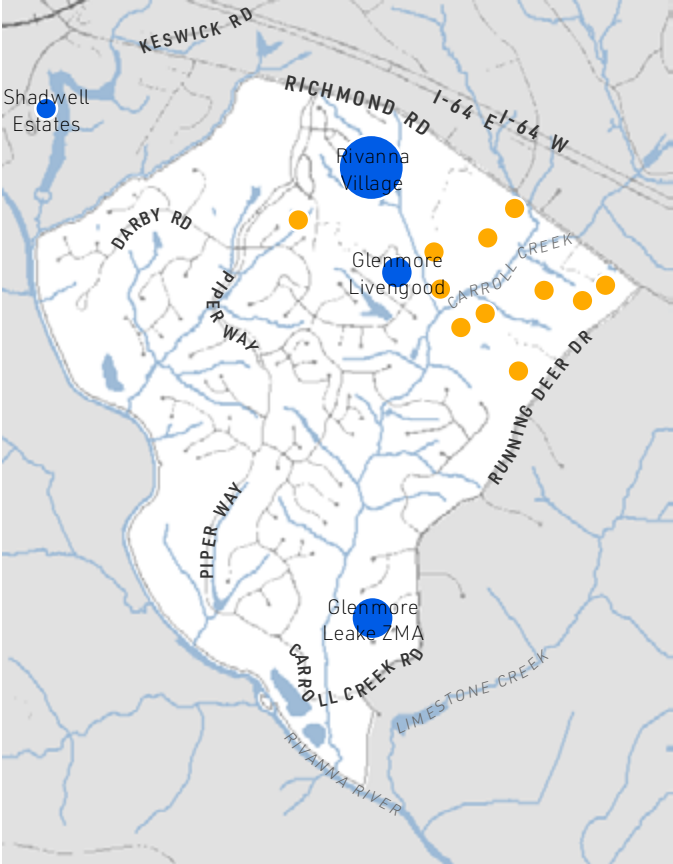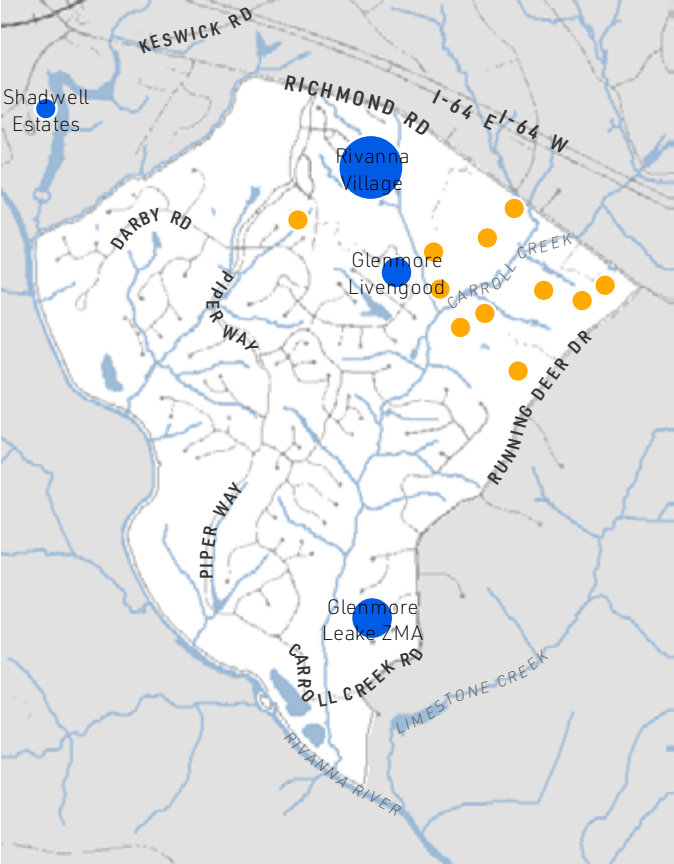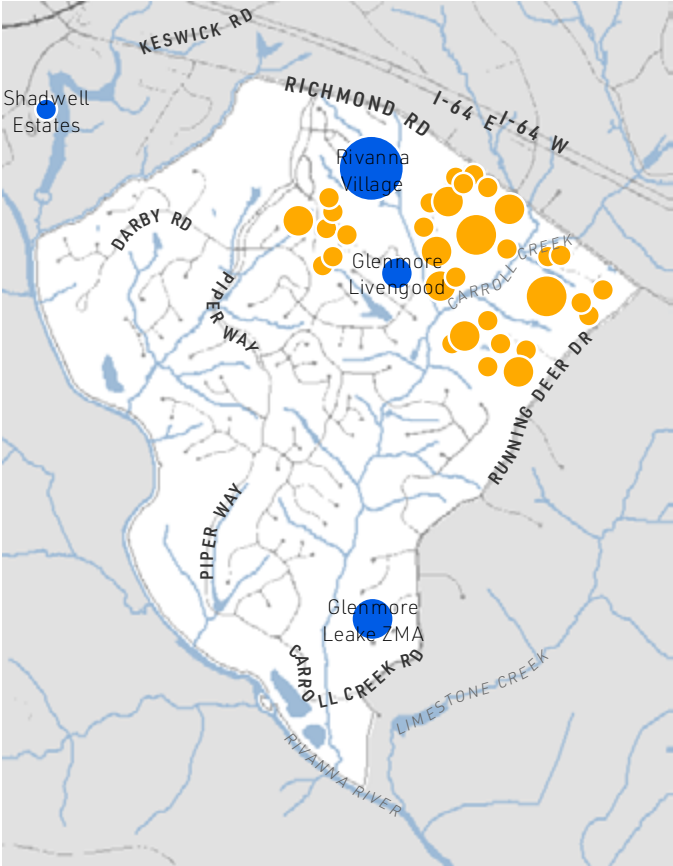
# Appendix A: Estimate Tables

## Zoning (Gross Density) Scenario

| Capacity | 2020 (low) | 2020 (high) | 2030 (low) | 2030 (high) | 2040 (low) | 2040 (high) |
|---|---|---|---|---|---|---|
| Projected Population[1] | 111,039 | | 125,718 | | 138,485 | |
| Current Population[1] | 108,639 | | 108,639 | | 108,639 | |
| Population Growth[2] | 2,400 | | 17,079 | | 29,846 | |
| | | | | | | |
| Residential Units Needed[3] | 945 | | 6,724 | | 11,750 | |
| | | | | | | |
| Units approved, but currently undeveloped -- in the pipeline[4] | 8,843 | | 8,843 | | 8,843 | |
| Units possible via undeveloped properties that are not in the pipeline, but designated for residential use under zoning[5] | 5,035 | 7,604 | 5,035 | 7,604 | 5,035 | 7,604 |
| Sum of units in the pipeline plus units available from undeveloped properties designated for residential use under zoning[6] | 13,878 | 16,447 | 13,878 | 16,447 | 13,878 | 16,447 |
| | | | | | | |
| Units in excess of, or needed to accommodate Population Growth[7] | **12,933** | **15,502** | **7,154** | **9,723** | **2,128** | **4,697** |

1  Source:  Weldon Cooper Center for Public Service: Population Projections for Virginia and its Localities, 2020-2040, published June 2019; Intercensal Estimate for July 1, 2018, published January 28, 2019.
2  Population Growth is determined by subtracting Current Population number from Projected Population number.
3  The number of people divided by 2.54. This multiplier is derived using the average number of persons per unit, by unit type from the 2017 Albemarle County Population/Housing Estimates (Development Areas). Due to the difficulty of projecting future population in group quarters, the multiplier does not attribute any future residents to facilities such as dormitories, detention centers, or institutional senior living. Instead, the population is distributed as if all residents will live in individual dwelling units. It may reflect a greater need for dwelling units as shown in the tables, than will actually occur.
4  The number of units that have been approved through Zoning Map Amendments (ZMA) and Special Use Permits (SP) to-date but have yet to be constructed.
5  The number of units possible under the comprehensive plan, but have yet to be planned for, or constructed. The "low" number represents units that could be built at the low end of the density scale recommended in the comprehensive plan. The "high" number represents units that could be built at the high end of the density scale recommended in the comprehensive plan. Area for future development includes vacant parcels and  portions of parcels of >2 acres with existing development where additional development could occur.
6  The total number of units that may be constructed sometime in the future either due to being previously approved via ZMA or SP, or allowed under the comprehensive plan.
7 The number of residential units in excess of (in black) or needed (in red) for the projected years, if all new units are built in the Development Areas.

## Zoning (Net Density) Scenario

| Capacity | 2020 (low) | 2020 (high) | 2030 (low) | 2030 (high) | 2040 (low) | 2040 (high) |
|---|---|---|---|---|---|---|
| Projected Population[1] | 111,039 | | 125,718 | | 138,485 | |
| Current Population[1] | 108,639 | | 108,639 | | 108,639 | |
| Population Growth[2] | 2,400 | | 17,079 | | 29,846 | |
| | | | | | | |
| Residential Units Needed[3] | 945 | | 6,724 | | 11,750 | |
| | | | | | | |
| Units approved, but currently undeveloped -- in the pipeline[4] | 8,843 | | 8,843 | | 8,843 | |
| Units possible via undeveloped properties that are not in the pipeline, but designated for residential use under zoning[5] | 3,653 | 5,578 | 3,653 | 5,578 | 3,653 | 5,578 |
| Sum of units in the pipeline plus units available from undeveloped properties designated for residential use under zoning[6] | 12,496 | 14,421 | 12,496 | 14,421 | 12,496 | 14,421 |
| | | | | | | |
| Units in excess of, or needed to accommodate Population Growth[7] | **11,551** | **13,476** | **5,772** | **7,697** | **746** | **2,671** |

1  Source:  Weldon Cooper Center for Public Service: Population Projections for Virginia and its Localities, 2020-2040, published June 2019; Intercensal Estimate for July 1, 2018, published January 28, 2019.
2  Population Growth is determined by subtracting Current Population number from Projected Population number.
3  The number of people divided by 2.54. This multiplier is derived using the average number of persons per unit, by unit type from the 2017 Albemarle County Population/Housing Estimates (Development Areas). Due to the difficulty of projecting future population in group quarters, the multiplier does not attribute any future residents to facilities such as dormitories, detention centers, or institutional senior living. Instead, the population is distributed as if all residents will live in individual dwelling units. It may reflect a greater need for dwelling units as shown in the tables, than will actually occur.
4  The number of units that have been approved through Zoning Map Amendments (ZMA) and Special Use Permits (SP) to-date but have yet to be constructed.
5  The number of units possible under the comprehensive plan, but have yet to be planned for, or constructed. The "low" number represents units that could be built at the low end of the density scale recommended in the comprehensive plan. The "high" number represents units that could be built at the high end of the density scale recommended in the comprehensive plan. Area for future development includes vacant parcels and  portions of parcels of >2 acres with existing development where additional development could occur.
6  The total number of units that may be constructed sometime in the future either due to being previously approved via ZMA or SP, or allowed under the comprehensive plan.
7 The number of residential units in excess of (in black) or needed (in red) for the projected years, if all new units are built in the Development Areas.

## Comprehensive Plan Scenario

| Capacity | 2020 (low) | 2020 (high) | 2030 (low) | 2030 (high) | 2040 (low) | 2040 (high) |
|---|---|---|---|---|---|---|
| Projected Population[1] | 111,039 | | 125,718 | | 138,485 | |
| Current Population[1] | 108,639 | | 108,639 | | 108,639 | |
| Population Growth[2] | 2,400 | | 17,079 | | 29,846 | |
| | | | | | | |
| Residential Units Needed[3] | 945 | | 6,724 | | 11,750 | |
| | | | | | | |
| Units approved, but currently undeveloped -- in the pipeline[4] | 8,843 | | 8,843 | | 8,843 | |
| Units possible via undeveloped properties that are not in the pipeline, but designated for residential use under zoning[5] | 4,924 | 15,787 | 4,924 | 15,787 | 4,924 | 15,787 |
| Sum of units in the pipeline plus units available from undeveloped properties designated for residential use under zoning[6] | 13,767 | 24,630 | 13,767 | 24,630 | 13,767 | 24,630 |
| | | | | | | |
| Units in excess of, or needed to accommodate Population Growth[7] | **12,822** | **23,685** | **7,043** | **17,906** | **2,017** | **12,880** |

1 Source: Weldon Cooper Center for Public Service: Population Projections for Virginia and its Localities, 2020-2040, published June 2019; Intercensal Estimate for July 1, 2018, published January 28, 2019.
2 Population Growth is determined by subtracting Current Population number from Projected Population number.
3 The number of people divided by 2.54. This multiplier is derived using the average number of persons per unit, by unit type from the 2017 Albemarle County Population/Housing Estimates (Development Areas). Due to the difficulty of projecting future population in group quarters, the multiplier does not attribute any future residents to facilities such as dormitories, detention centers, or institutional senior living. Instead, the population is distributed as if all residents will live in individual dwelling units. It may reflect a greater need for dwelling units as shown in the tables, than will actually occur.
4 The number of units that have been approved through Zoning Map Amendments (ZMA) and Special Use Permits (SP) to-date but have yet to be constructed.
5 The number of units possible under the comprehensive plan, but have yet to be planned for, or constructed. The "low" number represents units that could be built at the low end of the density scale recommended in the comprehensive plan. The "high" number represents units that could be built at the high end of the density scale recommended in the comprehensive plan. Area for future development includes vacant parcels and portions of parcels of >2 acres with existing development where additional development could occur.
6 The total number of units that may be constructed sometime in the future either due to being previously approved via ZMA or SP, or allowed under the comprehensive plan.
7 The number of residential units in excess of (in black) or needed (in red) for the projected years, if all new units are built in the Development Areas.

## 2019 Albemarle County Population/Housing Estimates

| Comprehensive Plan Area | Single Family Dwelling Units | Single Family Multiplier | Single Family Population | TH, SFA, DUP Dwelling Units | TH, SFA, DUP Multiplier | TH, SFA, DUP Population | Multi-Family and Single-Family Condos Dwelling Units | Multi-Family and Single-Family Condos Multiplier | Multi-Family and Single-Family Condos Population | Mobile Homes Dwelling Units | Mobile Homes Multiplier | Mobile Homes Population | Group Quarters Population | Total Dwelling Units | Total Population |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Neighborhood 1 - Places 29 | 500 | 2.60 | 1,300 | 845 | 2.60 | 2,197 | 2,495 | 1.59 | 3,967 | 124 | 3.07 | 381 | 262 | 3,964 | 8,107 |
| Neighborhood 2 - Places 29 | 1,937 | 2.60 | 5,036 | 1,066 | 2.60 | 2,772 | 1,843 | 1.59 | 2,930 | - | 3.07 | - | 228 | 4,846 | 10,966 |
| Neighborhood 3 - Pantops | 424 | 2.60 | 1,102 | 567 | 2.60 | 1,474 | 1,329 | 1.59 | 2,113 | - | 3.07 | - | 214 | 2,320 | 4,904 |
| Neighborhood 4 | 817 | 2.60 | 2,124 | 424 | 2.60 | 1,102 | 481 | 1.59 | 765 | 4 | 3.07 | 12 | 476 | 1,726 | 4,480 |
| Neighborhood 5 | 916 | 2.60 | 2,382 | 252 | 2.60 | 655 | 1,409 | 1.59 | 2,240 | 407 | 3.07 | 1,249 | - | 2,984 | 6,527 |
| Neighborhood 6 | 434 | 2.60 | 1,128 | 111 | 2.60 | 289 | 479 | 1.59 | 762 | - | 3.07 | - | 5,671 | 1,024 | 7,850 |
| Neighborhood 7 | 415 | 2.60 | 1,079 | 342 | 2.60 | 889 | 1,144 | 1.59 | 1,819 | - | 3.07 | - | 94 | 1,901 | 3,881 |
| Crozet | 2,244 | 2.60 | 5,834 | 668 | 2.60 | 1,737 | 102 | 1.59 | 162 | 132 | 3.07 | 405 | 231 | 3,146 | 8,370 |
| Hollymead - Places 29 | 1,995 | 2.60 | 5,187 | 668 | 2.60 | 1,737 | 300 | 1.59 | 477 | 331 | 3.07 | 1,016 | - | 3,294 | 8,417 |
| Piney Mtn. - Places 29 | 227 | 2.60 | 590 | 436 | 2.60 | 1,134 | - | 1.59 | - | 1 | 3.07 | 3 | - | 664 | 1,727 |
| Village of Rivanna | 861 | 2.60 | 2,239 | 14 | 2.60 | 36 | - | 1.59 | - | 1 | 3.07 | 3 | - | 876 | 2,278 |
| DEV AREA SUBTOTAL | 10,770 | | 28,002 | 5,393 | | 14,022 | 9,582 | | 15,235 | 1,000 | | 3,070 | 7,176 | 26,745 | 67,505 |
| Rural Area 1 | 4,872 | 2.22 | 10,816 | 240 | 2.22 | 533 | 408 | 1.37 | 559 | 169 | 1.76 | 297 | 48 | 5,689 | 12,253 |
| Rural Area 2 | 3,169 | 2.22 | 7,035 | 21 | 2.22 | 47 | - | 1.37 | - | 111 | 1.76 | 195 | 33 | 3,301 | 7,310 |
| Rural Area 3 | 5,511 | 2.22 | 12,234 | 46 | 2.22 | 102 | 69 | 1.37 | 95 | 152 | 1.76 | 268 | 23 | 5,778 | 12,722 |
| Rural Area 4 | 3,703 | 2.22 | 8,221 | 18 | 2.22 | 40 | 16 | 1.37 | 22 | 281 | 1.76 | 495 | - | 4,018 | 8,777 |
| RURAL AREA SUBTOTAL | 17,255 | | 38,306 | 325 | | 722 | 493 | | 675 | 713 | | 1,255 | 104 | 18,786 | 41,062 |
| Town of Scottsville | 198 | 2.60 | 515 | 16 | 2.60 | 42 | 10 | 1.59 | 16 | 2 | 3.07 | 6 | - | 226 | 578 |
| ALBEMARLE COUNTY | 28,223 | | 66,823 | 5,734 | | 14,785 | 10,085 | | 15,927 | 1,715 | | 4,331 | 7,280 | 45,757 | 109,146 |

Notes on Methodology: Due to the varying types of Group Quarters (dormitories, fraternities and sororities, and elderly care facilities) dwelling unit counts were not collected for group quarters, instead population figures were gathered by ascertaining the census of the facility at the time of the estimate. Dwelling unit counts for all other dwelling units types were calculated, by Comprehensive Plan Area, from parcel data in Albemarle County's Development Tracking System, CountyView. Multipliers for these areas were based on a sample of the average number of persons per housing unit type as found in the Census Bureau's 2011-2015 American Community Survey 5-Year Estimates. The average number of persons per housing unit type were grouped together by the Comprehensive Plan Areas with rural characteristics (Rural Areas 1-4), the Comprehensive Plan's remaining designated Development Areas (Neighborhoods 1-7, Crozet, Hollymead, Piney Mountain, and Rivanna), and the Town of Scottsville. The vacancy rate is factored in by including vacant dwelling units when compiling the multiplier. Prepared by the Albemarle County Community Development Department, July 2019.

# Appendix B: Pipeline Projects

## Approved by Special Use Permit / Zoning Map Amendment (since 2001)

| Development Area | Project Name | Maximum Units Approved[1] | Units Built[2] | Unbuilt Units |
|---|---|---|---|---|
| | | A | B | A-B |
| **Neighborhood 1** | Greenfield Terrace | 33 | 0 | 33 |
| | Oakleigh Farm | 22 | 0 | 22 |
| | Stonefield (Albemarle Place) | 800 | 271 | 529 |
| | Woodbrook Station | 8 | 0 | 8 |
| **Neighborhood 2** | Belvedere | 775 | 531 | 244 |
| | The Lofts at Meadow Creek | 65 | 0 | 65 |
| **Pantops** | Cascadia | 330 | 197 | 133 |
| | Fontana Phase 4C | 34 | 0 | 34 |
| | Peter Jefferson Place | 250 | 0 | 250 |
| | Riverside Village | 105 | 65 | 40 |
| **Neighborhood 4** | Avinity | 108 | 105 | 3 |
| | Avinity II | 102 | 9 | 93 |
| | Avon Park II | 32 | 0 | 32 |
| | Spring Hill Village | 100 | 0 | 100 |
| **Neighborhood 5** | Remaining Portion of Biscuit Run | 100 | 0 | 100 |
| | Whittington | 96 | 68 | 28 |
| **Neighborhood 7** | Kenridge | 65 | 57 | 8 |
| | Out of Bounds | 56 | 51 | 5 |
| | White Gables | 76 | 30 | 46 |
| **Crozet** | Blue Ridge Co-housing | 26 | 7 | 19 |
| | Foothills Daily | 180 | 12 | 168 |
| | Old Trail Village | 2,200 | 384 | 1,816 |
| | Wickham Pond I | 107 | 105 | 2 |
| | Wickham Pond II | 106 | 56 | 50 |
| **Hollymead** | Brookhill | 1,550 | 0 | 1,550 |
| | Cedar Hill Mobile Home Park | 32 | 0 | 32 |
| | Hollymead Town Center Area A2 | 1,222 | 0 | 1,222 |
| | Hollymead Town Center Area C | 120 | 82 | 38 |
| | North Pointe | 893 | 0 | 893 |
| | Willow Glen | 234 | 32 | 202 |
| **Piney Mountain** | Briarwood | 661 | 540 | 121 |
| | NGIC Residential Expansion | 120 | 0 | 120 |
| **Village of Rivanna** | Glenmore Livengood | 43 | 29 | 14 |
| | Glenmore Leake | 110 | 31 | 79 |
| | Rivanna Village | 400 | 18 | 382 |

[1] Maximum residential units allowed under approved Zoning Map Amendment or Special Use Permit.
[2] Units within approved project boundaries issued a certificate of occupancy as of July 1, 2019.

## Staff-Adjusted Special Use Permit / Zoning Map Amendment Buildout Estimates

| Project Name | Maximum Units Approved[1] | Adjusted Buildout[2] | Units Built[3] | Unbuilt Units | Adjusted Unbuilt Units | Unused Approved Capacity | Site Plan Approval Information |
|---|---|---|---|---|---|---|---|
| | A | A₁ | B | A-B | A₁-B | A-A₁ | |
| Avinity | 108 | 107 | 105 | 3 | 2 | 1 | Phase 1: 67 units Phases 2-3: 33 units Phase 4: 7 units |
| Cascadia | 330 | 266 | 197 | 133 | 69 | 64 | Blocks 1-3: 120 units Blocks 4-7: 146 units |
| Out of Bounds | 56 | 52 | 51 | 5 | 1 | 4 | Phase 1: 38 units Phase 2: 14 units |
| Riverside Village | 105 | 93 | 65 | 40 | 28 | 12 | Blocks 1: 24 units Blocks 2-4: 45 units Block 5: 24 units |

[1] Maximum residential units allowed under approved Zoning Map Amendment or Special Use Permit.
[2] All final site plans/subdivision plats for this development have been approved as of July 1, 2019 and no land remains to support additional units up to the maximum originally approved by the Zoning Map Amendment or Special Use Permit.
[3] Units within approved project boundaries issued a certificate of occupancy as of July 1, 2019.

## Approved by Site Plan / Subdivision Plat (By-Right)

| Development Area | Project Name | Units Approved[1] | Units Built[2] | Unbuilt Units |
|---|---|---|---|---|
| | | A | B | A-B |
| **Neighborhood 1** | Commonwealth Apartments | 22 | 0 | 22 |
| **Neighborhood 2** | Dunlora Park Ph. 1 | 31 | 14 | 17 |
| | Dunlora Park Ph. 2 | 14 | 0 | 14 |
| | Free State Run | 28 | 26 | 2 |
| | Stonewater | 34 | 33 | 1 |
| **Neighborhood 5** | Brookdale | 96 | 0 | 96 |
| | Wintergreen Farm Ph. 1 | 45 | 37 | 8 |
| | Wintergreen Farm Ph. 2A | 17 | 16 | 1 |
| | Wintergreen Farm Ph. 2B | 10 | 7 | 3 |
| | Wintergreen Farm Ph. 3 | 13 | 9 | 4 |
| **Crozet** | Sparrow Hill | 35 | 7 | 28 |
| | Chesterfield Landing | 25 | 20 | 5 |
| | Chesterfield Landing II | 18 | 11 | 7 |
| | Creekside 3, P 3D | 6 | 4 | 2 |
| | Foothill Crossing Ph. 4 & 5 | 33 | 31 | 2 |
| | St. George Properties | 4 | 1 | 3 |
| | The Vue | 126 | 0 | 126 |
| | Westlake Hills Ph. 2 | 27 | 15 | 12 |
| | Westlake Hills Ph. 1 | 47 | 42 | 5 |
| | Westlake Hills Ph. 3 | 17 | 1 | 16 |
| | Westlake Hills Ph. 4 | 46 | 1 | 45 |

[1] Maximum residential units allowed under approved final site plan or subdivision plat.
[2] Units within approved project boundaries issued a certificate of occupancy as of July 1, 2019.

# Appendix C: Model Documentation

## Purpose

The intention of this document is to explain the methodology, assumptions, benefits and limitations of the new model for assessing capacity analysis in the Comprehensive Plan Areas of Albemarle County.

Capacity analysis refers to the assessment of potential future land supply (or capacity) for industrial, commercial and residential use. This information may be used for many purposes, most importantly in comparing potential land supply to expected land demand based on population growth and economic development projections.

The primary benefits of automating this process are that it lowers the chance of human error and allows for the analysis to be performed on a more regular basis than the current two year timeframe set out in Strategy 4b of the Development Areas Chapter of the Comprehensive Plan.

## Background

The new ArcGIS/R methodology has two obvious components: the **ArcGIS component**, which will select the appropriate land, and the **R component**, which will produce estimates for new development based on this land. Remembering this distinction will help in clarifying how the methodology as a whole works.

There are three different type of capacity analysis that may be performed on land in the county's Development Areas, corresponding to the three criteria upon which land is assumed to develop:

1. Comprehensive Plan (Land Use)

2. Current Zoning (Gross Density)

3. Current Zoning (Net Density)

The type of capacity analysis chosen will affect the ArcGIS component and the R component differently. In the ArcGIS component, it will determine what land is selected (e.g., by excluding land with an Airport District land use, or a Planned Unit Development zoning). The difference between Net Zoning and Gross Zoning is that environmental constraints are removed under Net Zoning capacity analysis and left in for Gross Zoning capacity analysis. Thus, the ArcGIS component will consider constrained land differently depending on the type of capacity analysis chosen (Net Zoning and Gross Zoning are treated in exactly the same way in the R component, however).

Each of the three types assumes that all land queried out based on the model's assumptions will be developed, and that levels of development (measured by **multipliers**, discussed below) correspond either to the land's zoning or land use, in addition to the land's corresponding Development Area. It is in regard to the latter assumption that the type of capacity analysis chosen will affect the R model.

The **multipliers** used in this model are values representing expected development (e.g., the number of dwelling units) per square acreage. These are multiplied by each selected piece of land's acreage to derive an estimated number of units for each parcel. For example, 1 acre of land that is zoned as R1 Residential is expected to yield between 0.97 and 1.45 dwelling units. The overall expected land supply comes from aggregating these values, as illustrated in Figure 1.
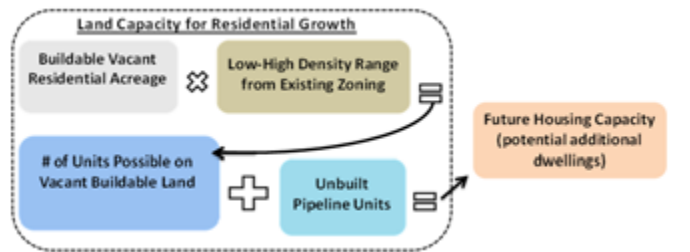


Figure 1. graphical explanation of how the zoning capacity analysis estimates future housing capacity.

## Instructions – ArcGIS

The first step in the capacity analysis procedure is to locate either on ArcMap or ArcCatalog the tool titled **Capacity Analysis Model**. This model is located in the following toolbox:

cob_planning \ GIS-USERS \ NeighborhoodPlanning \ Capacity Analysis \ 2019 \ CapacityAnalysis2019.gdb \ CapacityAnalysis
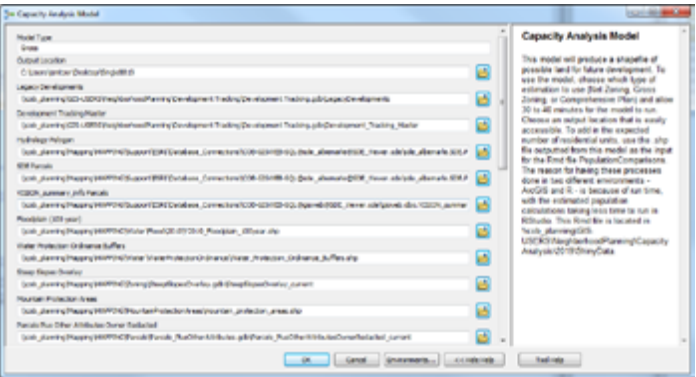


Figure 2. user-interface for Capacity Analysis Model in ArcMap.

Clicking on this tool should open a GUI that resembles Figure 2. It is recommended that the user inspect each parameter input and read its description in order to understand the relevance of each in the model as a whole.

In most instances, the user will only have to alter two of these fields: **Model Type** and **Output Location**. Model Type corresponds to which type of capacity analysis is to be performed.

The **Iterative Capacity Analysis Model** does not require the user to input a Model Type, because it will automatically produce all three model types in the same Output Location file (with an approximate runtime of 104 minutes).

Once the appropriate Model Type and Output Location parameters have been inputted, pressing OK will run the model. Allow around 30 minutes for the model to run to completion (run time is discussed in the Model Components and Conclusion chapters), at which point the output Shapefile(s) should be visible in the specified output location.

The attribute table of this Shapefile will include the following fields (columns): FID, Shape, ZONING, ParcelID, GPIN, PIN_SHORT, Owner, LotSize, PropName, LandValue, LandUseValue, ImprovementsValue, TotalValue, Constraint, Area (referring to Comprehensive Plan area), LandUse, Type, Shape_Length, Shape_Area. The Type field indicates whether the land has been deemed as potentially developable vacant land, infill for residential or industrial land, or manually added land. These distinctions are explained in the Model Components section of this paper.

## Instructions - R

The second step in the capacity analysis procedure is to open the **PopulationComparisons.Rmd** file in RStudio. This file is located in the following folder:

cob_planning \ GIS-USERS \ NeighborhoodPlanning \ Capacity Analysis \ 2019 \ RComponent

Above the code should be a Run Document button. By clicking on this, an HTML page should appear that resembles Figure 3, listing instructions. One may choose to open this in their browser by clicking on the "Open in Browser" button located at the top of this page.



Figure 3. user-interface for instructions

The page contains four tabs: Instructions, Assumptions, Single, and Iterative. The Instructions page is the default page and provides basic instructions for how to use the page. The Assumptions tab lists the assumptions made in the R component of the model, which may be altered by the user (these assumptions are explained in the model components section of this paper). The Single and Iterative tabs correspond to which of the ArcGIS methods were chosen, with the Single tab allowing the user to run the model on one Shapefile and the Iterative tab allowing the user to run the model on three Shapefiles.

Like with the ArcGIS model, the user should input the output location for the final capacity analysis data as well (Caution: R requires that paths use forward-slash separators, whereas Windows uses back-slash separators, which will mean that the outputted data from R will show up in the user's R working directory if not inputted correctly).

In the "Input Shapefile:" textbox, type in the path to the .shp file produced by the **Capacity Analysis Model** (normally titled **Gross.shp**, **Net.shp**, or **LandUse.shp**)[1]. Finally, select from the "Projection:" dropdown list the corresponding capacity analysis type to be performed on the Shapefile. Allow for the analysis to run and the page should eventually resemble Figure 4.

Figure 4. results of the Single page.

At this point, the user can choose to export the data as a table or as a Shapefile, including columns showing high and low estimates of residential units. The raw data table includes more data on non-residential units as well, which may be joined with the Shapefile in order visualize expected Warehousing, Industrial land, Open Space, etc.

In addition to the chart and table located at the bottom of the page, the user can view the expected residential units in the generated maps (one representing the Low expected count, the other representing the High expected count). Hovering the cursor over a parcel will show the expected number of dwelling units produced there.

To make any alterations to the final results (e.g., removing certain parcels), it is recommended that this be done in ArcMap using the downloaded Shapefile.
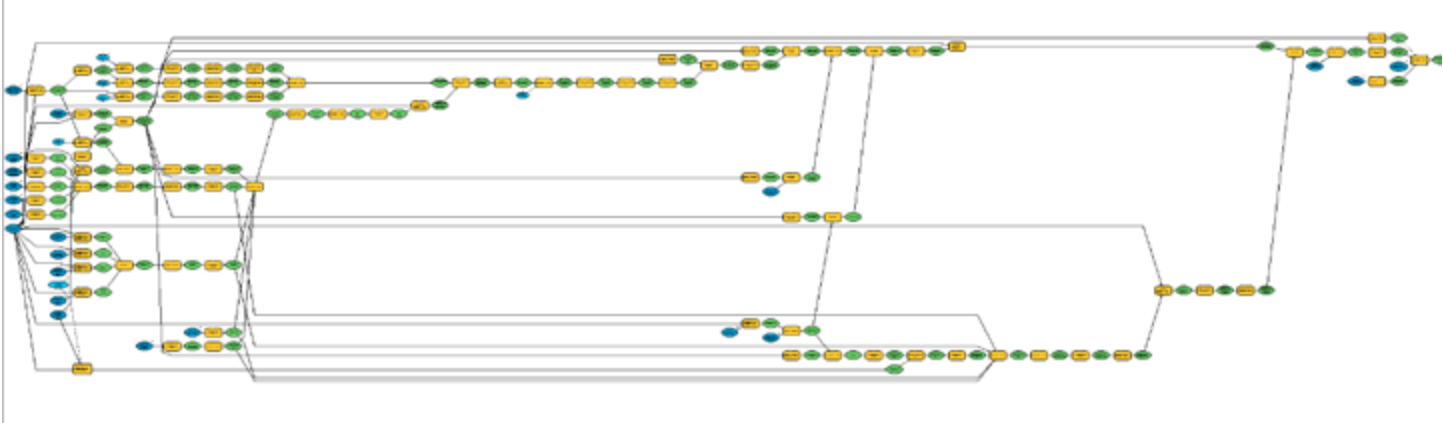


Figure 5. Model Builder layout of the ArcGIS model.

# Model Components – ArcGIS

The model used to query out possible land for development was constructed using Model Builder, an ArcGIS platform for linking tools and creating automated processes. Figure 5 shows the layout of the **Capacity Analysis Model**.

The model first applies the Union tool to multiple feature classes in order to find, for each parcel, which portions have certain zoning designations, land use designations, environmental constraints, and parcel attributes. The model first creates a single feature class that represents all environmental constraints in the county in a single column. Another similar union is performed to create a feature class storing all land uses for the Development Areas. With these two initial unions executed, a final union brings together all data that will be included in the final Shapefile (e.g., Owner, LandValue, CPA, etc.).

To improve the runtime, certain assumptions are made so that this union can take in the least amount of information needed. To do this, land is initially removed if it is in non-Development Areas, and fields are dissolved so that the union does not consider unnecessary information. The most presumptive query at this point focuses on removing land that is assumed to not develop based on its taxation status. The query statement used for this (which requires an initial join with tax information) is:

TaxType = 4 OR (StateCode = 79 AND TaxType = 1) OR (StateCode IN (71,72,73,74,75,76,77,78)) OR TaxType = 5

This SQL expression is used to remove regulated utility companies, regional government buildings, religious buildings, and other organizations that are not likely to be developed/redeveloped.

Now with a broad collection of land across the county, the next step further queries out land in order to find areas that could be classified as one of three types (listed in the Type column):

1. Vacant land
2. Single-Family Residential (SFR) infill, or
3. Commercial/Industrial (CI) redevelopment

As mentioned in the conclusion section of this document, queries are run in tables and then joined to Shapefiles afterwards in order to reduce overall runtime. This is the approach taken to find Vacant, SFR infill and CI redevelopment land. From the **gisweb.dbo. VISION_summary_info** table, land is queried out based on the following SQL expressions:

1. Vacant land

ParcelLevelUseCode IN (200, 250,601,603) OR ((ParcelLevelUseCode IN (210, 220) OR StateCode IN ('4A','4B')) AND ImprovementsValue < 25000)

2. Single-Family Residential (SFR) infill

GPIN NOT IN (SELECT GPIN FROM VacantLand) AND ParcelLevelUseCode IN (210, 220) AND ImprovementsValue > 25,000

3. Commercial/Industrial (CI) redevelopment

GPIN NOT IN (SELECT GPIN FROM VacantLand) AND LandValue > 0 AND StateCode IN ('4A', '4B')

Once the Grid Parcel Identification Number (GPINs) associated with these queries have been found, they are joined to the large Shapefile already created. Thus, in the attribute table of this Shapefile, three columns have been added indicating whether the land is classified as Vacant, SFR infill, CI redevelopment, or none of the three. The model removes all land that is not one of these three types.

The next few tools in the model rely on the **Model Type** input parameter[2]. The model will select the appropriate row from the **ModelExpressions** table (located in the same geodatabase as the model itself) corresponding to which of the three capacity analysis methodologies are inputted, and extract the following information: the name of the capacity analysis method, for the name of the final Shapefile; the types of land use or zoning to be removed; and the types of environmental constraints to be removed. In addition, for technical reasons this step in the model is also used as a precondition for earlier processes in order to jumpstart the model into removing joins and starting fresh every time a new capacity analysis methodology is inputted.

The land has now been almost completely stripped of undevelopable land (with two exceptions to be run at the end). The next step is to make manually altered adjustments to the model by selecting parcels of land to be added or removed that had not been done correctly by the model, based on exceptional circumstances or qualitative analysis.

To have parcels manually added or removed, the **Parcel Modifications** table, again located in the same geodatabase as the model, is used. The three columns used in the model are GPIN, Action and Note, with the Note column being used to indicate that the parcel has been modified through other means (by being added or removed at another step in the process[3]). The GPIN column indicates the GPIN of the parcel and the Action column lists either "add" or "remove". If a row has "remove" as its Action field value, the GPIN of that row is matched to the GPIN of the parcels feature class and is erased from the Shapefile of developable land. If a row has "add" as its Action field value, it is matched to the parcels feature class and modified to all of the columns included in the developable land Shapefile through the Union tool (with a much lower run time than the previous Unions tools). In the Type column, these "add" parcels are given the value "Manually Added". Once the "add" parcels are properly formatted, they are added to the developable land Shapefile through the Merge tool.

The final two steps referenced earlier are applied to this merged Shapefile. They are both uses of the Erase tool used to remove two kinds of land that are not to be included. The two land types are:

1. **Named/Platted Subdivisions** – These are developments (included in the Shapefile **LegacyDevelopments**) that are already built out and will not be redeveloped due to the presence of owners' associations and CC&R.

2. **Development Pipeline** – This is land that is already approved for new projects and will be counted in the Comprehensive Plan separately. A query is applied to this layer before being erased:

use <> 'Rural' AND pipeline IN ('Parent', 'Approved', 'Under Construction', 'Built')

# Model Components – R

The ArcGIS model saves the Shapefile as: **%Output Location%\%ModelType%.shp**, which uses inline variables to save the file in the correct location and with the same name as the capacity analysis methodology used. This file is then used in R as the "Input Shapefile". Once the file has been read in R, the High and Low values are added using a loop that goes through each row in the Shapefile.

The script first verifies that the CPA and land use or zoning are valid and, based on these two variables, selects from either **Densities** or **DensitiesZoning** (both tables located in the same folder as the Rmd file) seven rows associated with these two values[4]. The seven rows correspond to seven kinds of land classification – Residential, Retail/Service, Office, R&D/Flex, Industrial, Warehousing & Dist., and Open Space – along with columns indicating the percentage of land that will be covered by each of these seven classifications, as well as their multipliers. For example, if the selected row from the Shapefile has "Pantops" as its CPA and "Commercial Mixed Use" as its land use, the seven rows selected from the table of densities are shown in Table 1.

| Row | Subarea | Use Type | Land Use | Mix | Low | High | Unit |
|-----|---------|----------|----------|-----|-----|------|------|
| 92 | Pantops | Residential | Commercial Mixed Use | 0.333 | 6.01 | 34 | du/ac |
| 93 | Pantops | Retail/Service | Commercial Mixed Use | 0.250 | 5000 | 13000 | GFA/ac |
| 94 | Pantops | Office | Commercial Mixed Use | 0.167 | 2000 | 15000 | GFA/ac |
| 95 | Pantops | R&D/Flex | Commercial Mixed Use | 0.100 | 5000 | 15000 | GFA/ac |
| 96 | Pantops | Industrial | Commercial Mixed Use | 0.050 | 2500 | 12500 | GFA/ac |
| 97 | Pantops | Warehousing & Dist. | Commercial Mixed Use | 0.0500000 | 1000 | 12500 | GFA/ac |
| 98 | Pantops | Open Space | Commercial Mixed Use | 0.0500000 | 0.00 | 0 | % |

Table 1. The multipliers associated with Commercial Mixed Use land in Pantops, from the Densities table.

In this example, the land in this row is assumed to become 33.3% residential, 25% retail/service, etc., and for each of these seven use types, a multiplier is included for the dwelling units per acre or ground floor area (GFA)[5] per acre.

Corresponding to each row in the Shapefile, the new table will contain the following data:

| ID | Area | Zoning | ...[1] | Mix | Low | High | Unit | Type | Check |
|----|------|--------|-----|-----|-----|------|------|------|-------|
| 1 | Crozet | C1 Commercial | ... | 0.2207 | 3 | 4 | du/ac | Vacant | True |
| 1 | Crozet | C1 Commercial | ... | 0.3679 | 1839 | 4782 | GFA/ac | Vacant | True |
| 1 | Crozet | C1 Commercial | ... | 0.3679 | 735 | 5518 | GFA/ac | Vacant | True |
| 1 | Crozet | C1 Commercial | ... | 0.2943 | 1471 | 4414 | GFA/ac | Vacant | True |
| 1 | Crozet | C1 Commercial | ... | 0.1472 | 367 | 1839 | GFA/ac | Vacant | True |
| 1 | Crozet | C1 Commercial | ... | 0.0736 | 73 | 919 | GFA/ac | Vacant | True |
| 1 | Crozet | C1 Commercial | ... | | 0 | 0 | % | Vacant | True |

Table 2. A sample extract from the final table in the R code.
[1] The columns not displayed here are simply repeated information from the table on the previous page.

In this example, the land from the Shapefile had "Crozet" as its CPA and is zoned as "C1 Commercial". The Mix column indicates how many acres are designated for each use type (the same seven types shown in Table 1) and the Low and High columns represent the product of the value in the Mix column and the multiplier values from the density tables, rounded down. The units of these values and the type of land is stores in order to perform analytics on the data afterwards. Finally, the Check column is added to perform a final query on the data to further address assumptions over the kind of land that will develop.

The Check column verifies the following assumptions (returning "False" if any criteria is not met, and "True" otherwise). These assumptions are listed on the Assumptions tab of the R interface, shown in Figure 5, giving the user the option to alter any of the following values as well as the ability to download a .txt file listing the assumptions in order to keep this information along with the exported Shapefiles.

1. That for SFR infill land, the **amount of land** is in excess of $\dfrac{2.5}{\text{Low multiplier (du/ac)}}$.

This assumption verifies that there is an adequate amount of land by checking that the more conservative estimate of growth will only occur with at least 2.5 acres of land available.

2. That the **TotalValue** ( = LandValue + LandUseValue + ImprovementsValue) associated with all CI redevelopment land is less than the following amounts depending on CPA:

   • Northern Urban Neighborhoods: $20/sf
   • Hollymead/Piney Mountain: $15/sf
   • Pantops: $15/sf
   • Southern Urban  Neighborhoods : $12/sf
   • Western Urban  Neighborhoods : $12/sf
   • Crozet: $13/sf

This assumption verifies that the strike price will be affordable enough for development.

3. That the **Low** value for CI redevelopment land is at least 3.

This assumption verifies that the land has enough potential for development to be pursued.

4. That the **total area** for CI redevelopment land is at least 0.249 acres.

This assumption verifies that the land is large enough to have potential for redevelopment.The following assumption is also used at this point in the R script, but does not factor into the value of the Check column directly:

5. For SFR infill land, the **number of dwelling units built** will be equal to the amount of residential land multiplied by the multipliers ( minus 1.

This assumption verifies that the existing dwelling unit on the land is not counted.

Finally, the R script subsets the data in this final table by only keeping rows that have a "True" check value. To produce the final Shapefile that may be downloaded from the R interface, the residential Low and High values from this table are right-joined to the Shapefile that was produced by the ArcGIS model. This new Shapefile, now including the high and low estimates for expected dwelling units, may then be downloaded in the R interface, along with a table of summary statistics at the CPA level.



Figure 5. Assumptions page.

# Conclusion – Benefits

**Faster Computation Speed, Allowing for More Frequent Analysis**

By automating the processes involved in capacity analysis through ArcGIS Model Builder and R, the values produced will no longer require aggregating data in Excel and calculated on a case-by-case basis. The process can be run in the background and completed in a relatively short amount of time.

**Greater Objectivity and Transparency in the Process**

The underlying assumptions in making projections of future development are accessible, and figures that had traditionally been presented in aggregated and tabulated forms may now be more easily shared in more engaging and micro-level formats. Additionally, the risk of human error is reduced by requiring little human input in the process.

**Allows for assumptions to be tested**

By accelerating the speed with which projections are made, planners and others can alter the assumptions made in predicting development and see the effects of such decisions.

## Conclusion – Limitations

**The model requires working within ArcGIS and R, rather than a single environment.**

Through converting the entire model to a Python script, the two components may be integrated. Relevant Python code for the R component is included in the capacity analysis folder, and the current ArcGIS model may be exported as a Python script in the ArcGIS Model Builder environment.
   The reason this avenue was not pursued initially is because of problems with Pandas and other packages not working in ArcGIS at the time of the model's creation. This avenue should be pursued once relevant Python updates have been made to the county's GIS system. Potential concerns that should be considered before pursuing this include the lack of a clear user-interface, the increased complexity making errors harder to trace, and an increased difficulty in altering the model in the future.

**The current total runtime is around one hour, making comparisons between different criteria difficult to perform in a quick manner.**

Many techniques were employed throughout building the model to ensure that runtime was being minimized, such as evaluating SQL statements on tables rather than feature classes, but many tools appeared unavoidably lengthy. The Python script "Model Speed Translator", located in the Capacity Analysis folder, may be used to assess the speed of each tool in the ArcGIS model, with current results presented in Figure 6.

This has been used as a guideline for finding possible areas of improvement in the model as a whole. The use of Union in particular can be very time consuming, with the two main uses of Union accounting for over twenty percent of total run time. The use of Union in these instances follows the methodology of the DevelopmentConstraints.py file used for Planning and Economic Development requests, and improvements to the runtime of these tools (including dissolving the inputs) should be a high concern. Four tools alone account for over forty percent of total run time, as highlighted in Figure 6.

Endnotes
1       In the case of the Iterative Capacity Analysis Model, input the path to the folder containing all three .shp files.
2       For the Iterative Capacity Analysis Model, the model runs through the three different types automatically.
3       For example, parcels may be added to the LegacyDevelopments layer discussed later.
4       In the case of the zoning densities, the CPA does not factor in the multiplier values – only the zoning is relevant.
5       This multiplier corresponds to how many square feet per acre will be covered by buildings intended for use types.



Tool Runtime for Iterative Capacity Analysis Model

Figure 6. Tool runtime in ArcGIS Model.
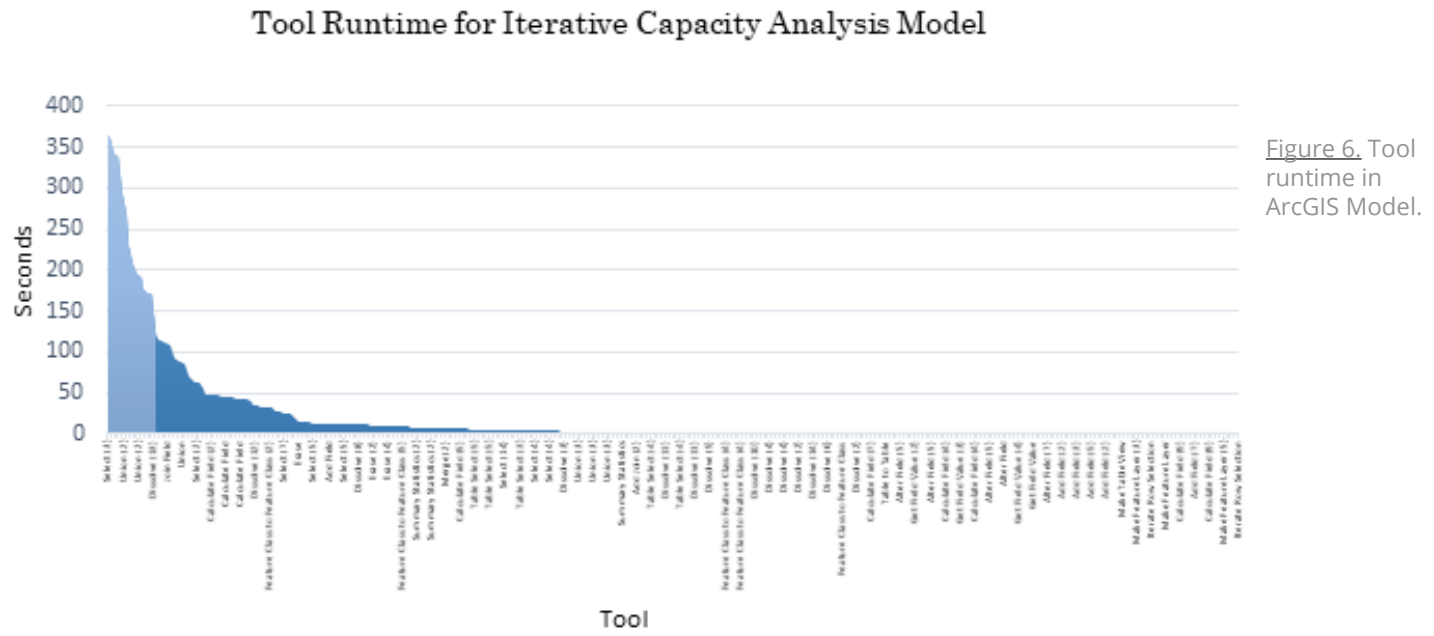
# Appendix D: Density & Mix Tables

| Subarea | Comprehensive Plan Land Use Designation | Mix | Low | High | Unit |
|---|---|---|---|---|---|
| Crozet | Downtown | 0.25 | 6.01 | 36 | du/ac |
| Crozet | Light Industrial | 0 | 0 | 0 | du/ac |
| Crozet | Mixed Use | 0.5 | 6.01 | 18 | du/ac |
| Crozet | Neighborhood Density Residential | 0.98 | 3 | 6 | du/ac |
| Crozet | Neighborhood Density Residential - Low | 1 | 0 | 2 | du/ac |
| Crozet | Urban Density Residential | 0.9 | 6.01 | 12 | du/ac |
| Hollymead/Piney Mountain | Commercial Mixed Use | 0.333 | 6.01 | 34 | du/ac |
| Hollymead/Piney Mountain | Heavy Industrial | 0 | 0 | 0 | du/ac |
| Hollymead/Piney Mountain | Light Industrial | 0 | 0 | 0 | du/ac |
| Hollymead/Piney Mountain | Neighborhood Density Residential | 0.98 | 3 | 6 | du/ac |
| Hollymead/Piney Mountain | P29 Neighborhood Service Center | 0.5 | 3 | 20 | du/ac |
| Hollymead/Piney Mountain | Office / R&D / Flex / Light Industrial | 0.1 | 6.01 | 34 | du/ac |
| Hollymead/Piney Mountain | P29 Urban Mixed Use (not in Centers) & Community Center | 0.5 | 6.01 | 34 | du/ac |
| Hollymead/Piney Mountain | P29 Destination Center & Uptown Center | 0.4 | 6.01 | 50 | du/ac |
| Hollymead/Piney Mountain | Urban Density Residential | 0.9 | 6.01 | 34 | du/ac |
| Northern Urban Nhoods | Commercial Mixed Use | 0.333 | 6.01 | 34 | du/ac |
| Northern Urban Nhoods | Neighborhood Density Residential | 0.98 | 3 | 6 | du/ac |
| Northern Urban Nhoods | P29 Neighborhood Service Center | 0.5 | 3 | 20 | du/ac |
| Northern Urban Nhoods | Office / R&D / Flex / Light Industrial | 0.1 | 6.01 | 34 | du/ac |
| Northern Urban Nhoods | P29 Urban Mixed Use (not in Centers) & Community Center | 0.5 | 6.01 | 34 | du/ac |
| Northern Urban Nhoods | Regional Center (Rio29 Small Area Plan) | 0.4 | 20 | 60 | du/ac |
| Northern Urban Nhoods | Urban Density Residential | 0.9 | 6.01 | 34 | du/ac |
| Pantops | Commercial Mixed Use | 0.333 | 6.01 | 34 | du/ac |
| Pantops | Neighborhood Density Residential | 0.98 | 3 | 6 | du/ac |
| Pantops | Office / R&D / Flex / Light Industrial | 0.1 | 6.01 | 34 | du/ac |
| Pantops | Urban Center (Community Mixed Use) | 0.4 | 6.01 | 50 | du/ac |
| Pantops | Urban Density Residential | 0.9 | 6.01 | 34 | du/ac |
| Southern Urban Nhoods | Light Industrial | 0 | 0 | 0 | du/ac |
| Southern Urban Nhoods | Neighborhood Density Residential | 0.98 | 3 | 6 | du/ac |
| Southern Urban Nhoods | Office / R&D / Flex / Light Industrial | 0.1 | 6.01 | 34 | du/ac |
| Southern Urban Nhoods | Community Mixed Use | 0.5 | 6.01 | 34 | du/ac |
| Southern Urban Nhoods | Regional Mixed Use | 0.25 | 6.01 | 34 | du/ac |
| Southern Urban Nhoods | Urban Density Residential | 0.9 | 6.01 | 34 | du/ac |
| Village of Rivanna | Neighborhood Density Residential | 0.98 | 3 | 3 | du/ac |
| Village of Rivanna | Neighborhood Density Residential - Low | 1 | 1 | 2 | du/ac |
| Western Urban Nhoods | Neighborhood Density Residential | 0.98 | 3 | 6 | du/ac |
| Western Urban Nhoods | Neighborhood Mixed Use | 0.5 | 6.01 | 18 | du/ac |
| Western Urban Nhoods | Office / R&D / Flex / Light Industrial | 0.1 | 6.01 | 34 | du/ac |
| Western Urban Nhoods | Community Mixed Use | 0.5 | 6.01 | 34 | du/ac |
| Western Urban Nhoods | Urban Density Residential | 0.9 | 6.01 | 34 | du/ac |

# Density & Mix Tables (continued - Zoning)

| Zoning | Mix | Low | High | Unit |
|---|---|---|---|---|
| R15 Residential | 1 | 15 | 20 | du/ac |
| R10 Residential | 1 | 10 | 15 | du/ac |
| R6 Residential | 1 | 6 | 9 | du/ac |
| R4 Residential | 1 | 4 | 6 | du/ac |
| R2 Residential | 1 | 2 | 3 | du/ac |
| R1 Residential | 1 | 0.97 | 1.45 | du/ac |
| Downtown Crozet District | 0.25 | 18 | 36 | du/ac |
| Planned District Mixed Commercial | 0.15 | 15 | 20 | du/ac |
| Planned District Shopping Center | 0 | 0 | 0 | du/ac |
| Highway Commercial | 0.1 | 15 | 20 | du/ac |
| Commercial Office | 0.15 | 15 | 20 | du/ac |
| C1 Commercial | 0.15 | 15 | 20 | du/ac |
| Heavy Industrial | 0 | 0 | 0 | du/ac |
| Light Industrial | 0 | 0 | 0 | du/ac |
| Rural Areas | N/A | manually calculated | manually calculated | du |