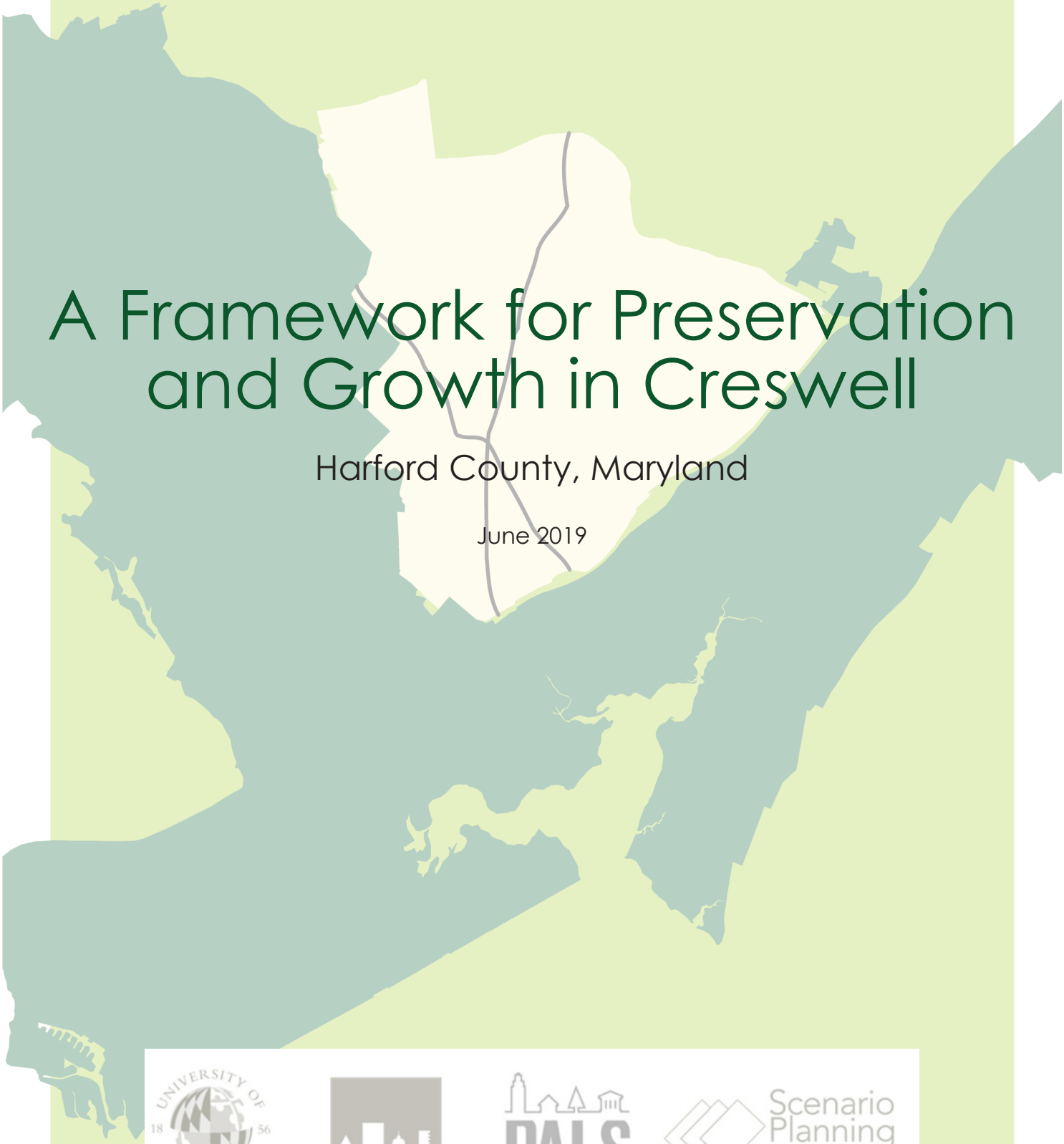
A Framework for Preservation and Growth in Creswell

Harford County, Maryland

June 2019



A Framework Plan for Preservation and Growth in Creswell

Harford County, Maryland

A study prepared for the Harford County Department of Planning and Zoning by students and faculty in a Scenario Planning Workshop, a graduate course in the Urban Studies and Planning Program at the University of Maryland, College Park.

June 2019

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The Partnership for Action Learning in Sustainability (PALS)

This study and report were executed under the PALS umbrella as part of a yearlong collaboration with Harford County during 2018/2019. PALS is administered by the National Center for Smart Growth at the University of Maryland, College Park. The campus-wide initiative harnesses the expertise of faculty and the ingenuity of students to help Maryland communities become more environmentally, economically, and socially sustainable. PALS facilitates innovative, affordable assistance for local governments by providing opportunities for University of Maryland graduate and undergraduate students to solve real-world problems in a classroom setting.

The variety of disciplines collaborating through PALS allows partnering jurisdictions to address a wide range of challenges. Faculty incorporate a jurisdiction's specific issues and objectives into their course, while students apply academic concepts and inventive thinking to complete these projects. As an award-winning program, PALS is recognized throughout Maryland and across the country for delivering high-quality, actionable solutions that are focused on sustainability.

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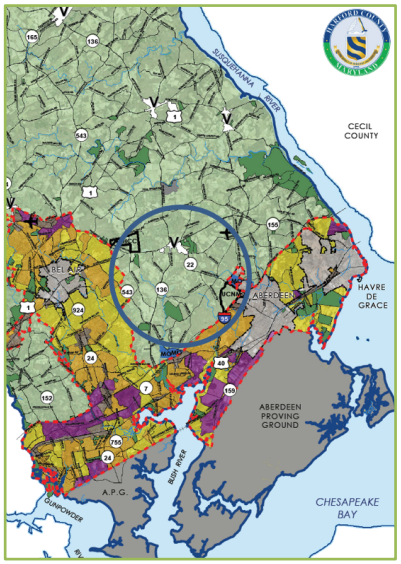
Executive Summary

In 2016, the Harford County Department of Planning and Zoning published their intention to study current and future needs in the Creswell area. Through extensive research and spatial analysis, this report—a first step toward that study—proposes a framework for preservation and growth that aligns with the County's long-term goals for agriculture, traffic, infrastructure, the environment, and economic development.

Scenario Planning Workshop

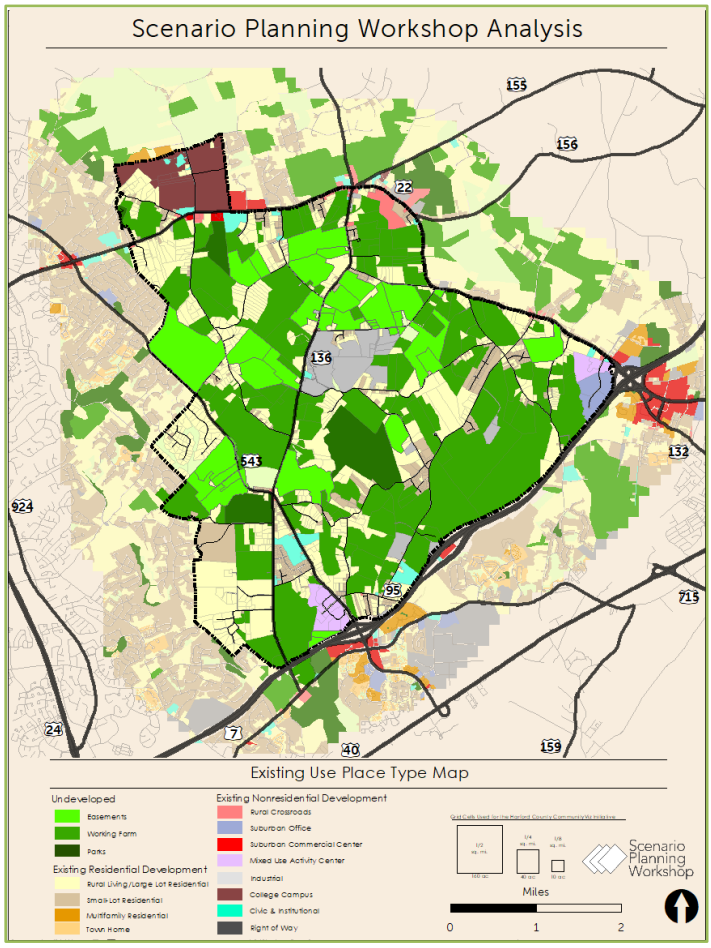
Executive Summary

Figure ES-1. Creswell Area



Creswell is a 13,000-acre area (approximately 20 square miles) in Harford County that lies between the arms of the county's longstanding Development Envelope (DE). The Development Envelope forms an inverted 'T' that connects Bel Air to I-95 via the MD Route 24 corridor to I-95, and then runs south of I-95 along the length of the county. The Creswell area lies in the southwestern corner of this T, between Bel Air and Aberdeen (Figure ES-1). Creswell is a fine-grained mixture of farms, large lot homes, forested areas, and parks, as Figure ES-2 shows.

Figure ES-2. Existing Place Types



This area was designated as a study area in *HarfordNEXT*, the county's 2016 Masterplan. The proposed study was to focus on current and future infrastructure needs in Creswell, especially for transportation. *HarfordNEXT* calls for a comprehensive analysis of facilities needed to serve the area and asserts that future development must be compatible with the preservation of Creswell's rural character.

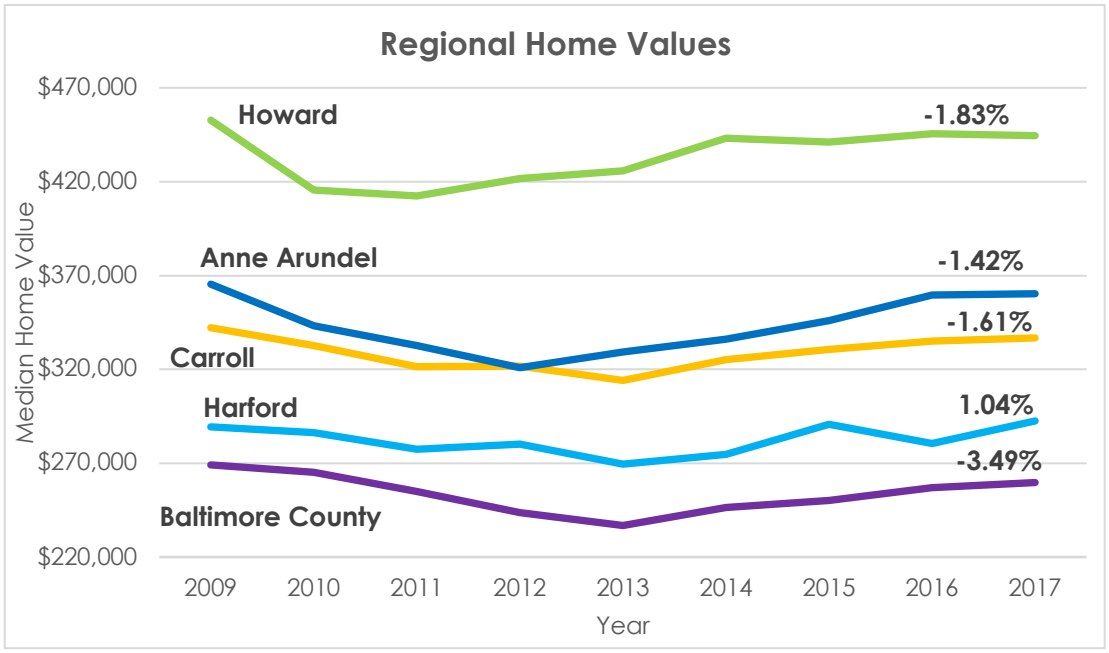
This mandate is the basis for the present study, conducted under the auspices of the University of Maryland's PALS program in the spring semester of 2019. The *HarfordNEXT*

language about the Creswell study is also the basis for five of this report's goals: **Conserve Farming; Protect the Environment; Preserve Rural Character; Minimize Traffic Impacts; Maintain Adequate Infrastructure.** In addition to these goals, the team added two others: **Provide Additional Housing; Ensure Positive Fiscal Impact.** Our choice of adding the housing goal is detailed below. We assumed that positive fiscal impact is always a goal, but one that needed testing.

Harford County, like most of Maryland's central counties, adopted their rural zoning and rural–urban boundary in the late 1970s. Like the rest of those counties, Harford has not much expanded these boundaries since. However, a growing Washington-Baltimore region, 40 years of ongoing housing demand, and a self-limited housing supply has, predictably, produced accelerating housing costs. Harford County estimates that its present supply of residential projects and land will accommodate about 14,000 more homes—enough to provide housing for the next 14 years or so at the county's assumed rate of housing growth. The other central Maryland counties have even less capacity. Baltimore County has 13 years of housing supply left. Anne Arundel and Howard have five and six years left, respectively, and Montgomery has 17 years to go.

The remaining housing capacity in the above listing refers to building on "greenfield" sites as opposed to new growth through redevelopment. But urban redevelopment requires market pressures sufficient to justify this slow and costly route to provide more housing. Counties that are part of the dynamic job growth of the DC region, like Montgomery, Anne Arundel and Howard have stronger prospects of being able to support redevelopment than those like Harford, northeast of the slow-growing Baltimore region. But even in the DC related counties, redevelopment has not yet taken off. This study therefore discounts it as a source of significant future growth, especially since Harford's housing prices are still significantly lower than the other counties facing buildout, as Figure ES-3 shows. This same figure, however, also, also shows Harford as being the only county with increasing housing values, suggesting the future escalation of county housing costs.

Figure ES-3. Regional Home Values



Source: ACS 1-year estimates for median home values collected for each jurisdiction.

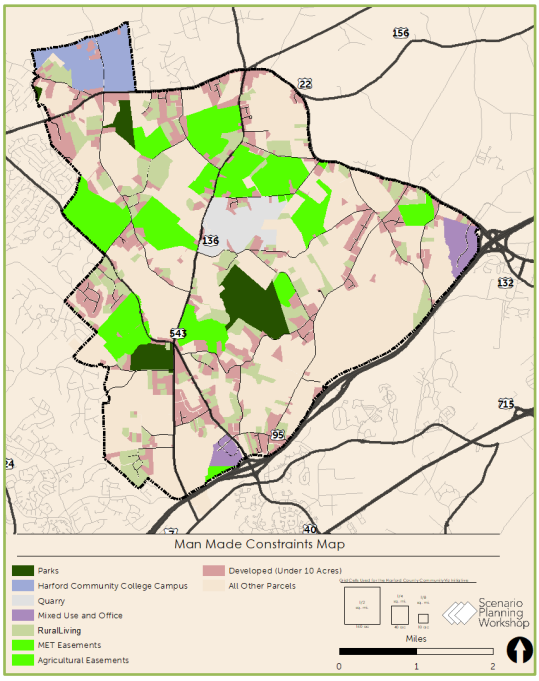
Of course, the county could simply choose "not to grow" in any significant way. We tested the impacts of this "trend" or "business as usual" scenario in Creswell. We found that because of general background traffic growth, congestion becomes considerably worse by 2040, even with planned improvements; schools reach their student capacity limits and require either expansion or addition; and the Fire and Emergency Medical Services available to Creswell residents, already below the County's goal for response times, will continue to be insufficient. Rural character, a prized attribute of Creswell, will be much compromised by current trends. Further, while a fiscal surplus would be realized by building out the remaining housing capacity at the current zoning of 750 homes in Creswell, this surplus would be relatively small (1% of the current total county budget) and not enough to make a significant difference to county levels of service overall. These findings are important because they highlight current and future deficiencies that need to be addressed, as per the Creswell study mandate. They were also sufficiently negative enough to persuade us to continue with an examination of housing growth options.

The County could add housing in various ways. One obvious option is to add more homes within the Development Envelope rather than expand it into Creswell or some other area. We tested this option by identifying all vacant or

underdeveloped parcels in the DE and assuming that they would be upzoned to the next denser zoning district. We discovered that this strategy could yield about 5,000 new homes at best—not enough to put a dent in the long-term housing need identified. Moreover, this strategy would require additional and costly sewer and water capacity expansions, and would stress schools and other services, not to mention the difficulties inherent in gaining community support for densifying parcels in neighborhoods that are largely low-density, single-family R-1 districts.

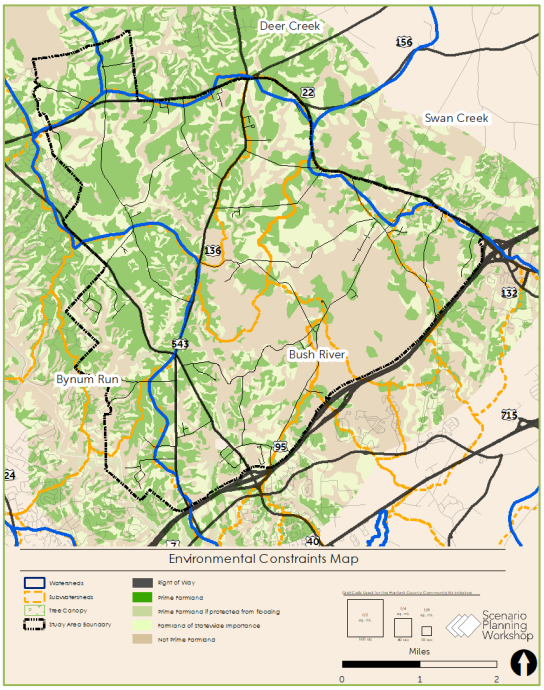
Another expansion option might be along the Route 152 corridor. The County's response to our suggestion was that this was not a feasible option. Accordingly, we focused on the Creswell study area, per the *HarfordNEXT* mandate, and brainstormed five different expansion options and assessed them against the eight goals listed earlier. Only one of our expansion options—which we called Selective Transfer of Development Rights—fared well enough in this evaluation to warrant further examination.

Figure ES-4. Man Made Constraints



We first analyzed man-made and natural constraints and opportunities in the region. Figure ES-4 summarizes the man-made constraints. These include a patchwork of permanent easements on farmland, large parks, existing rural residential subdivisions, the large quarry area in the center of the area, and some nonresidential districts at the two I-95 interchanges. These constraints left a very fragmented area available to consider for development. Compounding these man-made constraints are a range of important environmental constraints. Summarized in Figure ES-4, these cover various kinds of farmland, including prime and nonprime farming soils, forested areas, and watershed boundaries, which are important for sewer planning and should, ideally, stay within gravity-flow sewersheds. Additionally, the majority of landscape elements which are most critical to the much-valued rural character of Creswell cover the majority of the central part of the study area. The environmental constraints map also breaks up the area into smaller subareas, contributing additional fragmentation.

Figure ES-5. Environmental Constraints



This fracturing of Creswell made us look more closely at the development opportunities represented by the limited number of remaining large parcels that were neither in easements nor in the central core of the area. We focused on large parcels of over 100 acres because they offer the best opportunities for integrated, environmentally sensitive developments. These larger blocks can foster continuous green infrastructure, and provide for the large-scale amenities and needs that many small, noncontiguous lots cannot.

Figure ES-6. Land Portfolio

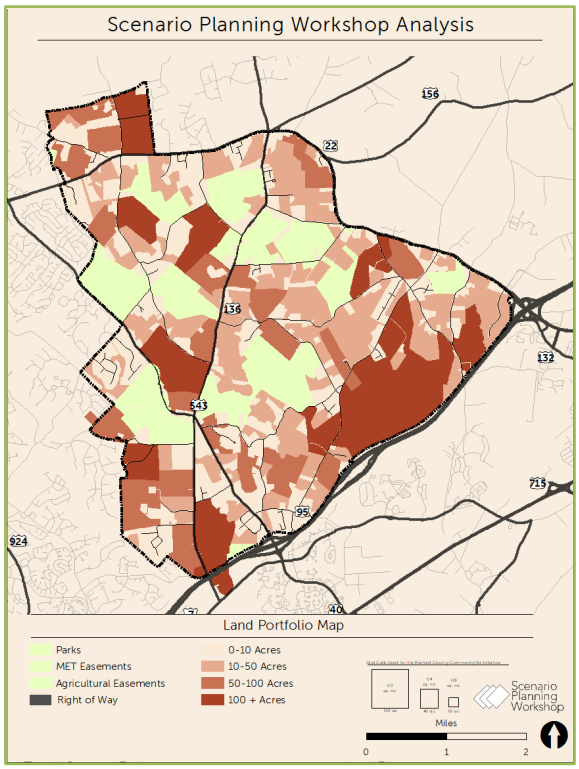
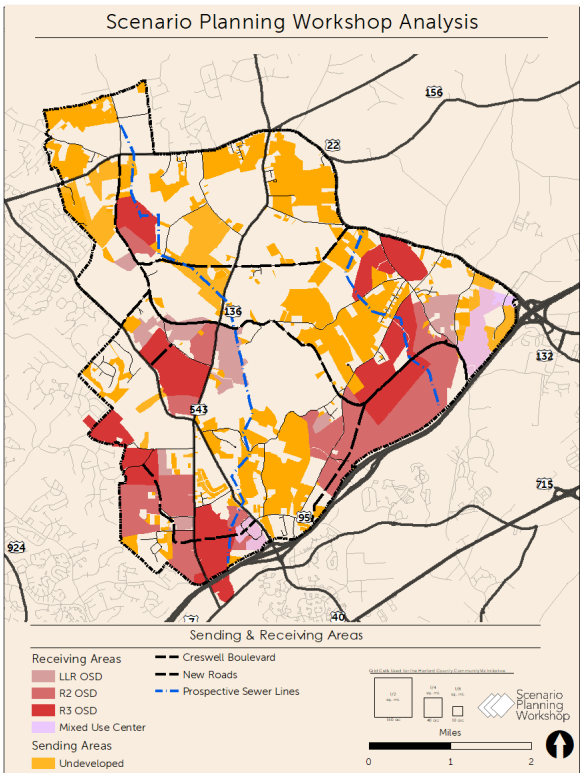


Figure ES-6 shows the locations of the small number of single parcels over 100 acres in dark red and, in lighter red, other large parcels that could be consolidated into large blocks for integrated, planned development. This map suggested that the transfer of development rights (TDR) framework might be a win-win concept for Creswell. TDR allows the transfer of development rights (one home = one development right) from designated “sending areas” that are then preserved, to designated “receiving areas” that are then able to be developed. If the arithmetic of the TDR concept could produce a strong market for both sellers and buyers of rights, perhaps development in Creswell could be concentrated into specific, less critical parcels, while the remainder of Creswell could be preserved in perpetuity at its current low

densities. This is a very different approach to TDR than that which currently exists in Harford County.

TDR has a long and largely successful history in Maryland and there are almost 300 examples around the country. Not all of these have been successful, however. Much research has been conducted on what makes for TDR success or failure. Our team reviewed this research and enlisted the advice of country's leading TDR experts. Using a land use model that we developed for Creswell via *CommunityViz* modeling software—a well-established proprietary software package whose owner was a course co-instructor—we tested numerous combinations of sending and receiving areas, varying both their ratios of sending to receiving areas and their densities. We settled on a framework for TDR that incorporated sufficient incentives for the buyer as well as sufficient density increases for both sellers and buyers to make the transactions attractive compared to the current option of developing onsite at one home per ten acres. The development densities envisioned are comparable to low to moderate suburban densities within the Development Envelope today. The distribution of sending and receiving areas in the Framework Plan is shown in Figure ES-7.

Figure ES-7: Sending and Receiving Areas



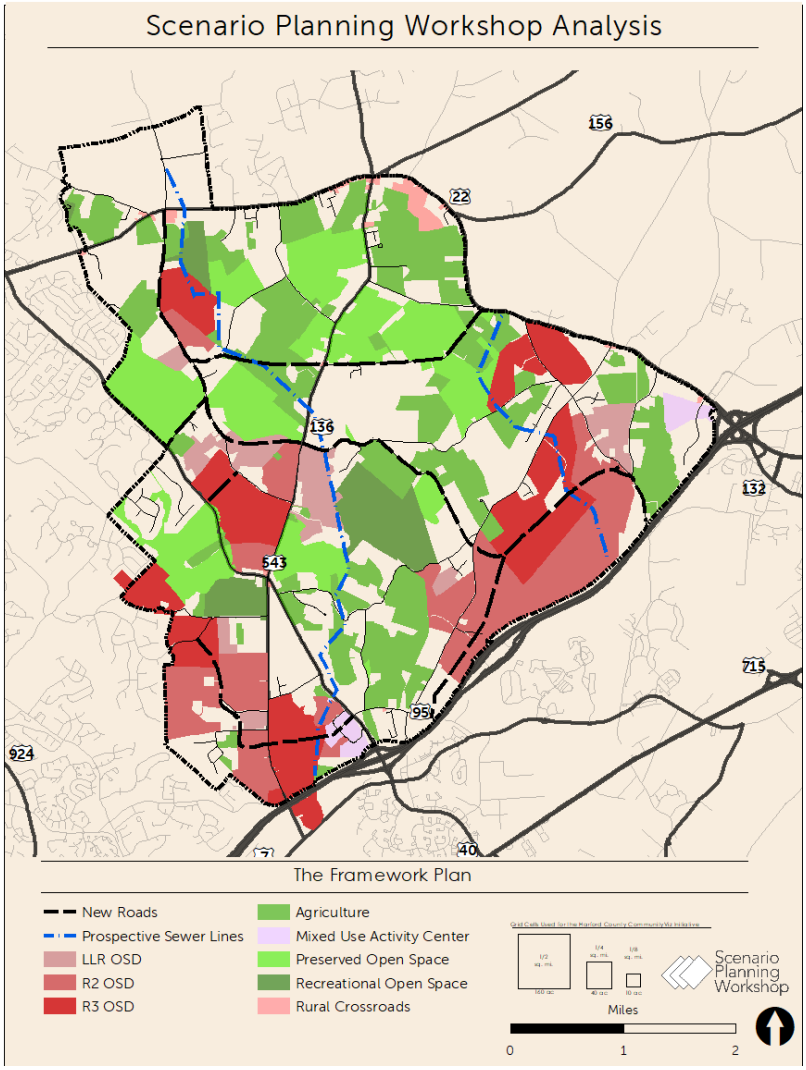
The range of new homes that could occupy the receiving areas is wide and depends on the areas and densities finally selected for development. This study is not a plan, but a framework for a plan, with many choices still remaining for the County. We estimated the framework's housing range at between 8,000 and 20,000 new homes. To test the various impacts of denser development in Creswell, we settled on two alternative options to be more fully explored in terms of impacts and implementation—10,000 new homes and 16,000 new homes respectively. This arithmetic plays out on about 2,900 acres of designated sending areas and 3,000 acres of designated receiving areas. The receiving areas would be zoned to match current zoning districts, but their development standards would be much stricter in terms of open space requirements. The net effect of these Open Space Design

(OSD) standards would be a relative increase in townhouse developments vs. the current mix of housing countywide, which is dominated by single-family detached homes. Evolving family composition and household sizes have been pushing the market in this direction in the county for the past several years.

Such densities, concentrated on particular parcels, would, of course, require public sewer and water. Accordingly, we identified logical sewer alignments to serve the western and eastern edges of the development areas. The increase in density would also require road improvements beyond those currently envisioned and planned by the county. The Framework Plan map shows a new interchange at Aldino-Stepney Road and I-95, which relieves congestion on Route 22 and other roads. The other major new transportation element is the alignment of a new four-lane Creswell Boulevard that connects to the new interchange and then to Shucks Road.

Figure ES-8. Framework Map

The framework plan should also explicitly accommodate the environmental features shown earlier and even enhance them via a strong "green infrastructure" element. This green infrastructure is where a trail system can be planned that connects development and the natural environment to create a unique natural amenity in Harford County. Figure ES-8 – brings all of these elements together in the Framework Plan for Creswell.



The combination of the TDR program and the OSD zoning means that two-thirds of Creswell will remain undeveloped as either farmland or forestland.

In settling on a range of 10,000 to 16,000 future homes as reasonable for Creswell, we were guided by our extensive testing of the impacts of this scale of development. The *CommunityViz* land use model referenced earlier allows for quantitative testing of land consumption and other impacts. We also ran a transportation model which provided traffic impacts with and without new and improved roadways. Finally, we applied a fiscal model to the proposed development program to see whether it produced net profits or losses. All these models are tried and tested and were run under the supervision of experts in their field. They were run for 2015 as a baseline, and then for 2040 under our proposed Framework Plan.

Figure ES-9, below, summarizes the key impacts of the two alternative development programs developed for Creswell against the seven goals of the study. As a bottom line, the fiscal impacts are particularly noteworthy. The annual net gain equates to 5% and 7% of the County's overall FY19 budget. These same results translate into a cumulative surplus for the County by 2040 of $453 million for 10,000 homes and $614 million for 16,000 homes, compared with surplus of $24 million for the Trends situation discussed earlier. These numbers assume the continuation of Harford's current impact fee rate, which is considerably lower than that of other counties in the region. The framework plans also assume that between 750,000 and one million square feet of commercial development will occur in concert with the residential development. This development adds considerably to the fiscal surplus but even without it, the residential growth pays its way.

Figure ES-9. Framework Plan Key Impacts

Goals	10,000 Homes	16,000 Homes
Conserve Farming	**77%** of agricultural land preserved	**67%** of agricultural land preserved
Protect the Environment	**74%** of forest preserved **1,139** Acres of Impervious Surface Added	**65%** of forest preserved **1,484** Acres of Impervious Surface Added
Preserve Rural Character	**15%** of key Rural Character Acres Impacted	**34%** of key Rural Character Acres Impacted
Minimize Traffic Impacts	Without improvements, 9% more congested than 2010 With improvements, 3% more congested	Without improvements, 10% more congested than 2010 With improvements, 4% more congested
Maintain Adequate Infrastructure	**2.6 MGPD** Water demand **2.2 MGPD** Sewer demand **5** New Schools **+117** Fire/EMS Staff Needed **130 Acres** of Parks Needed	**4.1 MGPD** Water demand **3.3 MGPD** Sewer demand **7** New Schools **+188** Fire/EMS Staff Need **600 Acres** of Parks Needed
Additional Housing Provided	**11%** increase in county housing supply	**17%** increase in county housing supply
Ensure Positive Fiscal Impact	**$51M annual net gain** to County by 2040	**$82M annual net gain** to County by 2040

In terms of implementation of the Framework Plan, we envisioned the western edge of Creswell that is adjacent to the DE being developed first, with the associated new sewer line extended northward to Harford Community College (whose further expansion has long been limited by its lack of public utilities). The development capacity along the west wing is roughly half that of the east wing. Development of the east wing depends on the construction of several key long-term projects: a new sewer trunkline up Gray's Run, the new interchange at I-95, and Creswell Boulevard. From a regulatory perspective, the Framework Plan would require:

- Amendments to *HarfordNEXT*, to include the new Green Infrastructure Plan as a map with status similar to the new Thoroughfare Plan and to update the text to reflect the revised subdivision regulations.
- Updates to the zoning code to implement the OSD concept in the sending and receiving areas via an overlay zone.
- Map and text revisions to the Sewer and Water Master Plans, the Parks, Open Space and Preservation Plan, and Schools plans.
- State-led remapping of the Priority Funding Areas (PFAs) for Creswell and a remapping of the sewer tiers map based on SB 236, also known as the Septic Bill.

Because this study was done over 16 intensive weeks, and without any community input, it could not explore numerous avenues or drill down further on some of the options that were explored. Some of these are noted in the last section, called Stones Unturned. Other information developed for this study but not included in this report is in an appendix volume, whose table of contents is listed at the end of the study.

Chapter 1
The Basis of the Study

Harford County's Masterplan, *HarfordNEXT*, informs residents that a follow-on study of the Creswell area will focus on current and future infrastructure needs. The plan calls for a comprehensive analysis of facilities needed to serve the area and asserts that future alternatives must be compatible with the preservation of rural character.

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Chapter 1. The Basis of the Study

HarfordNEXT, the county's 2016 masterplan, informs residents that a follow-on study of the area east of the Development Envelope between US 1 and I-95 will focus on current and future infrastructure needs, especially for transportation. The plan's text, quoted in full below,[1] calls for a comprehensive analysis of facilities needed to serve the area and asserts that future development must be compatible with the preservation of Creswell's rural character:

> "In order to assess and control the impacts of ongoing growth outside of the Development Envelope, evaluate the integration of already planned or expected development, and evaluate how to serve the current and future needs of residential, business, and institutional uses in the area, the County will initiate a study of the area east of the Development Envelope between US 1 and I-95. The study will include a comprehensive analysis of the community facilities needed to serve this area, including schools, police, fire/EMS, water and sewerage, transportation, parks and recreation, and libraries. A primary outcome will be the formulation of an infrastructure improvement plan to address existing traffic concerns including MD 22 and MD 543.
>
> It is essential that the County maintains the public commitment and investment in the agricultural, environmental, and historic easements within the study area. To that end, the study will identify strategies for preserving the agricultural, environmental, and historic heritage of the area to ensure the quality of our cultural and natural resources are maintained and explore innovative mechanisms to preserve additional resources as an instrument to minimize future demand for public services and to protect the economic and practical viability of farming.
>
> Additionally, the study will provide recommendations on the form and function of any future development. The desired outcome is a landscape that conforms to the rural character of Harford County. Any new development should be coordinated such that it maximizes open space through the clustering of residential or commercial uses. Likewise, the study will identify desired amenities that will enhance the quality of life for existing and future residents; trails, parks, and other features that maintain and enrich the sense of place will be prioritized."

Executing this study became the top priority for Harford County in its current collaboration with UMD's *Partnership for Action Learning in Sustainability* (PALS)

[1] Harford County Government, *HarfordNEXT: A Master Plan for the Next Generation* (2016), 35-36.

program. Several PALS projects addressed aspects of the study; this one synthesizes their results and completes the effort.

The first paragraph of the Masterplan's text outlines the scope of the proposed study. The effort represented by this report has followed and expanded upon that scope. The Masterplan also describes the values or goals that should define the study's outcomes. This project has extracted these goals from the text, further discussed them with County staff, elaborated on them where indicated, and used them both to drive the ideas explored in the planning work and as the criteria to evaluate those ideas.

The first five goals below are clearly derived from the Masterplan text; the housing goal derives from our own analysis of County needs, presented in Chapter 3; and the last goal is assumed to be a fundamental criterion for acceptability of any framework plan:

- **Conserve Farming**
- **Protect the Environment**
- **Preserve Rural Character**
- **Minimize Traffic Impacts**
- **Maintain Adequate Infrastructure**
- **Provide Additional Housing**
- **Ensure Positive Fiscal Impact**

Chapter 2
Creswell Today

At just over 13,000 acres in size, Creswell is dominated by agricultural zoning, working, rural landscapes, and a number of enviable environmental assets. Adjacent to the Development Envelope and I-95 corridor, the area is also characterized by high-value housing, spot congestion, and gaps in infrastructure.

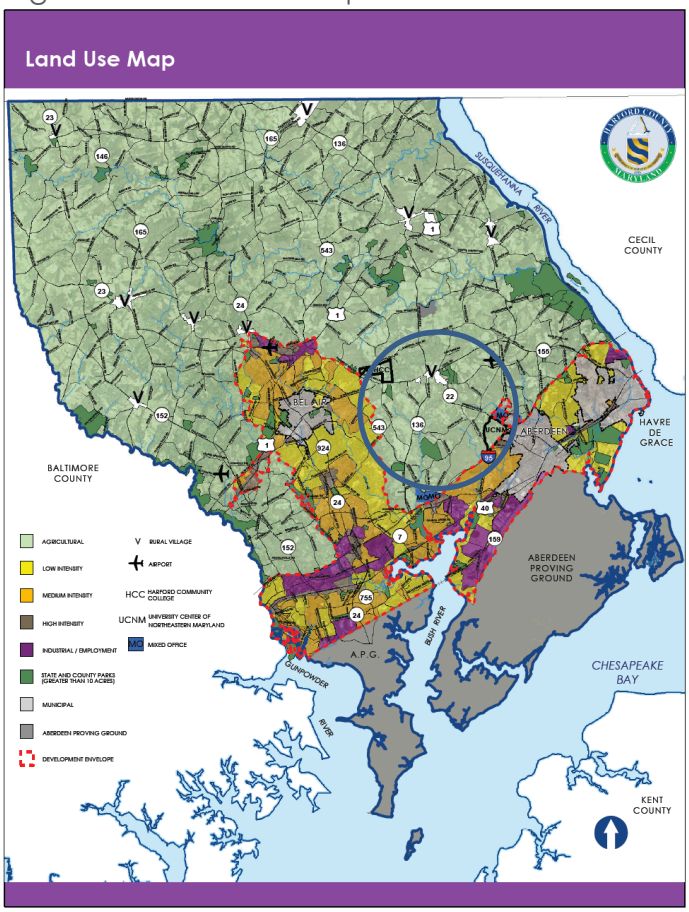
Scenario Planning Workshop

Chapter 2. Creswell Today

Creswell in the Setting of Harford County

Harford County is dominated by its agricultural and rural landscapes, evidenced by the green seen in Figure 2-1. Fully 55%, or 126,000 acres, of Harford County is designated for agricultural land use. Residential land use is the second largest category, comprising of 25% of the county's total area, which can be seen in the yellow, orange and brown on the same map.[2] The county's Development Envelope generally defines where the highest intensity zoning districts should be established and where density-enabling infrastructure should be constructed.

Figure 2-1. Land Use Map



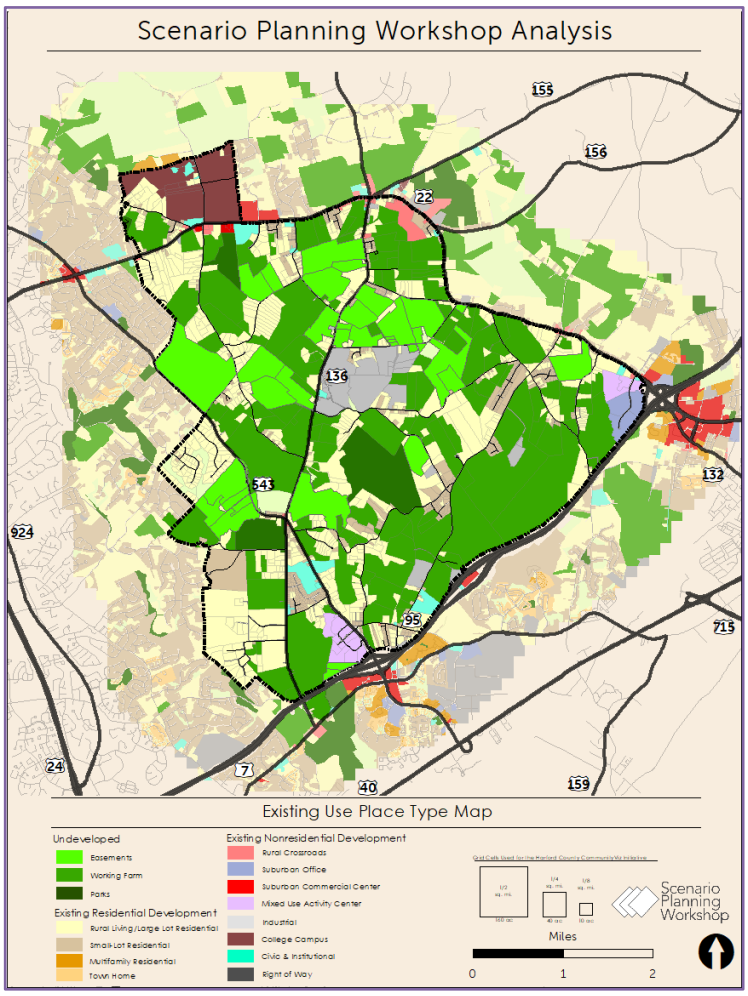
Source: *HarfordNEXT,* 2016.

Harford County's Development Envelope was first established in 1977 with the purpose of concentrating growth along the MD-24 and US-40 corridors, giving it a distinct upside down "T" shape. Since then, 86% of residential development has occurred within the Development Envelope; a figure that was increased to 91% between 2012 and 2017.[3] The County's three incorporated communities, Bel Air, Aberdeen and Havre de Grace can be seen in light grey. These communities and the areas seen in purple represent significant employment centers for the county. However, Harford County's largest employer is the 39,000-acre Aberdeen Proving Ground (APG) military facility that lines the county's southern (and most of its coastal) border.

[2] *HarfordNEXT,* 28.
[3] *HarfordNEXT,* 32.

The Creswell study area represents 13,000 acres of Harford County, and can be seen in the blue circle in Figure 2-1, above. Without a doubt, agricultural landscapes and rural living are the defining characteristics of Creswell as well. This can be observed in Figure 2-2 by the green areas: forests, farms and preservation easements. In fact, fully 88% of the study area is zoned for agricultural use. Creswell's 20 square miles of land is found outside of the Development Envelope, west of MD-24 and north of I-95. MD-136 and MD-154 are the spines of Creswell, and it is generally bounded by MD-22 along its northern and eastern borders. As can be seen in light yellow, there is a patchwork of low-density single family detached residential development fragmenting the study area's farmland and open space. The Creswell study area also features several other key features including Harford Community College, the Churchville Rural Village, the Martin Marietta Churchville Quarry, and two hubs for office space along I-95.

Figure 2-2. Existing Place Types



Existing Conditions in the Creswell Area

The Agriculture zoning district that dominates the study area allows for agricultural use and residential development at one home per ten acres. Nearly 900 acres are zoned as Rural Residential, allowing for development at one home per two acres. These two districts cover over 95% of the entire study area. There are roughly 2,800 homes in Creswell, and based on the current zoning, it has the potential for 750 additional single-family homes. Harford Community College (HCC) and the two offices space areas (which are currently underutilized and

being redeveloped) provide opportunities for economic development, along with the previously mentioned employment centers of Aberdeen Proving Ground and the municipalities of Havre de Grace, Aberdeen, and Bel Air.

Agricultural Land Use and Economy

From apple orchards to dairy farms to fruit and vegetable operations, farming is inextricable from what it means to live and work in Creswell. After a sharp decline in the number of farms and farm sizes between 2007 and 2012, the latest data from the USDA Census of Agriculture show a nearly 8% increase in Harford County's number of farms (currently 628), and a 5% increase in average farm size (118 acres). Given that Creswell contains approximately 6% of Harford County's land,[4] the area can be estimated to contain approximately 6% of its working farms, or between 30 and 35 total, ranging in size from less than one to 300 acres. Harford County's average net cash farm income—a common measure of economic health—has been steadily declining since 1997. These data suggest that Harford County generally and the Creswell study area specifically will continue to negotiate challenges to the long-term survival of working landscapes.[5]

Agritourism may provide an option for supplemental income for the Creswell area's farmers. Agritourism is one of the fastest-growing segments of agricultural direct marketing, both in Maryland and nationwide.[6] The Creswell area has a higher proportion of agritourism businesses than anywhere else in the County, indicating excellent conditions for this stream of on-farm income that can be crucial to a farm's financial success. In 2017, the average Harford County agritourism operation generated an additional $34,266 in on-farm income per year, per operation—the fourth-highest average in the State.[7] This is due in no small part to the fact that Harford County was one of the first counties in Maryland to allow on-farm agriculture-commercial zoning, which has been in place since 2008.[8]

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[4] Calculated with input from Harford County Planning and Zoning. We estimated that Creswell accounts for 4,650 of Harford County's 74,273 acres in farms, or 6.2%. One could also make this estimate considering that Creswell contains 12,873 acres of Harford County's 279,680 total acres of land, or 4.6%.

[5] This revelation is unlikely to surprise anyone who follows agricultural trends in Maryland and nationwide, but it is useful background for understanding the needs and possibilities that future alternatives for Creswell could bring to life.

[6] University of Maryland Extension, "Agritourism," University of Maryland, accessed April 2019, http://extension.umd.edu/mredc/specialty-modules/agritourism.

[7] United States Department of Agriculture National Agriculture Statistics Survey, *Census of Agriculture by State and by County, 2012-2017,* (2017).

[8] Maryland Department of Agriculture, "Summary of Planning and Zoning Issues Related to Agritourism/Agriculture at the County Level," (2014), accessed April 2019, https://mda.maryland.gov/about_mda/Documents/Planning-Zoning-Issues.pdf.

Low-Choice, High-Cost Housing

Creswell's historic core is the Churchville Rural Village, an unincorporated community with a deep-rooted history which has long been considered central to Creswell's heritage. Churchville's residences and businesses are clustered in the northeast corner of the study area primarily at the intersection of MD-22 and MD-136. There are also several small housing developments in the area, and homes scattered through the rural landscape. In addition, Creswell features two hubs for office space, including the University Center for Northeastern Maryland office park at the intersection of MD-22 and I-95 and the MacKenzie Commercial Real Estate Services mixed-use development—also known as the James Run Mixed-Use Center—that is currently being built at the corner of MD-543 and I-95.

Figure 2-3. Creswell v. Harford Home Values

Home Value: Owner-Occupied Units	Harford	Creswell
Total Owner-Occupied Units	73,027	2,393
Median Value	$281,400	$375,451
Less than $99,999	6.04%	5.22%
$100,000-$199,999	18.78%	11.83%
$200,000-$299.999	30.66%	26.54%
$300,000-$499,999	35.56%	31.76%
$500,000-$999,999	8.24%	21.86%
$1,000,000 or more	0.72%	2.80%

Source: U.S. Census Bureau, "American Community Survey 2012-2017 Five-Year Estimates," (2017).

Over 90% of these homes are single family detached homes, according to the American Community Survey 2012-2017 five-year estimates for census tracts 3011.02 and 3037, which together cover a majority of the area considered in this report. As shown in Figure 2-3, this area has a much higher median home value compared to Harford County as a whole: $375,451 in Creswell versus $281,400 county-wide.[9] Homes in the study area are not connected to public water and sewer but do have access to all other public facilities and services provided by Harford County.

Moderately Congested Transportation Network

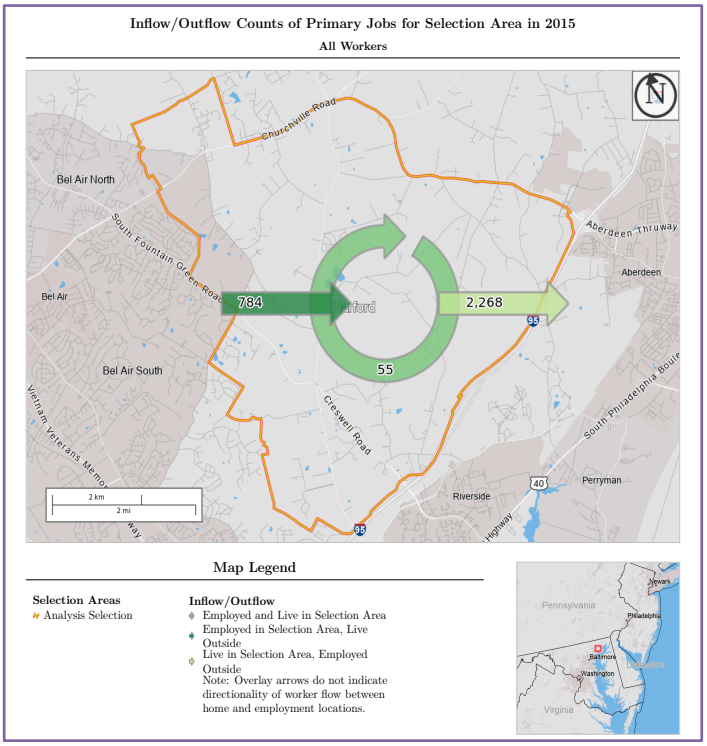
The Creswell area is bounded on four sides by its major regional roadway network: to the north and east by MD-22/Churchville Road, to the west by MD-543 (which also intersects the study area), and to the south by I-95 (between MD-543 and MD-22). Although the roadway network is generally adequate for

[9] U.S. Census Bureau, "American Community Survey 2012-2017 Five-Year Estimates," (2017).

existing use, as an area situated between major employment, residential and commercial destinations locally (Bel Air, Aberdeen, Aberdeen Proving Ground) and regionally (Baltimore), Creswell experiences significant peak-hour congestion at key links its major roadway network.

This congestion is especially severe during peak-hour commuting windows along state arterials (MD-22 and MD-543) and major collectors (MD-136), all of which have limited access controls. An estimated 98% of Creswell residents commute outside of the study area, consistent with its dominant agricultural and residential land uses.[10] Figure 2-4 displays the inflow/outflow commute patterns of Creswell residents and workers. The study area received less than a third of the workers it sent elsewhere on a daily basis in 2015,[11] a sharp contrast with countywide inflow/outflow averages (53% of residents working in the county).[12] In order of attraction, regional job centers for the 2,323 workers living in the study area that year were Bel Air, the Baltimore metro area, Harford Community College, and Aberdeen Proving Ground.

Figure 2-4. Creswell Commuter Inflow/Outflow



Source: On the Map, US Census Bureau, 2015 LEHD Origin Destination Employment Statistics (LODES) Data

[10] U.S. Census Bureau, "On the Map - 2015 LEHD Origin Destination Employment Statistics (LODES) Data," (2015).
[11] Ibid.
[12] *HarfordNEXT*, 94.

Infrastructure Adequacy: Schools, Water & Sewer, EMS & Fire Service, Parks

In addition to transportation, the major infrastructure needs examined in this study for the Creswell area included schools, water and sewer, emergency medical and fire service, and parks. At present, the infrastructure found in Creswell is largely adequate for the existing population. Schools are a frequent pinch point for growth, but Creswell's schools are generally at acceptable levels of utilization. Furthermore, because Creswell sits in between the areas of Bel Air, Abingdon, and Aberdeen, its students can matriculate to schools in those communities where space is available and can provide more capacity for those communities where schools are already overwhelmed. At present, the only school in the study area that surpasses the 110% utilization threshold set by the County's Adequate Public Facilities Ordinance (APFO) is Homestead/Wakefield Elementary,[13] meaning subdivisions larger than 5 dwelling units will be denied in that school district until enrollment falls below 110%. While the study area's other schools do not currently surpass the 110% threshold, they are certainly incapable of absorbing student enrollment for thousands of new dwelling units.

Adequate Public Facilities Ordinances

> Adequate public facilities ordinances (APFOs) are growth management tools that connect the timing of new development to the availability of the public facilities needed to service that development. In Harford County, public facilities include schools, parks, roads, water, and sewer. The APFO process requires that new development only be approved in concert with the required expansions of existing facilities or the provision of new facilities.*

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* National Center for Smart Growth, I-li. "Adequate Public Facilities Ordinances in Maryland: An Analysis of their Implementation and Effects on Residential Development in the Baltimore Metropolitan Area." 2006.

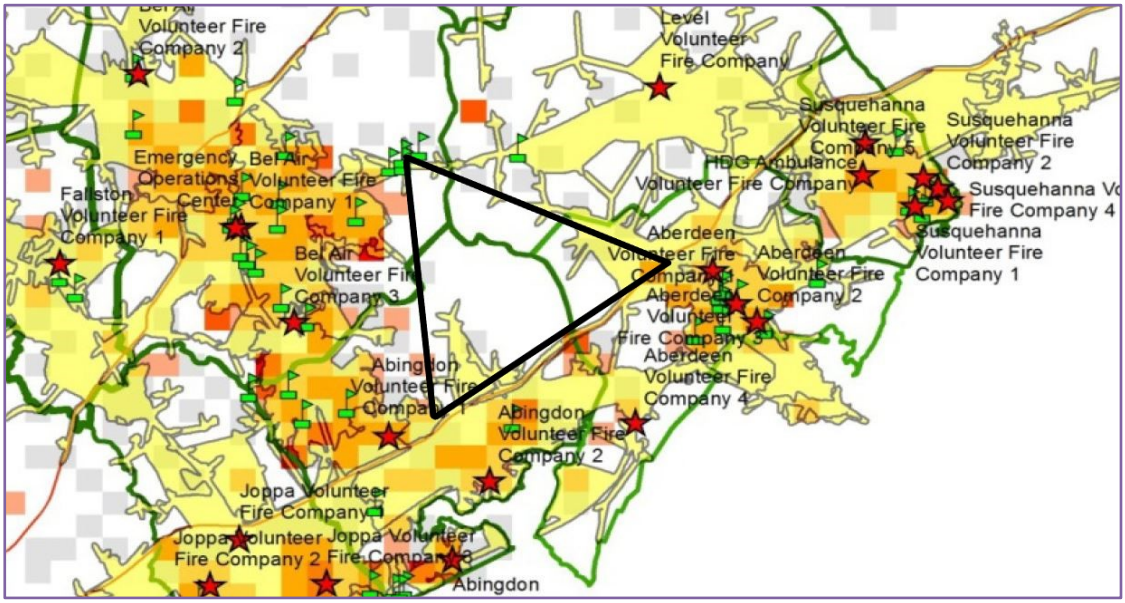
Currently, the Creswell study area is virtually entirely unserved by these public utilities with homes running on septic. Furthermore, with the exceptions of the office space areas, the vast majority of Creswell is designated as Tier 3 and Tier 4 under Maryland's septic tiering system, meaning there are no future plans for

[13] Harford County Department of Planning and Zoning, *2017 Annual Growth Report - Amended December 2018*, (2018), 47.

water and sewer expansion. Consequently, growth will require the expansion of the County's current water and sewer service lines into the Creswell area, and this expansion would likely need to occur before the current maximum capacity date for the Harford County Development Envelope (approximately 2035) in order to accommodate additional growth in Creswell.

As the number of households increases, as well as the area which those households cover, consideration must be given to whether they will be adequately covered by Fire and EMS service. The Creswell Study Area is primarily served by the Abingdon Volunteer Fire Company District, but also includes areas of the Bel Air, Level, and Aberdeen Fire Company Districts. In Figure 2-5, below, Fire Company Districts are designated by green lines and the study area is shown roughly as the black triangle.

Figure 2-5. Harford County Volunteer Fire Department 8-Minute Catchment Area



As this map clearly shows, most of the study area lies outside of the minimum 8-minute response time catchment area that the county uses as a barometer for evaluating adequacy of service. The county will need to considerably expand its EMS and Fire service capabilities if Creswell is to see significant new growth. In order to ensure that the Creswell residents are able to maintain a high standard of living outdoors, the County's 2018 Land Preservation, Parks and Recreation Plan stipulates that there must be 29.5 acres of parkland per 1,000 residents. At this time, there are 520 acres of parkland owned and operated by the County, with 60 of those acres found around schools. There is an additional 350 acres of state-owned parkland. This high ratio of parkland acreage to Creswell's current population far surpasses the 29.5 acre per 1,000 residents benchmark, though the

County will need to find ways to procure additional park space if the study area grows.

Environmental Assets

The environmental assets and conditions of the study area must be taken into account in tandem with its manmade infrastructure conditions. Creswell's agricultural backbone is reliant upon the study area's 6,731 acres of prime soils, which make up 52% of the study area. These prime soils are largely focused in the western edge and northern core of the study area, with the eastern edge and stream buffers made up of nonprime and hydric soils.[14] Creswell and its water supply are located largely in the nontidal estuary portion of the Bush River watershed and larger Bush River Basin, and overlaps with six primary subwatersheds. Overall, the area's water quality is relatively stable and of high quality. However, it is also extremely sensitive to changes to the infrastructure and ecological landscape.[15]

Green Infrastructure Explained

This report considers hubs, corridors, and cores—three types of resource land that define Creswell's green infrastructure. "Cores" are large, contiguous areas of land that often contain contiguous interior forests, wetland complexes, important animal and plant habitat, pristine stream and river segments, and/or protected natural resource lands. They are critical to numerous species and environmental health of the region and represent the most important ecological patches of land remaining in Maryland. "Hubs" surround cores, providing contiguous forested buffers for interior habitats from roads and intensive land uses while supporting a wide variety of plant and animal species. "Corridors" are the linear features that connect hubs and cores, ensuring safe animal and plant migration. Streams, ridgelines, and forested valleys are examples of corridors common to Maryland.

—

* Adapted from Harford County Planning and Zoning, *Draft Green Infrastructure Plan*, (2018).

Creswell's forested land, diverse habitats, and green infrastructure ecosystem provides a wealth of environmental resources which create key ecological services: water and air quality improvements, support for biodiversity of flora

[14] Harford County Department of Planning and Zoning, *Draft Harford County Green Infrastructure Plan*, (2018).
[15] Ibid.

and fauna, and open space and recreation opportunities for residents. There is a stark contrast between the two sides of the Development Envelope and the large, contiguous green infrastructure seen in green along MD-24 and I-95. This map shows a distinct environmental character within Creswell, emphasized by the relatively high quality of Creswell's green infrastructure, which accounts for 14% of the total green infrastructure within Harford County. More specifically, 69% of Creswell's 6,983 acres of forested lands are made up of core habitats. Hubs, or edge forests, make up another 16%, and biodiversity corridors make up the remaining 15% of green infrastructure.

Chapter 3
The Trend Future

Business-as-usual change in Creswell—rooted in the growth provided for by existing zoning and the area's remaining development rights—will result in a future where traffic, road conditions, and infrastructure worsen. This study finds that if the County goes with a business-as-usual future, it risks leaving money and problems lingering on the table.

Scenario Planning Workshop

Chapter 3. The Trend Future

Harford County desires to properly study the Creswell area so that it can be prepared to make decisions on critical infrastructure regardless of growth. The history of the Route 152 Corridor, west of the Development Envelope, which grew rapidly as a rural-residential corridor without adequate planning for infrastructure, is a model that the County would like to avoid for Creswell.

Based on the current zoned density within the Creswell area, the 13,000-acre study area could accommodate about another 750 new homes, all of which would be single-family detached units. However, even this level of development would still have an impact on the County's infrastructure needs. In particular, because of general background traffic growth, congestion – already a noted problem in the area – would worsen. In fact, our analysis suggests that traffic congestion in Creswell could spread to the larger road network of Harford County. Additionally, the area is still outside the 8 response time catchment area for Fire and EMS service, and thus, the large capital costs which would incur if the County chose to respond to this lack by building and staffing new stations continues to be a concern. These homes would also generate new schoolchildren, who would need to attend local schools – many of which are nearing capacity, particularly the elementary schools. It is likely that at around 50% of buildout (375 new homes), the area would require either an expansion of its existing elementary schools or the construction of a new school. Furthermore, letting the Creswell area build out at its current density would sacrifice a significant opportunity for economic growth. Our fiscal impact analysis shows that adding 750 new units would not help to alleviate the County's long-term spending problems, whereas additional development would be a significant boost to the County's economy and bottom line.

Traffic Worsens

As described previously, baseline congestion trends in the study area are generally acceptable, with heavy congestion limited to a few major intersections and links along MD-22 (Prospect Mill and Thomas Run Road, as well as MD-136 and Level Road, Churchville), and the MD-543/MD-136 intersection. In order to evaluate the traffic implications of various future alternatives for Creswell considered in this study, we used the Baltimore Metropolitan Council (BMC)'s Cube model, a widely accepted four-step travel demand forecasting tool. Such tools are typically used to assess overall travel behavior under different conditions.

With this kind of model, traffic conditions can measured in various ways. For Creswell, where congestion is a key concern, we used a Level Of Service (LOS) metric for each of the many roadway links defined in the highway network. LOS is measured as the volume to capacity (V/C) ratio for at the roadway or link.[16] The model was set up to forecast PM Peak Hour traffic, as this is generally considered the time of day with the greatest travel demand due to high commute and other trip purpose volumes.

Level of Service in Traffic Models

Levels of service (LOS) range from "A" to "F", or free-flow of traffic to gridlock with incremental increases in congestion in-between. We established a LOS threshold for these links at level D or lower based on existing standards in Harford County. The County requires developers of projects expected to generate over 249 trips per day to conduct a Traffic Impact Analysis on area intersections. As a standard, intersections are expected to operate at LOS C or better, meaning that if new traffic causes this level to drop to level D or below, the developer will be required to mitigate the impact. For this reason, we considered links performing at LOS D or lower to be unacceptable. It must be mentioned however that traveler perceptions of congestion and LOS are not necessarily analogous. The creation of such a threshold suggests that levels A or B are inherently better, whereas the difference between links and intersections performing at LOS C and D may only be realized in a few moments of delay for travelers. Correspondingly, a new roadway performing at LOS A or B might just as well suggest an underutilized road as an efficient one. Ultimately, investments in expensive roadway infrastructure must balance mobility for travelers and an acceptable level of use to the public, given the high cost and dedication of land to new roadways.

While traffic conditions in Creswell today are largely acceptable, there are certain congested intersections. As future background growth occurs (approximately 750 new homes added), the existing congestion in the study area will intensify Projecting trend growth using the BMC travel demand model, we found that congestion worsened not only at links with existing congestion problems, but also throughout the greater network, including key arterials. Figures 3-1 and 3-2 below are a graphical network representation of the area's roadways in 2010 and

[16] In reality, of course, congestion is as much a function of intersection LOS (whether signalized or not) rather than just link congestion. Each link is coded for its speed and in this way the congestion effect of intersections are captured, if imperfectly. A very different kind of model is required for intersection analysis. Such models do not capture overall network travel characteristics.

2040, modeled according to the parameters outlined in the Models appendix. The "No Build" in the title of Figure 3-2 means that no new major roads are built or improved beyond those assumed in Figure 3-1, identified from the 2012 JMT study. Note that the widening of MD-22 from two to four lanes west of I-95 is included in the "no build" scenario. The highlighted roadways are experiencing worsening congestion.

Figure 3-1. 2010 Baseline Scenario LOS

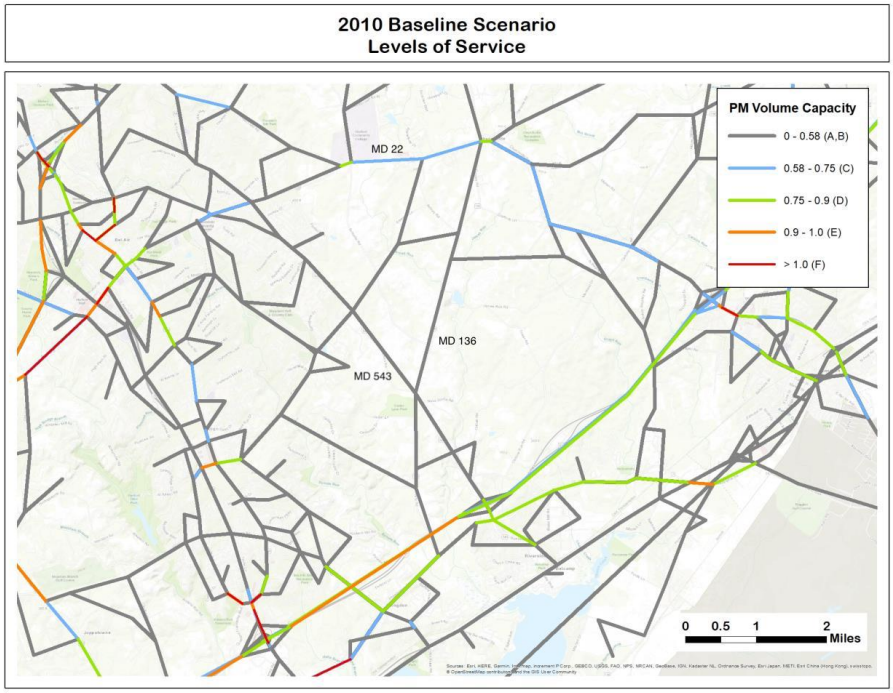
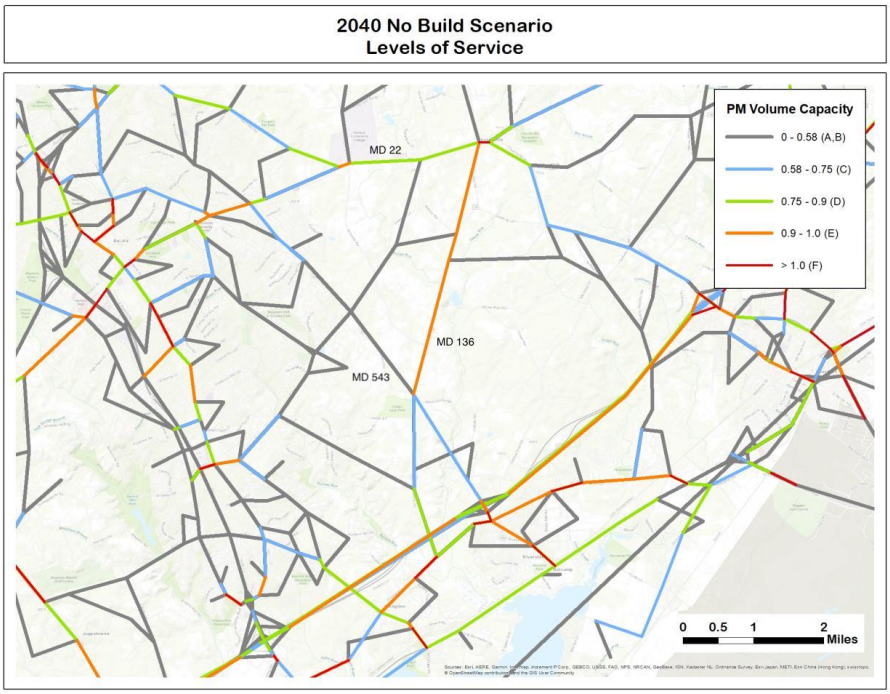


Figure 3-2. 2040 No Build Scenario LOS



Despite assuming the improvements to MD-22 in line with the JMT 2012 corridor study's recommendations, many links experience a worsening of congestion to LOS D or lower by 2040, particularly those connecting to other arterials. MD-136 experiences severe congestion in this scenario (LOS E) between MD-22 and MD-543, again worsening before crossing I-95. The number of road links experiencing heavy congestion at an unacceptable level of service (≤ LOS D) increases by 2%. This means that regardless of the limited amount of growth in Creswell, roadway conditions there will worsen, particularly along key links in the regional network, as well as those that have already been identified for improvement.

Figure 3-3. MD 22 Corridor Study Proposed Improvements

Summary of JMT 2012 MD 22 Corridor Study Proposed Improvements			
Corridor Improvements	Intersection Improvements		
Corridor: MD-543 to MD-156	MD-543	MD-462	Thomas Run Rd.
Corridor: MD-156 to Long Dr. Technology Dr.	MD-156	Mt. Royal Ave.	HCC Entrance / Exit
Corridor: Long Dr. / Technology Dr. to N. Post Rd.	Long Dr. / Technology Dr.	US-40 Interchange	Campus Hills Shopping Center
Corridor: N. Post Rd. to Aberdeen Proving Grounds	Beards Hill Rd.	N. Post Rd.	MD-136
	Middleton Rd.	Prospect Mill Rd.	MD-155

Proposed roadway improvements along MD-22 Corridor and Intersections from JMT 2012 Study. Source: Johnson, Mirmiran & Thompson, Inc. (JMT). MD 22 Corridor Study, Harford County, MD. 2012, ES-2.

Fire/EMS Service Remains Below County Goals

Adding an additional 750 homes in the Creswell area in the form of large- or small-lot single family detached residences would likely have a minimal impact on fire and emergency medical service needs in the area, because these homes would be slowly added over a 20-year growth period. While additional service calls would certainly occur, their numbers alone are unlikely to drive the immediate construction of a new station, ambulance, or fire engine. However, as the Creswell area is not adequately covered by Fire/EMS service now—three separate volunteer fire companies split the area's coverage and all three are more than the goal distance of an eight-minute response time away—additional call volume would be an additional incentive for the County's Fire/EMS staff to

request a new station in the area with the appropriate level of funding from the capital budget.[17]

School Facilities Near Capacity

Over a 20-year buildout of 750 single family detached homes, the student numbers in the Creswell area would increase, but not fast enough to require any new schools to be constructed for at least the first ten years of that buildout. However, the current elementary school serving the area, Churchville Elementary, is currently functioning at 99% capacity—and if the school reached 110% of capacity, the County's APFO regulations would kick in, causing a moratorium on further development without the construction of a new elementary school or expansion of the current ones.[18] Figure 3-4 below shows the student generation rates for 750 new single family detached homes.

Figure 3-4. Student Generation Rates

Student Type	Number of New Students Generated by 750 SFD Homes
Elementary School	173
Middle School	98
High School	143

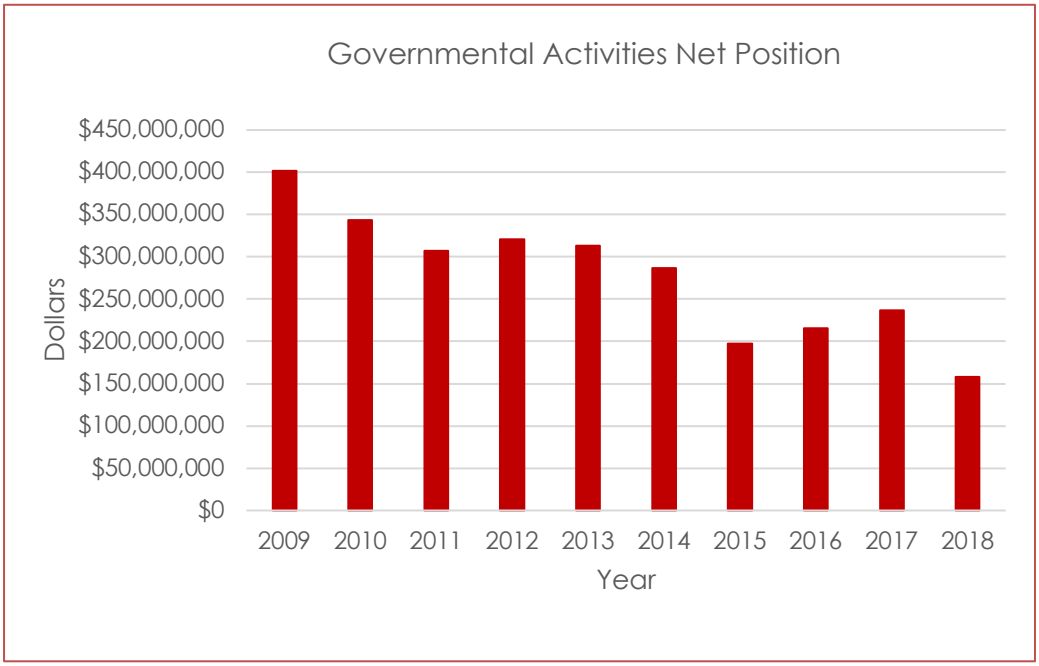
Fiscal Health Declines

To assure ongoing economic wellbeing, the County needs growth. While job growth most obviously fuels economic health, new jobs do not come to suburban jurisdictions in the absence of new residents. This mutual synergy of homes and jobs takes time, of course – and not all residential development, in the absence of accompanying commercial growth, will result in a fiscal net positive to the county. This occurs primarily because of the school capacity need created by new residents – schools being the major fiscal drain on county revenues. The exact fiscal impact of residential growth in the county varies by housing value and type and location. The key question for Creswell is: what will its trend growth of 750 units yield fiscally and can it provide a surplus that can benefit both *existing* residents and *future* residents?

[17] Personal communication with Edward Hopkins, Director of Emergency Services for Harford County, June 5, 2019.
[18] Harford County Government Department of Planning and Zoning, (2017). Annual Growth Report. Retrieved from www.harfordcountymd.gov/DocumentCenter/View/3753/2017-Annual-Growth-Report---Amended-December-1-2018.

As Figure 3-5 shows, Harford County's net position has been falling despite prudent fiscal management by the County Executive. This simply reflects the rising costs that are associated with population growth. These costs include, but are not limited to: roadway improvements, constructions and staffing of new Fire/EMS stations and building new schools.

Figure 3-5. County Government Net Fiscal Position



In Creswell specifically, new homes are a net gain for the County in terms of annual revenues minus operating costs and capital costs per new home built. That is to say, new homes bring in more revenue than their operating cost and capital cost impacts. Therefore, it can be reasonably assumed that the revenue generated from additional residential development in Creswell could yield a surplus not just for the Creswell area, but for the county as a whole. For example, considering Creswell's median home value is nearly $100,000 more than the county at-large, the increased property taxes generated from Creswell development would likely be higher than most other areas for development within the county.

Our fiscal analysis, whose methodology is detailed in Chapter 9, shows that the 750 new homes do, in fact yield a net fiscal surplus. Over the next 20 years the county will gain $2.7 million annually as a net surplus for a cumulative total of $28 million from the final buildout of Creswell by 2040. This analysis accounts for the needed infrastructure to serve Creswell. The modest annual surplus from Creswell (less than 1% of the overall county budget), spread across the entire county, means that there is some overall benefit to all residents from the Trend growth picture, but it is small and likely overwhelmed by the other overall fiscal needs of the county.

In the fiscal impact analysis section of this report (Chapter 9), which provides much greater detail, we find that developing Creswell at 10,000 or 16,000 units can add as much as 4-5% annually to the County's budget by 2040, or cumulative totals of $361 or $440 million respectively, numbers which may be large enough to confer benefits on existing and future residents County-wide. Thus, the County should consider the trade-offs between letting Creswell develop at its current density and finding economic growth elsewhere in the County or by other means. Given the magnitude of the difference in net impacts, choosing not to develop in Creswell may be a significant missed opportunity.

Ultimately, given the County's heavy reliance on residents for 77% of its income, the County's solution to its long-term spending problem likely involves increasing the size of its tax base, whether that happens in the Creswell area or not.

Chapter 4

The Potential for Growth

Creswell and, more broadly, Harford County, must be considered in the regional context of Central Maryland. Projected regional housing supply and demand, coupled with continued population increases, suggest that Harford County should proactively prepare for growth. Otherwise, the County faces growing housing and infrastructure needs.

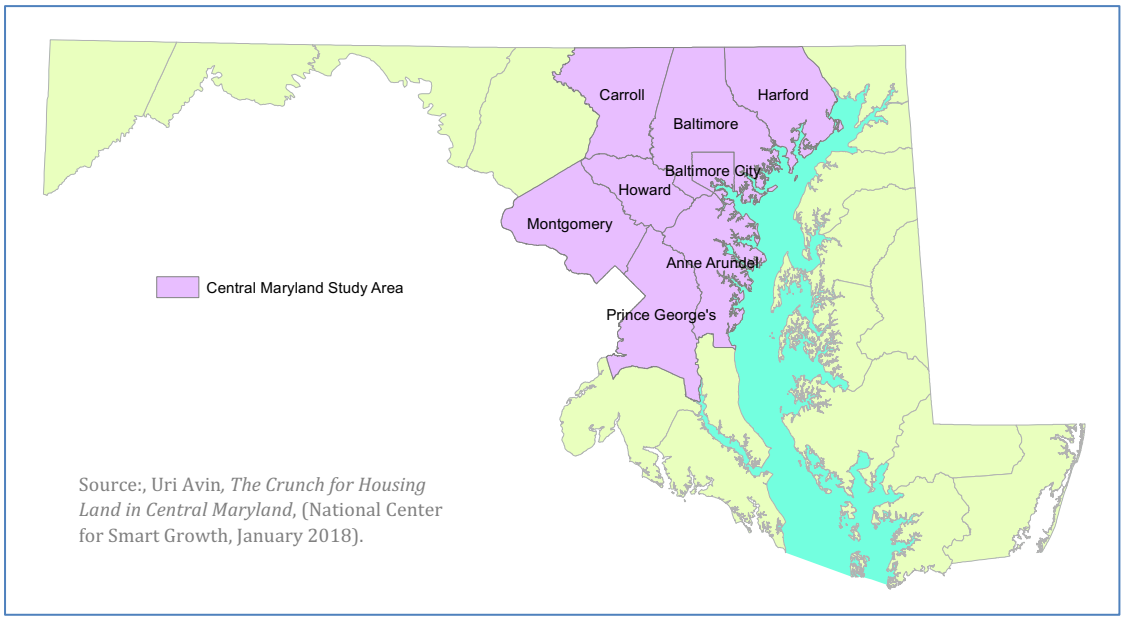
Scenario Planning Workshop

Chapter 4. The Potential for Growth

Regional Trends in Central Maryland

Any discussion of Harford County's growth potential needs to be set within the Baltimore region's growth trends. Given Harford's good rail connections to Washington, DC, this discussion should arguably relate to growth in the DC region as well. This central Maryland region (see Figure 4-1) contains 76 % of the State's housing and 81% of its jobs and is the state's economic engine.[19]

Figure 4-1. Central Maryland Counties Analyzed for Growth

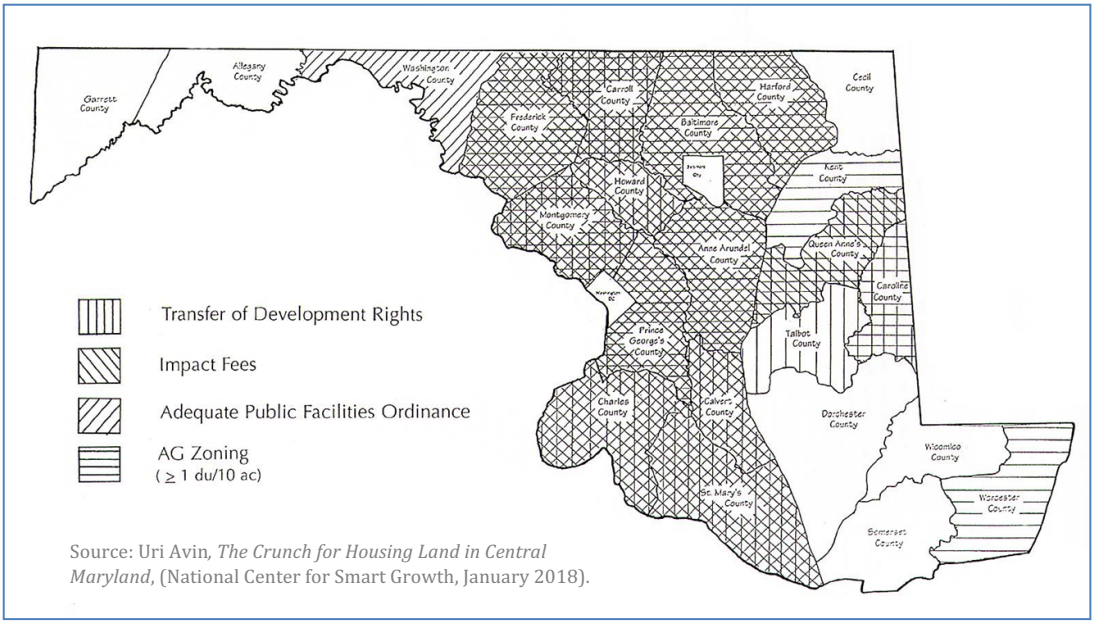


Source:, Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

The land markets for housing in central Maryland have long been shaped by strong County-directed growth management measures such as Urban Growth Boundaries (UGBs), low-density agricultural zoning, and Adequate Public Facilities Ordinances (APFOs), to name some of the most noteworthy of these measures. In all the central counties, these measures were initially enacted between 30 and 40 years ago and have been periodically tightened since then (i.e. the periodic comprehensive downzonings seen in rural areas of these central counties). These kinds of efforts, exemplified by Montgomery and Baltimore Counties, have received widespread national attention and made Maryland a leader in Smart Growth circles. Figure 4-2 illustrates the widespread adoption of growth management measures in Maryland by the early 2000s.

[19] Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

Figure 4-2. The Adoption of Growth Management Measures in Maryland as of 2004



Source: Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

Harford County adopted their key growth management measures — the Development Envelope (a de facto urban growth boundary), agricultural zoning of one unit per ten acres, and an initial APFO — beginning in 1977, and developed them throughout the early 80s. Like the great majority of UGBs around the country, those of Central Maryland, including Harford County, have stayed fixed since they were adopted in the 70s and 80s. Given the strong continued growth of Central Maryland since the 60s, three obvious questions for central Maryland, that relate to Harford's growth potential, are

- How much growth is projected?
- How does this demand relate to supply?
- How might any noteworthy surpluses or deficiencies be addressed?

Projected Regional Demand

The dwelling unit (DU) projections by the Maryland Department of Planning (MDP) for 2040 are the official set of numbers used for traffic, utilities, and planning purposes. These are set regionally and are the negotiated results of both a top-down modeling of growth trends (births, deaths and migration projections) and the influence of local policies, based on their plans as well as trends and market pressures. Given the region's long history of growth management, even trends will have been shaped by planning and zoning measures.

Getting a handle on more market-driven projections, however, as opposed to policy-dominated ones, requires a different lens. Several firms conduct these kinds of econometrically based projections and we will use those generated by Woods and Poole Economics, Inc. (W&P)[20] as a counterweight to the official MDP projections for the region overall and for Harford specifically.

Figure 4-3, the table below, shows the 2010 numbers for dwelling units and the MDP and W&P projections for the eight jurisdictions of central Maryland. As might be expected, W&P has slightly more DUs projected overall and reflects a 27% increase over the 30-year timeframe compared with a 22% increase by MDP. The totals, however, mask some significant differences by jurisdiction. The discrepancy for Harford between these two sets of projections—the official policy-influenced projections and the market-driven projections—is significant. The W&P methodology, which responds to state and regional job and population dynamics, sees a much stronger growth potential for Harford.

Figure 4-3. Current and Projected Dwelling Units (2010-2040)

County	Census 2010	MDP Projected 2040	W&P Projected 2040
BALTIMORE	316,725	355,375	371,601
CARROLL	59,775	72,025	109,531
HARFORD	**90,225**	**117,225**	**150,821**
BALTIMORE CITY	249,900	283,575	229,361
ANNE ARUNDEL	199,375	234,500	256,870
HOWARD	104,750	144,225	189,946
MONTGOMERY	357,075	462,425	454,849
PRINCE GEORGES	304,050	362,825	364,813
Total	**1,681,875**	**2,032,175**	**2,127,792**

Source: Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

Projected Regional Supply in Comparison with Demand

Maryland is fortunate in having a parcel-level database ("MDPropertyView"[21]) that allows detailed land use analysis, including assessment data. More than a

[20] W&P is a private corporation that specializes in long-term county economic and demographic projections. Their widely-used projections are one of the most comprehensive county-level projections available. The strength of Woods & Poole originates from its detailed historical county database and the integrated nature of the projection model. The database contains more than 900 economic and demographic variables for every county in the States for every year from 1970 to 2040. The projection for each county is done simultaneously so that changes in one country will affect growth or decline in other counties.

[21] MDPropertyView is a product of the Maryland Department of Planning, and can be accessed at https://planning.maryland.gov/Pages/OurProducts/PropertyMapProducts/

decade ago, the Maryland Department of Planning (MDP) developed a methodology for projecting development capacity for vacant land, accounting for zoning, flood plains, wetlands and other features. This methodology assumes all such vacant land not publicly owned could be developed. In 2007, the National Center for Smart Growth (NCSG) further refined this methodology and the associated capacity database to account for open space and public uses. The results represent county-wide supply for all residential zoning categories in each Maryland county, including Harford.[22]

Figure 4-4 shows the numbers of DUs of demand as their increment over 2010 for both the MDP and W&P projections, and compares these with total DU supply at theoretical buildout of all vacant lands, based on the above-described methodology, irrespective of the date buildout might occur. For Harford, the total supply of just over 22,000 homes (as of 2015) is relatively consistent with the county's own internal calculations as reflected in *HarfordNEXT*.[23]

Figure 4-4. Growth Increment and Supply of Dwelling Units

County	Demand Increment (offl)*	Demand Increment (mkt)**	Degree of Change(offl)	Degree of Change(mkt)	Total Supply at Buildout***
BALTIMORE	40,583	54,876	12.81%	17.33%	27,616
CARROLL	12,863	49,756	21.52%	83.24%	21,841
HARFORD	**28,350**	**60,596**	**31.42%**	**67.16%**	**22,385**
BALTIMORE CITY	35,359	-20,539	14.15%	-8.22%	36,803
ANNE ARUNDEL	36,881	57,495	18.50%	28.84%	18,690
HOWARD	41,449	85,196	39.57%	81.33%	14,377
MONTGOMERY	110,618	97,774	30.98%	27.38%	69,135
PRINCE GEORGE'S	61,714	60,763	20.30%	19.98%	101,490
Total	**367,815**	**445,917**	**21.87%**	**26.51%**	**312,337**

Source: Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

How many years of land supply are left for the various jurisdictions if we assume official demand projections and compare them with available supply? Figure 4-5, below, provides this answer.

MDPropertyViewProducts.aspx

[22] This methodology does not capture any redevelopment potential or future rezonings. It reflects typical zoning yields based on local historical development data, not necessarily the maximums permitted. To that degree, it may *understate* development potential. For the purposes of this analysis, they are considered reasonable enough.

[23] *HarfordNEXT,* 28-29.

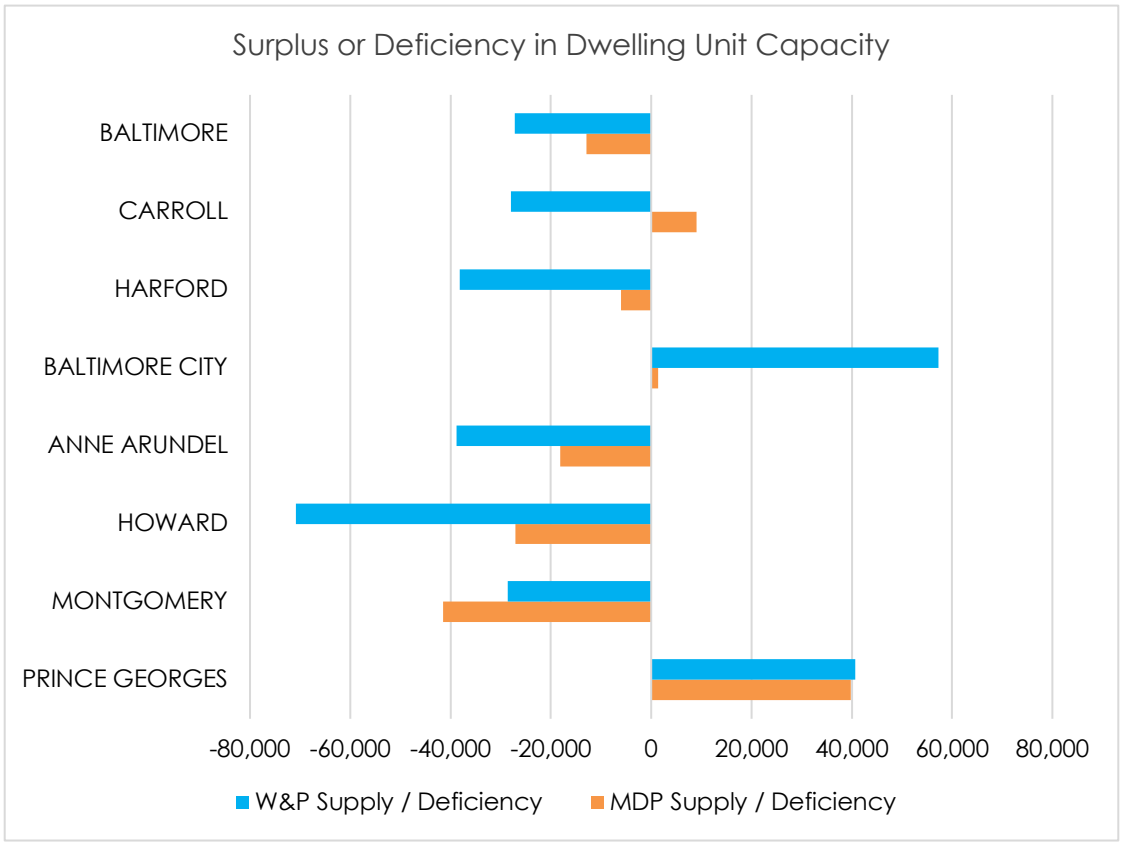
Figure 4-5. Years of Supply Left by Jurisdiction

County	Supply (years left at average growth rates, 1998-2016)	Year that Supply "Runs Out"
BALTIMORE	16	2032
CARROLL	32	2048
HARFORD	**17**	**2033**
BALTIMORE CITY	56	2072
ANNE ARUNDEL	8	2024
HOWARD	9	2025
MONTGOMERY	20	2036
PRINCE GEORGES	47	2063
Total (Ignoring Jurisdictional Boundaries)	**22**	**2038**

Source: Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

The remaining supply assumes that growth from 2017 to 2040 will occur at the same average rate of growth as seen between 1998 and 2016 in each jurisdiction. Jurisdictions "run out" of land between 2024 (Anne Arundel County) and 2072 (Baltimore City). If we assume internal rebalancing and ignore jurisdictional boundaries, then the region as a whole "runs out" of capacity by 2038, nineteen years from today. In this simplified analysis, Anne Arundel, Howard, Baltimore and Harford counties experience the tightest land demand/supply crunch, and will therefore also experience the strongest impacts of a housing shortage, including increased housing costs. Figure 4-6, below, simplifies the interpretation of Figure 4-5 by subtracting the demand from the supply and presents these results for the Official and Market demand projections.

Figure 4-6. Central Maryland Dwelling Unit Capacity



Source: Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

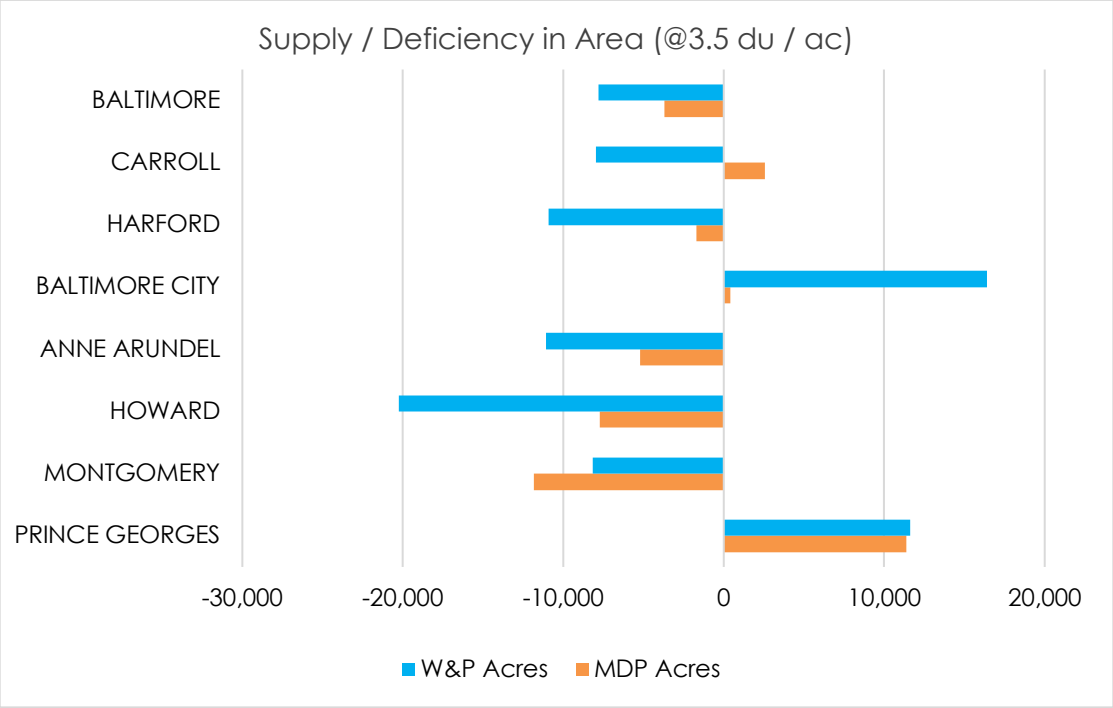
For Central Maryland, the official numbers show an overall *deficit* of more than 55,000 DUs. From a market perspective, that deficit grows to over 133,000 DUs. Baltimore City and Prince George's County are the only jurisdictions that retain a surplus of DUs under both projections. Carroll County retains an "official" surplus of just under 9,000 DUs, though it has a deficit of almost 28,000 DUs in market terms. By 2040, Harford has an "official" deficit of about 6,000 DUs but a market deficit of almost 38,000 DUs, similar to the deficit in Anne Arundel County and second only to Howard County in size.

To more fully understand the land supply implications of this analysis, the number of DUs need to be converted into *acres of land* which will either be needed or be in surplus. To do this, we will simply assumed that all of the demand should be accommodated within the Priority Funding Areas (PFAs) of each jurisdiction, as this is consistent with MDP policies. We further assumed that all such development will occur at the minimum PFA threshold density of 3.5 DUs/gross acre.

Figure 4-7 is the bottom line finding of this conversion calculation. It shows the results for each county's PFA for both the "official" and market projections.

Overall, we see an "official" deficit of almost 16,000 acres and a market deficit of just over 31,000 acres. However, the acreages in deficit vary dramatically by county. Harford's deficit ranges from almost 2,000 acres ("official") to just over 10,000 acres (market) at the 3.5 DU/acre density assumed.

Figure 4-7. Central Maryland Net Supply / Deficiency



Source: Uri Avin, *The Crunch for Housing Land in Central Maryland*, (National Center for Smart Growth, January 2018).

Baltimore, Carroll, Anne Arundel, Howard Counties and Montgomery Counties have no plans to expand their UGBs and are very unlikely to do so. Therefore, the regional demand for housing is likely to remain unsatisfied—and there is a high likelihood of significantly more housing growth than officially predicted by MDP occurring wherever expansion *is* permitted. Our discussion on housing capacity does not assume or account for the potential for redevelopment of existing areas at higher densities. Urban redevelopment requires market pressures sufficient to justify this slow and costly route to provide more housing. Counties that are part of the dynamic job growth of the Washington D.C. region, like Montgomery, Anne Arundel and Howard have stronger prospects of being able to support redevelopment than those like Harford, northeast of the slow-growing Baltimore region. But even in the counties nearer D.C., redevelopment has not yet taken off. This study therefore discounts it as a source of significant future growth, especially since Harford's housing prices are still significantly lower than the other counties facing buildout, as Figure 4-11 on page 34 shows.[24]

[24] *The Crunch for Housing Land in Central Maryland*, 2018.

Conclusions

The regional analysis suggests the following conclusions:

1. **Housing costs will rise significantly.** Given the moderate to severe deficits of housing land projected in the rapidly growing counties and the historical difficulties in attracting large numbers of residents to Baltimore City, it seems clear that housing costs will rise significantly in Central Maryland as the demand/supply relationship plays out over the next two decades.

2. **Workforce residents will be squeezed out to outlying counties.** Recent rapid growth in southern Pennsylvania, West Virginia, Northern Virginia and Delaware supports our evidence on the housing shortage in Central Maryland, especially affordable housing. The picture we have painted here, though, is one which shows an even more severe housing shortage than official predictions—yielding longer commutes as central Maryland's workforce is squeezed out to outlying counties, and a reduction locally spent dollars in the central counties. from the Maryland economy.[25]

3. **This dynamic will ultimately affect employment growth.** Since housing and jobs growth are linked, jobs that can decentralize to follow out-migrating populations will do so. But beyond rooftop-driven jobs, more basic employment growth may also choose outlying locations if possible or simply avoid locating in Central Maryland in the first place. This would reduce the economies of scale and agglomeration realized in the state's current job centers, including support of transit.

Options to address the housing land crunch identified include:

1. **Accept the spiraling dynamic described above.** This presumes that the negatives of slower or even stagnant growth may be overstated and its benefits under-appreciated. Less future congestion, less pressure on open space and rural areas, rising home values for current residents etc. are

[25] Uri Avin with Dr. Thomas Hammer and Christopher Dorney, "Examining Deflection; an Unintended Consequence of Smart Growth within Maryland," paper presented at the Maryland@10 conference, (October 2007).

some of these advantages. This is the least-cost strategy politically because the negatives will accrue in the medium term rather than the short term.

2. **Increase redevelopment and infill.** The previous State administration had embarked on a redevelopment initiative. While redevelopment has been ignored in our own simple analysis, it seems unlikely that redevelopment *alone* will be able to absorb the deficits. Widespread redevelopment at higher densities, typically in attached or multifamily units, will attract a certain market segment. Its depth and size is open to debate and we have very little to no data on this phenomenon in Central Maryland. Both the broader market for redevelopment and the willingness of elected officials to brave local opposition to such densification is untested in this region. The redevelopment market in Harford is likely several decades away.

3. **Selectively expand urban growth boundaries.** Unlike Oregon and Washington State, which require that jurisdictions provide for 20 years of supply within their UGBs[26], none of Central Maryland's jurisdictions require such built in expansion. Clearly the community politics of UGB expansion are extremely challenging, especially where the UGB is abutted by rural residential, large lot development already in place, as is partly the case in Harford. Where that is not the case, however, or where it is abutted by very low density zoning, selective expansion of UGBs in Central Maryland to accommodate urban densities offers one way to provide enough capacity for projected growth. While such expansions should be targeted to those counties with the largest deficits (see Figure 4-7) land markets in adjacent counties may be somewhat substitutable.

4. **Selectively allow rural infill. I**n terms of the Septic Bill adopted in 2013, some Tier 3 rural areas may have room for more absorptive capacity of "infill" rural lots. Strong intra-rural transfer of development rights (TDR)) programs may facilitate such transfers, or the base zoning may allow somewhat more density. A mix of this and the above strategy may help alleviate the pending crunch.

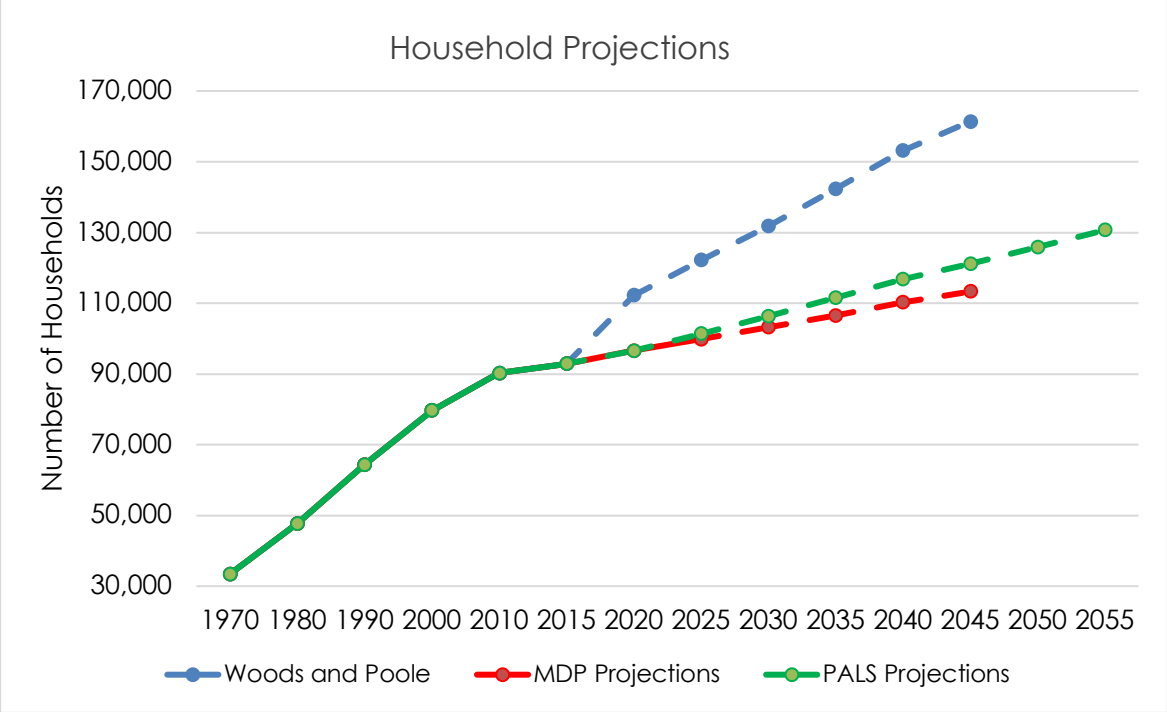
The scale of the looming crunch is such that ignoring or deferring it would be the least prudent route. For the purposes of this study, we have assumed that Harford wishes to provide for more housing choices and avoid spiraling housing costs by following option 3 above, and focusing that effort in the Creswell area.

[26] Although in practice many Oregon jurisdictions "game," this requirement in various ways is in response to pressure from stakeholders who resist UGB expansion.

Population and Housing Projections for Harford

To understand the future, this report evaluated two different population forecasts—one by the Maryland Department of Planning and the second by Woods and Poole Economics, Inc., as noted in the previous section. Based on our the analysis of regional and local growth trends discussed earlier, we have created a third set of projections which will be referenced in this report as PALS projections. These projections anticipate a growth rate slightly higher than the official MDP projections and substantially less than the W&P projections. Our projections target around 117,000 homes in 2040, 7,000 more than the MDP numbers of around 110,000. Figure 4-8 shows these three projections.

Figure 4-8. Projected Household Growth

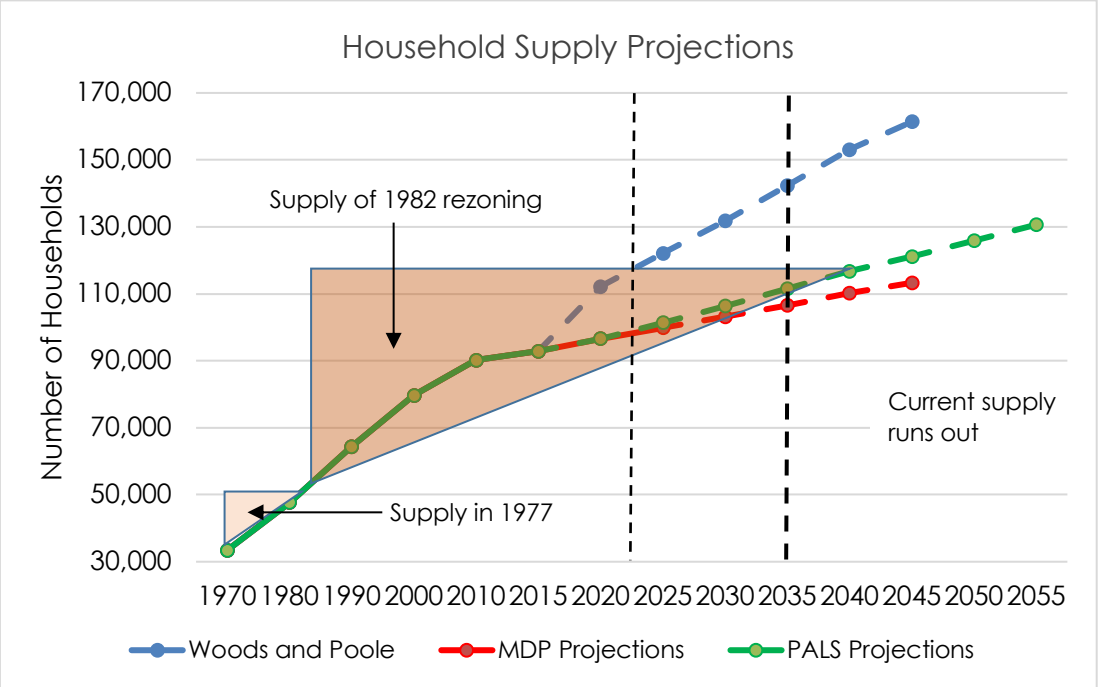


Source: Maryland Department of Planning; Woods and Poole Economics, Inc.

If Harford County decides to accommodate the projected future growth expected from these projections, the county then must decide how they want to grow, where they want to grow, and the best way to accommodate the needs of all current and future residents. Figure 4-9 shows how Harford County's 1982 rezoning has accommodated the County's growth over the last several decades. As described above, Harford County's land and housing supply within their development envelope will "run out" of developable land around 2033. Due to the Creswell study area's location adjacent to the county's development envelope and

its accessibility to I-95, development in Creswell is an attractive option for accommodating the future growth of Harford County.

Figure 4-9. Household Supply Projections



Source: Maryland Department of Planning; Woods and Poole Economics, Inc.

Housing Markets

Construction of homes in the Baltimore Metropolitan region was strongest from 2000 to 2006. Home construction was slow to rebound after the 2007-2009 recession, but over the last four years, the region has begun to see an increase in the number of homes constructed per year. However, that increase is still 34% less than the number of homes constructed annually during the peak of construction from 2000-2006.[27]

The evolution of housing types in Harford County is very consistent with that of many rural/suburban counties across America. The construction of single-family detached homes has dominated the housing market in Harford County since the late 1970s. As of 2017, 60% of all homes in the county were single-family detached units. However, since the early 2000s, the type of homes built in Harford County has begun to diversify. There is now a more varied mix of single family detached, single family attached, and multifamily units being built within Harford County. Of all homes built from 2008 to 2017, only 39% were single family

[27] U.S. Department of Housing and Urban Development, "Comprehensive Housing Market Analysis Baltimore-Columbia-Towson, Maryland," (2016).

detached homes, while 32% were multifamily units and 28% were single family attached homes.[28]

Figure 4-10. BMA Median Home Values

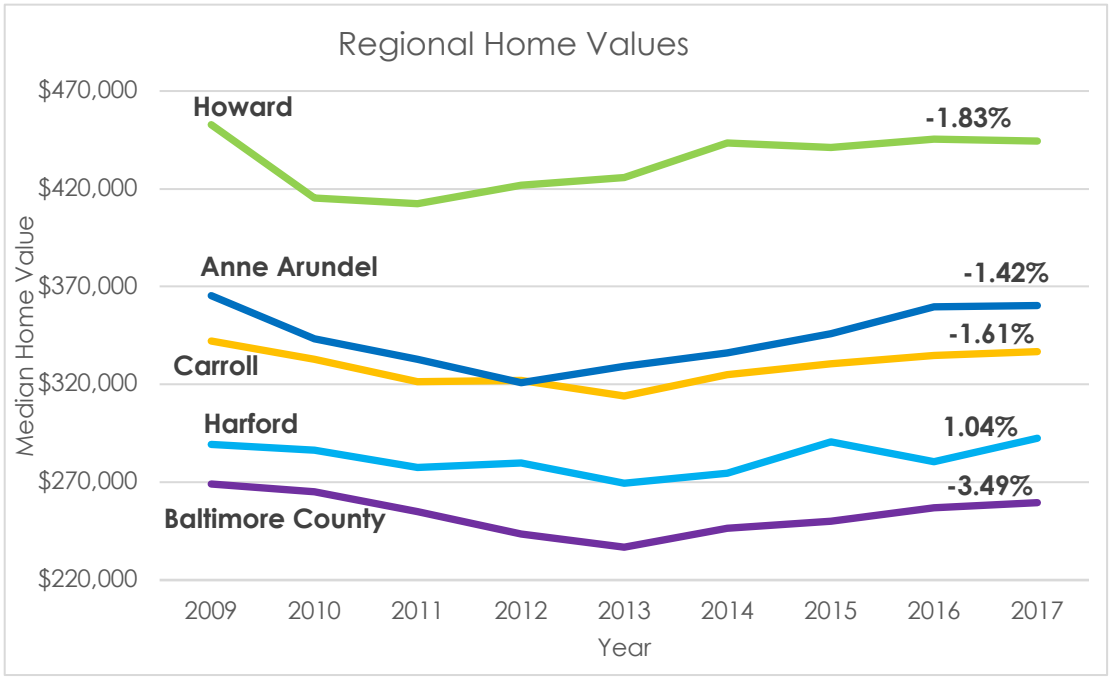
Locale	2018- YTD	2017-YTD
Howard	$415,000	$409,950
Anne Arundel	$336,000	$325,000
Carroll	$319,900	$300,000
Baltimore Metro	$265,000	$255,210
Harford	$255,000	$240,000
Baltimore County	$239,000	$228,000

Source: Bright MLS, "Baltimore, MD Metro Area - June 2018 Housing Market Update," 2018.

As of 2018, Harford County has a median home sales values of $255,000, according to Bright MLS, which is currently less than the median home sales values for all homes in the Baltimore Metropolitan Area which is $265,000. Figure 4-10 provides the median home values for each of the County's in the Baltimore Metropolitan Area.

In the regional context, Harford County is still relatively affordable compared to the other suburban counties. However, this appears to be changing.[29] Harford County is the only suburban jurisdiction which has seen an increase in median home values since 2009, increasing 1.04%. All the other Baltimore Metro suburban counties have seen their median home values decrease.[30]

Figure 4-11. Regional Home Values



[28] Baltimore Metropolitan Council, "Building Permit Data System," (2017).
[29] Bright MLS, "Baltimore, MD Metro Area - June 2018 Housing Market Update," (2018).
[30] American Community Survey one-year estimates for median home values were compiled for each County for each year from 2009 to 2017.

Furthermore, home values are rising at a quicker rate in Harford County compared to the other suburban jurisdictions as Figure 4-11, above, shows.

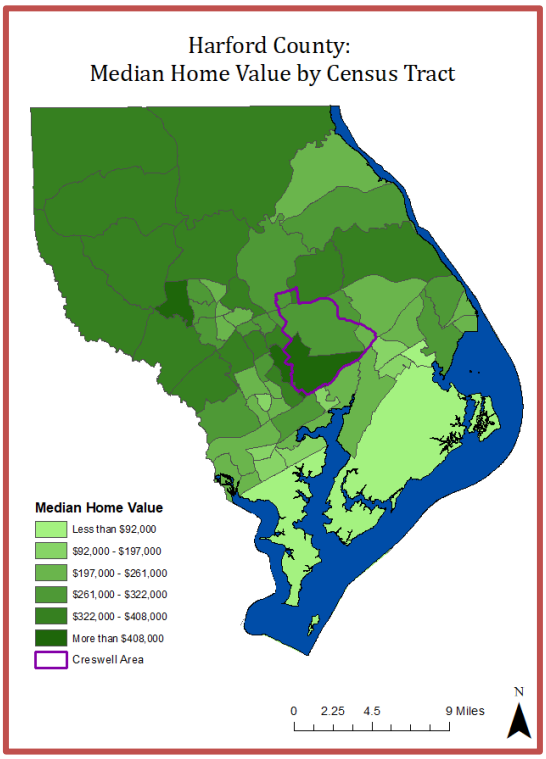
Figure 4-12. Harford v. Creswell Home Values

Home values	Harford	Creswell
Total Owner-Occupied Units	73,027	2,393
Median Value	$281,400	$375,451
Less than $99,999	6.04%	5.22%
$100,000-$199,999	18.78%	11.83%
$200,000-$299.999	30.66%	26.54%
$300,000-$499,999	35.56%	31.76%
$500,000-$999,999	8.24%	21.86%
$1,000,000 or more	0.72%	2.80%

Source: ACS 2012-2017 5-year estimates.

Within Creswell itself, home values are considerably higher than in the County overall, as Figure 4-12 illustrates. The map in Figure 4-13 depicts the contrast between the high-end, newer homes built on large acreage lots in the southwestern part of the Creswell Study Area and the older, more average value homes located in the northeastern part of the study area closer to the Churchville Rural Village, setting the stage for a diverse range of price points in the future.[31]

Figure 4-13. Harford County Median Home Values



Source: ACS 2012-2017 5-year estimates.

[31] All data was collected from ACS 2012-2017 five-year estimates.

The Bottom Line on Housing Need

This wide-ranging discussion of regional and local housing market demand and supply can be generalized and summarized as follows:

- Harford County currently assumes an average growth rate of about 1,000 new homes per year to 2040.
- Harford County is on track to absorb all of its vacant, buildable residential land—equal to about 14,000 homes—around 2033–2035.
- The projected demand for homes beyond that to the year 2040—the time horizon of this study—starts at the low end of about 6,000 homes, based on State, County, and PALS projections. We believe this number is unrealistically low given market driven demand and regional supply shrinkage.
- Market-based projections, as opposed to official, policy-driven projections, suggest that the high end of 2040 demand could be as much as 38,000 homes.
- How much of this demand to 2040 or beyond that the County chooses to accommodate is a matter of public policy of course. In this study, we assume that for the Creswell area alone, a growth-oriented policy might range between 10,000 new homes, providing slightly more than the officially projected demand countywide, to 16,000 new homes, providing half of the high end countywide demand.

There are, of course, many different ways in which this demand could be satisfied. The next chapter presents the different development scenarios we explored and the preferred alternative selected for more study and testing.

Chapter 5
Alternative Future Scenarios

A review of comparable planned areas in Maryland and consultation with the County yielded five alternative scenarios for the future of Creswell. The likelihood of public acceptance and alignment with County goals whittled the five down to one that would come to underpin the framework plan developed by this study.

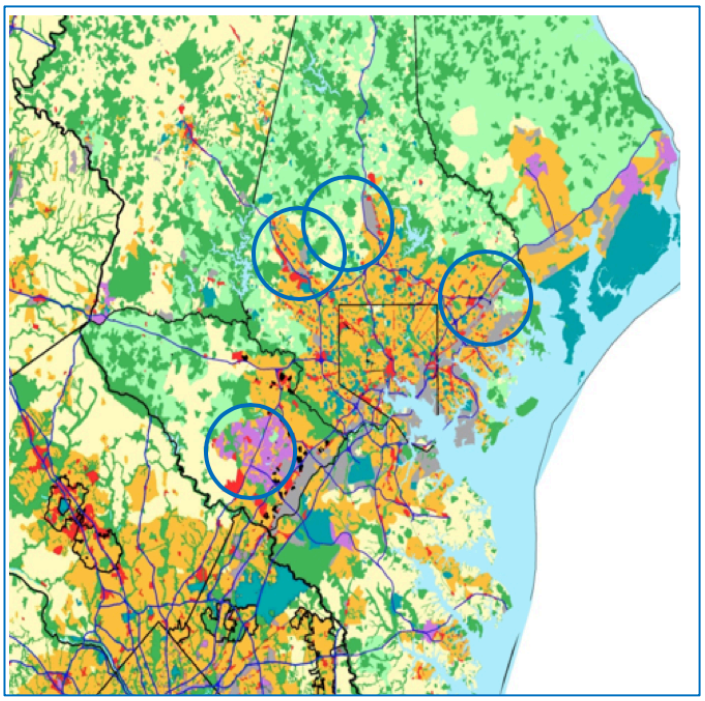
Scenario Planning Workshop

Chapter 5. Alternative Future Scenarios

Chapter 3 described and assessed a Trends, or 'business as usual' future: essentially one with almost no change or growth in Creswell beyond the anticipated slow buildout of about 750 homes. We asserted that this trend scenario was not problem-free, but brought with it much increased traffic congestion, a large development footprint from estate lots, and high opportunity costs to the county. In Chapter 4 we argued that local economic development, fiscal, and housing needs all supported the exploration of a development-based future, one subject to Harford County's clear preservation goals. This chapter describes the exploration which we conducted and its outcomes.

There are several examples in our region of plans for large areas like Creswell's 13,000 acres. They differ in purpose and kind. Figure 5-1 shows their location.

Figure 5-1. Regional Large Planned Areas



In Baltimore County, White Marsh and Owings Mills—both around 12,000 acres—were planned in the 1980s as the two major growth centers that would accommodate most of the County's future development. Consistent with the County's adopted Masterplan of 1979, these two growth poles would be the major anchors of the County's development envelope (called the Urban-Rural Demarcation Line or URDL). Both of these areas had only a few large landowners and relatively few residents, making the public sector planning and zoning of the plans relatively straightforward via the County's quadrennial comprehensive zoning process. Whitemarsh, as its number of residents increased, was downzoned significantly in later years.

While Harford County engages in countywide general plan updates followed by countywide comprehensive rezoning, Montgomery and Prince George's Counties follow a different process. The regional Wedges and Corridors General Plan of 1964 continues to govern and sets broad direction for growth in both counties. Sector and area plans refine the general plan's direction for smaller areas, similar in size to Creswell. These sector and area plans are then implemented by comprehensive rezoning actions. This process can be more focused on particular and specific local planning issues with positive results. In the case of Germantown, the resulting build-out is largely as was planned.

Columbia, which occupies 14,000 acres in Howard County, is the brainchild of developer Jim Rouse. As a new town, Columbia was planned largely by business entities. With one master developer, Columbia was able to ensure the creation of a fine-grained, mixed-income, and mixed-density series of villages and the execution of a continuous green infrastructure plan encompassing 37% of its lands. With about 40,000 homes, Columbia's gross density is 2.85 units/acre and its net density is 5 units/acre. All of the preceding plans have fairly high gross densities and very substantial employment nodes.

Alternative development in Creswell would most likely be governed by a general plan update or possibly an area master plan. Since Creswell is outside of Harford County's development envelope, some change to that map would predicate any innovative zoning changes. This kind of a planning action, at this scale, has not been initiated by any Maryland counties in many decades. However, as we pointed out in describing the housing crunch facing central Maryland other counties will face this challenge and choice in the future.

Any plan for Creswell, therefore, must be sensitive to its context as an expansion of the development envelope into an existing complex patchwork of land uses and activities. This context argues for a sensitive, infill-type approach rather than a start-from-scratch concept that imposes one singular vision on a complicated picture. Because the area is so large, its stakeholders so diverse, the long term market unclear, and its buildout long-term, the kind of plan needed should allow for flexibility. Such flexibility should apply both to its phasing and to a viable range of future development intensities so that elected officials can respond to unfolding realities. We have therefore conceived of this plan as a *Framework Plan* to reflect this flexibility. Moreover, since this project was executed over a sixteen-week university semester, further study is required.

A possible model with many useful lessons for Creswell does exist in the region. It is one of the country's most famous large-scale infill plans: the Landmark Plan for

the Valleys, developed by Ian McHarg and David Wallace in 1963 for the 70 square miles of rural acres between two major development corridors in Baltimore County. About 35,000 homes were planned on these 45,000 rural acres, the amount of growth officially projected, but it was accommodated in very specific and limited ways. The Plan for the Valleys was a variegated plan that preserved three large farming valleys and allowed development at suburban and urban densities only on the hillsides and plateaus. It accepted significant growth while ensuring preservation via the transfer of development rights concept. The gross density of the Plan was a low 0.8 units/acre. As implemented, however, the dense nodes were reduced to estate lots and utilities were not extended into the Valleys. Nevertheless, this plan is the closest model in Maryland to the Creswell context.

Scenarios and Alternatives Considered

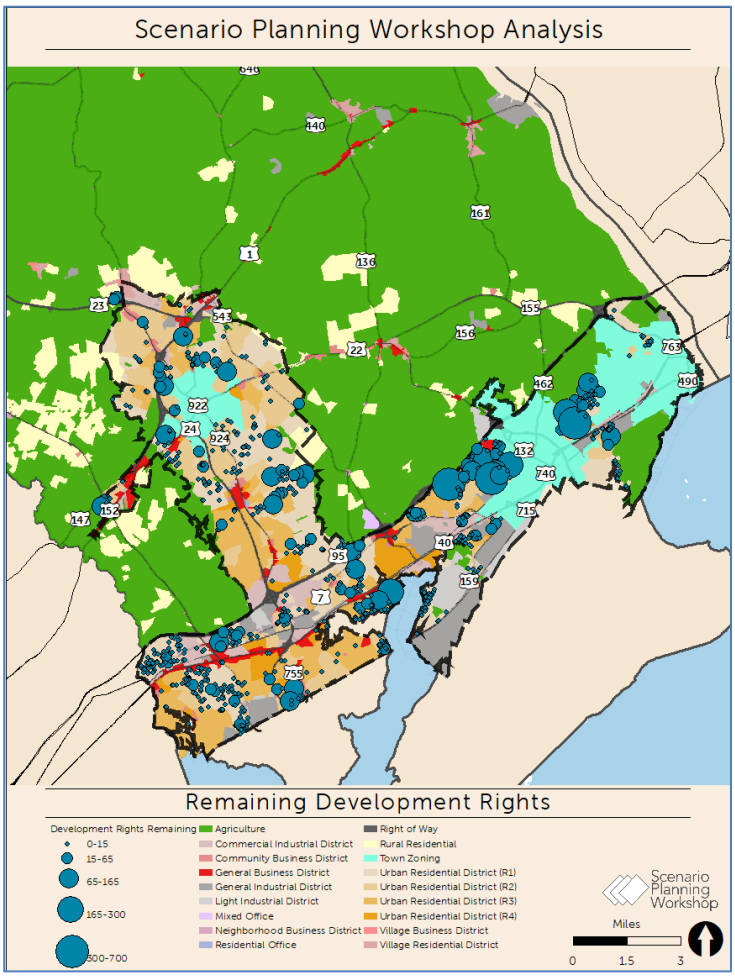
In brainstorming various ideas for the expansion of housing choices in the County, we developed five scenarios. We refer to these scenarios as 'Densify within the Development Envelope', 'East to West Expansion', 'West to East Expansion', 'Creswell Core Densification', and 'Selective Transfer of Development Rights.' Each of these is briefly presented, together with our thinking on the pros and cons of each and our reasoning behind our decision to further explore it or not. Scenarios 2 and 3 are combined in that they simply reverse the phasing of the development. Each of these two, however, contains three options. This produces a total of 6 distinct scenarios.

While the scenarios were not rigorously tested because of time and resource limitations, professional judgment was applied in a team ranking exercise (see the summary table in Figure 5-7, at the end of this chapter, which ranges from a low of 6 to a high of 1). The ranking for each scenario is a result of assessing it against the seven goals identified for this study in Chapter 1 plus a judgement about the political feasibility of the scenario given the key stakeholders involved. Building more rather than fewer homes is seen as a positive, all else equal, given the case we make for the imminent housing shortage. The scenarios' housing yields, however, are elastic in that they derive from assumed gross densities, typically at 3.5 DU/acre (to comply with the State's Priority Funding Area minimum), which could be higher if desired.

Densify within the Development Envelope

This is a Trends future, where another 750 homes are slowly built in Creswell, and the remaining undeveloped parcels *within the development envelope* (DE) are targeted for increased densities. This approach represents a pure Smart Growth philosophy, preserving rural areas via a strict urban growth boundary and densifying in existing communities via infill and redevelopment.

Figure 5-2. Remaining Development Rights



To calculate remaining housing yields within the DE, we used the County's GIS development database and excluded approved but unbuilt subdivisions (about 5,500 homes) or those now under construction. We did not assume redevelopment of existing homes would occur within this scenario. We believe the market for redevelopment, at a meaningful scale, is decades away for Harford County as argued in the previous chapter. There are about 5,000 acres of undeveloped or underdeveloped lands within the DE, diffused among over 834 parcels. All told, these parcels would yield about 8,000 new homes based on their current zoning. Figure 5-2 shows their location. We also tested the housing yield if these parcels were all rezoned to the next denser zone. This would produce an additional 6,500 homes, if they were all built to their maximum zoned potential. In practice, the achievement of maximum allowable density does not occur in the County because of site or market conditions. Only about 80% of the potential yield is reached, as per the county's reports. In this case, that would reduce the 6,500 homes to about 5,200.[32] We also tested the housing yield if these parcels

[32] This number of 8,000, when added to the 5,500 in-process homes, equals a remaining DE capacity of 13,500 homes in April 2019. This is roughly consistent with the June 2017 Growth

were all rezoned to the next denser zone. This would produce an additional 6,500 homes, if they were all built to their maximum zoned potential. In practice, the achievement of maximum allowable density does not occur in the County because of site or market conditions. Only about 80% of the potential yield is reached. In this case, that would reduce the 6,500 homes to about 5,200.

This scenario realizes the high-priority conservation goals discussed in Chapter 2. However, it also intensifies the problems identified in the Trend scenario of Chapter 3. Traffic and infrastructure are heavily stressed— for example, the sewer capacity of present infrastructure, sized as it is for the current DE and its current zoning, runs out in 20 years or so[33]—and, most importantly, relatively little additional housing is added. Given, however, that 80% of these parcels are surrounded by communities at the same densities as the vacant or underdeveloped lands (mostly R1 single family development), we judged that, in reality, local opposition to densification would significantly reduce the number of homes actually built in this scenario to perhaps half the possible 5,200, or just 2,600 homes—far less than the need by 2040 of 7,000 to 40,000 homes (beyond the current remaining DE capacity of about 15,500) projected in Chapter 4. The tradeoff between limited housing yields and possible political strife was judged to be a fatal flaw of this scenario.

For similar reasons of limited capacity in the DE and even more severe political hurdles, and because we wanted to examine the challenge of UGB expansion in a sustainable way, we did not explore a TDR program from Creswell into the DE. It is hard to make the case for using a TDR to further preserve Creswell's agricultural and forest base in the face of only 750 more units of housing.

For similar reasons of limited capacity in the DE and even more severe political hurdles, and because we wanted to examine the challenge of UGB expansion in a sustainable way, we did not explore a TDR program from Creswell into the DE. It is hard to make the case for using a TDR to further preserve Creswell's agricultural and forest base in the face of only 750 more units of housing.

East-to-West Expansion and West-to-East Expansion

This set of scenarios envisions development initially moving out eastward in what would appear to be a logical expansion from the existing DE, served by a new sewer line up the James Run, along what is a corridor largely west of Route 136. After this phase, the county could choose to continue this pattern of suburban

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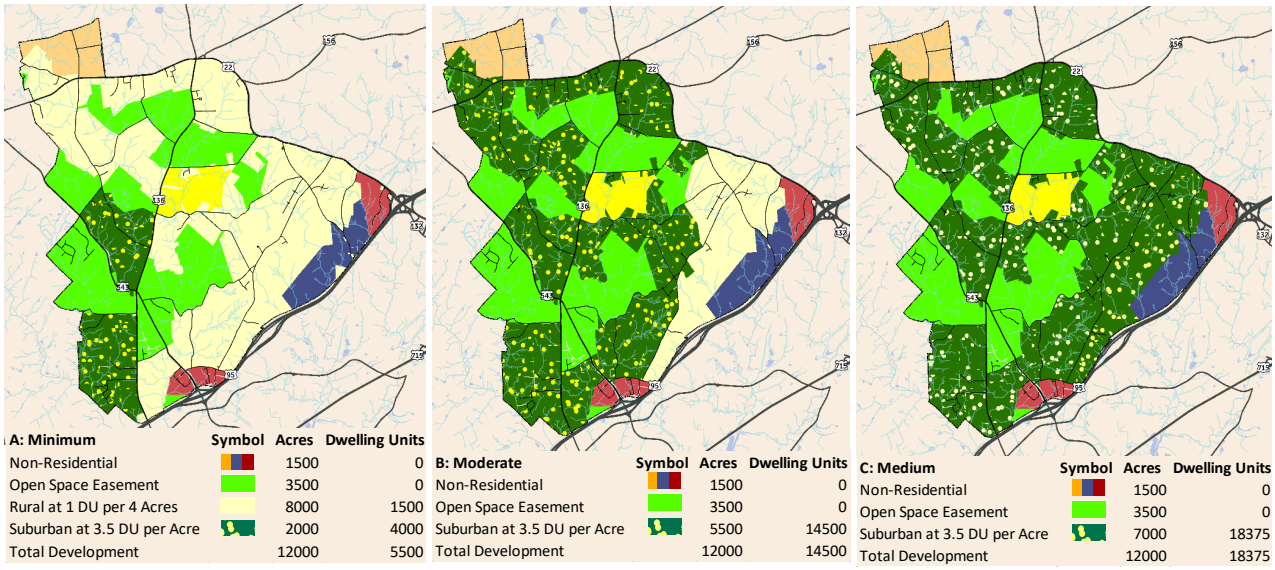
Monitoring Report by Harford's DPZ which estimated a 15,500 home capacity in the DE two years ago.

[33] Refer to the Public Water and Sewer Must Be Provided section (p.86) for more details.

development into the central core area of Creswell or it could extend rural residential type development into the core area and allow for its development this way. If it so choses, the County could then extend this same rural residential pattern to the East, or choose to treat the East, with its substantial parcel development opportunities, as another suburban wing in later years.

Conceptually similar to the West-East scenario, the East-West alternative reverses the order of the expansion on the logic that the East area is actually the easiest to develop first, owing to its large tract ownerships, sparse population, good market access via the MD-22 interchange, and distance from the complicated ownership and use mix of the core area. Figures 5-3 and 5-4 depict the four options (suburban or rural estate, for each direction of development) within these two scenarios.

Figure 5-3. West-East Scenarios Concept

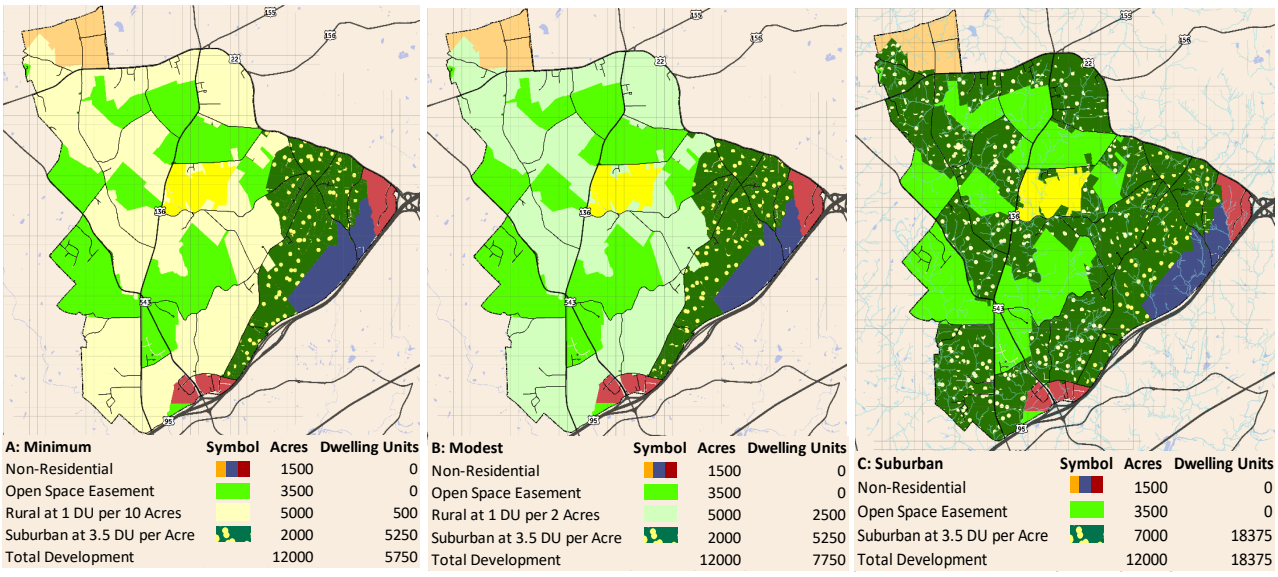


A: Minimum	Symbol	Acres	Dwelling Units
Non-Residential		1500	0
Open Space Easement		3500	0
Rural at 1 DU per 4 Acres		8000	1500
Suburban at 3.5 DU per Acre		2000	4000
Total Development		12000	5500

B: Moderate	Symbol	Acres	Dwelling Units
Non-Residential		1500	0
Open Space Easement		3500	0
Suburban at 3.5 DU per Acre		5500	14500
Total Development		12000	14500

C: Medium	Symbol	Acres	Dwelling Units
Non-Residential		1500	0
Open Space Easement		3500	0
Suburban at 3.5 DU per Acre		7000	18375
Total Development		12000	18375

Figure 5-4. East-West Scenarios Concept



A: Minimum	Symbol	Acres	Dwelling Units
Non-Residential		1500	0
Open Space Easement		3500	0
Rural at 1 DU per 10 Acres		5000	500
Suburban at 3.5 DU per Acre		2000	5250
Total Development		12000	5750

B: Modest	Symbol	Acres	Dwelling Units
Non-Residential		1500	0
Open Space Easement		3500	0
Rural at 1 DU per 2 Acres		5000	2500
Suburban at 3.5 DU per Acre		2000	5250
Total Development		12000	7750

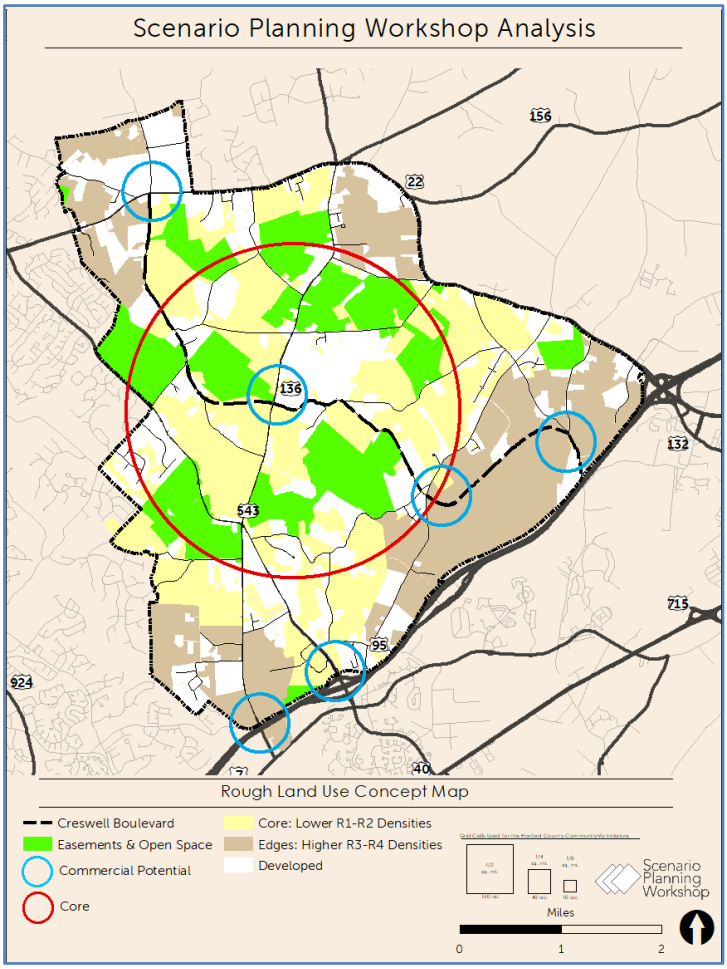
C: Suburban	Symbol	Acres	Dwelling Units
Non-Residential		1500	0
Open Space Easement		3500	0
Suburban at 3.5 DU per Acre		7000	18375
Total Development		12000	18375

For both scenarios, the Rural Residential option after the first suburban phase offers a very different future than continued suburban expansion. While rural estate housing would undermine farming and conservation goals, its resulting smaller population would limit infrastructure impacts and likely be more politically acceptable to property owners who would realize financial gains. In considering the West vs. East phasing sequence, the leapfrog nature of the East-first option, its need for a new sewer trunkline, and its access impacts at MD-22 all suggested that this order of development expansion was more problematic than the reverse direction in the context of a rural-residential alternative.

In the end, the rural-residential options, while perhaps politically viable, seemed to squander both the preservation and growth opportunities in Creswell. The suburban expansion options provide very substantial new housing choices and, likely, strong fiscal benefits, even given significant infrastructure needs, but fly on the face of the County's strongly held rural conservation goals. This contradiction was judged to be a fatal flaw.

Low Core-High Edges Densities

Figure 5-5. Creswell Core Concept



This concept locates much of the new suburban development, at low densities, within and adjacent to the easement lands and parks in the core of Creswell so as to maximize the visual and home-value benefits to the new residents of these rural, scenic areas. It places the higher densities along the edges of Creswell.

The housing yielded by this scenario was not calculated, but we estimate it could range between 15,000 and 25,000 homes depending on the densities assumed. The diagrammatic map below (Figure 5-5) does not yet respond to scenic views, green infrastructure

linkages and other considerations and is thus still very conceptual.

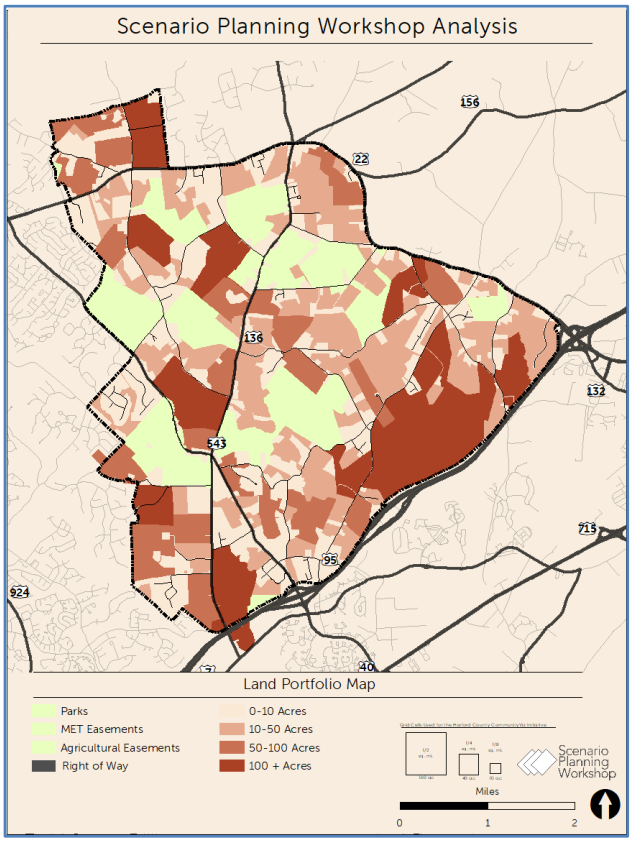
The circles are potential locations for nonresidential development that the new growth can support—perhaps ¾-to-one million square feet; not all of this commercial development might be activated. Beyond Shucks Road, no additional commercial is shown along MD-22 in order to minimize traffic impacts, avoid scale dissonance, and prevent competition with existing commercial areas in Churchville. Phasing of construction of the new Creswell Boulevard (shown in the dotted black line on the diagrammatic map) and of road interchanges is one critical component of overall phasing for this scenario.

While significant housing yields and fiscal gains would result from this scenario, and densities could be tuned to mitigate infrastructure impacts, this concept ultimately conflicts with the conservation goals of the County and embeds predictable and intense rural/urban conflicts in the farming-oriented heart of the area, a recipe for ongoing strife and instability.

Selective Transfer of Development Rights

This scenario keys off the land use reality of there being a few large parcels and many smaller ones, as shown in Figure 5-6. This sharp contrast in parcel size suggests that testing the TDR concept in Creswell for its viability makes a lot of sense. Large parcels, by definition, can better locate development to screen it from scenic views, can preserve sensitive environments intact, can provide onsite amenities like parks and schools sites even, which small parcels cannot. Beyond responding to the area's suggestive parcel size breakdown, TDR has the well-known, potential virtues of equity and achieving the goals of both conservation and growth. The challenge for implementing TDR successfully is in designing a program that creates a strong market for sellers and buyers of development rights. This

Figure 5-6. Parcel Sizes



scenario would target the larger parcels as receiving areas and the smaller parcels, mainly located in the core of the area, as the sending parcels. Depending on the program's specifics and design, a wide range of housing yields is possible—roughly between 8,000 and 20,000 homes. This gives meaning to the Framework Plan concept.

If the detailed design of the TDR program can produce a robust market, then this approach would seem politically viable and one that can meet most of the County goals. Beyond tweaking the TDR arithmetic, the potential to create supportive TDR policies (e.g. the County acting as a TDR bank) to ensure win-win outcomes for landowners and developers suggested to us that this scenario should become the focus of the remainder of the planning effort.

Summary

The preceding scenarios were not tested through models or quantitative analysis. Professional judgment, informed and confirmed by later quantitative testing of the preferred alternative, was applied as to how each of these scenarios would satisfy the study goals. A summary of this process is shown in Figure 5-7. Given the time constraints of this study, we could not examine the scenarios in more depth. Because subsequent studies may wish to revisit them and because they reflect an array of ideas, we have recorded them in this chapter, rather than discard them.

Figure 5-7. Compatibility of Scenarios with County Goals

Scenario	Number of New Homes	Ranking
Densify in the Development Envelope	Upzone one level → 2,600 new homes	**4**
East-to-West or West-to-East Expansion	Minimum → 5,750 new homes	**2**
	Rural Residential → 7,750 new homes	**5**
	Suburban → 18,375 new homes	**6**
Low Core-High Edges Densities	15,000 to 25,000 new homes	**3**
Selective TDR	8,000 to 20,000 new homes	**1**

Chapter 6
Opportunities and Constraints

An analysis of the man-made and natural constraints in Creswell reveal cues for planning in the area's fragmented land use pattern. The size and distribution of undeveloped and underdeveloped parcels give shape to a preservation core that provides for potential growth at Creswell's edges.

Scenario Planning Workshop

Chapter 6. Opportunities and Constraints

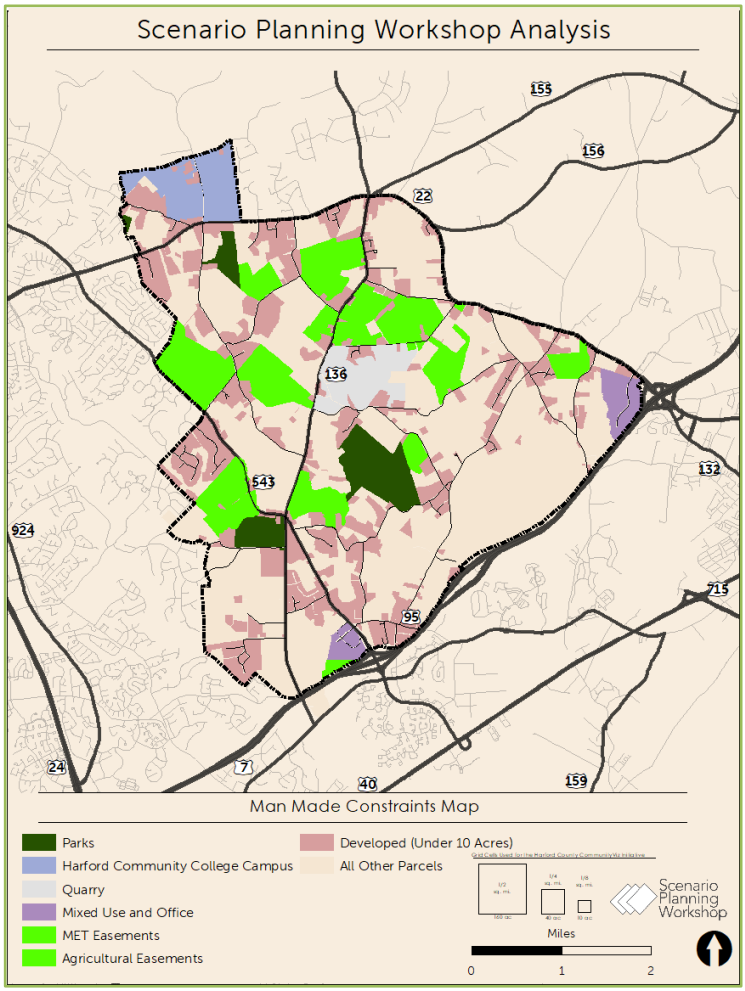
Given our inclination toward a TDR alternative, described conceptually in the preceding Chapter, we next analyzed the various opportunities and constraints to pursuing such an alternative. To assess how to balance growth and preservation in Creswell, we first identified what exists in Creswell today that cannot accept new growth, which areas of Creswell required protection from impacts of development, and where and how Creswell might accommodate new growth. This section will outline existing conditions in the study area, limitations to development, and opportunities to accommodate housing and economic development.

Man-Made Constraints

Existing conditions in Creswell's 13,000 acre area provide a patchwork of development dispersed throughout a rural agricultural and environmental landscape. In large part, Creswell is dominated by farmland, forests and parks (see Figure 6-1). In particular, easements (light green) and parkland (dark green) are prominent, totaling 2,229 acres of the study area.

Criss-crossing through this landscape are roads ranging from rural collectors to interstate highways, including MD-543 and MD-136 in the center of Creswell, MD-22 on the northern edge of the study area, and I-95 along the southern and eastern edge of the study area. Excluding MD-22 and I-95, rights of way make up for 472 of the 13,000 acres in Creswell. Outside of land reserved for conservation and transportation, several large developments dot the study area along its edges and within its center. Harford Community College owns 415 acres in the northwestern corner of the study area, and has developed around half of its land. The Churchville Quarry occupies 356 acres in the center of Creswell along MD-136. Lastly, the Batelle mixed office center and new James Run mixed use center total 162 acres in the northeast and southeast corners of the study area, respectively.

Figure 6-1. Man-Made Constraints



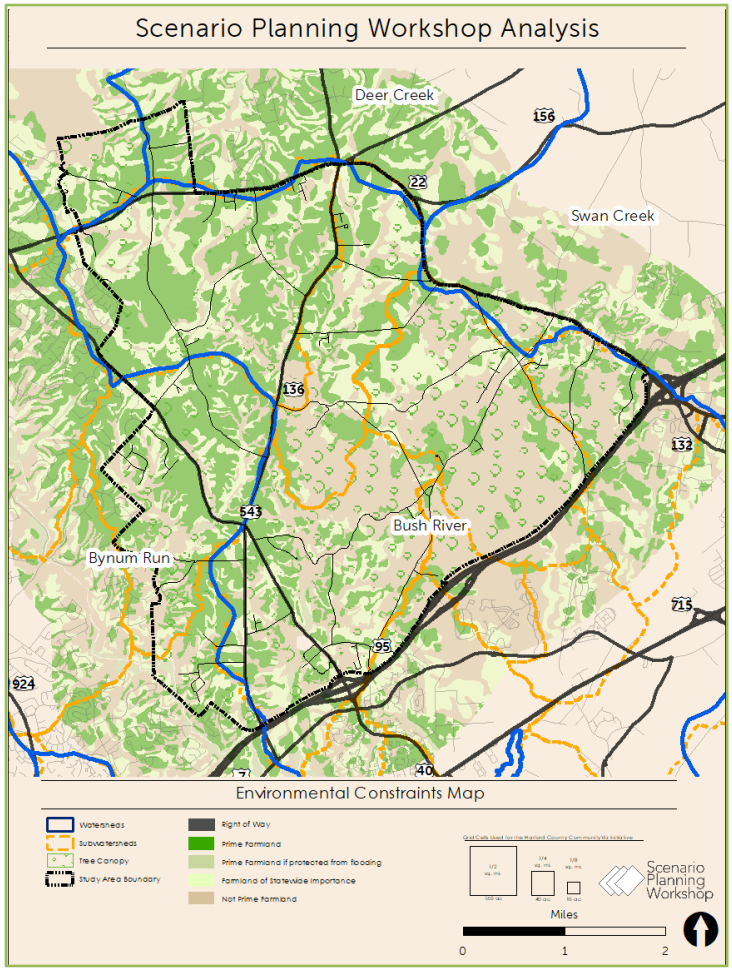
Outside of larger developments, small rural crossroads and commercial developments are scattered throughout Creswell on parcels 10 acres and under, seen in light red in Figure 6-1. On parcels as large as 30 acres, large lot neighborhoods and rural residential land are located alongside commercial developments and easement land, seen in green in Figure 6-1. These smaller developments make up the majority of land unavailable to accommodate growth in the study area, totaling 2,700 acres.

In total, existing developments, protected land, and rights of way constrain 6,304 acres from development, or 47% of the total 13,326 acres in Creswell. This protected, reserved, and developed land is scattered throughout the study area, limiting its ability to accommodate growth in a single area of Creswell. Further, with a clustering of smaller parcels and protected land in the center of the study area, the ability to accept new growth in the center of Creswell is limited.

Natural Constraints

In addition to a patchwork of built and protected land in the study area, Creswell has a rich landscape of high value natural resources, agricultural industry, and historic and rural character that requires protection from degradation, fragmentation, and loss of quality while accommodating growth.

Figure 6-2. Environmental Constraints

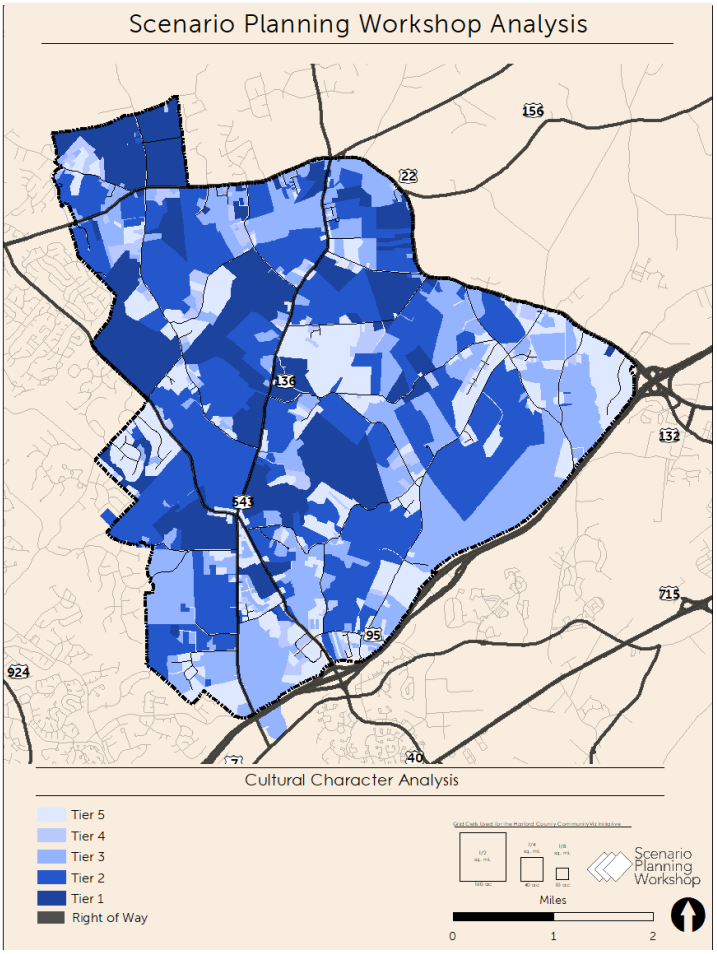


Creswell is located largely in the nontidal estuary portion of the Bush River watershed and larger Bush River Basin, which reach to the tidal coast of the Chesapeake Bay in the south, up to the north of Bel Air, and further northwest towards Jarrettsville. Although water quality in the core of Creswell remains high, fragmentation of contiguous forests, seen in the tree graphic throughout Figure 6-2, which provide significant interior forest space, biodiversity, riparian buffers, and wetland filtration of runoff, will diminish water quality throughout the Bush River watershed. Thus, development strategies must preserve the existing high quality contiguous forest in Creswell, particularly in areas of direct drainage to the Chesapeake Critical Area.[34]

Outside of the green infrastructure in Creswell, prime productive soils (seen in solid green in Figure 6-2) account for just over half - 6,731 acres - of the study area, and have continued to support local agricultural industry in Creswell.[35] As a hub of agritourism with easy access to urban areas near Bel Air and Aberdeen, the protection of Creswell's agricultural economy through the conservation of prime soils is key in informing an agriculturally sustainable framework to accommodate growth in the area.[36]

[34] Harford County Department of Public Works, *Bush River Watershed Total Maximum Daily Load (TMDL) Restoration Plan for PBCs,* (2018). For a more detailed overview of environmental resources in Creswell, refer to the environmental appendix.
[35] United States Department of Agriculture Natural Resources Conservation Service, "Soil Survey Geographic Database", (2019).
[36] For greater detail on agritourism and the agricultural industry in Creswell, refer to the Agricultural Appendix.

Figure 6-3. Cultural Character Analysis



Lastly, while the natural resources within Creswell provide significant environmental services and economic benefits to Creswell and the surrounding region, the rural and natural landscape of Creswell also constitute rural character. This character consists of open space and agriculture, allowing scenic viewsheds, access to open space and the natural environment, and a connection to environmental resources.

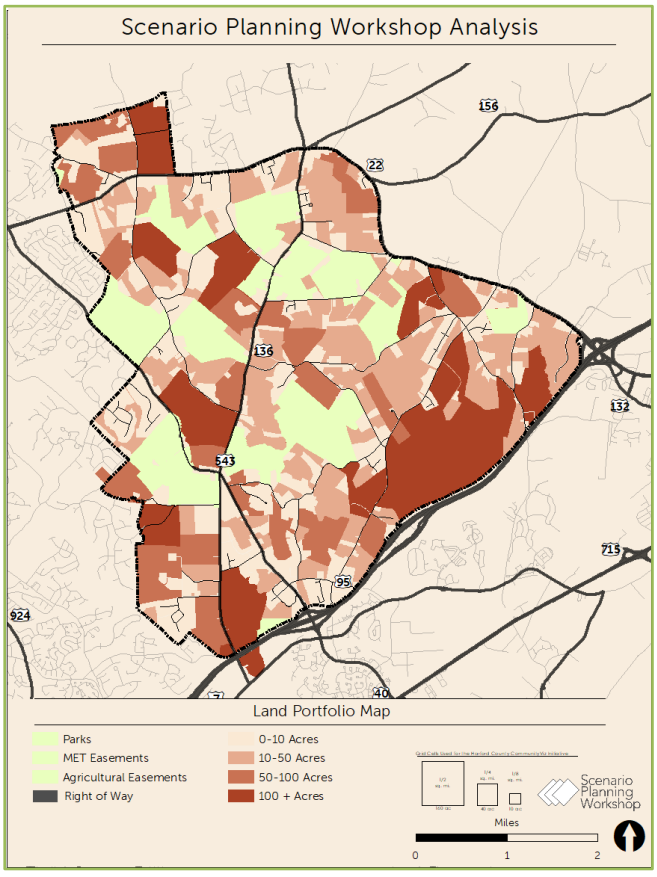
A rural character analysis was also executed, which produced an index. This index utilized natural resources such as streams, forested land, and open space; viewsheds; and historic architecture, including three National Historic Sites within the study area. The results of the rural character analysis can be seen in Figure 6-3, where darker blues indicate higher scoring for rural character.[37] Rural character is concentrated in the center of the study area, where historic sites, open viewsheds, and conserved land create a rich landscape of agricultural and natural character. Thus, the need to protect not only existing open space, but also the viewsheds within the high value rural character core within the center of Creswell, as well as the corridors with unobstructed landscape views, will be key in accommodating sustainable growth that maintains the rural character of Creswell.

[37] For greater detail on rural character analysis in Creswell, refer to the Rural Character Appendix.

Conclusion

Creswell is a patchwork of agricultural, forested, and protected lands that surround small scale commercial crossroads and rural residential neighborhoods throughout the study area. Key developments including Harford Community College, and the mixed office and mixed use centers are located on the edges of the study area. Within the center of the study area, small scale development, open space, and agriculture create a rural landscape characteristic of Creswell. Protected and unprotected agricultural land supports an active agritourism industry on Creswell's prime productive soils, crossroad rural residential and commercial centers neighbor farming and open space, and viewsheds of the surrounding character and historic sites inform a key rural character core. Throughout the study area, high value natural resources support water quality, biodiversity, and the open space that contributes to the rural character in Creswell. Thus, the preservation of open space will be essential not only to maintaining rural character in Creswell, but also to supporting an environmentally sustainable framework.

Figure 6-4. Land Portfolio



Opportunities: The Core and Edges

About 53% of undeveloped land that can accommodate growth in the study area is focused along the western and eastern edges. Figure 6-4 depicts the land portfolio within Creswell, where protected lands are in green and shades of red correspond with parcel size. Within these wings, around 2,900 acres of the 100 acre or larger parcels (in dark red) are able to accommodate growth. These large parcels provide an opportunity not only to accommodate significant growth on a limited number of parcels, but also can also accommodate signicant , connected open space and needed for public facilities, such as school sites, parkland, or trails.

In combination with medium-red parcels of 50-100 acres, which add another 700 acres to the 2,900 of the 100 acre + parcels, growth can be accommodated in clustered areas within the wings of Creswell, where large parcels act as anchors for clustered developments. The use of clustering would allow the remaining lighter red parcels of less than 50 acres in the wings to remain undeveloped, and therefore would maintain natural resources, agricultural activity, and rural character throughout Creswell.Combined with a central core of patchworked undeveloped parcels, all under 100 acres, in the center of Creswell, these parcels of less than 50 acres make up another 3,000 acres. of Creswell. The smaller undeveloped parcels and nodal clustering of growth in the wings of Creswell present an opportunity to apply a transfer of development rights (TDR) in Creswell. By preserving small acreage parcels and a central core of rural and agricultural character, the clustered growth in the wings of Creswell could meet housing needs while maximizing open space and preserving rural character.

Chapter 7
A New Approach to Preservation and Growth

Given the constraints of Creswell's land portfolio, and the County's commitment to the sustainability of local farming, it is necessary to plan for growth that is spatially and financially compatible with farming in Creswell. Selective transfer of development rights and open space subdivision design offer a way forward.

Scenario Planning Workshop

Chapter 7. New Approach to Preservation and Growth

Farming in Creswell

There are many bright spots in Creswell's farming landscape. Agritourism in Harford County generates an average of $34,266 in additional sales per operation—the fourth highest average in the state, even as Harford County ranks tenth in total number of agritourism businesses overall.[38] Creswell itself is home to five of Harford County's 15 agritourism businesses— remarkable considering that the area has just 6% of the county's total farm operations.[39] This demonstrates that conditions in Creswell are especially favorable for agritourism, perhaps owing to Creswell's proximity to the Development Envelope, its extensive rural character, and the success of its renowned anchor farm, Broom's Bloom Dairy. The importance of agritourism to Creswell, coupled with the financial challenges of traditional farming, point to an evolving opportunity for operators to adapt to higher-value practices that require less acreage and will appeal to a local consumer base. Adaptive farming pursuits have been shown to be especially compatible with farming on the metropolitan fringe, which offers farmers a built-in market for direct sales.[40] More immediately, and fundamental to the continuity of farming at any scale, however, is the conservation of prime soils as part of a contiguous, stable farmland base.

Given the constraints of Creswell's land portfolio, and the County's commitment to securing the sustainability of local farming,[41] it is necessary to plan for growth which is compatible with farming in Creswell. The economic volatility of the agricultural industry affects Creswell's estimated 30 agricultural operations.[42] The landscape is defined by a range of producers, the majority of whom depend on off-farm income to subsist. Eighty-five percent of Harford County's total farm operations generate less than $50,000 in sales per year, compared with 75% of

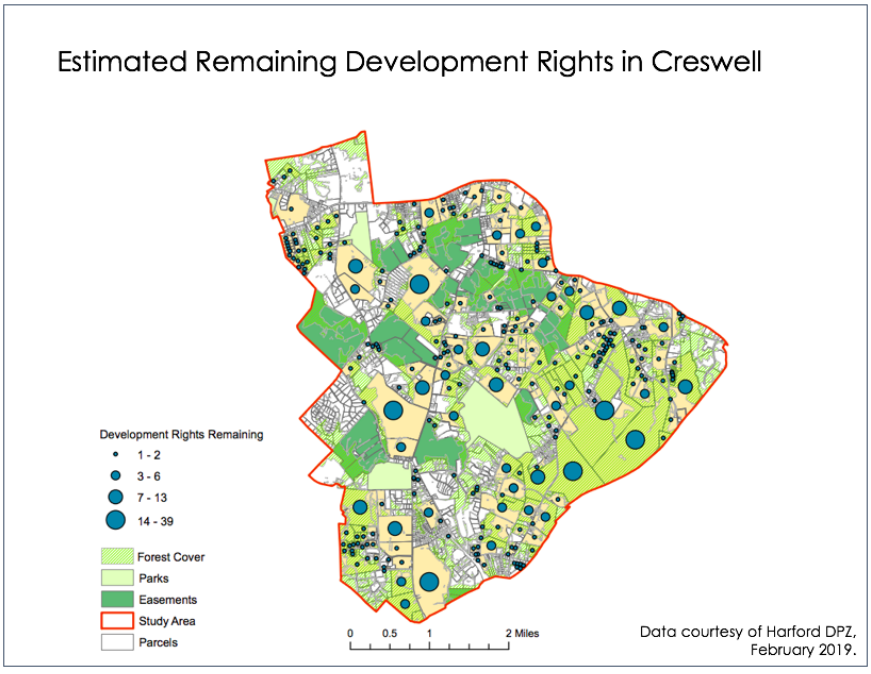
[38] *Census of Agriculture by State and by County, 2012- 2017.*
[39] Ibid.
[40] Janelle Larson, Jill Findeis, and Stephen Smith, "Agricultural Adaptation to Urbanization in Southeastern Pennsylvania," *Agricultural and Resource Economics Review 30/1* (2001), 32-43; Catherine Brinkley, *Fringe Benefits*, (PhD dissertation, University of Pennsylvania, 2013); E. Heimlich and Charles H. Barnard, "Agricultural Adaptation to Urbanization: Farm Types in Northeast Metropolitan Areas," *Northeastern Journal of Agricultural and Resource Economics* (1992).
[41] *HarfordNEXT,* 78-80.
[42] Please refer to the Agriculture Appendix for a full accounting of the character, trends, and economy of farming in Creswell.

farms statewide.[43] Additionally, while the size of farms in Harford County has increased by 5% since 2012, average annual sales per operation has fallen 7.5% across that same period, suggesting that land-intensive operations are no longer value-efficient.[44]

Existing Land Preservation Programs

The viability of farming is predicated on access to a stable farmland base. Creswell's patchwork of land uses stands to become even further fragmented if the area's remaining estimated 750 development rights are built out at their existing low-density, large-lot zoning allowance—1 unit per10 acres with two-acre minimum lots will cost Creswell roughly 2,000 developable, potentially farmable acres. While the agricultural landscape in Creswell is mostly intact, the farmland base is currently neither stable nor secure given the number and widespread distribution (on a total of 131parcels) of these development rights (Figure 7-1). Government policy and planning centered on preservation can ensure options for future generations of Creswell farmers by making careful choices about growth patterns.

Figure 7-1. Development Rights

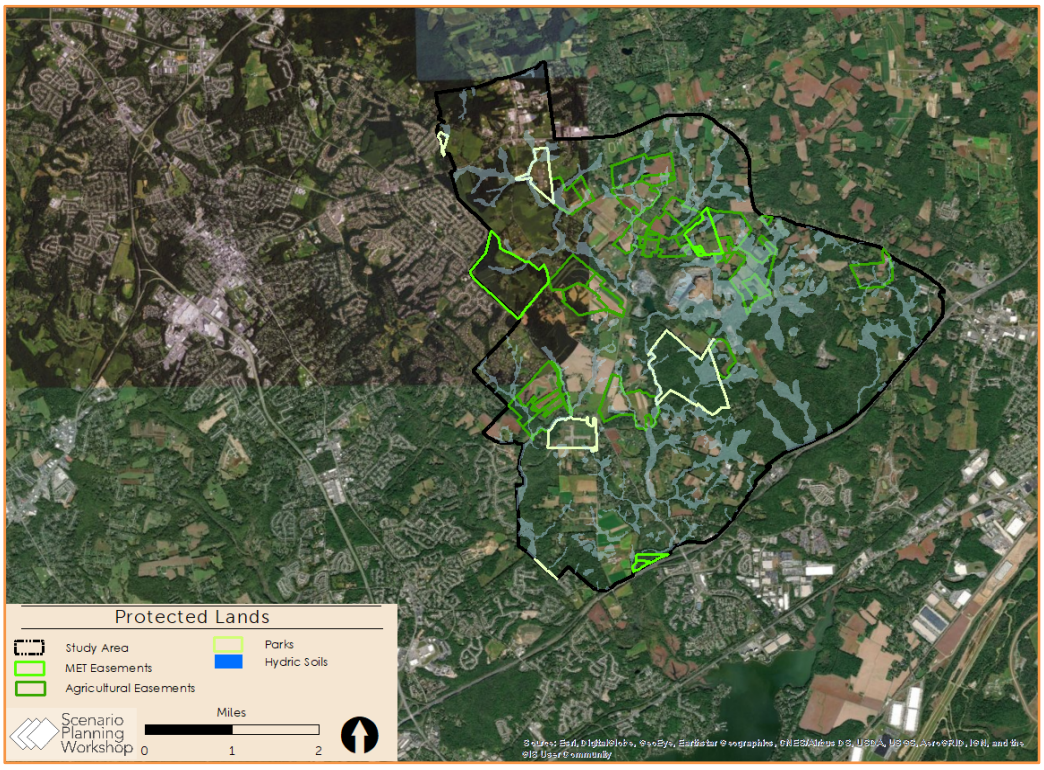


We say this despite the strength of Harford County's Agricultural Land Preservation Program (HALPP) (Figure 7-2, Protected Lands).[45] HALPP is a Purchase of Development Rights (PDR) program, meaning that the development rights of approved landowners are purchased by

[43] *Census of Agriculture by State and by County, 2012-2017.*
[44] Ibid.
[45] The State-run Maryland Agricultural Land Preservation Foundation (MALPF) program is also active in Creswell and Harford County, accounting for about 14,000 of preserved acres countywide. Rural Legacy and Maryland Environmental Trust (MET) easement donations round out the land programs.

the County using public revenue from one-half percent real estate transfer taxes, then retired in perpetuity.[46] This results in the total and permanent preservation of specific parcels of agricultural land. In exchange, owners receive per-acre compensation that fluctuates with fair market value and annual program budget.[47] Since the program's first purchase in 1992, HALPP has preserved nearly 2,000 acres of productive farmland in Creswell and more than 30,000 acres countywide, at an all-time average per-acre price of $4,300.[48]

Figure 7-2. Protected Lands



In comparison to the transfer of development rights (TDR)—or the sending of development rights from an area for preservation to an area designated for growth using private money— PDR has been shown to be effective, but less effective at preserving large parcels of land, preserving contiguous parcels, and preventing the erosion of the farmland base overall.[49] This may be due in part to a municipality's preservation strategy prioritizing quantity of acres over location. In Creswell, preservation of strategically located smaller parcels could supply

[46] This funding mechanism is voter-approved at the county level.
[47] Harford County Agricultural Preservation Advisory Board, "Meeting Minutes, March 5, 2019," (2019).
[48] Data provided by Harford County Planning and Zoning staff. Per-acre prices fluctuate year to year. In 2019, for example, the HALPP Advisory Board set the per-acre price cap to $6,500, up from $6,000 in 2018.
[49] Elizabeth Brabec and Chip Smith, "Agricultural land fragmentation: the spatial effects of three land protection strategies in the eastern United States," *Landscape and Urban Planning* 58(2-4), (2002).

critical connective tissue between farms and easements (see Figure 6-1). But, as HALPP is voluntary, competitive across the County, and targeted to parcels that are 50 acres and larger, the program can only strongly influence rather than control preservation and growth at the micro-scale in Creswell. In contrast, tightly managed, mandatory TDR programs have been shown to be more effective than PDR at conserving the farmland base and directing growth to preferred locations.[50]

The transfer of development rights is complex, requiring coordinated and transparent collaboration between landowners, developers, and municipal leadership.[51] Maryland has many examples of TDR programs, both successful and failed,[52] and Harford County's current program offers an example of one that could be greatly improved. At present, properties zoned in the agricultural (AG) district in Harford County are granted one development right per ten acres of property. The only properties that can receive these development rights are those designated as Rural Residential or Village Residential in the most recently adopted Land Use Map,[53] or other AG zoned properties that are within a half-mile of the property sending its development rights. This limits the program's effectiveness in terms of its ability to preserve land and its ability to orchestrate growth. Consequently, the program is virtually unused.[54]

A Revised TDR Program

When TDR succeeds, it provides win-win outcomes for landowners and developers by accommodating growth and still preserving land, using private money.[55] The tool may be underused due to the complexity of drafting and implementing a worthwhile program,[56] but the opportunities in Creswell for a well-designed TDR program are clear (see Figure 6-4). There are 3,000 acres of developable land in smaller 10- to 100-acre parcels in the core, of which __- acres are in parcels in the 50 – 100 acre category. Some of these could join together to achieve the 100 acre threshold for larger parcels. There are 2,900 acres of developable land in parcels that are 100 acres or larger in the west and east

[50] Brabec and Smith, 266-267.
[51] Virginia McConnell and Margaret Walls, *Markets for Preserving Farmland in Maryland: Making TDR Programs Work Better,* (UMBC and Resources for the Future, 2007); Rick Pruetz and Noah Standridge, "What Makes Transfer of Development Rights Work?" *Journal of the American Planning Association* Vol. 75, No. 1, (2009).
[52] McConnell and Walls.
[53] "Harford County Code." § 267-53(D)(4)(e). AG Agricultural District. (2018): 148.
[54] William D. Amoss, Harford County Chief of Historic and Agricultural Preservation, interview on February 9, 2019.
[55] McConnell and Walls, 157.
[56] Ibid.

corridors.[57] The majority smaller parcels, mostly in the center of Creswell, would become sending areas, while the west and east edges nearer to the Development Envelope and I-95 corridor would mostly become receiving areas. Spatially, this aligns preservation with many of the active farms, prime soils, conservation easements, rural viewsheds, and environmentally sensitive features in Creswell's core, while funneling growth to larger parcels that are better suited to development, clustering, and integrated planning. A well-designed TDR program has the potential to ensure that farming remains a defining feature of Creswell.

Rick Pruetz, FAICP, is a leading scholar on the transfer of development rights.[58] In 2009, he and Noah Standridge published a literature review spanning forty years of scholarship on TDR and yielding an empirical analysis of the nation's most successful programs. Success is defined by the greatest amounts of land preserved, but developer participation is also part of his analysis. Building on Pruetz's research to develop recommendations for Creswell, we also considered the work of Virginia McConnell and Margaret Walls who analyzed TDR programs in Maryland specifically, reaching many of the same conclusions that Pruetz later affirmed. In sum, for a TDR program to work within Creswell, the following six interdependent components for success should become part of the County's regulatory framework:

1. **Sending areas have strict development regulations.** First, to incentivize developers to build elsewhere, density in Creswell's sending areas should remain at one DU per ten acres, and not be upzoned .[59] To incentivize landowners to sell their rights, this study proposes that eligible landowners should be able to send their development rights at a much higher density than 1 per 10 acres ensure that landowners will be motivated to sell.

2. **Receiving areas should be customized to fit local conditions.**[60] Area attributes will vary, but in addition to clear geographic designation, political acceptability, and consistency with the comprehensive plan, there should also be a strong market for TDR. This study proposes designating between 2,900 and 3,600 acres of Creswell's large-acre parcels as receiving areas, to accommodate a wide range of new units depending on County decisions on density. (see Chapters 7 and 8 for impacts and implementation). The amount of land actually in development areas is at least twice that actually needed to

[57] Harford County can designate receiving areas elsewhere too, but see Chapter 4 for a longer discussion of why this study does not focus on Development Envelope infill areas.
[58] Pruetz also consulted with the authors about this analysis for Creswell and their conception of the proposed TDR approach.
[59] Pruetz and Standridge, 83.
[60] Pruetz and Standridge, 81.

absorb the development rights that can be sent. This will ensure a viable market.[61]

3. **Market incentives benefit landowners and developers alike.**[62] Development rights should be allocated to sending areas in a ratio that benefits landowners (factor 1) while ensuring that rights will be affordable for developers in receiving areas. This study proposes allowing sent rights to be used at double the density at which they are sent. This will motivate developers to make use of the TDR program.

4. **Demand for bonus density in the area.**[63] Harford County's housing market is strong and getting stronger (see Chapter 3). Demand for bonus density the receiving areas will increase as the Development Envelope reaches capacity over the next 14 years.

5. **No or few alternatives to TDR for achieving bonus density.**[64] County regulation can ensure that the Creswell TDR program will be the only way to increase development densities in receiving areas.

6. **Strong public support for land preservation.**[65] This is clearly the case in Harford County, where HALPP is publicly funded and has already preserved approximately 30,000 acres of agricultural land.[66] Moreover, the agricultural community has specifically expressed their keen interest in TDR as a tool for increased land preservation.[67]

Open Space Subdivision Design

While the TDR concept could accommodate a wide range of new units – anywhere between, say, 5,000 and 20,000 – we chose to analyze and test two mid-point alternatives – for 10,000 and 16,000 new homes. We calculated how much and what types of land will be preserved in each alternative. The bottom line is that with the use of TDR, *coupled with strategic site design in receiving areas,* we provide for the preservation of 67% to 77% of the land that is currently zoned agricultural, even while accommodating 10,000 or 16,000 new homes. TDR

[61] Philip Gotwals, a leading state agricultural economics practitioner, advised that a "viable market" is based in part on there needing to be about three times the number of units being demanded vs. supplied.
[62] Pruetz and Standridge, 84.
[63] Pruetz and Standridge, 81.
[64] Pruetz and Standridge, 83.
[65] Pruetz and Standridge, 87.
[66] *HarfordNEXT*, 78.
[67] Harford County Planning and Zoning staff interviews on February 9, 2019, and on April 30, 2019.

establishes the framework for preservation, while open space subdivision design protects farmland and critical habitat at the parcel and sub-parcel level.

Open space subdivision design (OSD), which is modeled after Conservation Subdivision Design (CSD), is a form of super-clustering that preserves 30% to 50% or more of buildable land on a given parcel by closely grouping homes to protect farmland, rural viewsheds, or other beneficial environmental features (Figure 7-3.).[68] Ideally, protected open space in Creswell will be strategically identified so as to expand connections with green infrastructure, increase recreational opportunities, preserve natural buffers between farmland and residential areas, and extend or preserve a farm's working acreage.[69] Harford County's zoning code currently offers CSD as a design option, but it is limited to parcels that are 35 acres or larger, and only for subdivisions of single family detached homes in AG districts[70]—the inflexibility may be one reason why CSD is rarely if ever used. Within the Development Envelope, Harford provides for a form of CSD called Conventional with Open Space (COS) design, which allows for smaller lot sizes in exchange for open space. Widely used, this version of COS only requires between 10% and 20% open space.

Figure 7-3. Westwood Commons, Oakland, MI

Source: Randall Arendt. Seventy percent of this developable parcel was preserved through clustering that prioritized open space and environmental conservation. At the time of building, prevailing home prices in the neighborhood were $100,000 to $300,000, but these homes each sold for between $475,000 and $800,000 in the late 1990s. The developer reports that the homes have maintained their value since the 2007 recession.

[68] Randall Arendt is a leading scholar and practitioner on designing subdivisions to preserve farmland. He coined the term Conservation Subdivision Design (CSD), a rural variant of Open Space Design (OSD) applied to suburban/urban subdivisions. He graciously provided all case studies and literature researched for this project, in addition to input on the TDR-OSD framework. See Randall Arendt, *Rural by Design: Planning for Town and Country*, (Abingdon and New York: Routledge, 2017).
[69] "Retaining Farmland and Farmers," in *Rural by Design: Planning for Town and Country* (2017).
[70] Harford County Code." § 267-72(A)(3). Conservation Development Standards. (2018): 284.

In Creswell, implementing a new open space development model would require coordinated improvements to existing zoning, subdivision regulations, and infrastructure plans, as well as an improved development process that both educates developers, landowners, and future homebuyers about the benefits of OSD.[71] Assuming these updates and revisions are politically feasible, Harford County could mandate or incentivize the use of OSD to result in attractive new neighborhoods and continued preservation of the farmland base. The following case study provides just one accounting of the many OSD and CSD examples that could guide the County toward a more land-sensitive growth pattern.

Creative Subdivision Design for the Ponds at Woodward, Chester County, PA

Now known as the Ponds at Woodward, the original parcel for the following subdivision was 120 acres and included a working orchard. Similar to Creswell, conventional zoning would normally have yielded 57 single-family homes on two-acre lots under the township's rural residential zoning allocation. Dissimilar to Creswell, the property was also eligible for a planned residential development (PRD) option that could have allowed a four-fold increase in overall density of up to 230 units. The owners were reluctant to pursue maximum density given the property's extensive environmental features and community benefits. Fortunately, the opportunities inherent in the PRD option allowed the County, a land conservancy, and the owners to collaborate on a better, more flexible option (see Figure 7-4).

Figure 7-4. Site Design for Ponds at Woodward

Source: Randall Arendt

[71] See the Agriculture Appendix and the Community Design Appendix for more information about OSD, CSD, and a recommended four-step process that identifies conservation features first before dividing parcels into lots.

The final development comprised 31 single-family detached homes on variable lot sizes, one-third to one-half acres, along with 24 condominiums attached in groups of three, set on 9,000 square feet of land per unit. The creative site design allowed for the conservation of 50 acres of working orchard, ten acres of mature woodlands, and about ten acres of meadowland and ponds. The condominiums sold for almost three times the market rate, and the detached homes fetched similarly healthy sales prices, owing to their beautiful location. The owner and developer credit the flexible zoning—varied housing types, multiple lot sizes—with generating the success of this subdivision.

Our concept for Creswell protects the landbase by proposing a reimagined TDR program in conjunction with open space subdivision design to maximize conservation at the micro-scale. The model demonstrates that by limiting the homes to a handful of large parcels, the vast majority of agricultural land will remain in farms. OSD can even work at the sub-parcel level to protect existing operations by preserving significant proportions of contiguous land. Coordinated revisions to the available planning tools could bring about a future where farming is and remains the "cornerstone of the community."*

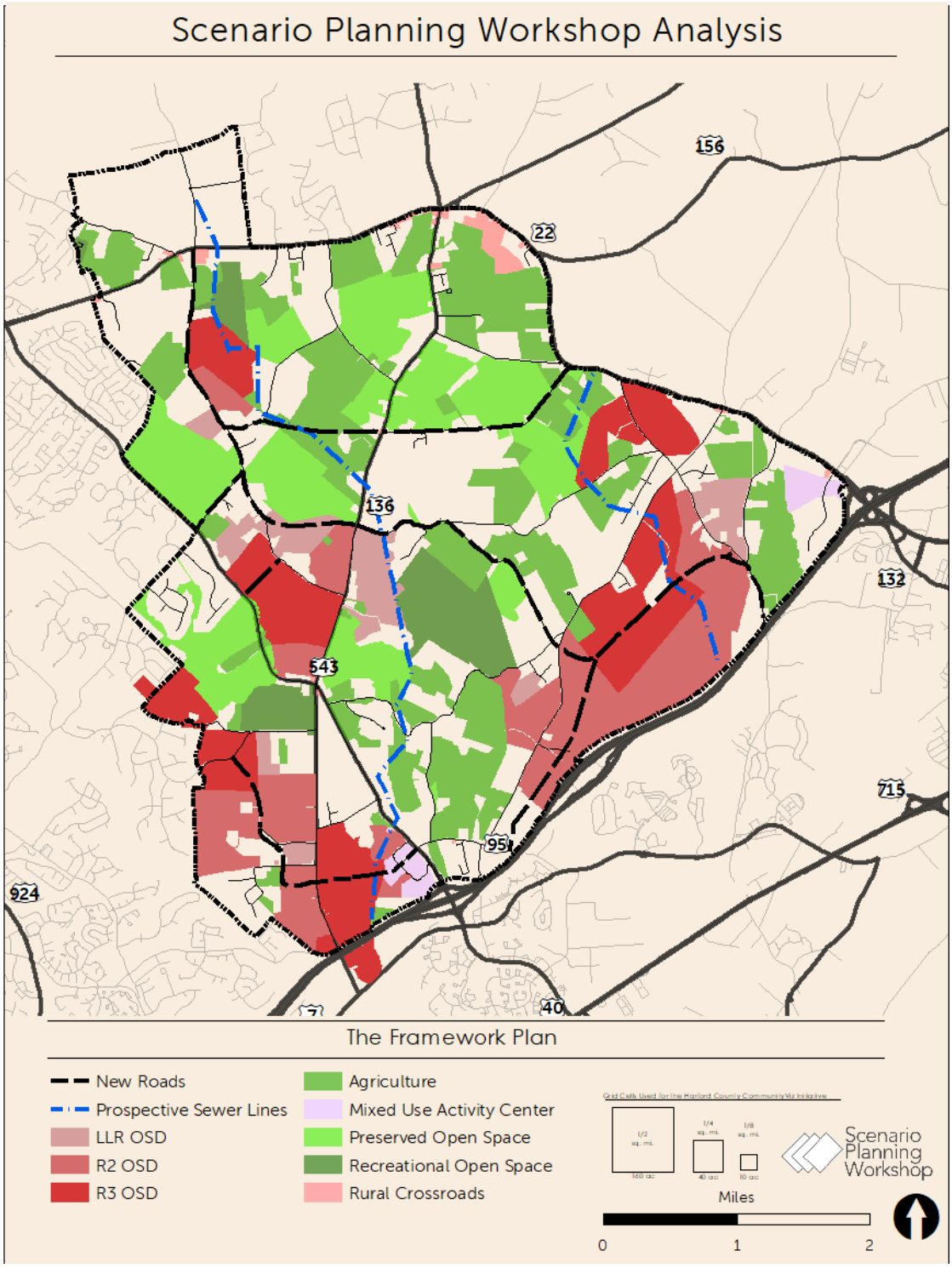
—

* HarfordNEXT (2016), 128.

The Framework Plan

Figure 7-5 pulls together many of the elements we have previously discussed and presented into one summary map that represents the Framework Plan proposed for Creswell. Land use designations, green infrastructure, transportation changes, trails, and sewer trunklines are all combined in this map.

Figure 7-5. Framework Plan



We call it a Framework Plan because it has a flexible structure that allows a range of housing outcomes depending, in order of importance, on the following factors:

- The parcels designated as sending or receiving
- The densities chosen for sending and receiving parcels
- The housing types selected by developers, as influenced by the market
- The timing of infrastructure and its capacity
- The role of the county as a TDR middleman and manager

We next discuss the above factors in sequence.

Earlier in this Chapter we gave a possible housing range of 5,000 to 20,000 units and then proceeded to provide acreage data on potential sending and receiving areas. We also suggested significant density increases and target ratios between sending (supply) and receiving (areas). Below we choose some specific values for these features to demonstrate how the TDR arithmetic might work in Creswell:

- Assume development on receiving parcels is set at **7 du/ac** (current R3 COS density)
- If all **3,000** acres of receiving areas were in the market, this produces a maximum **demand** of 3,000 ac @ 7 du/ac = **21,000** units
- Assume **2,200** acres out of the 2,900 large sending parcels (100 ac +) choose to sell their rights
- Assume sending right density is **4.5 du/ac**, (current R2 COS density; compare with 1/10 ac onsite development option)
- Possible housing units = 2,200 ac of sending parcels x 4.5 du/ac = **9,900** units max
- This maintains a ratio of housing demand to supply of **2.1** (21,000/9,900), below the ideal of 3 but acceptable
- The receiving area actually needed to accommodate 9,900 units @ 7 du/ac = **1,414** ac.
- That is **less than half** the available 3,000 acres designated as receiving areas ensuring competition among developers to buy the scarce rights

From the above example it should be clear that varying the sending or receiving acreages or the densities can produce very different results. A lower yield of, say, 5,000 units could result from a smaller base of sending acres or setting lower densities and a higher yield of, say, 20,000 units could result from a higher sending base or just setting higher sending or receiving densities. The example also demonstrates that the exact location of future development or preservation

cannot be predicted in advance since one cannot know where the sellers or buyers will be.

The issue of a practical range of densities brings us to the next item on the earlier bulleted list – housing types and markets. Densities of 7 du/ac can generate small lot SFD units (e.g. 4,000 sf lots) or townhouses if spread across the whole parcel. However, if only a portion of the parcel is available for development because of an OSD minimum opens space requirement (e.g. 50%) then the net density of the development on the buildable land must double to 14 du/ac if the same number of units are built. This density means either townhouses or garden apartments will be built. These unit types have different implications for the demographics of the residents, including school children. In the end, market dynamics will heavily influence unit types and therefor the exact projections of future populations and development impacts must be estimates.

We have, nevertheless, done enough iterative testing of various combinations of sending and receiving acreages and densities and their impacts to suggest some targets. We have selected and tested both 10,000 and 16,000 units for Creswell. We believe that this represents a good range that sufficiently meets housing needs and targets acceptable acreages for preservation or development at sending densities of 4 du/ac and receiving densities of 8 du/ac. The housing mix implications of our two selected alternatives are detailed in next Chapter on the Plan's impacts.

Figure 7-6. Existing Uses and Acreage

Existing Use	Acreage
Undeveloped	6,930
Easements and Parkland	2,229
Right of Way	472
Existing Development	2,668
Quarry	357
Harford Community College	415
Mixed Office and Mixed Use	163
Total	**13,324 Acres**

Figure 7-6 presents the land use totals for Creswell. Figure 7-7 illustrates one possible set of locations for these levels of development. Note that while we use 2,900 acres for sending acreage, it is possible that some of the 700 additional acres of 50-100 acre parcels may join in, yielding a total of 3,600 acres of receiving area. Therefore the total under Allocated to receiving areas is given as 28,800 (3,600 ac x 8 du/ac = 28,800).The large parcels targeted for receiving areas were selected based on size, adjacency to each other, minimizing impacts on easement

properties and on rural character, agritourism, accessibility to major roads and sewer, soils, and green infrastructure. Based on these factors, we also assigned the parcels zoning district designations. We assumed OSD design standards (see proposed specifics in the Implementation Chapter under Land Use and Growth Management) would be mandatory and thus we were able to yield open space percentages for these two alternatives. The relative acreage usage in these two alternatives is shown in the tables that accompany each of them.

Figure 7-7. Transfer of Development Rights Variations

Full Capacity	10,000 Homes	16,000 Homes
2,900 Acres Send Growth	**2,900 Acres** Send Growth	**2,900 Acres** Send Growth
3,247 Acres Allocated Growth	**2,097 Acres** Allocated Growth	**2,574 Acres** Allocated Growth
Allows for **28,800 Homes**	Allows for **10,000 Homes**	Allows for **16,000 Homes**
Average Density of **8.87** Homes Per Acres	Average Density of **4.77** Homes Per Acres	Average Density of **6.21** Homes Per Acres

Figure 7-6 outlines preserved, used, and undeveloped acreage in Creswell. We note that 6,930 acres are available in total for sending and receiving development rights in Figure 7-6. About 2,900 sending acres provide rights to send to a maximum of about 3,500 acres. But, as shown in Figure 7-7, variations in the total number of homes built increases or decreases the number of acres where growth is allocated to receiving areas, and thus the amount of open space reserved. This variation in acres of open space and total units realized changes the overall average density across all developed parcels at full capacity, 10,000 home, and 16,000 home build outs.

This can also be seen in Figures 7-8 and 7-9, where black dots represent actual units built in the land allocation model. Despite a larger number of acreage being designated as a receiving area for new growth, both 10,000 and 16,000 homes accommodates growth while preserving open space where the maps show OSD areas without actual units (black dotted areas).

Figure 7-8. Dot Density Framework: 10,000 Homes

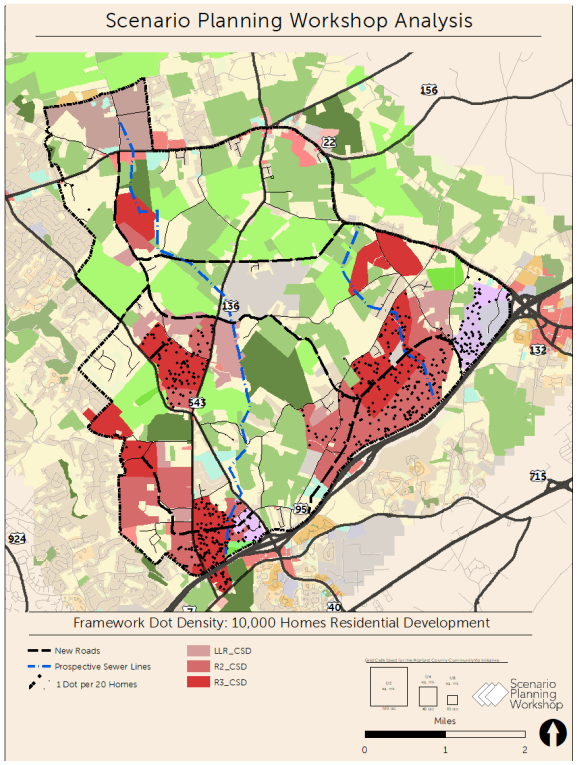
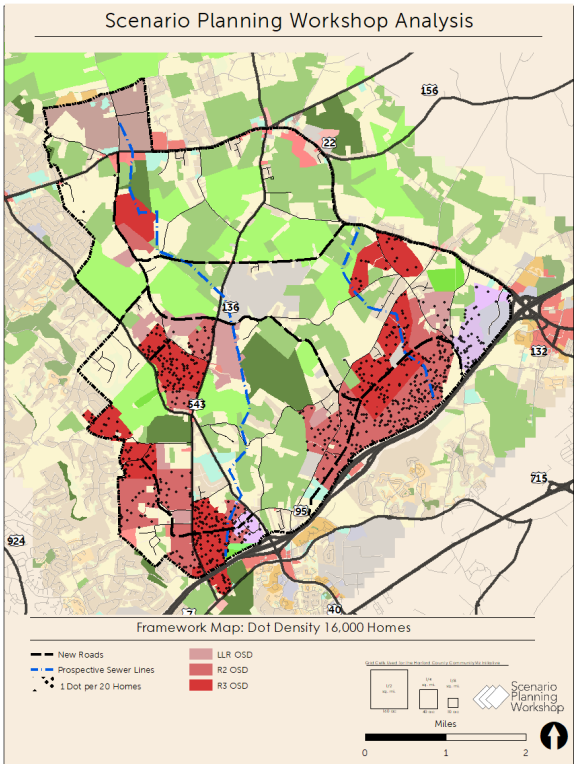


Figure 7-9. Dot Density Framework: 16,000 Homes



Since key roadway and sewer infrastructure will be phased in, we assumed a Western corridor phase followed by an Eastern corridor phase, (whose logic is discussed in more detail in the Implementation Chapter). Each phase would have its own housing yields and Figure 7-10 presents this information. The yields assume the construction of necessary infrastructure, especially of roads needed

Figure 7-10. East and West Phasing Table

Unit Type	Number of Units at 10,000 Homes		Number of Units at 16,000 Homes	
	West	East	West	East
Single Family Detached	1,750	1,750	2,800	2,800
Single Family Attached	2,000	2,000	3,200	3,200
Multifamily	1,250	1,250	2,000	2,000
Total	**5,000**	**5,000**	**8,000**	**8,000**

to maintain acceptable traffic conditions. In the East wing particularly, development intensities and approvals will depend on the coordination of sewer extension and on the construction of the new I-95 interchange at Aldino-Stepney and Creswell Boulevard. The Framework Plan assumes that Phase I may not be

followed by Phase II, for any variety of reasons. Each phase is thought of as self-sufficient. For our planning exercise, we simply divided the housing yields equally between phases. In reality a more detailed analysis and public input, would of course, likely produce different totals. Our impact analyses, however, consider the total development program at buildout.

The final item in our earlier list of five key factors influencing the housing yield was the role assumed by the County as TDR middleman and manager. Earlier in this Chapter we listed six interdependent components of a successful TDR program based on research by Rick Pruetz. Another component Pruetz lists as an important driver of success is the jurisdiction's role in facilitating the transfer of development rights. The County can set up a TDR bank, for example, to ensure an ongoing supply of development rights by advance purchases and proactive targeting; such actions can influence both the pace and amount of rights developed in practice. The County's role in promoting and educating potential participants in the TDR is also key to its success.

Non-Residential Development

We have focused on residential supply but the extent of residential development possible will also, of course, affect the amount of supporting commercial development that will be needed. Commercial development will affect both traffic and the fiscal picture and, therefore, it is important to project its likely extent. We used a jobs/housing ratio to project overall employment growth in the County and a ratio approach of job types in the county overall versus Creswell for some job sectors in Creswell. The retail component of commercial growth is directly related to the amount of new homes and was simply projected as a ratio using the industry standard of 60 sq. ft. of retail per home. Office and industrial growth relies not just on residential growth but on the probability of new exogenous growth in Creswell given its accessibility to I-95 and capacity in the two mixed use/office parks at the I-95 interchanges with MD 543 and MD 22. We use standard suburban/urban type intensities for Floor Area Ratios (FAR) and square feet per employee to generate square footage and acreage requirements. Our projections are presented in Figure 7-11.

Figure 7-11 Non-Residential Projections

	Employees	SF Required	FAR	Ac. Required
10,000 homes				
Retail		755,176	0.25	54.98
Office	349	560,731	0.25	44.32
Industry	259	1,259,080	0.4	66.97
Total		*2,574,987*		*166.27*
16,000 homes				
Retail		1,114,798	0.25	88.01
Office	494	762,219	0.25	62.83
Industry	367	1,746,143	0.4	94.92
Total		*3,623,160*		*245.75*

Chapter 8
Impacts of the Framework

We evaluate our framework plan at two levels: with the addition of 10,000 new homes and with the addition of 16,000 new homes. In both scenarios, this growth improves housing mix and can largely mitigate traffic congestion. The style of growth enables both agricultural and environmental preservation. Additional infrastructure needs are significant but manageable.

Scenario Planning Workshop

Chapter 8: Impacts of the Framework

Overall, under the Framework plan outlined in Chapter 7, the County's goals for Creswell and beyond are largely achieved. We evaluated the Framework Plan at two levels: 10,000 new homes and 16,000 new homes. Under both alternatives, as the summary table below shows, this growth improves the housing mix and can mitigate traffic congestion, given associated roadway improvements. The style of growth we have suggested allows for conservation of agricultural land and protection of the environment and rural character of Creswell. New infrastructure needs, though substantial, are fiscally manageable.

Figure 8-1. Summary of Framework Impacts.

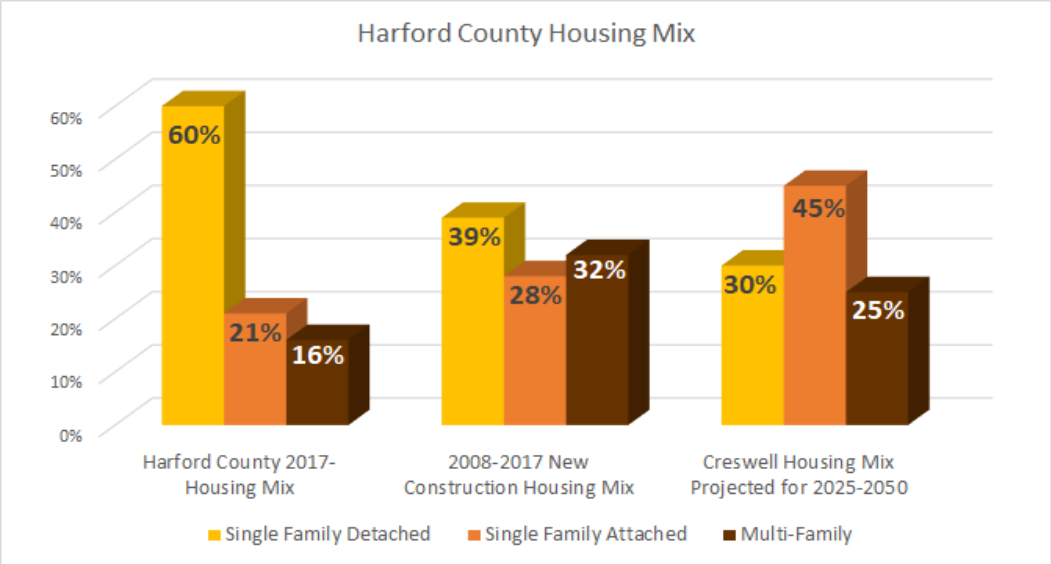
Goals	10,000 Homes	16,000 Homes
Conserve Farming	**77%** of agricultural land preserved	**67%** of agricultural land preserved
Protect the Environment	**74%** of forest preserved **1,139** Acres of Impervious Surface Added	**65%** of forest preserved **1,484** Acres of Impervious Surface Added
Preserve Rural Character	**15%** of key Rural Character Acres Impacted	**34%** of key Rural Character Acres Impacted
Minimize Traffic Impacts	Without improvements, 9% more congested than 2010 With improvements, 3% more congested	Without improvements, 10% more congested than 2010 With improvements, 4% more congested
Maintain Adequate Infrastructure	**2.6 MGPD** Water demand **2.2 MGPD** Sewer demand **5** New Schools **+117** Fire/EMS Staff Needed **130 Acres** of Parks Needed	**4.1 MGPD** Water demand **3.3 MGPD** Sewer demand **7** New Schools **+188** Fire/EMS Staff Need **600 Acres** of Parks Needed
Additional Housing Provided	**11%** increase in county housing supply	**17%** increase in county housing supply
Ensure Positive Fiscal Impact	**$51M annual net gain** to County by 2040	**$82M annual net gain** to County by 2040

The Housing Mix Diversifies

The construction of homes in Harford County is very consistent with many rural suburban counties across America. The construction of single family detached homes has dominated the housing market in Harford County since the late 1970s. As of 2017, 60% of all homes in the County were single family detached units. However, since the early 2000s, the type of homes built in Harford has begun to diversify. There is now a more varied construction mix of single family detached, single family attached, and multi-family units within the County. Of all homes built from 2008 to 2017, only 39% were single family detached homes, while 32% percent were multi-family and 28% were single family attached homes.[72]

[72] Baltimore Metropolitan Council, "Building Permit Data System", (2017).

Figure 8-2. Harford County Housing Type Mix



Source: Harford County and expected Creswell Housing Mix. Source for 2017 Harford County Housing Mix: ACS 2012-2017 5 year estimates. Source for 2008-2017 New Housing Construction Mix: Baltimore Metropolitan Council; Building Permit Data System.

According to the American Community Survey 2012-2017 five-year estimates, the Creswell area currently has 2,829 homes, with over 90% being single family detached units.[73] If Harford County decides to pursue residential growth in Creswell, our alternatives suggest that the construction of a greater mix of housing types than what is currently present would best meet the needs of current and future. Taking into account expected demographic shifts in the makeup of residents, including a nearly twofold increase of County residents 65 years and older, along with an accompanying slight decrease in household size,[74] our alternatives were planned to approximate the following housing mix: 30% single family detached, 45% single family attached, and 25% multi-family units. Figure 8-3 depicts the evolution of County housing contrasted with the Creswell projections.

Figure 8-3. Projected 65+ Age Population

	2017*	2020	2025	2030	2035	2040	2045
Population 65+	37,366	45,205	53,980	62,015	66,103	67,972	66,577
Household Size	2.64	2.63	2.62	2.60	2.59	2.58	2.55

**ACS 2012-2017 5-year estimates. Projections from the Maryland Department of Planning.*

[73] These estimates are from two census tracts 3011.02 and 3037, which cover most but not all of what we are calling the Creswell study area.
[74] Maryland Department of Planning Projections (2017).

Traffic Congestion Can Be Mitigated

In order to compare the impacts of growth alternatives, traffic implications were modeled for a moderate household increase of 10,000 homes and a medium household increase of 16,000 homes, both with and without major roadway improvements. The Baltimore Metropolitan Council's Cube model was used to forecast volume versus capacity (v/c) ratios by link, with some intersection improvements included as part of the BMC model. As noted previously, we assumed that improvements such as the widening of MD-22 and other proposed improvements in the study area, like the intersection-level improvements at MD-543 and MD-136 would occur, regardless of the alternative. (See Chapter 3 for more details on this assumption.)

Finally, we compared these results to baseline trend (no growth, no additional network improvements) in order to evaluate the impacts associated with additional development. Each alternative was tested at the PM Peak Hour congestion to evaluate the period of greatest impact on each network at corresponding levels of growth. The two alternatives evaluated at both the 10,000-household and 16,000-household levels were called "Land Use" (assuming growth with no significant network improvements) and "Land Use plus Network" (assuming growth along with all significant new roadway expansion and extensions tested), hereafter shortened to "Network". As our primary goal was to demonstrate the impacts of implementing all roadway improvements or none at all for each growth level, different levels or combinations of road improvements were not tested for each alternative.

All the proposed improvements are listed in Figure 8-4. The most significant improvements we modeled were a new four-lane rural arterial, called "Creswell Boulevard", and a new highway interchange at Aldino Stepney Road and I-95 to which it would connect. In modeling such improvements, we assumed that given the high degree of congestion experienced at existing interchange at MD-543, a third interchange and boulevard would reduce the burden on both arterials and other ramps, distributing traffic more evenly throughout the roadway network. Results from our analysis demonstrate that this is true both for both the moderate and medium growth alternatives.

Figure 8-4. Proposed Road Improvements

Section	Type	Length (Miles)	Lanes	Classification	Notes
Creswell Boulevard Connector to Aldino Stepney	New	0.08	2	Major Rural Collector	
Aldino Stepney to new Interchange	Existing	0.422	4	Principal Rural Arterial	Creswell Blvd
Between Hollywood Rd. and Tower Rd.	New	1.8	4	Principal Rural Arterial	Creswell Blvd
Tower Road/James Run Rd. to MD-136	Existing	2.0547	4	Principal Rural Arterial	Creswell Blvd
MD-136 to Shucks Rd.	New	0.706	4	Principal Rural Arterial	Creswell Blvd
Shucks Rd.	Existing	2.173	4	Principal Rural Arterial	
E Wheel Rd. between Shucks and MD-543	Existing	0.56	2	Urban Collector	
MD-543 to Shucks Rd. (S)	New	0.363	2	Major Rural Collector	
Goats Hill Rd.	Existing	0.51	2	Local	
Tobin Rd.	New	1.6	2	Major Rural Collector	
Tobin Rd.	Existing	0.56	2	Major Rural Collector	
Hollywood Rd.	New	1.62	2	Major Rural Collector	Carsins Run Parallel Road
Carsins Run Rd.	Existing	2.10	2	Minor Rural Collector	

Section	Type	Length (Miles)	Lanes	Classification	Notes
Old Tower Rd.	Existing	0.10	2	Local	
Nova Scotia Rd.	Existing	2.0	2	Major Rural Collector	
Snake Ln.	Existing	2.53	2	Major Rural Collector	
TOTAL		19.18			

10,000 Households

Congestion levels for the 10,000-household growth alternative were modeled for baseline improvement as well as network improvement conditions. Note that in this alternative, a modest amount of new commercial development associated with the household growth (approximately 750,000 to one million square feet) is also incorporated into the land use program and modeled. This commercial development is located at intersections near the core of the study area (MD-136 and Shucks Road) and at I-95 adjacent to MD-543 and MD-136. In this "Land Use" growth scenario with no major network expansion, the number of congested roadways throughout the study area increases by about 11%. Along MD 22, LOS worsens along a majority of the corridor to LOS D or lower, with those links identified in the map below (Figure 8-5) declining to a rating of F. Several links along MD-543 and MD-136 degrade slightly from a rating of A or B to C, while one section of MD-543 just south of MD-22 worsens to an unacceptable LOS of D.

In comparison, the "Network" scenario (Figure 8-6) for a 10,000-household growth alternative – one in which all the above-mentioned roadway improvements are implemented – sees significant improvement in LOS as compared to the "Land Use"-only option. This scenario shows that in 2040 there would only be around 3% increase in heavily congested roadways in the study area as compared to congestion levels in 2010. Creswell Boulevard appears to succeed in diverting some traffic from MD-22, where LOS along certain sections are reduced from D to C or A/B. Conditions along MD-136 also improve from a projected LOS D to C or A/B. Carsins Run Road, modeled here as a two lane facility, is also projected to degrade to LOS F, although we believe this would be amended by either its expansion to four lanes or by the inclusion of another parallel connector road. Improvements to roadways like Carsins Run Road will be dependent on the actual layout of roadway access points associated with new development.

Figure 8-5. 2040 Land Use Scenario LOS (10,000 households)

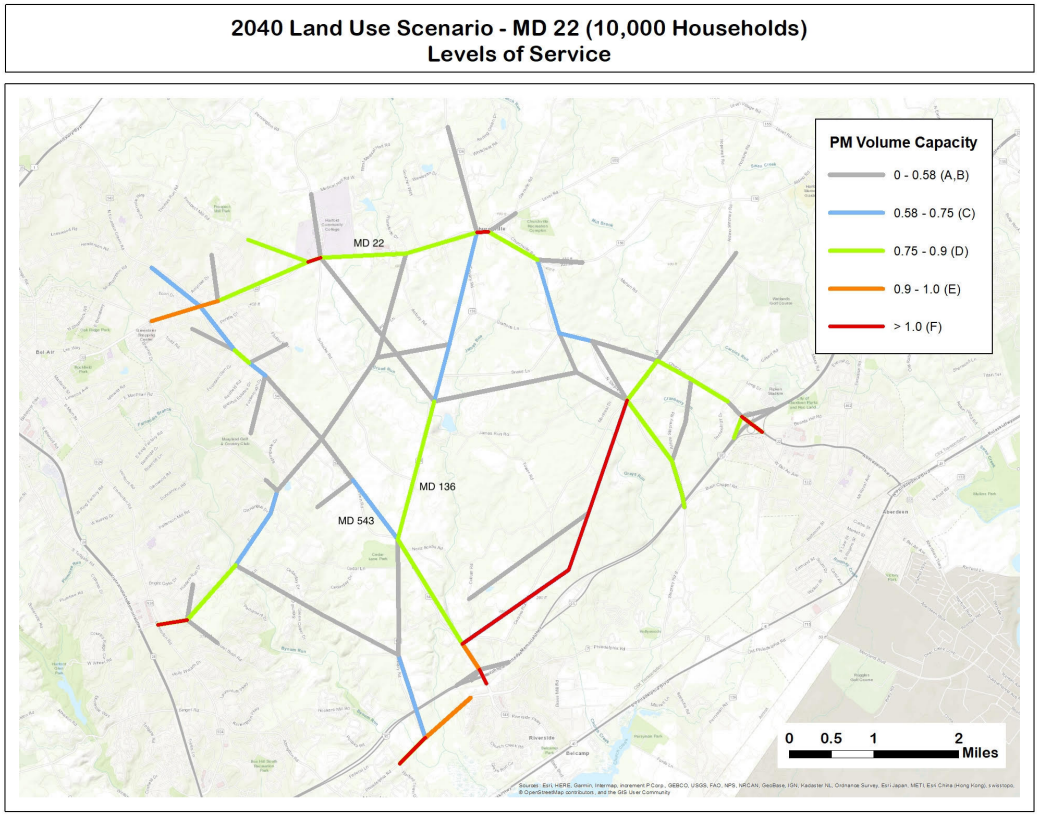
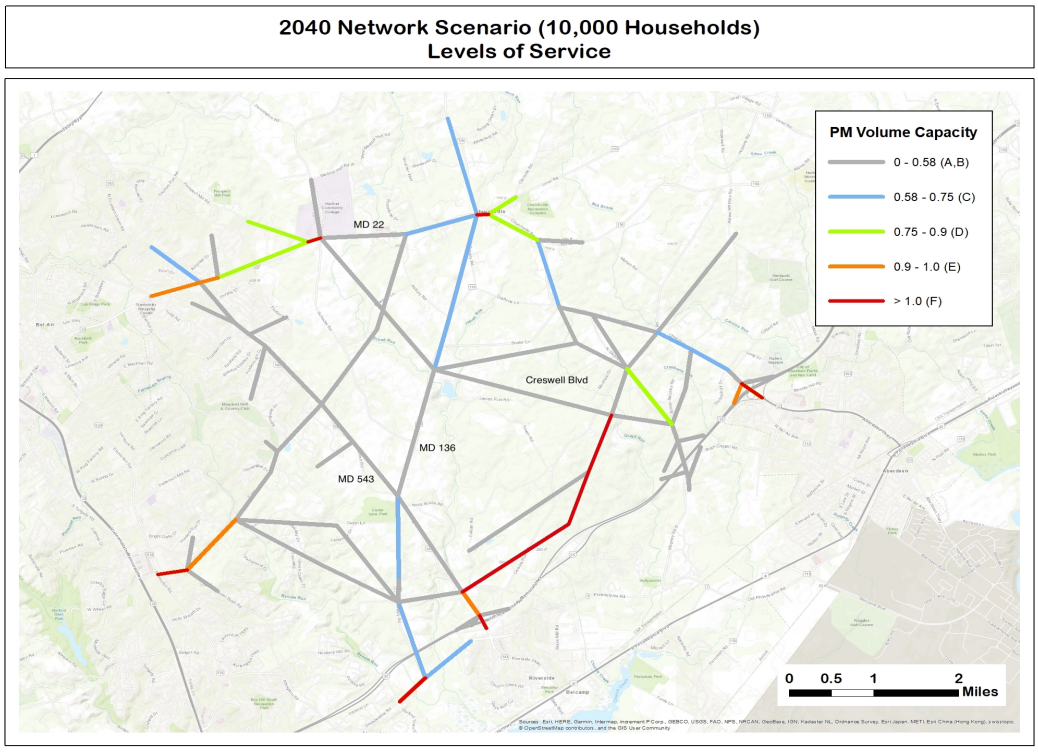


Figure 8-6. 2040 Network Scenario LOS (10,000 households)



16,000 Households

The impact of adding 16,000 new homes to the study area is also a direct function of the degree to which the roadway network is improved. The same commercial growth as modeled for the 10,000-home alternative, in the same locations, was used in this model as well. At this level of household growth, the BMC model identifies stark differences between an alternative in which there were major improvements to the roadway network and one in which there was none other than those expected in the baseline condition. As previously outlined, we assumed that these baseline improvements would include only those expected for MD-22 and the intersection of MD-543 and MD-136. Figures 8-7 and 8-8, below, display the results of the travel demand model's projections for growth alternatives with and without additional roadway improvements:

Figure 8-7. 2040 Land Use Scenario LOS (16,000 Households)

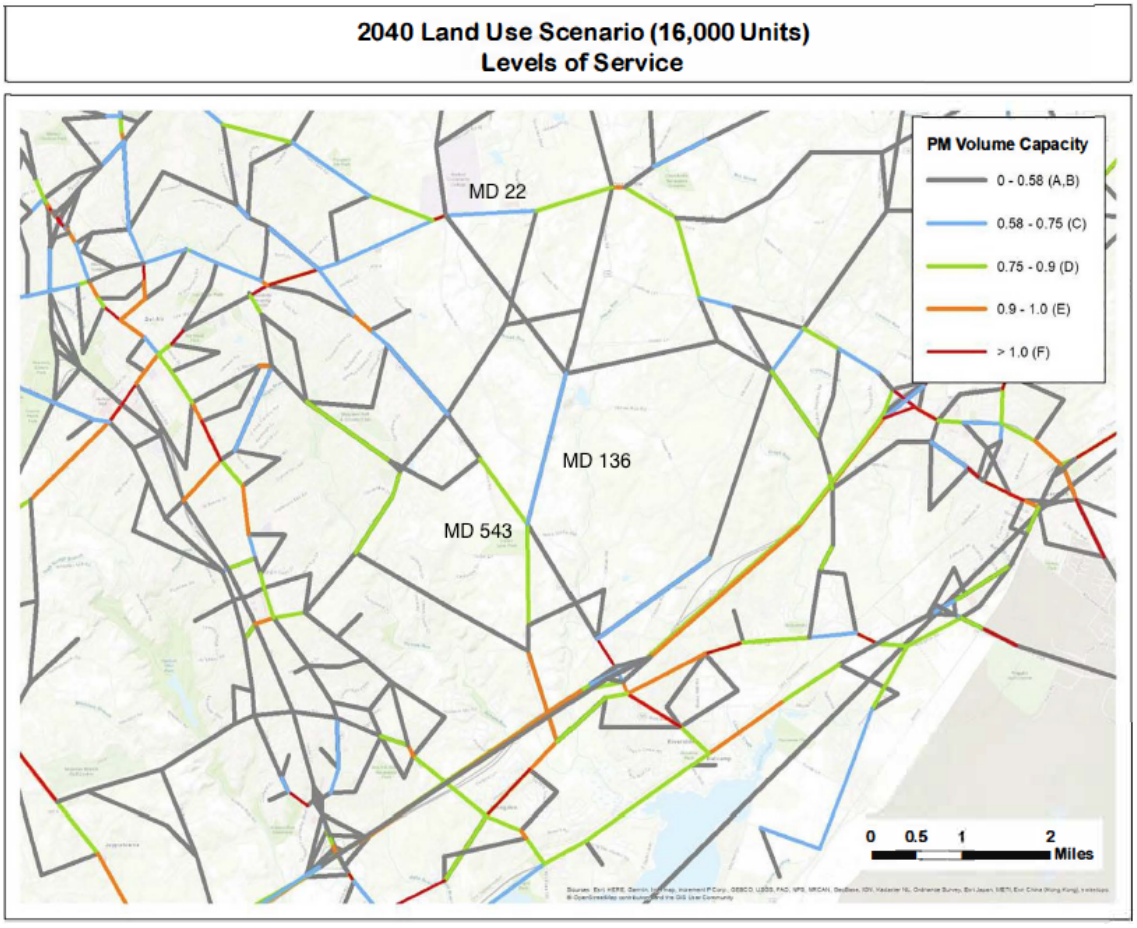
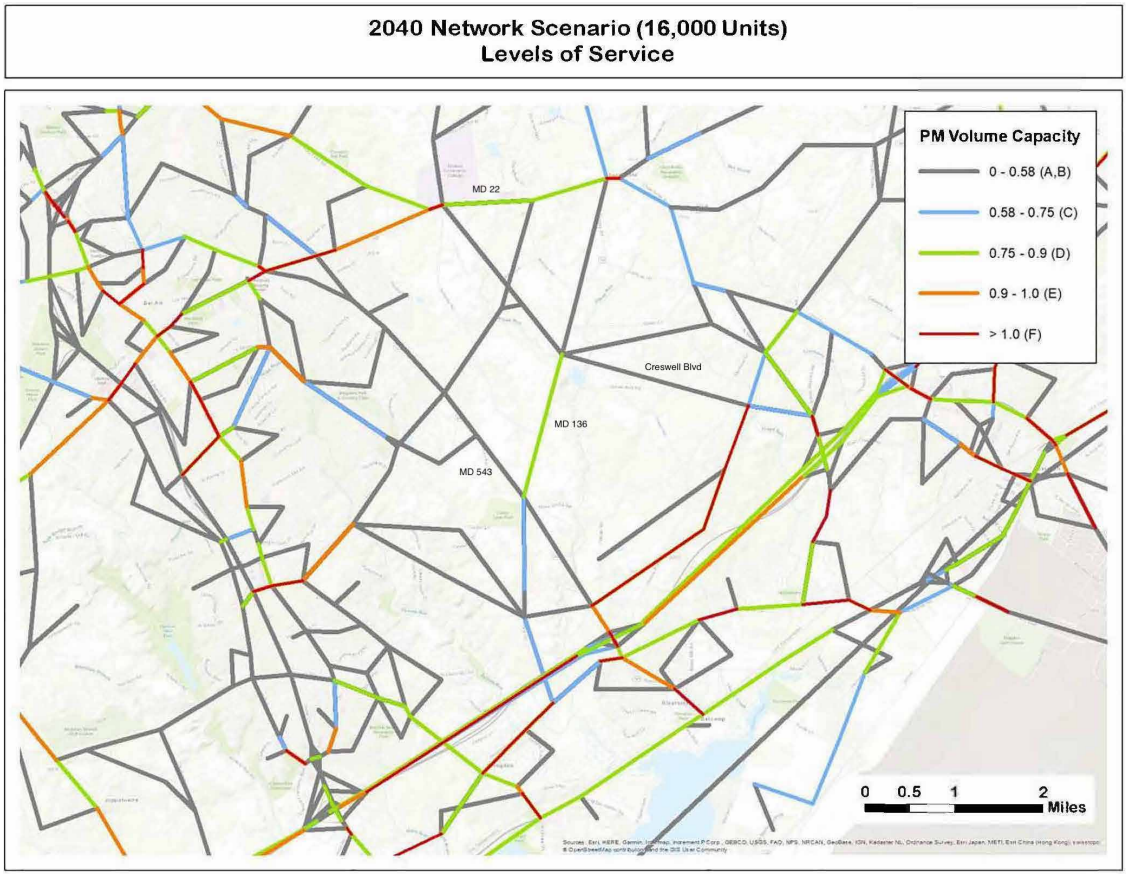


Figure 8-8. 2040 Network Scenario LOS (16,000 Households)



Our analysis of the travel demand model results found that a growth alternative with only the baseline roadway improvements (the "Land Use" scenario) would result in a 12% increase overall in the number of heavily congested roadways (links with failing LOS) throughout the study area during the PM Peak Hour. As depicted in the Land Use scenario above, conditions worsen in particular along MD-22, between MD-543 and Brierhill Drive, throughout the Churchville area, and just south of James Run Road. Critically, conditions also worsen along MD-543 and MD-156 from LOS A/B to level D, particularly the links just past their intersection, which already experience heavy congestion. Congestion also increases severely along Carsins Run Road, in part due to greater connectivity between the I-95 interchanges at Aldino Stepney and MD-543. A proposed connector road or widening of the existing two-lane facility would address this worsening congestion.

Comparing these results to the Network alternative, for which major roadway improvements were coded into the travel model (realized here as the creation of new links), illustrated the impact that such additions to the network have on congestion projections. With the inclusion of these major improvements, as well

as the extension, expansion or creation of other major collectors, the number of heavily congested links was projected only to increase 4% above 2010 baseline levels. Additionally, LOS projections for links along MD-543 and MD-136 under this Network improvement alternative were at passing levels (LOS C or above), what the county's development standards would consider satisfactory and not in need of further mitigation. While one link in the study area (representing Carsins Run Road) is projected to worsen to LOS F due to its proximity to the new I-95 interchange at Aldino Stepney, which draws traffic along that roadway, the inclusion of a parallel collector in the proposed roadway map which appears in Chapter 10 of this report will likely mitigate this problem.

Comparing Traffic Impacts: 10,000 Households vs. 16,000 Households

The modeled increase in the number of households in each scenario is accompanied by significant increases in congested links within the study area, largely localized along key road segments, and reflect modest differences that reflect the addition of 6,000 more units. In the 10,000-home "Land Use" alternative, congested links are forecasted along MD-22, Carsins Run Road, and MD-136 and MD-543 near the I-95 interchange. In the 16,000-unit alternative, congestion also appears in key sections of these roads adjacent to Churchville, highway interchanges, and connections with communities to the west and south of the study area. The "Network" scenarios for both the 10,000-home and 16,000-home reflect worsening of conditions largely along the same corridors, including sections of MD-22 west of Churchville, portions of MD-136 north of the intersection with MD-543, and along Carsins Run Road, but the congestion levels overall are much improved. In both the "Land Use" and "Network" scenarios, the aggregate difference between congested links at the 10,000-home and 16,000-home levels are each just 1%, suggesting that an extra 6,000 households has a marginal impact on traffic congestion.

Figure 8-9. Congestion Comparisons

Alternatives	10,000 Units	16,000 Units
Land Use	11%	12%
Network	3%	4%

Conclusions

Given that an increase in the number of households in the study area would generate additional trips and thus place additional strain on the roadway network, roadway improvements will be necessary. Having evaluated these projections, our analysis of the modeled projections found that congestion worsens most significantly at the 16,000-home growth alternative where roadway improvements do not occur ("Land Use" scenario). However, where

growth is accompanied by commensurate network improvements (including the construction of parallel arterials and connectors that can successfully divert the flow of traffic off of already burdened roadways), i.e. the "Network" scenario, congested links overall increase at approximately by the same amount (4%) as they would in a trend-growth baseline (2%).

At the moderate (10,000-home) growth alternative, the benefits of these roadway expansions are also apparent. While our analysis of alternative projections at the 10,000-home level demonstrated that without improvements ("Land Use" scenario), we might expect an 11% increase in congested roadways, if improvements were made ("Network" scenario), this increase would reduce to 3%, compared to 2% in the trend growth alternative. Thus, in general there is little difference between overall congestion levels for the moderate and medium growth alternatives, and both alternatives would require targeted network improvements to mitigate new congestion in order to achieve levels of service similar to those in a trend growth baseline scenario.

Impacts on Recreation and Parks

The existing level of service for parkland in Harford County is 29.50 acres per 1,000 residents, within a half-mile buffer of a residential area (within the development envelope) or within a five-mile buffer (outside the development envelope). In order to maintain this level of service for Creswell under a 10,000-home or 16,000-home growth alternative—alternatives which would see the Creswell area becoming part of the development envelope and therefore subject to the half-mile buffer constraint on parkland access – more parkland will need to be acquired.

Currently, the Creswell area has access to 459.81 acres of County-owned parkland which is either within or intersects a half-mile buffer around the study area border. This acreage meets the level of service needs of the existing population. Furthermore, as the Harford County Parks and Recreation Department has a multi-use agreement with Harford County Public Schools, allowing for community use of existing public school recreation spaces and facilities in the off-hours[75], the undeveloped school property site next to the Schuck Regional Sports Complex in the northwest of Creswell is part of the calculated 459.81 County-owned parkland acres. This school-owned land is counted as 60% of its total acreage for purposes of calculating levels of service, as stipulated in the County's 2018 Land Preservation, Parks, and Recreation Plan.

[75] Harford County Parks and Recreation Department, *Land Preservation, Parks, and Recreation Plan,* (2018). https://www.harfordcountymd.gov/DocumentCenter/View/12284/2018-Land-Preservation-Parks-and-Recreation-Plan.

Additionally, Creswell has access to 349.63 acres of state parkland. However, this acreage was not counted towards the existing demand or needed acres, due to its acreage falling below 60 acres per 1,000 residents, consistent with the methodology of the County's 2018 Parkland Needs Assessment Analysis.[76]

The Harford County Parks and Recreation Department recognizes that the acquisition of new parkland in the development envelope is difficult due to the expense and scarcity of available land post-development, and therefore the County has primarily focused on a greenbelt strategy to acquire parkland at a reasonable cost and distance for dense population centers. However, new parkland has not been acquired within the Creswell area.[77] In a scenario of residential development in Creswell, where land uses are in flux and subject to development pressures, acquiring new parkland before development occurs will be critical. Parkland property should be identified to meet the demands of a higher population to ensure equal access, cost reduction, and effective placement of park resources. The open space subdivision regulations which this framework plan proposes are one way of integrating parkland with agricultural and residential land uses—since the open space subdivision design supports the use of portions of a parcel for conserved public use, these portions could become part of a park.

School Capacity Needs Increase

Any—even a business-as-usual trend scenario—level of residential development in the Creswell area will require Harford County to make a significant investment in school infrastructure in order to provide adequate facilities for the area's schoolchildren and maintain the current high quality of educational resources for the County as a whole. Harford County's schools are, in many cases, already well over capacity. Utilization percentages for both elementary and secondary schools in the County are over 80%, with higher utilization rates for elementary schools.[78] While the Harford County Public School system has not currently expressed any need for a new school, focusing instead on additions, modernizations, and direct infrastructure replacement of existing schools,[79] if the Creswell area were to experience growth, new elementary schools would quickly be required.

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[76] Harford County Parks and Recreation Department, *Parkland Needs Assessment Analysis,* (2018). https://www.harfordcountymd.gov/DocumentCenter/View/12284/2018-Land-Preservation-Parks-and-Recreation-Plan.
[77] *Land Preservation, Parks, and Recreation Plan,* (2018).
[78] Harford County Public Schools, *Educational Facilities Master Plan*, 2018.
[79] Personal communication, Missy Valentino, Facilities Planner, Harford County Public Schools. May 3, 2019.

The Harford County APFO ordinance places a moratorium on approving preliminary plans for subdivisions of greater than five lots in school districts where full-time enrollment currently exceeds, or is projected to exceed, 110% of capacity within three years. Furthermore, the location of school sites in an undeveloped area cannot be accurately determined until the future land use in that area is established. However, using the pupil yield factors from the Harford County Department of Planning's *Annual Growth Report* (AGR) from 2017 and knowing the projected housing mix and dwelling unit numbers for the development scenario being considered,[80] we were able to extrapolate estimates for total future school facility needs.

School boundary changes may address the additional students generated by development in Creswell. We assume some redistricting will occur over the next decade so existing schools with capacity may provide relief to overcrowded facilities. We considered surrounding schools by virtue of their proximity to the Creswell area, not present school district assignments. Being mindful of the County's goal of a maximum 45-minute school commute time, we discarded schools with more than a 20-minute travel time from the study area (accounting for distance as well as pick-up/drop-off schedules and future traffic increases). This led us to include ten elementary schools, four middle schools, and four high schools in our analysis of current facilities. We also considered pupil yield projections up to 2022 (as used in the Annual Growth Report) for utilization rates in these schools, attempting to build off of existing trends. For our recommendations, we also assumed that a new elementary school would have a rough capacity of 750 students, a middle school 1,300, and a high school 1,600, consistent with County standards.

Figure 8-10 shows our calculations for school needs at the 10,000 new homes and 16,000 new homes points, in a situation of full buildout.

Figure 8-10. School Needs

	10,000 New Homes	16,000 New Homes
Elementary School Students	2080	3328
Middle School Students	1060	1696
High School Students	1375	2200
New Elementary Schools Required	3	5
New Middle Schools Required	1	1
New High Schools Required	1	1

[80] Our housing mix was set at 35% single family detached, 40% single family attached, and 25% multifamily. Because our development does not include specific provisions for mobile homes or condos, we disregarded the pupil yield rates for these types of units.

The first school infrastructure project ought to be the construction of a new elementary school within the Creswell area, presumably on the site currently owned by HCPS off Shucks Road. This school would begin to provide some of the needed capacity any growth scenario in Creswell would require, and likely would be needed soon even in a no-build scenario, given the number of nearby schools that are already over capacity. At a full build-out of 10,000 new dwelling units, two more elementary schools and both a new middle school and high school would be required to meet pupil demand. The middle and high school would likely be necessary in the late 2020s or early 2030s, and the additional elementary schools in the 2030s, considering a build of 1,000 units per year (the high end of absorption—500 is the low end). At 16,000 new dwelling units, one more elementary school would be necessary, near the end of the 2030s. We recommend this phasing approach because it would allow for significant readjustment should the high end of the build-out not be reached.

Fire and Emergency Medical Services Require Expansion

As the number of households and the number of residentially developed acres in the Creswell area increases, consideration must be given to whether these will be adequately covered by Fire and EMS service. Ultimately, Harford County will need to expand Fire and EMS service significantly to serve this population of new residents.

As was shown in the earlier examination of current conditions, most of the Creswell area lies outside of the 8-minute response time catchment area which is Harford County's coverage goal. According to the Fire and EMS Master Plan (published in 2009), 90% population coverage is an industry-wide standard which Harford County seeks to achieve. At the time the Master Plan was published, Harford County was reporting an 80% population coverage county-wide, which is lower than their target. This means that if new dwelling units are constructed in the Creswell area, the population coverage would certainly drop, since almost all new dwelling units would be located outside of the 8-minute response time coverage area. Accordingly, in any development scenario for Creswell, at least one new fire station will need to be constructed to service the area.

In addition, the Insurance Services Organization (ISO) stipulates that "the built-upon area of the city should have a first-due engine company within 1.5 miles and

a ladder-service company with 2.5 miles".[81] Sections of the Study Area are up to four miles away from the nearest station—also implying that another reason why at least one more new station would have to be built to serve the Creswell area in the event the development envelope is expanded. In order to adequately serve the number of households, additional stations may also be necessary, depending on the degree of development which occurs.

At a minimum, one new fire station would require one pumper fire truck and one ALS ambulance. The National Fire Protection Association provides limited guidance on staffing, suggesting that "the number of on-duty fire suppression members shall be sufficient to perform the necessary fire-fighting operations given the expected fire-fighting conditions" and "EMS staffing requirements shall be based on the minimum levels needed to provide patient care and member safety."[82] According to the 2009 Harford County Fire and EMS Master Plan, however, each pumper fire truck requires four staff at any given time and each ALS ambulance requires two staff at any given time.[83] The Harford County Fire and EMS Master Plan also notes that to staff one position for 24 hours per day and seven days per week, Harford County would be required to hire 4.8 employees.[84] As such, running a fire company with just a pumper fire truck and an ALS ambulance would require 28.8 full-time employees (six positions, each requiring 4.8 full-time employees to reach 24/7 coverage).

These findings do not take into consideration the impacts of building additional water infrastructure in the Creswell area. The County's water buildout plan is interdependent with fire equipment and staffing needs. The additional development laid out in all the alternatives will require the County to run water to the Creswell area, which will reduce demand on the fire service and number of fire stations required, especially with respect to cisterns or large-capacity fire trucks. New water infrastructure will also reduce ISO insurance requirements, which will lower insurance costs for the residents. Additional water infrastructure will not impact the required EMS coverage. Given that the number of households in the County may increase by up to 25%, we would expect the number of EMS calls to go up by a similar amount, all other factors being equal. As such, more EMS coverage may be required. This report estimates required coverage under the assumption that Fire and EMS will be expanded proportionally. In reality, the new development area may require less Fire service but more EMS service than is estimated here.

[81] Harford County Government, *Fire and EMS Master Plan*, (2009), 109.
[82] National Fire Protection Association, *Codes and Standards,* (2016).
[83] Fire and EMS Master Plan, 169.
[84] Ibid.

There is another consideration unique to the Creswell area which reflects the evolving professionalization of emergency service in Harford County. Harford County is currently served by an all-volunteer emergency department, but they are beginning the transition over to an all-professional emergency department, which will require salaries and benefits to be incorporated into annual operating costs. Both the creation of new fire companies and the conversion from volunteer to career fire companies will mean additional costs for Harford County, which will need to be factored into the speed and phasing of development in Creswell.

Public Water and Sewer Must Be Provided

In order to provide adequate public facilities for the Creswell area in a situation of residential growth, new options for water and sewer infrastructure are required. In any development scenario, an expansion of the County's current water and sewer service lines into the Creswell area is necessary, and this expansion will have to occur sooner than the current maximum capacity date for the Harford County development envelope (approximately 2035). Additionally, Harford County will need to develop additional water supply and sewage treatment capacities for development in Creswell along with continued development within the Development Envelope. Figure 8-11 describes estimated sewer and water demand for our growth scenarios, taking into account the CommunityViz model's allocations of residential and commercial development, as well as the mix of housing types used throughout this study:

Figure 8-11. Water and Sewer Demand

	Water Demand (MGD)	Sewer Demand (MGD)
10,000 DU alternative	2.35	1.90
16,000 DU alternative	3.81	3.07

Furthermore, by the point of full build-out, even in the 10,000 DU alternative, the Sod Run wastewater treatment plant—the County's main WWTP—will begin to reach its design capacity of 20.0 MGD. This will require either the expansion of Sod Run or the construction of an additional plant. Providing adequate public sewer and water infrastructure to support development must also take into account the debt-to-income ratio of the Water and Sewer Enterprise Fund, the hydrological and topographic constraints of the Creswell area, and the history of sewer and water demand in the region, including the concerns of Harford Community College.

Hydrology, Topography, and Locating Future Sewer Lines

The Creswell area is within two watersheds: the Bush River watershed, which covers the central and eastern portions of the area, and the Bynum Run watershed, which covers the western section. The Bynum Run watershed is also the watershed containing Bel Air and the stretch of the development envelope between Bel Air and I-95. In general, the Creswell area offers favorable topography for a gravity sewer network that follows the Bush River watershed. Such a gravity sewer would not need a great number of pumping stations, as it would in general run from higher elevations to lower ones. Additionally, the steepest slopes which would create difficulties in maintaining adequate fire flow water pressures are located in areas unlikely to see development, like the Churchville quarry.

Given that the study area lies partially within the Bynum Run watershed it may be best to consider extending the existing sewer and water system in the Bynum Run watershed to serve the western portions of Creswell in a development scenario. However, the Bynum Run's capacity is designed to accommodate the growth of the development envelope only, so adding service Creswell may exacerbate capacity issues within the current development envelope and result in a network buildout before the current capital planning estimate of 2035. As an illustrative example, the Bynum Run trunk sewer line, which runs about 10 miles (6,600 linear feet) from just north of Bel Air and ends east of Edgewood at the Bush Creek pumping station, is currently being upgraded. At the moment, the Bynum Run interceptor has a daily flow rate of 9.6 MGD, and provides nearly 80% of the wastewater flow which is processed by the Sod's Run WWTP.[85] After the upgrade of the interceptor, its capacity will reach 15 MGD—but all of this excess is meant to be absorbed by growth in the development envelope, and cannot be used to accommodate Creswell's development.[86]

Therefore, we recommend that, in a situation of residential growth, a new gravity sewer trunk line should be constructed, running up James Run towards Harford Community College, in parallel to the smaller James Run pipe which will serve the James Run mixed-use office development. Then, if the market for residential development in the Creswell region continues to be strong, environmental and traffic impacts are being managed, and development reaches into the eastern portion of the study area, a second trunk line which traverses the northeastern subsewershed will be necessary. Topologically, this trunk sewer is best constructed along Grays Run.

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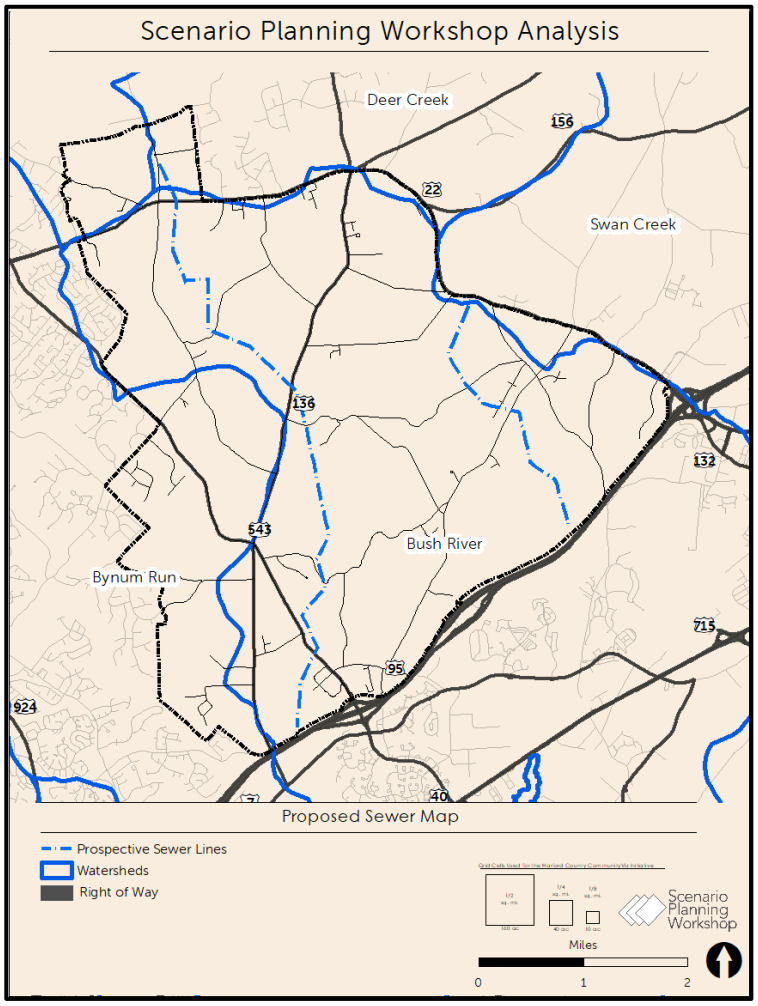
[85] Harford County Government, *Fiscal Year 2019 Approved Capital Budget and Capital Improvement Plan*, (2018).
[86] Interviews with William Bettin, Harford County Public Works, March-April 2019.

Figure 8-12 shows these schematic alignments.

Figure 8-12. Proposed Sewer Alignments



These sewer and water lines can be built in phases, but the nature of sewer and water infrastructure—which is most efficient when constructed with pipe capacity large enough to serve the maximum buildout of expected development—implies that even phased development should take into account the possibility of a maximum growth scenario, so as to adequately serve the new residents.

Another merit to running a trunk sewer line up James Run early in the development process is that it will enable public sewer and water to reach Harford Community College (HCC), located in the northwestern part of the Creswell study area. HHC is an anchor institution in the County, providing workforce development programs, undergraduate education, vocational training, and both youth and adult extension education programs. HCC currently runs on a well and septic system for providing potable water and collecting wastewater. This system has limited its ability to expand, and the College has been requesting access to public water and sewer for decades. Bringing this infrastructure to HCC via the James Run would not only provide for the College's long-wished-for connection, but also avoid the topographic difficulties of steep slopes and ecologically sensitive areas which bringing public sewer and water to HCC over from the Bynum Run watershed would entail.

Nevertheless, running a sewer and water line up to HCC from the base of the study area creates an immense expense—if such a line did not have to reach the

College, development could be more easily confined to the southern portions of the study area, and the infrastructure costs would be correspondingly reduced. Bringing this hypothetical line all the way up to HCC would create substantive pressure on the Water and Sewer Enterprise Fund which might not be recouped by development progress for a substantial period of time.[87] However, *not* bringing the sewer line up to HCC would cause the overall development yield to also be substantially reduced. The range of options in this framework plan allows for a careful consideration of development phasing in concert with fiscal concerns.

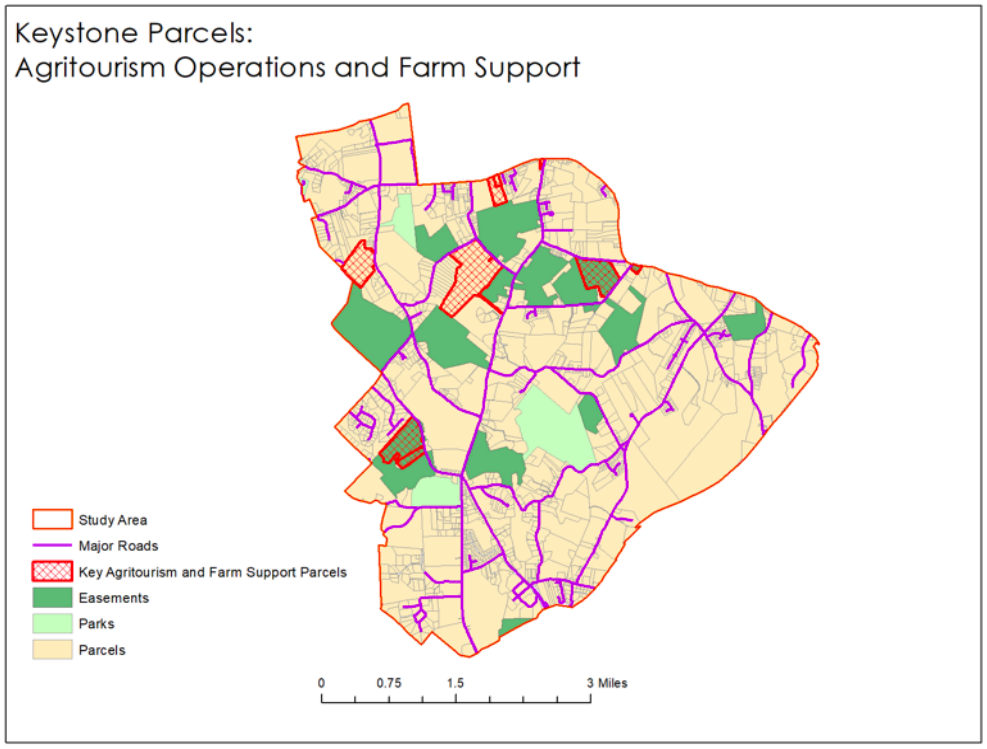
Agriculture Is Preserved

Employing transfer of development rights and maximizing its use across the sending areas means that the 3,000-acre core of Creswell will be preserved, even with the addition of 10,000 or 16,000 new homes in the west and east wings. Open space subdivision design goes one step further by preserving 30% to 50% of developable land on each individual parcel. By preserving 67% to 77% of AG zoned land overall, the TDR-OSD approach will stabilize the land base over time while still accommodating growth. Yet, land quantity is not equivalent to land quality, and this study recommends that the County also conduct a parcel- and sub-parcel-level analysis to more thoroughly understand the impacts of growth on agriculture.

For example, two of the five agritourism businesses in Creswell operate wholly on protected conservation easements, while the remaining three operate entirely on developable parcels or on some combination of easement and developable parcel. Figure 8-13 illustrates the parcels operated by Creswell's five agritourism businesses. In addition, several small parcels in Churchville depict the region's sole tractor dealer, an agricultural support business that is both dependent on and necessary to farms in the immediate area. The interconnectedness of multiple parcels to individual operations, as well as to the community of farming in Creswell more broadly, demands that choices about growth patterns are especially careful to not to harm this web of strong businesses. Open-space subdivision design offers a solution that may enable farmers to more efficiently operate these key parcels in concert with super-clustering, but the point is that they will need to be considered carefully to protect the agritourism and farm base.

[87] Interviews with William Bettin, Harford County Public Works, March-April 2019.

Figure 8-13. Keystone Farm Parcels



Finally, it is essential to understand that the ongoing challenges of farming are substantially more acute for dairymen. Even with significant State and Federal aid, the number of cow dairies in Harford County has plummeted 43% since 2012, and just 16 dairies persist countywide; Creswell is home to two (12.5%) of them.[88] Owing to its on-farm restaurant, Broom's Bloom Dairy is shown as a keystone agritourism parcel, but there is an argument to be made for coding Schenning's Dairy as a keystone farm as well, given its importance in the regional context. Overall, our proposed framework for preservation and growth demands and provides for careful parcel- and sub-parcel-level decisions, but deeper analysis would further illuminate the exact landscape and the exact level of political support that will be required to protect quality over quantity of land.

Environmental Conservation Is Possible

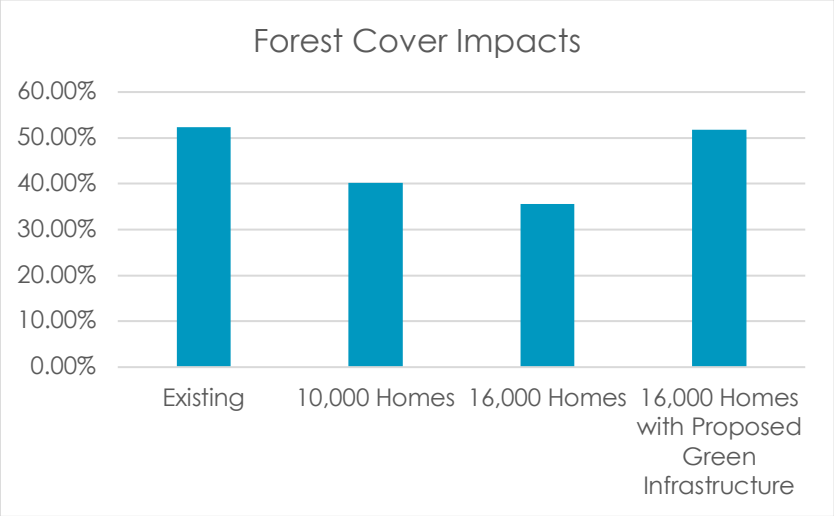
The use of TDR and open space design preserves 65%-74% of forested land in Creswell, accounting for forest preservation through the Maryland Forest Conservation Act. The Framework Plan also creates opportunities for reforestation and afforestation of sites within the preservation core of

[88] USDA, National Agriculture Statistics Survey. Census of Agriculture by State and by County, 2012-2017.

undeveloped land to both further mitigate loss of forest cover and to improve upon the existing green infrastructure network.[89]

The preservation of 64–74% of forested land within Creswell still leads to some initial loss of the overall forest cover. With 10,000 new homes, Creswell's forest cover is reduced from 6,982 acres (52.4% of the total acreage) to 5,364 acres (40%). At 16,000 new homes, forest cover is reduced to 4,736 acres, or 36% of total acreage. However, these estimates only take into account existing and minimum forest preservation, and do not consider potential forest cover expansions through the green infrastructure improvements within the preservation core and open space site design methods that are included in the Framework Plan. The proposed green infrastructure plan prepared by Harford County in 2018 currently preserves 41% of forested land on developed parcels alone. But, with the inclusion of the proposed new green infrastructure in the Framework Plan (further elaborated on in Chapter 10, Implementing the Framework), it is possible to maintain an overall forest coverage of 51.8% of Creswell. Thus, the proposed green infrastructure can preserve the same amount of forest coverage that exists today while accommodating housing and economic development needs.

Figure 8-14. Forest Cover Impacts



Our land use allocation model estimated impacts on water quality and stormwater runoff by generating impervious surface coverage added by the Framework Plan. Impervious percentage estimates were sourced from a 2013 study on impervious coverage by land use type and density in Frederick County, MD[90]. With 10,000 new homes, there is an estimated increase of 1,139 acres of impervious surface (8% of the study area). At a buildout of 16,000 homes, impervious surfaces are increased to

[89] The Environmental Implementation section provides recommendations to prioritize and improve upon the green infrastructure network in Creswell. These recommendations can act as guidelines for site reforestation and afforestation practices.

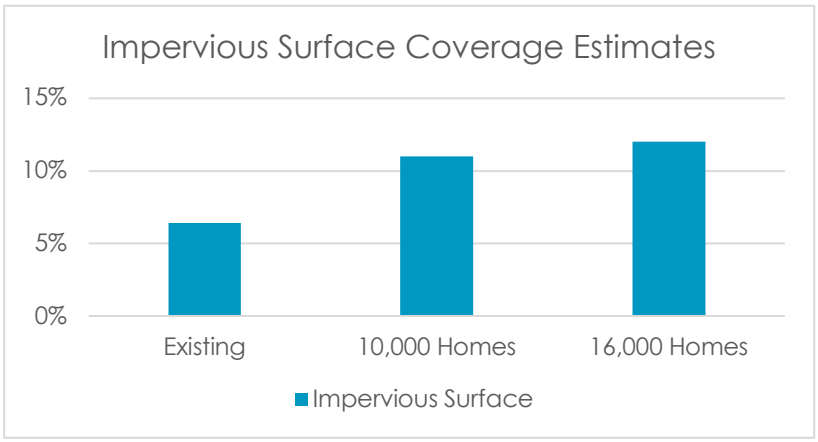
[90] U.S. Environmental Protection Agency Ecosystems Research Division, Exum, Linda R., Sandra L. Bird, James A. Harrison, and Christine Perkins, *Estimating and Projecting Impervious Cover in the Southeastern United States*, (2005).

1,484 acres (11% of the study area). This would mean an overall impervious coverage of 15-18% of Creswell.

However, these estimates do not account for open space design. Since open space design allows for 35-55% of developed parcels to remain undeveloped, the Framework Plan would in fact add only an estimated 834 acres (6%) or 984 acres (7%) of impervious surface at 10,000 and 16,000 homes respectively. In combination with the 856 acres of impervious surface already existing in Creswell, the addition of 10,000 homes would lead to an overall impervious coverage of 12% of the area. At 16,000 homes, impervious coverage would increase minimally to 13%. Considering that the development envelope in Harford has 14% impervious surface coverage, this increase in impervious surface in Creswell would be comparable to, or slightly less than, other areas of the county.

Yet, these estimates may still overestimate impervious surface generated by the Framework Plan, since average impervious coverage rates were based on conventional developments. The use of clustering, open space design, and environmental site design practices could drastically decrease these estimates. The development of site design guidelines and site-specific data would help to inform estimates of impervious surface and runoff with greater accuracy than was currently available for the scope of this study.

Figure 8-15. Estimated Impervious Surface Coverage



Chapter 9

Fiscal Outcomes and Growth

Our allocation model of residential and non-residential uses shows that a new home built in the Creswell area produces a substantial net fiscal gain for the County. Revenues from property-related taxes—including taxes on real and personal property, income, and recordation and transfer taxes—far exceed the operating and capital costs required for development.

Scenario Planning Workshop

Chapter 9. Fiscal Outcomes

Alternative development strategies in Creswell require significant capital investment in new and improved infrastructure, including new water and sewer lines, new schools and road upgrades, to name a few. Furthermore, there are operating cost implications for the County as the government must presumably maintain the levels of service it provides existing residents while extending them to new residents in Creswell as well. However, new residents are also a source of revenue and this is particularly true in Harford County, where residents comprise 77% of the tax base. Therefore, it is critical for the County to know whether the revenues from new homes and businesses in the Creswell area justify the costs to support development and promote economic growth of the County.

A fiscal impact analysis compares revenues against operating and capital costs for new development within a jurisdiction, considering each component independently; development will bring in a certain amount of tax revenue, and will cost a certain amount to build, support and maintain. This is notably different from the budgeting process, which must project its expenditures based on the revenues it receives. Thus, a fiscal impact analysis should not be seen as a budget forecast. Rather, it only considers whether revenue from new development can cover its needs for facilities and services based on the current spending levels.

It is important to distinguish a fiscal impact analysis from an economic impact analysis. An economic impact analysis projects private sector growth, which is of course affected by new residents. And, the positive (or negative) impact of the new residents on the private sector will affect cash flows to the public sector. However, this study does not conduct an economic impact analysis, evaluating only new cash flows to the public sector. Nonetheless, it is important to understand that adding new residents can have a dynamic effect on the economy.

The fiscal impact analysis conducted for the Creswell study area explores three development alternatives: 1) a trend scenario of 750 new homes by 2040; 2) 10,000 new homes by 2040; and, 3) 16,000 new homes by 2040. The trend scenario is based on 'business as usual', where the current density in Creswell would remain unchanged. If this were the case, the entire 13,000-acre Creswell area could accommodate a maximum of 750 new units. The other two scenarios assume changes in density but, unlike the trend scenario, require more infrastructure investment, although the trend case still requires some capital spending as well.

Methodology

Before describing the methodology, there are several things to note:

- The inflation rate is assumed to be zero over the 20-year period that is being studied (2020–2040). Therefore, all results are reported in constant 2019 dollars.
- Revenues are based on the current revenue structure and rates and do not assume any changes over the 20-year study period.
- Current levels of service are assumed to hold constant in the future.
- All revenues and operating expenditures analyzed are all drawn from the Harford County FY19 Operating Budget.
- All annual impacts are shown per new home built. Therefore, the unit of analysis for nonresidential land uses is the average square footage of all nonresidential land uses associated with each new home in the alternatives we consider.
- All assumptions and outputs have been produced in consultation with the nation's leading fiscal impact analysis firm, TischlerBise, Inc.

In general, the formula for calculating an annual fiscal impact per any given unit is: **Annual Fiscal Impact = Revenues—Operating Costs—Capital Costs.**

For the trend scenario, the impacts of the projected 750 new homes are analyzed. In the other two alternatives, we assume a mix of SFD units, single-family attached (SFA) units and multi-family (MF) units as well as some square footage of new nonresidential land uses. Figure 9-1 shows the mix of housing types per alternative. This model also calculates the fiscal impact of nonresidential land uses on a per square foot basis. In sum, the annual fiscal impact per new home is multiplied by the number of new homes in each scenario. This is added to the annual fiscal impact of nonresidential land uses per square foot, multiplied by the total number of square feet in each alternative.

Figure 9-1. Housing Type Mix per Alternative

	SFD	SFA	MF	Total
Trend	750	0	0	750
10K	3,500	4,000	2,500	10000
16K	5,600	6,400	4,000	16000

Total Fiscal Impact
=
(Annual Fiscal Impact per
New Home) x (# of New Homes)
+
(Annual Fiscal Impact per Sq. Ft. of
New Nonresidential Space) x (Total Square Feet)

Revenue Methodology

All revenue sources for the County, other than intergovernmental transfers, existing fund balances and user/capital charges for the water and sewer enterprise fund, were incorporated into this fiscal impact analysis.

Real property tax income is calculated on a marginal basis, reflecting exactly the revenue that would be collected based on the property values we have assumed for the three type of housing units. In addition, revenues from income tax and the recordation and transfer taxes are also based on these assumed property values. For income tax, we calculated the income needed to purchase properties worth our assumed values. Recordation and transfer taxes, which are based on the value of a property being deeded or sold, are assumed to be assessed every seven years, reflecting a 7-year turnover rate for homes in the County. The property value assumptions are detailed in the housing section of this report. Figure 9-2 shows the average property values assumed in each of our four proposed zoning codes, which are all some combination of 3 types of housing units (SFD, SFA and MF).

Figure 9-2. New Home Value Assumptions

Proposed Zone	Price
RR	$571,000
R2	$483,000
R3	$356,000
R4	$292,500*

**Harford County Median Home Value*

Personal property tax revenues for Creswell are projected using the FY19 average personal property revenue per employee, since personal property is not assessed on residents in Harford County. A marginal approach is not possible because this study does not predict the kinds of corporate personal property that would be taxed in each alternative and so we project those tax revenues based on the current levels of personal property income.

Moreover, while only a small portion of the County's overall revenue, other revenue sources of income like licenses and permits, fines and forfeitures and, service charges, are also accounted for. The current revenues are averaged and then used to project revenues for new homes and nonresidential land uses in the Creswell area. Finally, each new home built is associated with an impact fee the developer must pay to cover some portion of infrastructure costs. This one-time revenue source is also calculated and presented in the results.

Operating Costs Methodology

For county expenditures on government operations, only costs listed in the General Fund were accounted for. The General Fund is by far the largest of the County's $734.6 billion operating budget, representing $571.7 billion in expenditures, including appropriations to Departments, the Board of Education, and Public Safety. Other funds, such as the Highways Fund and the Stormwater Management Fund were not analyzed.

Most of the expenditures are calculated using the average cost of these services per capita and per employee. Thus, each new unit in Creswell is associated with some cost to the operating budget. However, some expenditures are considered to be fixed in that they are unaffected by new development. One example is the dollar amount appropriated to towns ($3.6 million in FY19). We were not given any indication that this value is related to development outside of those towns, so it is not included as a cost for new homes in Creswell.

Finally, based on consultation with the Department of Emergency Services, the gradual transition of Volunteer Fire/EMS to the County payroll will lead to a $2.5 million increase in the County's expenditures, regardless of development. As a result, the operating costs for Emergency Services are increased by this amount to more realistically project costs for new development.

Public Works

One expenditure, the appropriation to Public Works, is not averaged based on a per capita or per employee basis, but rather, on the number of vehicle trips each home or nonresidential land use generates. This is because the variation in trips by housing unit type and by employment type varies significantly and much of the public works budget is dedicated to transportation costs.

Capital Costs Methodology

We also assessed capital investment needs for schools, fire/EMS, water and sewer and parks. Using these estimates for capital needs, we determined per unit values

for new homes and nonresidential land uses, although we omitted capital costs associated with providing water and sewer to Creswell. This was because we did not analyze the County's enterprise funds, where some portion of the construction costs are covered by user and connection charges. The four capital needs that we have included in our analysis are: schools, fire/EMS, highways and parks. The estimate for highway capital costs was provided to us by a local consultant (Matt Wolniak of JMT), who ran the transportation model described elsewhere in this framework.

Given that nonresidential land uses do not contribute to school needs; school costs only accrue to each new home built. The same is true for parks costs. However, the fire/EMS needs accrue to both new homes and nonresidential land uses in Creswell. The expected number of new residents and new employees was used to determine a proportional share of the Fire/EMS capital costs that should be associated with new homes and new nonresidential land uses.

A similar calculation was made for Highways. However, instead of using the number of new residents and employees, the total number of new trips generated by the development was used to determine the average cost per new residential and nonresidential land uses. Furthermore, since highway improvements in the study would benefit more than just new residents in Creswell, and because developers and the State contribute a large portion of highway costs, the per unit highway costs we consider are discounted. We assume that only 50% of the trips on Creswell roads would come from new Creswell residents and that 75% of the road costs are covered from sources other than the County.

Capital costs were also determined in the case that development in Creswell continued at current trends. However, park needs were not determined for the trend scenario and this cost is excluded as a capital cost in the analysis of needs Creswell at its current residential capacity. However, given that the park needs would likely be very small for 750 new units compared to 10,000 or 16,000, omitting this cost will only have a marginal effect on the accuracy of the final results.

Fiscal Impact Results

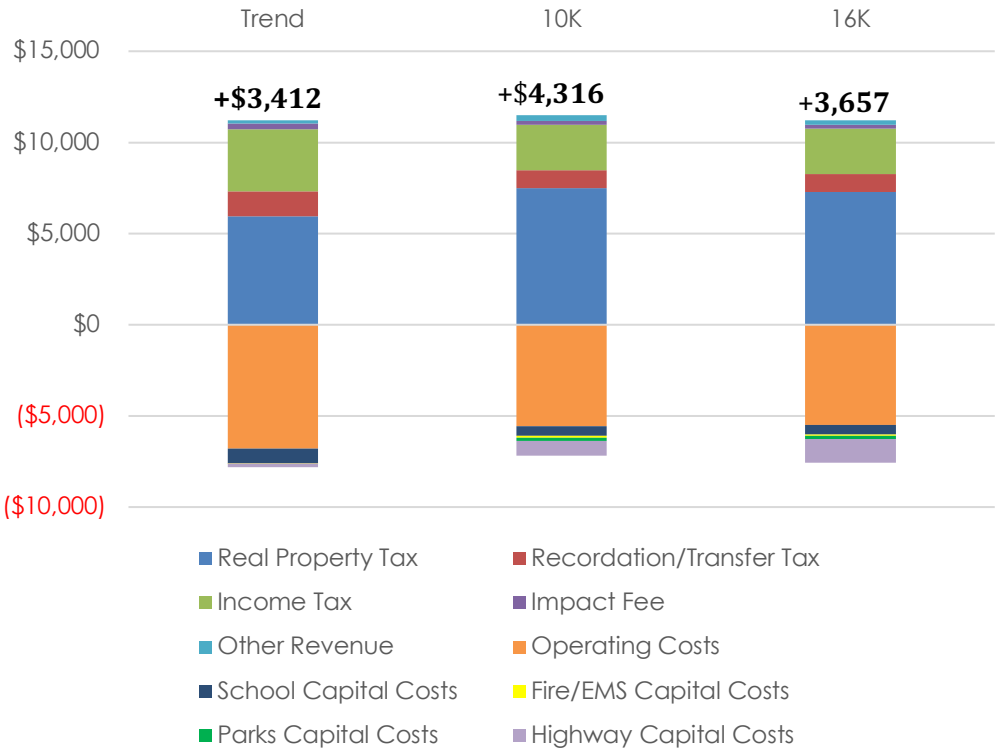
This section presents and discusses the fiscal impacts of the development alternatives considered in this report. First, the annual net income per new housing unit is shown, including the impact of nonresidential land uses, providing a snapshot of how the major revenue and cost components add or subtract from the final impact. Then, the average overall annual gains across the 20-year study

period are shown, which indicate the annual economic growth the County can expect from the alternative fiscal impacts. The cumulative net impact over the 20-year period is also provided as this helps to compare the trade-offs between each alternative. Finally, a discussion on impact fees follows as the annual net income per new home suggests that impact fee revenue is insufficient, even though the County would see an overall net gain from new development.

Average Annual Impact of Each New Home

Any new home built in the Creswell area would bring in net revenues. Over 90% of the revenues come from real property taxes, income tax and the recordation and transfer taxes, all of which are based on the home values we have assumed in the model. Figure 9-3 shows the net impact per unit, showing that revenues outweigh costs.

Figure 9-3: Annual Net Impact per New Home
(including impact from new nonresidential land uses)



Not only is the per unit impact in the trend case smaller than for new homes in the other alternatives, but also the $6,800 operating costs for trend is approximately $1,300 greater than in either of the other alternative, indicating the economies of scale that come with extending service to more new residents. Indeed, the overall fiscal gain of developing Creswell at the current density is very much lower than the other two alternatives, as discussed in the next section.

Notably, the net positive impact per new home built is higher in the 10K alternative compared to 16K. This is almost entirely due to the increase in highway capital costs associated with 16,000 new homes. Our transportation model suggests that more new development is associated with proportionally higher trips, as each new home is associated with more than one trip.

Note: The unit of analysis for nonresidential land uses is the average square footage of nonresidential land uses associated with each new home.

Unlike Figure 9-3, Figures 9-4 and 9-5 differentiate between residential and nonresidential sources of revenue. Importantly, we assume that of the total allocated nonresidential land uses, the retail portion of it is a direct product of adding new homes. That is to say, in our alternative scenarios, we expect the nonresidential retail space to be developed regardless of whether other nonresidential land uses like office and light industry are developed. In our land allocation model, 43% of the nonresidential land uses is this residential-related retail in the 10K alternative and 58% is retail in the 16K alternative.

Figure 9-4: Annual Fiscal Impact of Residential, Retail and Nonresidential Land Uses (10K)

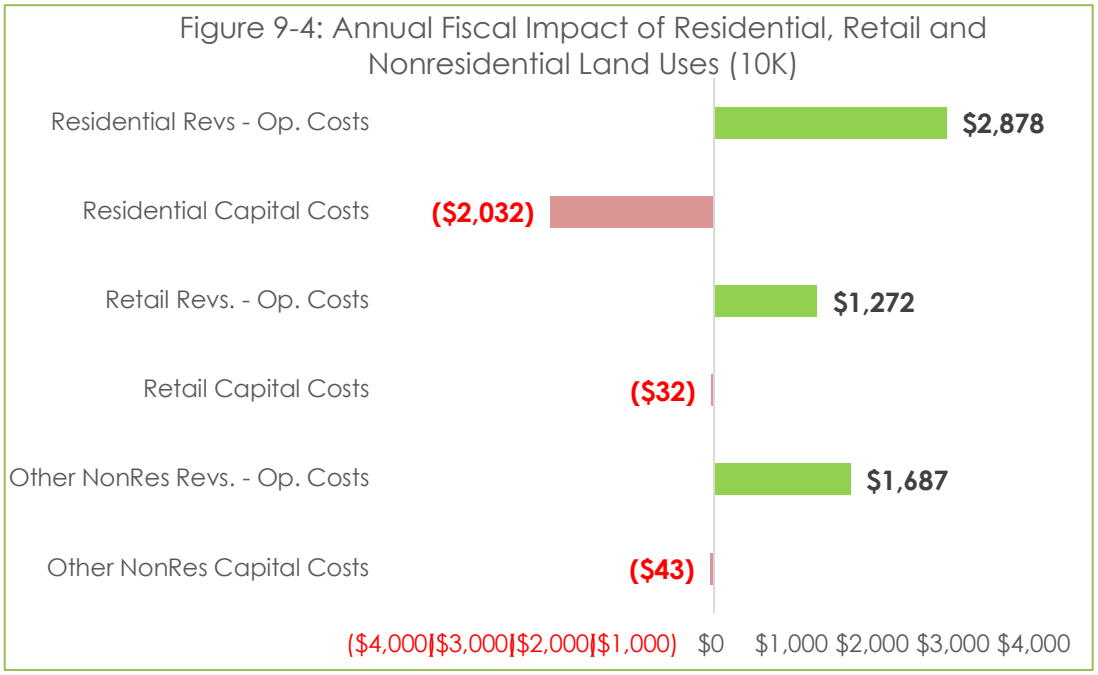
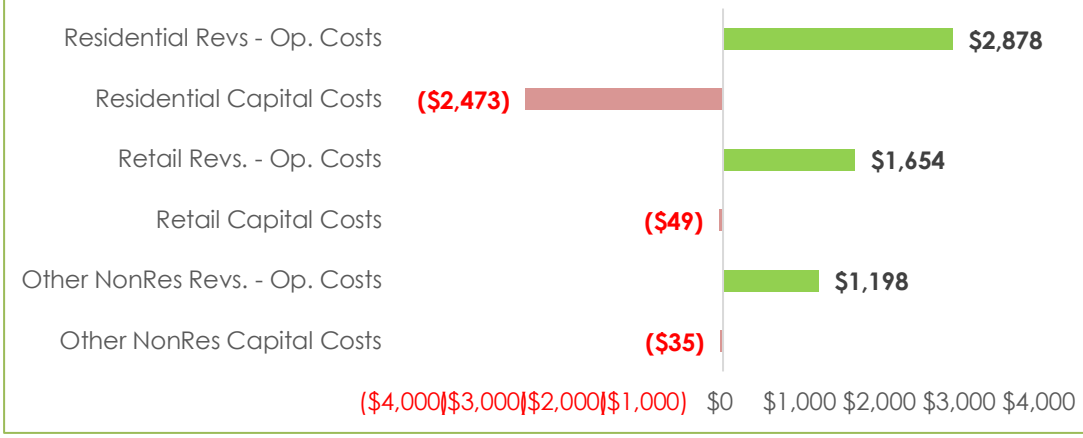


Figure 9-5: Annual Fiscal Impact of Residential, Retail and Nonresidential Land Uses (16K)

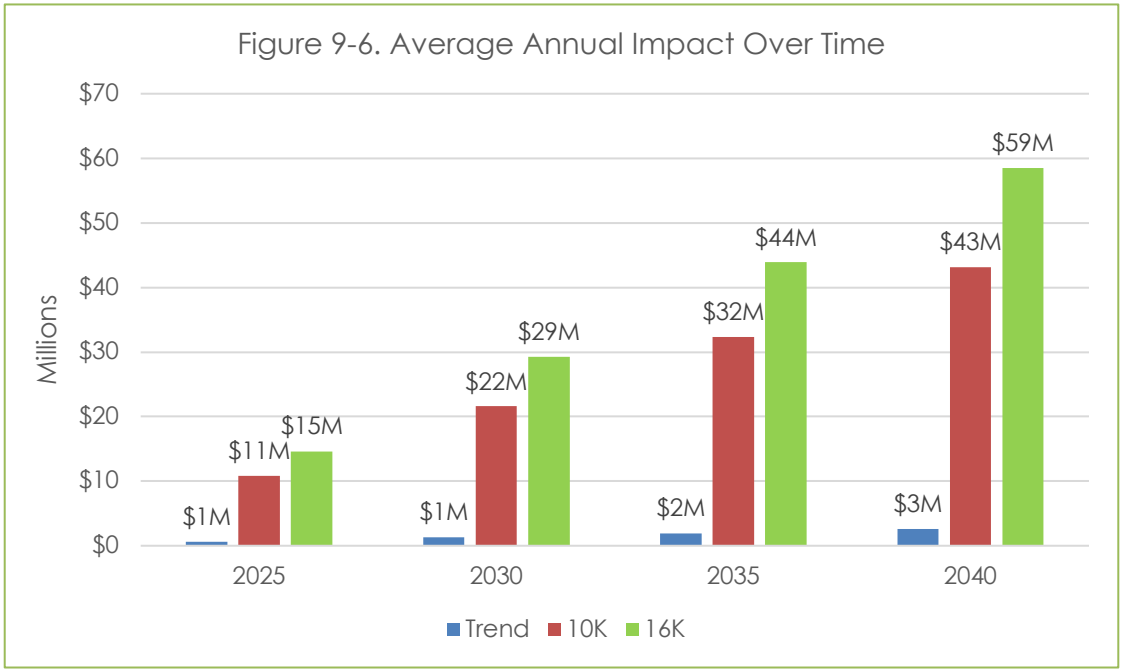


This assumption is critical to the net impact of building new homes. As Figure 9-4 shows, in the 10K alternative, building new homes alone has a smaller net gain than the nonresidential land uses, including retail. And, in fact, as Figure 9-5 shows, building new homes alone in the 16K alternative is an even smaller net gain than in the 10K alternative. However, if indeed each new home is associated with some retail, then each new home in either alternative is a net gain of over $1,000. Moreover, if other nonresidential land uses are allocated and developed along with retail, the County would only stand to gain more net revenue.

Thus, the viability of residential development is much strengthened through the development of associated retail. Development becomes more attractive from a fiscal impact standpoint if other nonresidential land uses are also included. This is because gains in property-related taxes from new homes are largely offset by the capital costs needed to develop in Creswell because they include school costs whereas nonresidential land use capital costs do not.

Overall Average Annual Impact

The significance of development at a larger scale than the current density allows is evident when the overall or cumulative annual net impact is considered. Figure 3 shows what annual gains the County can expect from development in each of the alternatives. Our analysis does not consider phasing nor is it sensitive to when capital needs to support development would be triggered if development of 10,000 or 16,000 new homes were to occur. Given these limitations, the results in Figure 9-6 assume that 5% of new homes are built every year for 20 years across every alternative. Furthermore, as many capital costs occur prior to development, the County should not expect net gains every year, particularly in the early years and later on as large capital facilities need to be built.



However, the key insight from Figure 9-6 is that by buildout in 2040, the County can expect annual gains of $43 million in the 10K alternative and over $59 million in the 16K alternative, which respectively represent 5% and 7% of the County's overall FY19 budget. This is a significant contribution to economic growth and is irrespective of the economic impact that new development would have on the private sector, especially compared to the $2,700,000 the County would expect to earn if only the currently allowed 750 new homes were built-out by 2040. Therefore, development is an economic development opportunity in and of itself. To the extent that there are limited opportunities for the County to grow at this rate and given the long-term spending needs of the County, choosing not to develop could be a significant missed opportunity.

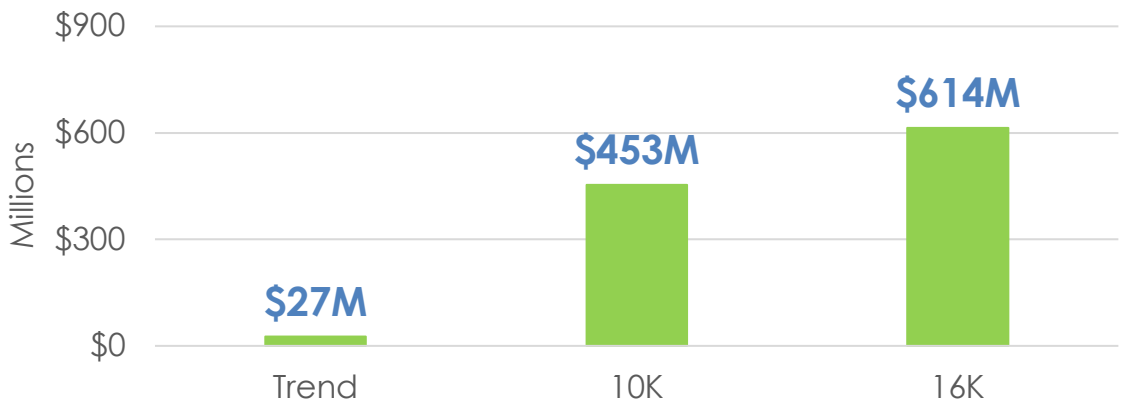
Moreover, despite the lower net impact per home in the 16K alternative, that scenario still leads to a larger overall average annual net gain than the 10K. This is due to the number of homes being built. Our analysis does not consider the threshold at which the cumulative impact peaks, although this is a useful metric for the County to investigate further.

Cumulative Net Results

Once again, assuming that 5% of new homes are built every year for 20 years across every alternative, Figure 9-7 shows the cumulative net impact of development in the Creswell area, or the total revenues generated minus operating and capital costs by 2040. This underscores the significance of the

economic development opportunity of development compared to the trend alternative. Developing either 10,000 or 16,000 new homes would lead to a realized gain of $453 million and $614 million by 2040, which are 17 and 23 times greater than allowing development to continue at the current density.

Figure 9-7. Cumulative Net Gains by Buildout (2040)



Impact Fees

An important finding from this analysis is that the impact fees currently assessed to developers may be significantly too low. Impact fees are one-time payments that developers make to offset the infrastructure costs their development incurs. In Harford County, impact fee revenues are dedicated solely to school construction, meaning they should to some extent cover the school costs incurred by development. Annually over the 20-year study period, impact fees per new home built average $199.

However, annual school costs per new home is far greater than $199 in both the 10K and 16K alternatives, meaning impact fees are not close to commensurate with the education costs related to development at this scale. This alone should motivate the County to consider conducting an impact fee study to assess what the appropriate impact fee should be, not only for school construction costs but also for infrastructure costs in general.

However, the County should also reconsider its impact fees and what they cover more generally, because it lags far behind other similar counties in Maryland. Note that almost all these counties have reassessed their impact fees over the past three years. This is shown in Figure 9-8.

Figure 9-8. Regional Impact Fees (single-family detached)

County	FY 17	FY 18	FY 19
Harford	$6,000	$6,000	$6,000
Anne Arundel	$12,473	$12,963	$13,390
Carroll	$533	$533	$533
Frederick	$14,881	$15,515	$15,515
Montgomery	$40,793	$45,159	$45,159
Prince George's	$23,007	$23,513	$24,094

Conclusions

Based on the results of this fiscal impact analysis, there are five main conclusions to be drawn:

1. Based on our land allocation model of residential and nonresidential land uses and assuming each new home is associated with a given amount of retail, a new home built in the Creswell area is a substantial net gain for the County because revenues from property-related taxes (including taxes on real and personal property, income as well as the recordation and transfer taxes) far exceed the operating and capital costs required to develop. This is true even in 10K and 16K alternatives, which require massive infrastructure investment compared to allowing development to proceed at the current density;

2. The net impact is boosted considerably by the impact of nonresidential land uses other than retail that have been included in our land allocation model as all nonresidential land uses are associated with fewer capital costs than new homes;

3. If the County chose to develop the Creswell area with either 10,000 or 16,000 new homes with the nonresidential components we have allocated, it would realize an average annual net gain of $43 and $59 million, respectively, by 2040. This would represent economic growth of over 5%. Compared to the less than $3 million average annual net gain in the trend alternative, this is potentially a significant missed opportunity;

4. This missed opportunity is underscored by the cumulative totals the County would have earned under each alternative. Compared to the $27 million the County will have gained by 2040 under current conditions, the County could add $453 million or $614 million overall if it chose to develop according to the 10K and 16K alternatives;

5. Impact fees are not commensurate with costs of development (or even just school construction costs) and are relatively low compared to similar counties. Furthermore, it does not appear that Harford County's impact fees have been reassessed recently. Thus, we strongly recommend conducting an impact fee study to assess how much money is being left on the table and considering expanding the use of impact fees to cover more capital costs beyond school construction as is the case in Harford County currently.

Chapter 10
Implementing the Framework

Implementing the planning framework will require a range of adjustments to the County's regulatory structure. Foundational changes include select updates and additions to *HarfordNEXT,* the Zoning Code, and the Master Sewer and Water Plan. Follow-on changes include modifications to the subdivision regulations and state-level adjustments to the PFA boundaries and sewer tiers.

Scenario Planning Workshop

Chapter 10: Implementing the Framework

Land Use and Growth Management

For the Creswell study area to absorb anywhere from 10,000 to 16,000 new homes, the county will need to consider major revisions to several land use and growth management regulations and policies. First and foremost, to accommodate the scale of development discussed for the Creswell study area, the county's Department of Planning and Zoning will need to propose amendments to the county's master plan. More specifically, the county will need to revise their Land Use designations, Land Use Map, and the Churchville/Creswell Community Planning Area section. The amended Land Use designations and Land Use Map will serve as strongly encouraged guidelines for future rezoning.

Perhaps most importantly, the revised Land Use Map will include an expansion of the Development Envelope to include the receiving areas. Generally speaking, the Development Envelope helps to concentrate growth by defining where the highest intensity zoning districts should be established and where density-enabling infrastructure (e.g., public water and sewer) should be constructed. As such, Development Envelope expansion is a highly political process and has tremendous implications for property owners both inside and outside of the growth area. Considering the inherently controversial nature of this undertaking, expansion rarely occurs at all, let alone doing so for 20 square miles. The process is governed by the Harford County Council, who last expended the Development Envelope by 28 acres in 2016.[91] As the primarily delineator between urban and non-urban growth areas, expanding the Development Envelope allows the county to amend the Sewer and Water Master Plan so that Creswell can be re-tiered to permit public water and sewer construction.

Once the county has successfully amended *HarfordNEXT* and adopted a land use map with revised Development Envelope boundaries, the growth framework can move from conception to implementation. As part of a comprehensive rezoning effort, the Harford County Zoning Code will need to be amended to include the guidelines for the new Creswell Overlay Zone, the revised TDR program and the new Open Space Design (OSD) zoning district requirements. The Zoning Code's *Article VII District Regulations* will require amending to include the purpose, intent, applicability and general development guidelines for the Creswell Overlay

[91] Zumer, B. "Harford Council approves HarfordNEXT master plan." *The Aegis*. June 22, 2016.

Zone. The amendment language will define the scope of the new overlay zone, outline the revised TDR program, and require the use of TDRs and OSD if a developer seeks to build beyond the base zone.

While the county has a TDR program, its narrow definition for its receiving areas restricts its effectiveness, both in terms of its ability to protect agricultural land from fragmentation and to concentrate density in more desirable areas. The guidelines for the new TDR program will need to be crafted to match the six best practices for TDR programs as outlined in Chapter 6. Not discussed in Chapter 6, however, is the importance of the county playing a significant role in administering and overseeing the TDR program. For instance, the county could help incentivize the process by establishing a TDR bank. By doing so, the county could serve as a middleman which holds enough rights to keep the TDR market liquid, perhaps purchasing rights from properties prioritized for preservation. The property owners would benefit tremendously by receiving forty times the development rights they would normally be allotted given the new 4:1 rights-to-acres ratio.

This would also benefit the developers, as the county's TDR bank would be an easy source of density-boosting development rights, and avoids the difficulties of hunting for a property owner interested in selling their rights. The developer will also benefit tremendously given the new and generous 8:1 dwelling unit-to-development right ratio. It should be noted that these recommended exchange ratios should be finalized through detailed negotiation and outreach, and they may change subject to the desired targets derived from these discussions. In addition, the county should require that TDR purchase information be publicly available so that developers and farmers alike can agree on a fair market value for TDRs. All of this will have to go hand-in-hand with a robust marketing and educational program to ensure that property owners and developers fully understand the rules of the game.

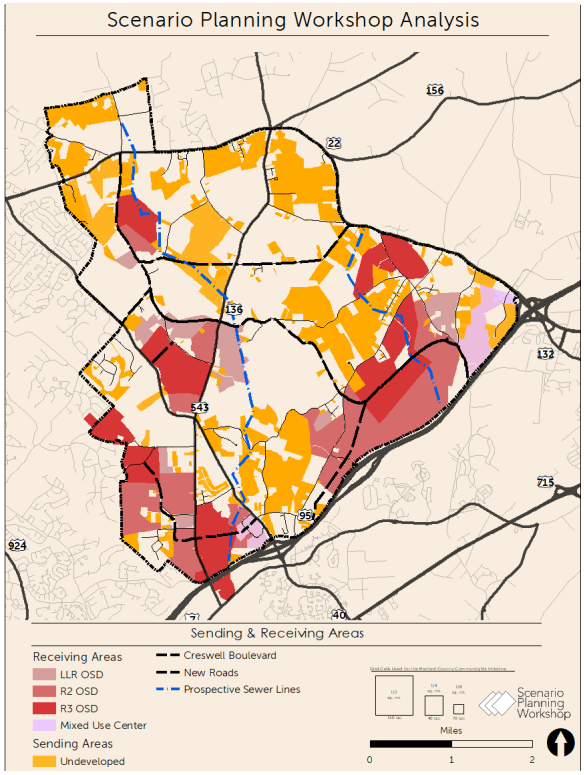
The OSD zoning district will need to be added to the code's *Article VIII Design Standards for Special Developments*. The county's current zoning codes' special districts that are designed to cluster development and preserve open space either offer minimal incentives for their implementation or generally require only marginal percentages of developable property be set aside for conservation. Our proposed OSD zoning district seeks to resolve those problems. As can be seen in Figure 10-1, OSD offers considerably more density per acre than the county's Conventional or Conventional with Open Space (COS) design standards. Additionally, OSD can require that up to 60% of developable land be preserved at an R4 density; three times as much as COS requires. Furthermore, OSD's lot size

requirements expressly encourage denser housing types, helping to cluster and diversify the county's housing stock. Last, OSD developments will require 100-acre or greater subdivision plans as this will help to create nodal development patterns and possibly site consolidation, rather than just a patchwork of conventional or COS developments throughout the county.

Figure 10-1. Existing and Open Space Design Standards

	Existing Districts						Proposed District		
	Conventional			Conventional with Open Space (COS)			Open Space Design (OSD)*		
District (unit types permitted)	DU per Acre	Lot Size (000 sf) SFD - Lot Line	OS %	DU per Acre	Lot Size (000 sf) SFD - Lot Line	OS %	DU per Acre	Lot Size (000 sf) SFD - Lot Line	OS %
R1 (SFD)	1.8	20	-	2.0	15	10	3	10	35
R2 (SFD, TH)	3.5	10	-	4.5	7.5-7	10	6	5	45
R3 (SFD, TH, GA)	5.0	7.5	-	7.0	6-5	15	10	6-4	55
R4 (SFD, TH, GA, HR)	8.0	7.5	-	10.0	6-4	20	12	5-3	60
*Requires subdivision plans be 100 acres or more									

Figure 10-2. Sending and Receiving Areas



The final piece of this comprehensive zoning effort needed to fully implement this Creswell growth framework from a land use and growth management perspective is the passage of a zoning map amendment. The Zoning Code calls for a Comprehensive Zoning Review to be undertaken every 8 years. Once this process is initiated, the Director of Planning would prepare a new zoning map for the Creswell Overlay Zone that includes parcel-level designations for the sending areas in the core of Creswell and the receiving areas along the wings. Figure 10-2 shows our proposal for sending areas in orange and receiving areas in red.

The deeper the shade of red, the higher the proposed density between R1 OSD—R4 OSD. Periodically, the Department of Planning and Zoning will need to evaluate and refine the TDR program and OSD design standards as the market determines what kind of growth is feasible in the Creswell study area. Ideally, all of these steps—expansion of the Development Envelope, amending the master plan and zoning ordinance, establishing the TDR program and passing the new zoning map—will pass contemporaneously, or at least in quick succession. Failing to do so risks a loss of faith in the TDR program, necessitating a quick and clear path towards implementation.

Transportation

With significant growth in the Creswell area, traffic conditions will worsen if no major steps are taken to mitigate the impact of development. We recommend a three-fold approach to enhancing access and mobility: improvements to the roadway network, including existing and new segments; access control policy amendments; and the creation of a new county bus line that helps to address the multimodal facilities gap in the study area.

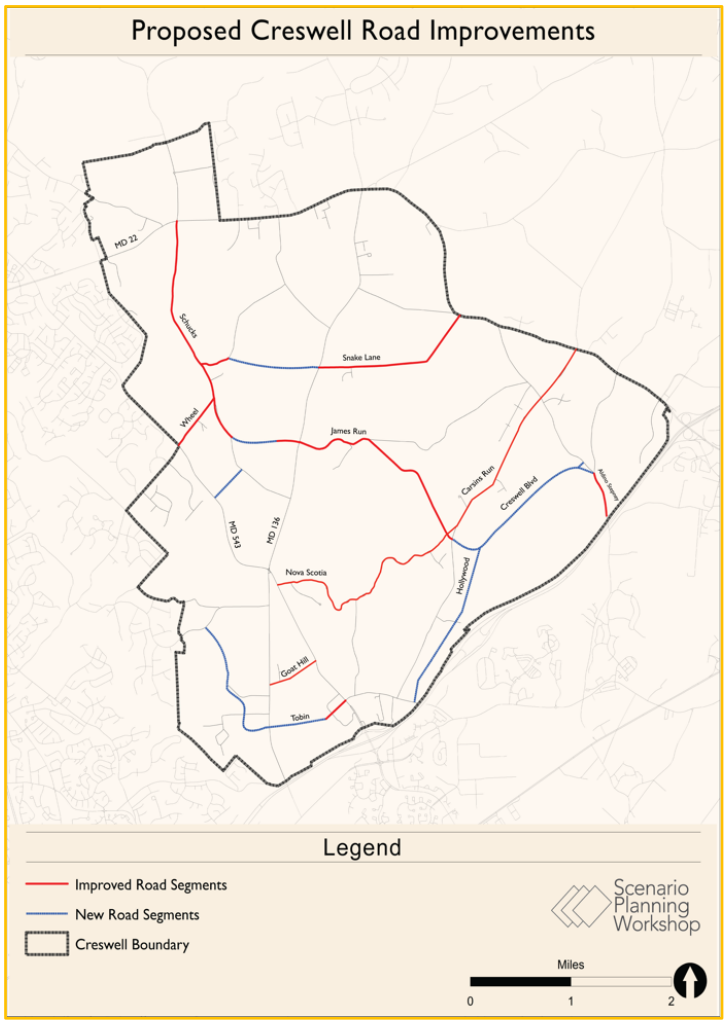
Roadway Improvements

As detailed in Chapter 8, the implications of growth without major improvements to the roadway network are significant. However, these impacts can largely be mitigated by selective, major roadway improvements, which are summarized in both Chapter 8 (Figure 8-4) and recapitulated below.

This new roadway plan proposes nineteen miles of roadway improvements if fully implemented. In consideration of the cost burden created by new roadway construction costs on County budgets, we prioritized improving existing roadways over new construction where possible. As such, existing roadways account for 68% (13 miles) of the Framework Plan's recommended improvements. The remaining 32% (6 miles) either create necessary links between existing roadways or provide critical new links in the network in order to improve circulation and address the existing gap in east-west connections in the study area. We assumed that developers would take on roadway expansion expenses on their development parcels, further reducing the need for County and state construction funding. This is reflected in our fiscal analysis in Chapter 9. The suggested interchange at Aldino Stepney and I-95 would be paid for by Maryland Transit Authority bonds, as I-95 is maintained by the MDTA.

The phasing of these roadway improvements should take into account the rate of growth in the study area, as well as the impact of particular developments on congestion. Pending further traffic studies, our suggested phasing prioritizes the creation of interior connections to add some needed redundancy of connections throughout the network. These are the "Primary" projects in Figure 10-4 below. Later improvements (labeled "Later" in Figure 10-4) would address congestion along major arterials expected to receive additional transportation investment, or which have already received it (such as MD-22 and MD-543). We did not include certain key elements of the roadway network (such as MD-136) in this list of proposed projects because of existing proposals and plans for major improvements, which we believe would address potential degradation of LOS there. These include the full list of JMT's 2012 MD-22 corridor study improvements, as well as enhancements at the intersection of MD-543 and MD-136 – i.e. the improvements we modeled in our trend scenario.

Figure 10-3. Proposed Creswell Road Improvements



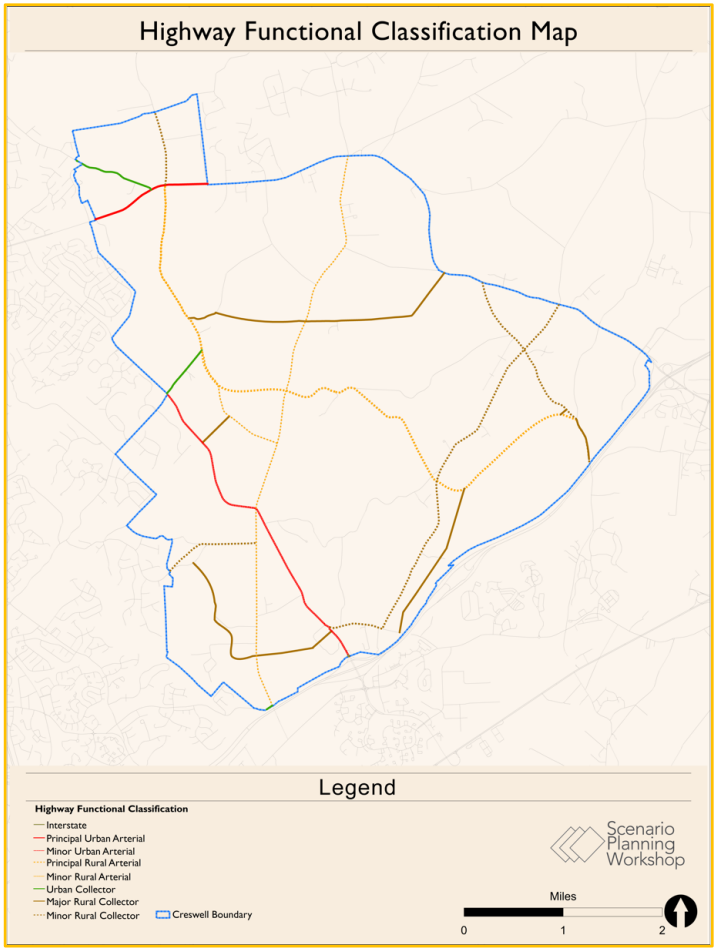
An overview of the links proposed for improvement, their lengths, and their highway functional classification is presented in Figure 10-4. It is followed by a new thoroughfare map of the study area which incorporates highway functional classifications (Figure 10-5). The Thoroughfare Plan should be included within an update to *HarfordNEXT* and cross referenced in the County subdivision regulations. The point of this provision is that the legal effect of an adopted Thoroughfare Plan is well established. It is the basis for County requirements for developers to dedicate needed rights of way (ROW) for expanded or new highways and precludes building within these ROWs. It also establishes, through

language in the subdivision regulations, the County's ability to require developers to build or improve part or all of the roadways in the Plan that are within or adjacent to their properties.

Figure 10-3. Proposed Road Improvements

Section	Type	Length (Miles)	Lanes	Classification	Phasing Order	Notes
Hollywood Road to Tower Road	New	1.8	4	Principal Rural Arterial	Later	Creswell Blvd
Tower Road/James Run Road to 136	Existing	2.0547	4	Principal Rural Arterial	Later	Creswell Blvd
MD 136 to Shucks Road	New	0.706	4	Principal Rural Arterial	Later	Creswell Blvd
Shucks Road	Existing	2.173	4	Principal Rural Arterial	Later	
E Wheel Road between Shucks and 543	Existing	0.56	2	Urban Collector	Primary	
MD 543 to Shucks Road (S)	New	0.363	2	Major Rural Collector	Primary	
Goats Hill Road	Existing	0.51	2	Local	Later	
Tobin Road	New	1.6	2	Major Rural Collector	Primary	
Tobin Road	Existing	0.56	2	Major Rural Collector	Primary	
Hollywood Road	New	1.62	2	Major Rural Collector	Primary	Carsins Run Parallel Road
Carsins Run Road	Existing	2.10	2	Minor Rural Collector	Later	
Old Tower Road	Existing	.10	2	Local	Later	
Nova Scotia Road	Existing	2	2	Major Rural Collector	Primary	
Snake Lane	Existing/New	2.53	2	Major Rural Collector	Primary	
TOTAL		19.18				

Figure 10-5. Highway Classifications



Access Control Management

Creswell's road network has limited access controls along its major roadways. A 2010 access control survey by the State Highway Administration (SHA) found that there were limited restrictions on the secondary system that runs through Creswell.[92] Several existing residential and commercial properties have direct access to these higher-functioning roads, and the area's lack of parallel streets further contributes to the intensity of congestion at key links. Although there are many properties along major arterials that have direct driveway access, as noted above, the county has existing subdivision regulations on road construction requirements for developments. The Harford County Zoning Code states that "Where a new subdivision involves frontage on an arterial or higher functionally classified road, particularly a controlled-access highway, the street layout should provide vehicular access to such frontage" by 1) a parallel street providing frontage for lots, 2) a series of cul-de-sacs or short loops, or a marginal, or 3) a marginal access street separated from the highway, offering access a suitable points."[93]

There is therefore an opportunity to enforce these subdivision regulations to a greater extent in the Creswell area, particularly in a case of future intensified development – to require developers to provide marginal access streets that filter traffic onto higher functioning roads, contributing to overall traffic management

[92] MDOT State Highway Administration. State Highway Access Control, Harford County, 2010
[93] Harford County Zoning Code. § 268-15. Streets, section H.

efforts. In addition to more stringent enforcement of existing regulations, we also recommend the *expansion* of the subdivision regulation requirements for access control to include major collectors. Given that many major collectors in the study area connect directly to arterials and can therefore expect to experience higher congestion in any growth alternative, requiring additional marginal access roads for developments located along these collectors might mitigate their impact on adjacent arterials. The interpretation of successfully meeting these requirements should also be expanded, to allow for additional center turn lanes or other methods of mitigating traffic generation.

In addition to the expansion of access control enforcement, a loosening of level of service standards for roads outside of the development envelope, or those specifically in Creswell, is recommended. The traffic impacts of growth in this report were evaluated using existing APFO requirements (LOS C or better), which are higher than the LOS D standard inside the Priority Funding Area (PFA). These standards have far-reaching implications for impact fees along lower-volume collector roads adjacent to developable parcels in the study area. In its 2006 report on APFOs, the National Center for Smart Growth recommended that it might be more reasonable to lower LOS standards for preferred development areas, reducing the need for costly traffic mitigation projects that may ultimately reduce intersection delays by just a few seconds.[94] As Creswell may remain in whole or in part outside the Priority Funding Area, we believe further investigation is needed into the costs and benefits of higher LOS standards outside the development envelope, and of alternatives such as targeted application of lower standards for a study area overlay district. Implementation of these regulatory changes should support a balance between the creation of necessary marginal access roads with more suitable options at other locations, so that concerns over access control do not cause over-construction of such streets.

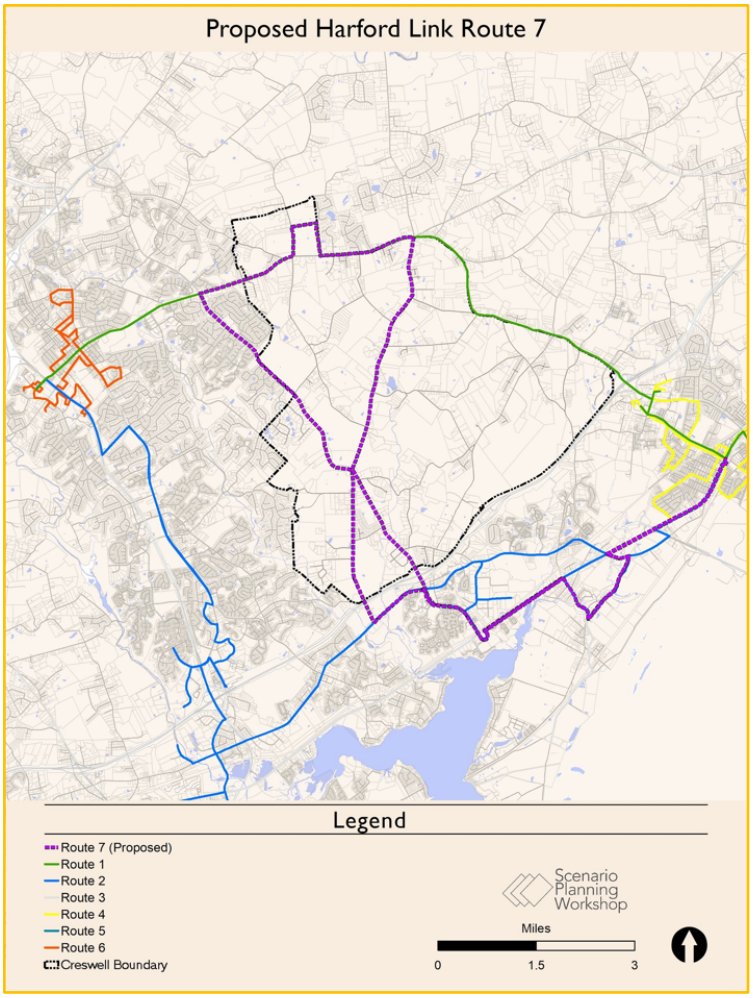
Multimodal Transportation: Proposed Harford Link Route

In line with *HarfordNEXT*'s commitment to expanding multimodal transportation options in the county, we propose an expansion of Harford County public transportation services through the study area as a new route for Harford Link. At present a majority of county residents commute in a single-occupancy vehicle. Alternative modal shares for study area commuters are very low, with an estimated 17 bus riders, 45 cyclists, and 25 residents who walk to work.[95] This may be due, in part, to the lack of dedicated public transportation service through the study area.

[94] National Center for Smart Growth, I-li. "Adequate Public Facilities Ordinances in Maryland: An Analysis of their Implementation and Effects on Residential Development min the Baltimore Metropolitan Area". 2006.
[95] US Census Bureau, ACS 2012-2017 5 Year Estimates for Census Tracts 3011.02 and 3037, 2017

Under this proposal (Figure 10-6) a "Route 7" would address the service gap that currently exists between Route 1, running along MD-22, and Routes 2, 3 and 4, running along Philadelphia Road south of I-95. The proposed "Route 7" would operate on MD-543 and MD-136, making connections at the Perryman Employment Center, and terminating at Harford Community College (HCC) and at the Aberdeen MARC station. This proposed route would connect Creswell residents to local and regional hubs and amenities. It would furthermore address the lack of multimodal corridors in the study area, and complete a network connection that could benefit all transit riders in the county. An alternative alignment would have the route operate on MD-24 to HCC, where it would overlap with existing Route 2 and 6, then down MD-136 to the Perryman Employment Center and then the Aberdeen MARC station. Since this proposal uses existing County vehicles, this route could be tested and refined as needed as growth occurs in the study area.

Figure 10-6. Proposed Harford Link Route 7



Additionally, we would recommend that Harford County explore an expansion of its Demand Response service, which provides shuttles to residents with verified disabilities as well as senior citizens who make requests at least 24 hours in advance. We propose an expansion that would relax requirements for program eligibility while still prioritizing the populations with the greatest need, and also allow for residents to make same-day requests for service. This expansion would

address the last-mile gap for residents of new and existing developments who might otherwise require a personal automobile.

Conclusion

The proposals made above address traffic mitigation, potential access control issues, and the need for expanding transit service in this study area in moderate to medium growth scenarios. Owing to the fact that this study presents a variety of potential growth alternatives, further studies will be necessary in order to determine the need for particular improvements detailed. As Creswell experiences growth in the future, the area's transit demand will need to be reassessed, and new transit routes tested if there is sufficient ridership. As regards the phasing of road network expansion, incremental improvements should prompt the re-running of models. We evaluated both the 10,000-home and 16,000-home growth alternatives under the same improvement thresholds (either no major roadway improvements or implementation of all those proposed). Thus, there was no sensitivity testing on specific proposed road segments such as Creswell Boulevard or interchange at Aldino Stepney.

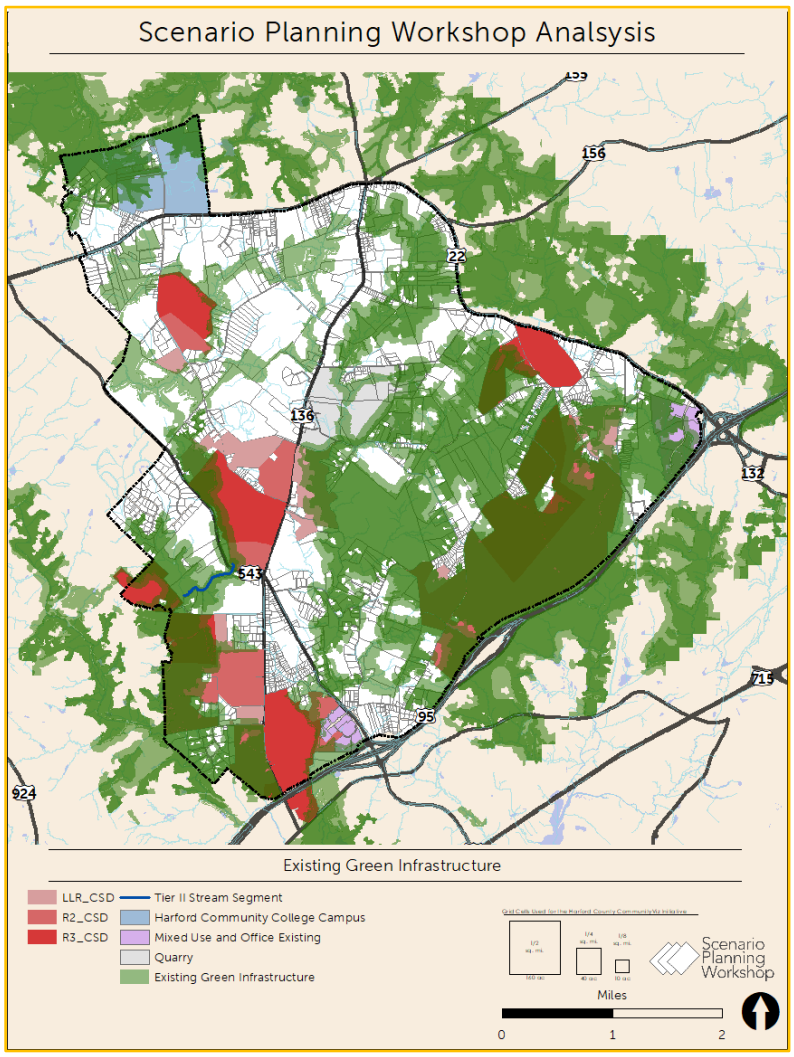
Nonetheless, the models for congestion in Creswell presented in this study demonstrate clearly that conditions can be expected to worsen in all alternatives – but the roadway improvements in the Network scenario represent the greatest opportunity for the County to manage congestion while enabling selective development. The proposals outlined in this Framework Plan provide a roadmap for the County to mitigate inevitable increases in congestion, while addressing access management controls and enhancing multimodal mobility in order to support long-term sustainability of the transportation system in Creswell.

Creating New Green Infrastructure Alongside TDR and OSD

The Framework Plan and its strategies of Transfer of Development Rights (TDR) and Open Space Design (OSD) provide opportunities not only to reexamine and prioritize the preservation of high value *existing* green infrastructure with development, but also create an opportunity to *expand and improve* the green infrastructure network in Creswell and the region. While accommodating growth in Creswell does allow for the loss of some existing green infrastructure, the use of TDR can preserve a high value core area of green infrastructure in growth areas through OSD that preserves forestland. This section will outline the prioritization of existing green infrastructure for preservation throughout Creswell and on sites where growth is allocated. Further, this section will recommend strategies to utilize the framework plan to expand upon the green

infrastructure network in Creswell, improving water and air quality, soil retention, and wildlife habitats.

Figure 10-7. Existing GI and Receiving Areas



The existing green infrastructure network, seen in Figure 10-7, accounts for 14% of green infrastructure within Harford County and is made up of 6,983 acres of forest[96]. About 69% of the widespread green infrastructure in Creswell is core interior forest habitat. Core habitats serve multiple functions: they provide high quality wildlife habitat and stormwater filtration potential; are key for maintaining water quality within state mandated total maximum daily loads; provide a biodiverse habitat connection between the coastal Critical Area to the south and the Priority Preservation Area to the north; and support easily accessible open space to the nearby urban areas.

With the accommodation of growth, the Forest Conservation Act of Maryland requires preservation of forests with some prioritization of forests that are essential to these ecological and community services. Under the Forest Conservation Act and Article VI of the Harford County zoning code, 40% of forested land on large medium-density residential developments, such as those in Creswell, must be preserved on the lot or parcel outside of the development envelope[97]. Forests that are connected to large, contiguous forest on adjacent

[96] *Draft Harford County Green Infrastructure Plan*, 2018.
[97] Harford County, Maryland. Municipal Code Art. VI § 267-39 Retention and Afforestation. 2008.

land, or that are part of a floodplain or stream buffer, are priorities for retention of existing forest under Article VI. While the Article provides some opportunity for conservation and prioritization of forests, the parcel and site review based nature of the preservation process in Article VI can lead to eventual forest and habitat fragmentation as site plans are considered on case by case basis, rather than as an overall plan for green infrastructure's conservation in the area.[98] Utilizing the Green Infrastructure Plan (GIP) and the Framework Plan, these priorities can be expanded on to support greater water quality, biodiversity, and contiguity of forests in the region.

Figure 10-8. Prioritized GI and Receiving Areas

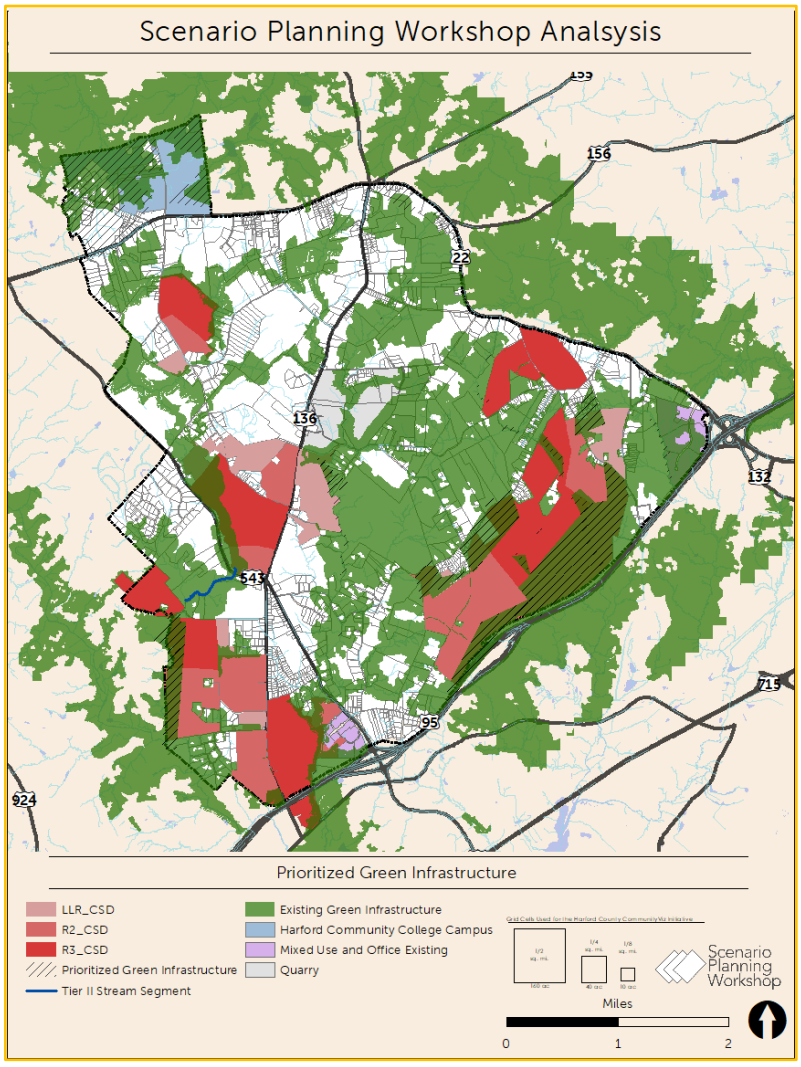
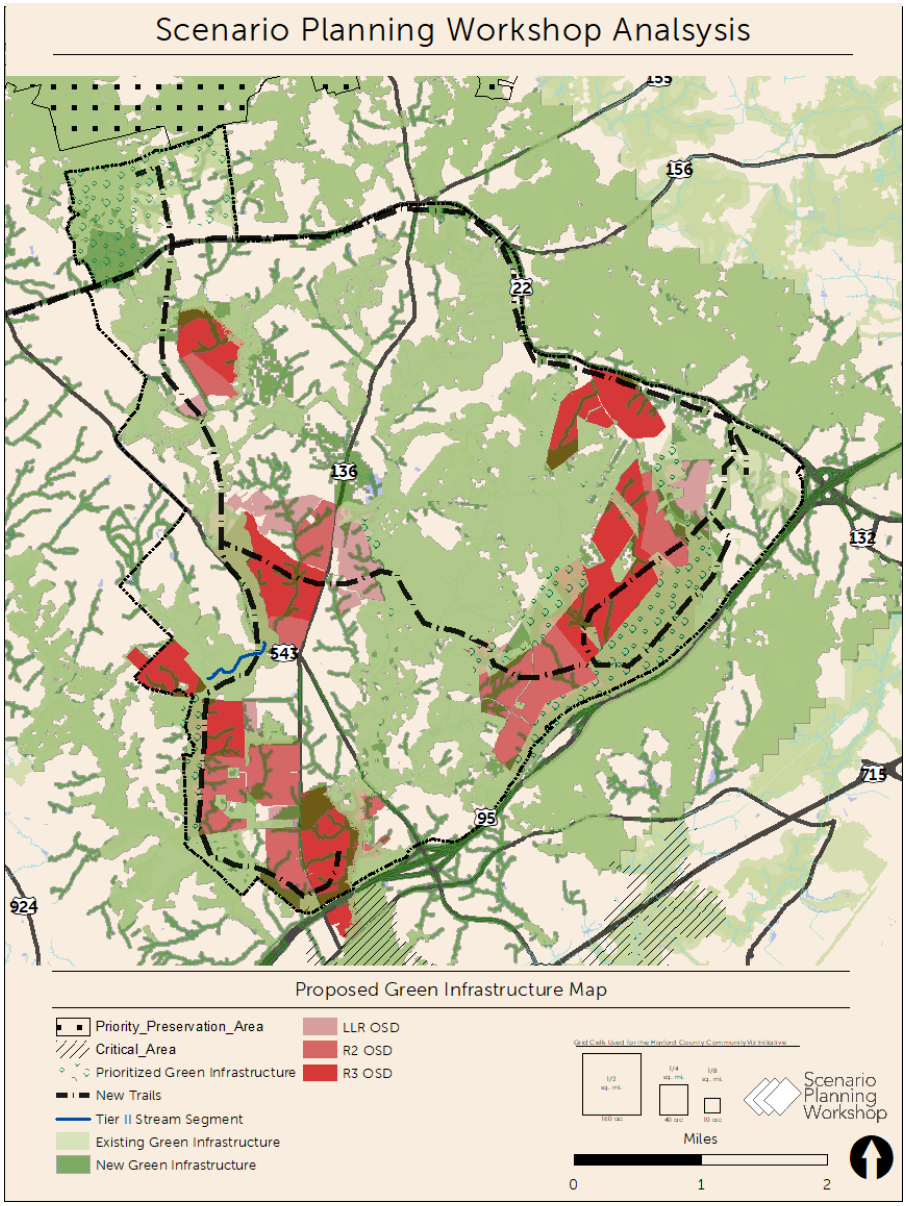


Figure 10-8 depicts proposed prioritized existing green infrastructure in Creswell, including the preservation of existing high value forests. In allocating growth within the Framework Plan, forest containing Maryland Targeted Ecological Areas, high Biodiversity Tier ratings provided by BioNet, and high percentages of interior forests were prioritized for preservation on a large scale. On parcels designated for open space subdivision design as part of the Framework Plan, existing forests were prioritized for conservation based on biodiversity measures, interior forest area, and the preservation of connections to and between major green infrastructure cores in Creswell and the region.

[98] Interview with Licensed Forester, April 18, 2019.

In addition to conserved *existing* green infrastructure, Figure 10-9 depicts *new* green infrastructure to be reforested or afforested to improve air and water filtration potentials, wildlife habitats, and plant species health throughout Creswell and Harford County.

Figure 10-9. Proposed Green Infrastructure



New green infrastructure was identified by filling green infrastructure gaps identified by the Maryland Department of Natural Resources;[99] stream buffers of 75 feet throughout Creswell and the surrounding area; a stream buffer of 150 feet along a Tier II stream segment (in blue in Figure 10-9) in the western portion of the study area; and new critical connections between large contiguous forests within Creswell, outside of Creswell to the southern Critical Area, and beyond the study area to the northern Priority Preservation Area.

The preservation and creation of a wide-reaching green infrastructure network that provides ecologically productive forests with high water filtration, soil retention, and biodiversity also allows for community use through open space and trails. In Figure 3, dotted purple lines represent proposed trail locations, which link key places such as Harford Community College, James Run Mixed Use Center, and the Mixed Office Center in the northeast to residential areas and activity centers outside of Creswell. The proposed trail network not only provides access to open space, but also encourages active transportation, recreation, and instills environmental outreach and education for the community.

The draft GIP and the Framework Plan provide several opportunities to implement the proposed prioritized and new green infrastructure to establish a preservation plan and associated policies that inform contiguous conservation of forested land in Creswell and throughout Harford County. The final GIP, with the Framework Plan's proposed afforested and reforested new green infrastructure, can act as a criteria for ensuring that TDR is approved only when site plans are consistent with the existing and proposed green infrastructure plans. Secondly, as proposed in the Draft Green Infrastructure Plan, a Forest Conservation Ordinance with an expanded definition of high priority forests for conservation would protect valuable and contiguous green infrastructure cores with greater specificity. This method would ensure forest canopy coverage at local and regional scales and assist in preventing forest edge fragmentation created by site based preservation methods. Lastly, the expansion of Natural Resource Districts to include prioritized green infrastructure as sensitive environmental features can ensure the protection of high value core forests throughout the site planning process.

The creation of a trail system, for which developers must provide easements, utilizes OSD and road network improvements to provide opportunities for new trails throughout Creswell. Outside of developing areas, trails within the forested areas of the green infrastructure network can act as part of an expanded Natural

[99] Ted Weber, "Green Infrastructure Assessment Tool," (Maryland Department of Natural Resources Watershed Services Unit, 2003).

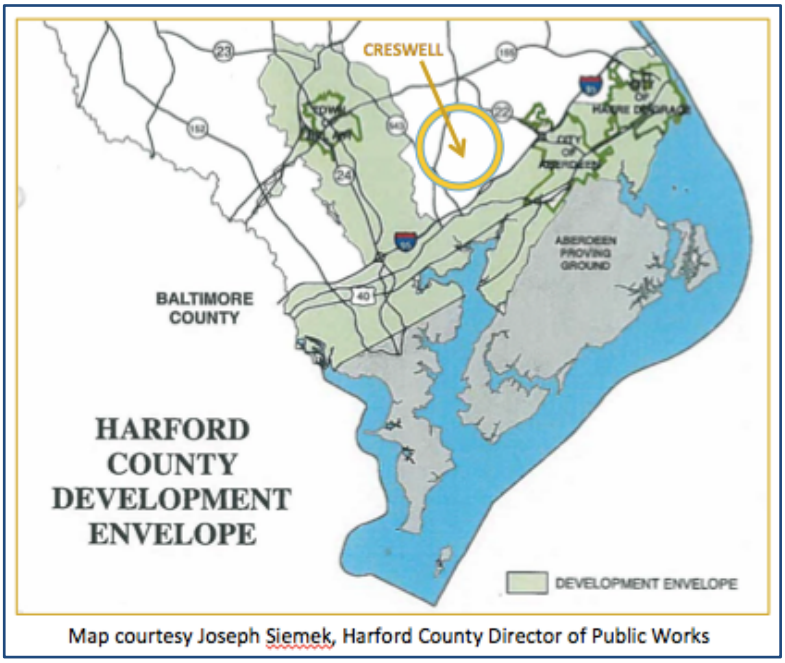
Resource District emphasizing high value green infrastructure, which allows for active trails use in forested areas[100]. The provision via easement of key links for trails can support the additional acreage needed for parks with an increase in growth in Creswell.

With a holistic framework for green infrastructure that works in tandem with, not despite, development, Creswell and Harford County can establish a network of healthy forested ecosystems that provide accessibility of open space, connectivity, and efficient ecological services for the county as a whole. Utilizing transfer of development rights and an expanded forest conservation ordinance from the Creswell Framework and Green Infrastructure Plan can inform a new vision for protected green infrastructure in Harford County.

Providing Sewer and Water Service

Providing adequate water and sewer needs for residential and economic growth in the Creswell area involves two significant implementation elements: first, a thorough revision of the County's current regulations concerning access to public sewer and water service, and second, a consideration of phasing of new sewer and water infrastructure and the fiscal demands this infrastructure will place on the County's Sewer and Water Enterprise Fund.

Figure 10-10. Development Envelope



Map courtesy Joseph Siemek, Harford County Director of Public Works

Regulatory Changes Needed to Bring Public Sewer & Water to Creswell

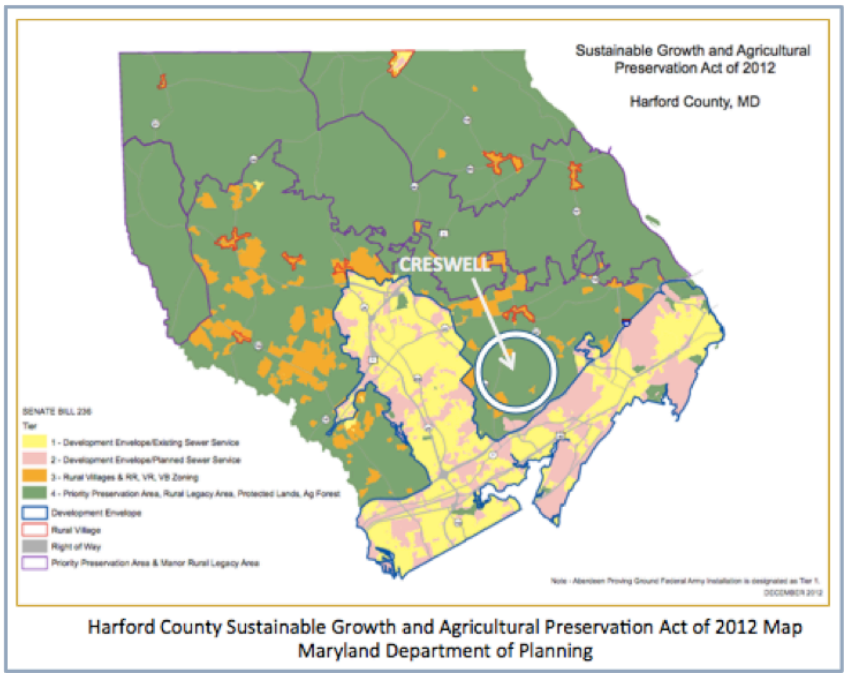
Within Harford County's development envelope, public sewer and water are planned; outside of it, public sewer and water are discouraged. Harford County's Sewer and Water Master Plan explicitly states:

[100] Harford County, Maryland. Municipal Code Art. VI § 267-62 NRD Natural Resource District. 2008.

"Public water supply and sewerage systems will be extended only into existing communities or areas where planned growth is consistent with the current Harford County Land Use Element Plan, the Transportation Plan, the other master plans and this Plan. The cost to provide these services will be supported by the persons who are benefited by the extension."[101] Thus, under current regulations, it is clear that Harford does not plan to provide sewer and water to areas not inside the designated development envelope, and has not formulated its capital budget to support such expansion.

In addition, the regulatory constraints on sewer which were codified by Maryland SB 236—the Sustainable Growth and Agricultural Preservation Act of 2012—present a further hurdle to sewering the Creswell area. SB 236 creates four tiers of sewerage service, designed to limit the development of subdivisions in areas which are marked for preservation and conservation. Most of the Creswell area is currently designated Tier IV, which prevents both gravity sewer and subdivisions on septic. Portions of the area—presently developed residential subdivisions, Harford Community College, and the rural village of Churchville, in specific—are designated Tier III, which does allow for subdivisions on septic. Public sewer and water is not permitted in either Tier III or Tier IV.

Figure 10-11. Sewer Tier Designations



Harford County Sustainable Growth and Agricultural Preservation Act of 2012 Map
Maryland Department of Planning

Residential expansion into the Creswell area requires public water and sewer and necessitates a change in the development envelope regulations, service maps, and/or an expansion of the development envelope to include the areas which are to receive service. These changes must occur before any infrastructure work begins, and thus would need to be among the first regulatory changes sought by the County to support residential growth in Creswell.

[101] Harford County Department of Public Works, *Sewer and Water Master Plan*, (2018), 16.

The changes necessary would derive from a revision to the Harford County masterplan, HarfordNEXT, because redrawing the boundaries of the development envelope and rezoning the Creswell area can trigger all the other regulatory changes and enable them to easily fall into place. After these changes to the County's master plan are made, the Sewer and Water Master Plan and the SB 236 regulatory are simple to adjust, because both the SB 236 bill text and the Sewer and Water Master Plan text provide clear methods for revision which are based on the County's master plan being revised.

The key text in the Sewer and Water Master plan reads as follows: "The following types of revisions are considered during the semi-annual review process: […] 2. Changes in the other components of the County's Master Plan that may impact on this Plan […]," [102] implying that changing the development envelope allows for changes to the sewer and water service regulations as well. Similarly, a provision in the text of SB 236 allows for changes in tier designations if they are first changed in a county's master plan and zoning code. Harford County is thus in control of its own sewer tier designations because it is in control of its own master plan. Development in the Creswell area will be prefigured on adjustments to the master plan and the devolved regulations which follow—but these are decisions that Harford County is in control of making.

Phasing of Sewer Construction & Financial Considerations

We propose two new gravity sewer lines and accompanying water pipes, which will follow the hydrology and topography of the Creswell area. As mentioned in the Impacts section above, these lines will run up the James Run and up the Greys Run, both in the Bush River watershed.

These sewer and water lines can be built in phases. The James Run sewer, which would run in parallel to the smaller James Run pipe that currently is planned to serve the James Run mixed-use office development, can reach all the way to Harford Community College. This line must be constructed first, and as a precondition of any dense development in Creswell. Additionally, if the market for residential development in the Creswell region continues to be strong over the 2030s, and development reaches the eastern portion of the study area, a second sewer trunk line which traverses the northeastern subsewershed will also be necessary. Topologically, this trunk sewer is best constructed along Greys Run.

[102] *Sewer and Water Master Plan* 2018.

The nature of sewer and water infrastructure—which is most efficient when constructed with pipe capacity large enough to serve the maximum buildout of expected development—implies that even phased development should take into account the possibility of a maximum growth scenario, so as to adequately serve the new residents. However, conversely, limiting the size of the built pipes to the threshold of desired maximum growth in the study area would be an effective growth management mechanism for guiding development.

Phasing will also depend on the fiscal health of the Sewer and Water Enterprise fund and the level of risk the County is willing to tolerate. The structure of the enterprise fund supports large capital projects and makes them cost-effective for the County—if, and only if, there is sufficient developer buy-in to the area newly being serviced by municipal sewer and water. Developer buy-in and a strong market for development ensure that the user fees generated by connections and usage are high enough to pay the debt servicing of the capital bonds which the fund would have to take on to complete an infrastructure project of this size and scope.

The County has been conservative with debt under the current administration. This level of infrastructure investment, while supportable by the County and the Enterprise Fund, would require solid political commitment. It might be useful to consider additional sources or methods of funding sewer and water expansion, at least for the early portion of construction before developer buy-in to the new system reaches critical mass. Some of these other financing methods might include developer-based financing (perhaps linked to the County's Adequate Public Facilities ordinance or conservation subdivision regulations), or the designation of a new sewer or water sub-district with special connection or usage fees—though this latter option may slow developer-driven growth.

All in all, the fiscal health of the Sewer and Water Enterprise Fund should remain a central consideration in the pace of development in the study area, so that a healthy ratio of debt to income can be preserved within the County as a whole, and this pacing should be central to the phased deployment of sewer and water infrastructure.

Stones Unturned

Since we developed the Framework Plan over a very compressed period of 16 weeks, there were many areas we wanted to explore further but lacked the time to do so. Subsequent refinement or modifications to the Framework Plan may wish to explore some of them.

Scenario Planning Workshop

Stones Unturned

Since we developed the Framework Plan over a very compressed period of 16 weeks, there were many areas we wanted to explore further but lacked the time to do so. Subsequent refinement or modifications to the Framework Plan may wish to explore some of them. These are listed below by subject area.

Demographics and Housing

- More data and analysis on housing costs and affordability versus regional factors;
- More exploration of accessory dwelling units and of housing for seniors.

Environmental Analysis and Modeling

- Vary the parameters of the TDR (ratios and densities) to further bracket the options;
- Site plan measures and ESD for analysis of stormwater runoff impacts;
- Update potential sites for constructed bioretention (updated from draft Green Infrastructure Plan);
- Update water quality and species inventory to inform prioritized green infrastructure protection;
- Consider policies to strengthen agritourism based in non-prime soils (vineyards, equine operations, pastures, etc.);
- Add new data, OSD site planning, and further impacts into model testing.

Agriculture and Transfer of Development Rights

- Provide more density-matching examples of sewered densification with OSD than provided in the report;
- Perform more exploration of ways to strengthen the agricultural economy, including biogas, solar farming, and on-farm event spaces that are not as dependent on prime soils or large acreages;
- Explore legislative and political barriers and benefits to renewable energy-based land uses in Creswell on agricultural properties.

Rural Character

- Convene Creswell residents for community engagement around the Rural Character analysis and ratings;
- Perform outreach in general to define community perceptions of rural character value and history;
- Explore viewsheds further using drone photography

- Perform a case study on the integration of agriculture, historic buildings, agritourism and viewsheds, using a particular location (e.g. Broom's Bloom).

Transportation and Community Design

- More sensitivity analysis of traffic effects of changing levels of road improvements;
- Perform more work on Traffic Impact Analysis changes needed in Creswell given development patterns
- A deeper dive into APFO regulations given Creswell's development patterns
- Provide more detailed work on subregulations, access controls, and road spacing recommendations.

Growth Management and Land Use

- Model the zoning code elements for OSD
- Model the proposed overlay district elements
- Provide examples of what the Framework Plan Priority Funding Areas (per the Maryland Department of Planning definition) and approval process might look like;
- Model framework and best practices for TDR bank administration.

Utilities

- Provide more details on trunkline and lateral locations to help with sewer phasing;
- Perform an environmental impact analysis of proposed sewerage on the Bush River watershed;
- Perform a full fiscal analysis of sewer costs with the constraints of the Water and Sewer Enterprise fund

Fiscal Analysis

- Vary the impact fee to see impacts and/or test excise tax effects;
- Vary the housing types or values to see impacts;
- Perform the fiscal analysis by phase – west wing and then east wing

In addition to these ideas for further research, modeling, and exploration, we have provided a full picture of our current background research in a separate volume entitled *Background Reports for the Creswell Framework Plan*. The table of contents of this volume appears below.

Background Reports for the Creswell Framework Plan

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Acknowledgments

Special thanks to Harford County Staff:
Brad Killian, DPZ
Jenny King, DPZ
Bill Amoss Jr, DPZ
Bill Bettin, DPW
Joel Gallihue, DPZ
Ed Hopkins, Fire/EMS
Bruce Johnson, DPZ
Brenda Morrison HCC
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While all the students participated in the overall development of the project, each student also took on a particular aspect of the work, as follows:
Bilal Ali, *Fiscal Analysis*
Sarah Latimer, *Environmental Analysis and Modeling*
Nick MacKereth, *Demographics and Housing*
Kari Nye, *Agriculture and Transfer of Development Rights*
Russ Ottalini, *Transportation and Community Design*
Jerah Smith, *Growth Management and Land Use*
AnnaLinden Weller, *Utilities and Rural Character*

The Studio Workshop, an elective course in the URSP program, was developed and taught during Spring 2019 by Uri Avin FAICP, Research Professor at the National Center for Smart Growth at UMD and Matt Noonkester AICP, Adjunct Faculty, President of *The City Explained* and owner of *CommunityViz* software.

Avin has a 45-year career in the public and private sector and public sector, including serving as a former deputy director of planning in Harford County. His plans have been honored through 20 national or state awards. Noonkester's 25 years of experience also include public and private sector work across the U.S. He is recognized as a national innovator and leader in the application of sketch planning tools for effective urban planning. In addition to this faculty, the course benefited from the mentoring and guidance of the following regional and national experts in topics at the core of this project, to whom special thanks are due:

Randall Arendt, Conservation Subdivision Design Consultant and Author
Carson Bise, TischlerBise Inc, Fiscal Consultants
Dr. Fred Ducca, Transportation Scenario Testing
Melina Duggal, Duggal Real Estate Advisors
Phil Gottwals, Ag. Preservation Consultant
Donna Mennito, Communications and Design
Rick Pruetz, FAICP, TDR Consultant and Author
Dr. Jana Vandergoot, UMD Architecture Professor and Author
Matt Wolniak, JMT Transportation Consultants