Arlington Analytics

Budget and Environmental Effects of *The Towns of 24th* Development

Summary

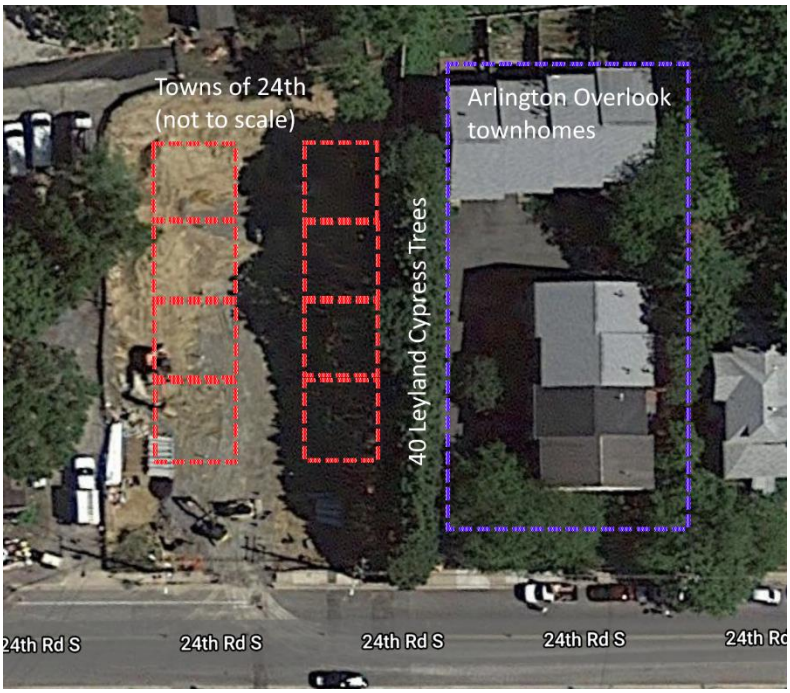
We analyze the effects of the development of the Towns of 24th, a new eight-unit townhouse development in Green Valley. For this development, two small houses have already been demolished to make way for eight three-bedroom, four-story townhomes. We analyze this development and find that:

- Construction will lead to a loss of 40 trees. We use tools developed in part by the U.S. Forestry Service to estimate that the trees contribute about $647 in environmental benefits and energy savings per year. This number is almost certainly an underestimate because multiple buildings are located near the trees, each of which benefits from lower energy consumption. This estimate excludes increases to property values or any other intangible value that residents may place on the trees.
- The development will generate $64,000 in additional revenue starting in 2022, increasing to $75,000 in 2031.
- Services for new residents and students will increase county spending by $75,000 ($64,000 excluding school construction costs) in 2022. Spending rises to about $92,000 in 2031 ($81,000 excluding school construction costs).
- The new buildings and walkways will displace approximately 7,600 square feet (0.17 acres) of permeable land, leading to additional burdens on the county's stormwater infrastructure.

Background

Towns of 24th is an ongoing development at 2811 and 2807 24th Road S in Green Valley. The development covers two parcels, 31025006 and 31025007, which are approximately 9,000 and 8,800 square feet respectively. The first of those two developments is listed as a two-bedroom detached

single-family house in Arlington's Residential Dwellings Interior dataset.[1] The dataset lists the second of those two houses as having seven bedrooms, which is likely an error given that the structure is only listed as having 1,650 square feet of finished space. For our subsequent analysis, we assume that this single-family detached house has three bedrooms.



According to Arlington GIS data on buildings and driveways, 2811 24th Road S has a driveway that occupies a little over 600 square feet and a building footprint of 1,135 square feet. The same source shows that the building at 2807 occupies a footprint of 762 square feet. Using online mapping tools and satellite imagery, we roughly estimate the existing street and sidewalk coverage at 1,252 square feet, while walkways are about 256 and 156 square feet respectively for 2811 and 2807 24th Road S. Excluding these paved surfaces and building footprints, these two parcels contribute about 13,600 square feet (0.31 acres) of permeable land to help with stormwater abatement.

Environmental Effects

This new townhome development hosts more residences on a larger footprint than the two detached single-family homes that previously occupied these parcels. Each of the four luxury townhouses has 2500 square feet of living space that requires electricity and gas for heating and cooling. Moreover, construction of this particular development has a significant effect on a large stand of trees on the east property line.

The increase in impermeable surfaces—buildings and paved surfaces—adds to stormwater management challenges. Site drawings indicate that the developer plans to maintain about 6,089 square feet (0.14 acres) of open landscape, which is a decrease in permeable space of about 55 percent. This decrease in permeable land will lead to a decreased capacity for the ground to absorb stormwater and further increase the burden on Arlington's taxed stormwater management system.[2]

[1] This property has two bedrooms according to a January 2019 vintage of the Arlington Interior Improvements data set. The property is no longer listed in the September 2020 vintage of the same data set.

[2] For explanation of how runoff varies with property type, the University of Vermont lists runoff associated with different development types in a guide published to help their community members protect their local water resources.

Furthermore, the development is expected to lead to the destruction of about 40 Leyland Cypress trees, on average about 9 inches in diameter. We use i-Tree, a tool developed by the U.S. Forestry Service with collaborators to quantify the environmental benefits of the displaced trees.[3] We present the full list benefits estimates from this tool in Table 4 in the Appendix. We summarize the value of these benefits for all of the trees below in Table 1.[4]

Table 1: Tree Benefits Calculations

	Benefit Per Tree	Number of Trees	Total Value
Yearly Environmental Benefits of Trees			
Carbon Dioxide Sequestration	$0.45	40	$18
Storm Water Runoff Avoided	$0.34	40	$14
Air Pollution Removed Each Year	$2.00	40	$80
Energy Usage Per Year	$10.37	40	$415
Avoided Energy Emissions	$3.02	40	$121
Total Benefits	$16.18		$647

Source: i-Tree valuation. Buildings for each tree consist of four from Arlington Overlook and two from Towns on 24th.

Benefits Per Tree

Each tree offers three main benefits that do not depend on how the tree is situated relative to neighboring buildings. First, each tree sequesters carbon. Each of the 40 trees sequesters about $0.45 cents of carbon per year for a total yearly benefit of $18. Next, trees abate the amount of storm water runoff that comes from the area. These benefits are estimated at about $0.34 per tree per year, or about $14 per year for the entire stand of 40 trees. Lastly, each tree removes air pollution from the air. These benefits are worth about $2.00 per tree or $80 per year total. The immediate vicinity of the project is a non-attainment area for ozone air quality so tree removals will adversely affect the residents health statistically.

Depending on its location relative to buildings, each tree provides benefits in the form of lower energy consumption for heating and air conditioning, which is estimated at $10.37 per year. Moreover, lower energy consumption leads to lower energy emissions, a benefit that is worth about $3.02 per tree for a building.

[3] As noted in its description, i-Tree is a cooperative effort between the USDA Forest Service, Davey Tree Expert Company, The Arbor Day Foundation, Society of Municipal Arborists, International Society of Arboriculture, Casey Trees, and SUNY College of Environmental Science and Forestry. We assume that the 40 Leyland Cypress trees are on average about 9 inches in diameter, they are in good condition, each is between 40 and 60 feet of four of the existing townhomes, that the buildings are typically east from the trees, that the buildings were built after 1980 (according to the Arlington property search tool, they was built around 1995), and that the sun exposure is partial.

[4] At noted by the i-Tree tool, these estimates are meant for guidance. Moreover, we omit a number of other consideration such as the possibility that the value of additional trees per building may decline as the tree population increases, the energy value of the trees declines per property declines as the buildings are situated more closely together, or that the trees may provide benefits to additional properties than the ones listed..

Total Benefits of the Stand of 40 Leyland Cypress Trees

Combining all of the benefits including carbon, stormwater, and air pollution abatement as well as direct and indirect energy savings, we arrive at a total value of about $647 per year for the entire stand of 40 trees.[5] However, this estimate almost certainly underestimates the true value of the trees in the area: there are multiple townhomes in the adjacent community as well as in the Towns of 24th that would benefit from the lower energy consumption because of these trees.

We should note that this analysis excludes property value, health, aesthetic and recreational benefits for the trees. Neighbors may value trees for their beauty, shade, and recreation, and that value is not reflected in this analysis. A simpler version of the i-Tree analysis tool used for simple estimates finds that each tree increases the property value of nearby multifamily units by $13, or about $520 for the entire stand of trees.

In 2016, Arlington's Urban Foresters published a study valuing Arlington's trees. The study estimated the average "structural value" of a tree—many larger trees, but more than half under six inches—is about $1,827 per tree, or approximately $73,000 for the entire stand. Alternatively, the "compensatory value", "the cost of having to replace a tree with a similar tree" is much higher. Unfortunately, replacing these mature trees is not possible so these approximations give a sense of the magnitude of the cost to replant and time needed for the stand to grow back to the condition and size prior to the development.

New Revenues

Most of the county's revenues from residential properties come from real estate taxes, however, new construction also brings substantial additional revenues. We use a comprehensive model of Arlington to estimate the effects of development on of all the county's revenue streams including Arlington Public School (APS) service charges, meal taxes, sales taxes, personal property taxes, utility taxes, state aid, and more.

We show the results from our simulations in Table 1. We claim that the new townhomes will be completed and occupied by July 2021, the start of the 2022 fiscal year.

Table 2: Revenues from New Development (Thousands USD)

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2022-2031
Real Estate	47	48	49	50	51	52	53	54	55	56	515
Personal Property	4	4	4	5	5	5	5	5	5	5	47
APS	3	3	3	3	3	3	3	3	3	3	30
Meal, sales, etc.	9	10	10	10	10	10	10	11	11	11	102
Total	64	65	66	68	69	70	71	73	74	75	695

[5] We chose the following options for the trees: the trees are in good condition, they have partial sun exposure, they are 40-59 feet within a building, the buildings were built since 1980 (they were built in 1995) they are 9 inches in diameter, and they are west of the affected townhome development.

Overall, we expect revenue from 2022 through 2031 to increase by about $695 thousand dollars.

The largest component of revenue comes from real estate taxes. Both an increase in the number of units as well as the increase in the per-residence assessment drive the increase in real estate tax revenues. Although revenue drops from the demolition of the existing houses, this is far more than made up for by the higher assessments for the new properties. Starting in 2022, we estimate that the new townhomes will increase real estate taxes by $47 thousand dollars. We estimate that the new townhomes will assess in the mid $700 thousand dollars, about 15 percent below the asking price of $890 thousand as of September 15, 2020.[6]

Personal property taxes are assessed against personal vehicles, which increase with the number of residences. Each property has a two-car garage, however, some of these spaces may remain unfilled. The net effect on the tax collected, after the cars associated with the existing properties are considered, is about $4 thousand per year. Additionally, APS receives additional revenue from the increase in enrollments. This revenue comes from fees for services such as lunch and extended day program tuition as well as additional revenues from the federal and Virginia governments.

There are a wide variety of other taxes and revenues that the county collects from residents. Taxes and revenues such as meal taxes, sales taxes, and the myriad of other county taxes and fees make up the last major segment of revenue. We expect these sources of revenue to raise a less than $10 thousand per year starting in 2022.

New Spending

New residents and new students increase the demands on the county's public services and APS resources. Using estimates of the new residents and students, we use our model to estimate the effects on the county and school operational budgets and school capital budgets.

Table 3: Spending from New Development (Thousands USD)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2022-2031
APS Operating	35	36	37	39	40	41	42	42	43	44	399
School Construction	11	11	11	11	11	11	11	11	11	11	113
County Operating	29	30	31	31	32	33	33	35	36	37	323
Total	75	77	79	81	83	85	86	88	90	92	835

We show our estimates of the effects of development on the county and school budgets budget in Table 2. In the first line of Table 2, we show an increase of $35 to $44 thousand per year in the school operating budgets. These expenditures are the year-to-year expenditures that support instruction and school operations of the anticipated newly enrolled students. They do not include the costs of new school construction—if necessary—from the anticipated increase in students from the development.

[6] County assessed value is typically lower than the sold price. An analysis of real estate sales by zip code found that assessments were between six and 10 percent lower than settled prices, and a more recent analysis reported that the difference could be as high as 14 percent.

The school construction costs are enumerated separately in the second line and may or not be necessary depending on growth in school enrollments and current capacity.

The county operating budget—which includes things like park programs, police, courts, county administration, human services, and other county programs—is listed in the third line and is expected to cost $29 thousand dollars in 2022, rising to $37 thousand by 2031. We break down these expenditures into greater detail in Table 4, included in the Appendix.

Although we do consider school capital costs in this analysis, we do not include other county capital expenditures such as new parks, road improvements, or other large-scale investments.[7] Therefore, we expect that the additional residents from this new construction would burden the areas parks, stormwater, roads, and other public infrastructure even if these costs are not directly reflected in the budget.

Conclusion

The Towns of 24th townhouse development adds eight townhomes at the expense of two single family homes in the Green Valley neighborhood. We estimate fiscal costs of this development from 2022 through 2031 at about $27 thousand excluding new school construction costs and $140 thousand including those construction costs. In addition to the fiscal costs of the development, the county will lose a number of trees and the environmental, energy, and stormwater benefits that come from fully-developed trees. The estimated value for the environmental, stormwater, and energy benefits for those trees is around $650 per year. In addition, those trees provide benefits to multiple buildings as well as aesthetic and health benefits to nearby residents, meaning that the true value of their benefits is likely considerably higher.

Notes and Acknowledgments

Written Jon Huntley, PhD and Mary Glass. All errors are the authors' own. Corresponding author's e-mail: jon.huntley@gmail.comLast updated, August 2020. For additional tools, data, and analysis, please visit https://www.arlington-analytics.com/

About the Authors

Jon Huntley, founder of Arlington-Analytics.com, has a BS in mathematics and economics from Duke University and a PhD in economics from Northwestern University. He has worked most recently at the Congressional Budget Office and is currently a Senior Economist at The Wharton School of the University of Pennsylvania.

[7] The county is close to its self-imposed borrowing limits; increases in the number of residents increase income, which relaxes the borrowing constraint and allows the county to borrow slightly more money. The increase in debt service from this increased borrowing is reflected in the county operating budget. Nonetheless, the increase in debt is small, and we do not expect that the additional borrowing is sufficient to cover new capital needs.

Mary Glass, long-time resident of Arlington, has a BA with a minor in Environmental Studies from the University of Michigan, a Masters in Environmental Management from UCLA, and an MBA in Finance from the George Washington University. She has worked extensively in the public and private sectors on energy and environmental affairs for more than 40 years.

Data Appendix

Table 4: i-Tree Valuations

MyTree Benefits

Leyland cypress, *(Cupressocyparis leylandii)*

Serving Size: 9.00 in. diameter
Condition: Good
Total benefits for this year: $16.18

Carbon Dioxide (CO_2) Sequestered	**$0.45**
Annual CO_2 equivalent of carbon[1]	42.77 lbs
Storm Water Runoff Avoided	**$0.34**
Runoff Avoided	37.84 gal
Rainfall Intercepted	134.46 gal
Air Pollution Removed Each Year	**$2.00**
Carbon Monoxide	< 0.1 oz
Ozone	4.98 oz
Nitrogen Dioxide	0.86 oz
Sulfur Dioxide	0.24 oz
$PM_{2.5}$	0.4 oz
Energy Usage Per Year[2]	**$10.37**
Electricity Savings (A/C)	36.9 kWh
Fuel Savings (natural gas, oil)	0.47 MMBtu
Avoided Energy Emissions	**$3.02**
Carbon Dioxide	55.64 lbs
Carbon Monoxide	2.07 oz
Nitrogen Dioxide	0.8 oz
Sulfur Dioxide	12.2 oz
$PM_{2.5}$	0.6 oz
CO_2 Stored To Date[3]	**$5.84**
Lifetime CO_2 equivalent of carbon[3]	553.63 lbs

Benefits are estimated based on USDA Forest Service Research and are meant for guidance only.

[1] For large trees sequestration is overtaken by CO_2 loss with decay/maintenance.

[2] Positive energy values indicate savings or reduced emissions. Negative energy values indicate increased usage or emissions.

[3] Not an annual amount or value.

Visit www.itreetools.org to learn more.
MyTree 2.5.16
Powered by the i-Tree Engine

Table 5: Change in Operating Spending by Category (thousands USD)

Year	Admin, DES, Development, and Non-Departmental	Human Services	Public Safety and Courts	Regional and WMATA Contributions	Debt Service	Libraries and Parks	APS Operating	APS Debt Service	Total Spending
2022	5	7	10	0	3	3	35	11	75
2023	5	8	10	0	3	3	36	11	77
2024	6	8	10	0	3	3	37	11	79
2025	6	8	11	0	3	3	39	11	81
2026	6	8	11	0	3	3	40	11	83
2027	6	8	11	0	4	3	41	11	85
2028	6	8	12	0	4	3	42	11	86
2029	6	9	12	0	4	3	42	11	88
2030	7	9	12	0	4	4	43	11	90
2031	7	9	12	0	4	4	44	11	92
Total	60	81	112	2	35	33	399	113	835