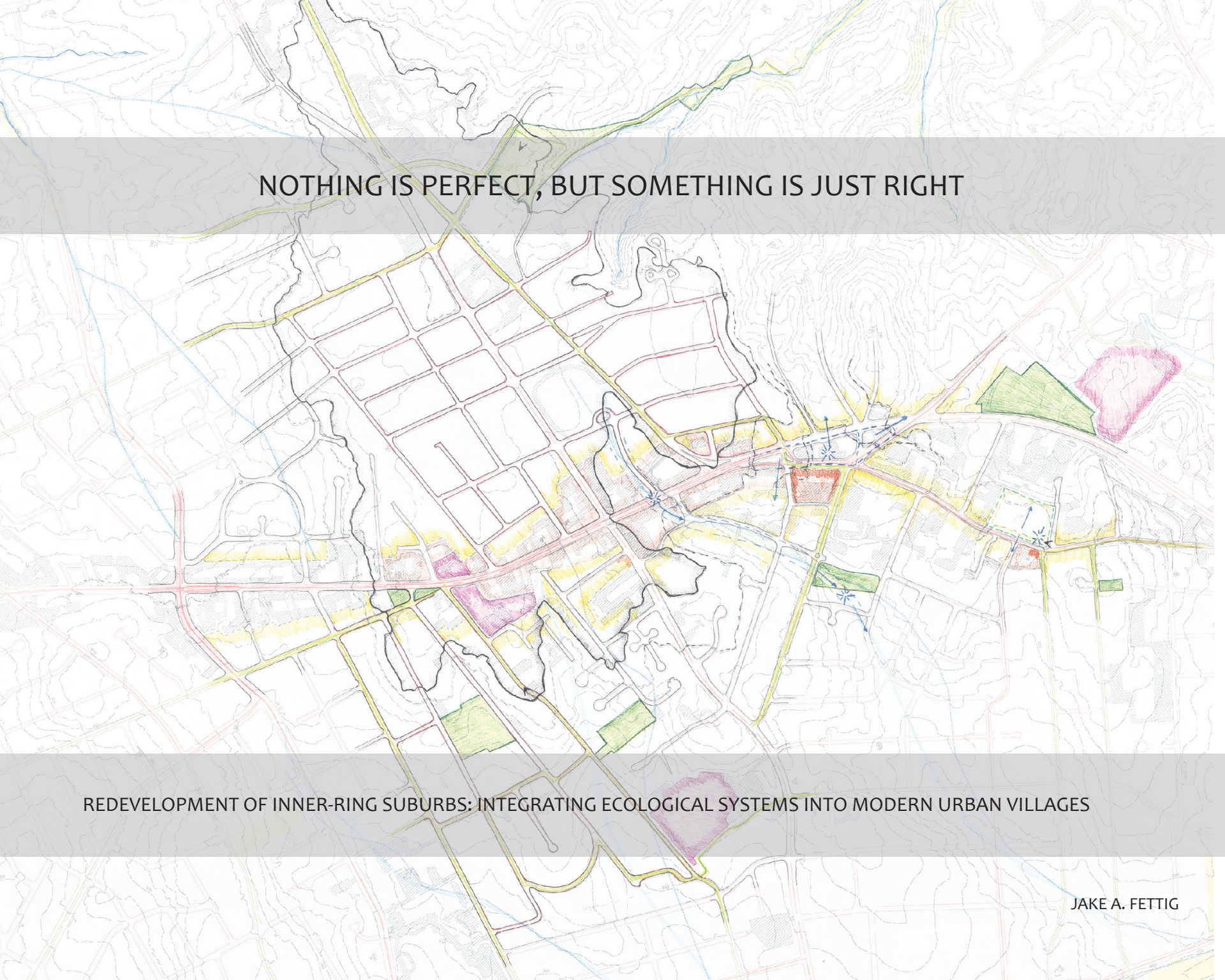
NOTHING IS PERFECT, BUT SOMETHING IS JUST RIGHT



REDEVELOPMENT OF INNER-RING SUBURBS: INTEGRATING ECOLOGICAL SYSTEMS INTO MODERN URBAN VILLAGES

JAKE A. FETTIG

Nothing is Perfect, But Something is Just Right
Redevelopment of Inner-Ring Suburbs: Integrating Ecological Systems into Modern Urban Villages

Jake A. Fettig

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

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Academic Abstract

The inner-ring suburbs of major metropolitan areas such as Washington, DC are either being redeveloped already or are poised to be quite rapidly over the next several decades. The engineered 'gray' infrastructure networks in these areas, largely put in place between 100 and 75 years ago, are aging and reaching the end of their useful life. New developments are being funded by real estate investment trusts and developers and are being welcomed by municipalities and a public that are often genuinely inspired to create the more livable places of the future. Such redevelopments provide a unique opportunity not to just import new 'green' features, but to reimagine the fundamental connections between ecological, human, and non-human systems within the fabric of the larger community in a way that profoundly improves the cognitive experience of a place for the people and wildlife that reside there.

The project begins by recognizing this opportunity and posing a question. Through thoughtful design, how can we bring people back into balance with their environment and back into touch with each other? By working with the cultural and built fabric of a place, the project proposes to reintroduce ecological systems and create places that might not be a perfect clean slate but are somehow just right for the people that live there. The project proceeds first by developing an understanding of the overall ecological context for each of four primary development corridors in Virginia, west of Washington, D.C. across the Potomac River. Then, key intersections between stream systems and the development corridors are identified and assessed to determine (a) whether any existing landscape framework surrounding the stream feature is in place and (b) whether the amenities necessary to support a walkable Urban Village center are present within a half mile in each direction along the route.

The project proposes a design for revealing a continuous flow stream channel currently piped underground and creating integrated stormwater detention basins along the historic stream channel path at the headwaters of Spout Run in northern Arlington County Virginia. Stormwater mains downstream from the headwaters have already been deemed below capacity for the unprecedentedly intense storms that have become an annual occurrence. Here, the major transportation and development corridor, Route 29 (Lee Highway), just across the Potomac River west of Washington D.C, crosses Glebe Road and a unique geological formation, dubbed for this thesis as the 'Headwaters Plateau'. It is an intersection between historically significant transportation routes as well as a unique intersection between landscape and the built environment. Around the Headwaters Plateau, not just Spout Run but the waters of four other streams begin their path to the Potomac River, flowing through numerous Arlington County neighborhoods along the way. As redevelopment plans take shape for the Lee Highway corridor through northern Arlington County, this thesis proposes the unique intersection between the Headwaters Plateau at Spout Run Gap along Route 29 as the site for the core of a modern Urban Village, with the Plateau and the Spout Run Headwaters Channel as the landscape framework around which the redeveloping Village should be built.

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General Audience Abstract

This thesis proposes a design for revealing a continuous flow stream channel currently piped underground and creating integrated stormwater detention basins along the historic stream channel path at the headwaters of Spout Run in northern Arlington County, Virginia. Stormwater mains downstream from the headwaters have already been deemed below capacity for the unprecedentedly intense storms that have become an annual occurrence. Here, the major transportation and development corridor, Route 29 (Lee Highway), just across the Potomac River west of Washington D.C, crosses Glebe Road and a unique geological formation, dubbed for the purpose of this thesis as the 'Headwaters Plateau'. It is an intersection between historically significant transportation routes as well as a unique intersection between landscape and the built environment. Around the Headwaters Plateau, not just Spout Run but the waters of four other streams begin their path to the Potomac River, flowing through numerous Arlington County neighborhoods along the way. As redevelopment plans take shape for the Lee Highway corridor through northern Arlington County, this thesis proposes the unique intersection between the Headwaters Plateau at Spout Run Gap along Route 29 as the site for the core of a modern Urban Village, with the Plateau and the Spout Run Headwaters Channel as the landscape framework around which the redeveloping Village should be built.

Through design, this thesis is an investigation of the potential integration of ecological systems such as stream hydrology into the design of modern 'Urban Villages' with the intent to create impactful individual experiences that provide a shared sense of connection within the community to its surrounding landscape. Throughout the country, redevelopment plans are focused on creating increased-density 'mixed-use' communities within existing urban and suburban areas - often called Urban Villages in the lexicon of the New Urbanism planning theory. This represents a move away from the predominant approach of separation of land use zoning practices. Such redevelopments provide a unique opportunity to not only import new 'green' features, but to reimagine the fundamental connections between ecological, human, and non-human systems within the fabric of the larger community in a way that profoundly improves the cognitive experience of a place for the people and wildlife that reside there.

Dedication

This is dedicated to my wife Jennifer and my children Grace and Andrew. Without their love, support, and understanding this would not have been possible. And to all those who take the time to help others to see themselves and their world through a kaleidoscope of eyes, as my family does for me.

Acknowledgements

I would like to thank my committee chair, Paul Kelsch, for his insight, guidance, patience, and knowledge through my thesis process as well as throughout my studies. In collaboration with Laurel McSherry, Nathan Heavers, and the other faculty at the Washington Alexandria Architecture Center (WAAC), you have made my education nothing less than inspiring. I would also like to thank Susan Piedmont-Palladino, member of my committee and director of the WAAC. Thank you for helping to make and keep the WAAC the WAAC. I would like to acknowledge the enormous role that the other students in the Landscape program as well as Architecture and Urban Design have played in development of my thinking, my expression, and knowing where to click. You are all mirrors that have helped me understand and improve my reflection.

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Urban Villages and the Landscape

Losing our Way

When many of the existing urban and suburban areas in the United States were first developed in the 19th and most of the 20th century, the prevailing approach to engineering the infrastructure systems and planning the zoning of land use was to separate them. Planners decreed (or codified the existing practices) that residences are best separated from places of work and industry.

Engineers were called on to pipe tributaries, creeks, and even rivers underground and to fill marginal wetlands, creating more land of perceived commercial value without fully understanding the economically valuable services those systems had been providing in wildlife abundance, flood mitigation, and air and water purification. Wildlife and natural areas were cordoned off in island 'parks' and pushed to the outskirts of towns and cities, even as the cities themselves continued to expand.

This expansion continues today, blurring the lines between urban, suburban, and rural character (Hough, 1990). This approach largely developed as a result of how we lived and worked on the land where our industrializing urban communities were located. Waterways were not safe and clean due to poorly regulated industrial and municipal waste management practices (Figure 1).

In example after example, cities and towns responded to worsening waterway pollution crises not by addressing the polluting processes and behaviors themselves, but by attempting to separate and protect the waterways by diverting them or burying them.

For example, the Park River in Hartford Connecticut is now buried 40 to 50 feet below the city, along a path that used to be a connecting armature for people and wildlife between the city's west side and the Connecticut River (Figure 2).

Figure 1 Stream pollution. City dump. Dubuque, Iowa. (n.d.). Retrieved from https://www.loc.gov/item/2017809951/.

Recognizing the Value of the Land

In Skinny Streets & Green Neighborhoods, C.L. Girling and R. Kellett (2005) show through several case studies that over the past two decades planners and designers working on new and redeveloped communities in and surrounding urban areas have begun to define parameters for overall spatial layouts that can make a more integrated community, both socially and environmentally (Figure 3).

Under the banner of emerging design theories such as Landscape Urbanism, there is a growing recognition that the land a community or neighborhood sits upon is a vital and integral component for the overall health and vitality of the community and must be reintegrated into the 'grey fabric' of our roads and other infrastructure.

The analysis demonstrates an explicit manifestation of many of the principles for building within the lands ecological constraints that were earlier demonstrated by Ian McHarg (McHarg, 1998). It represents a recognition of a systems-based view that emphasizes the need to integrate the human, non-human, and ecological networks that affect each other.

In one such example, Portland, Oregon has been building on the Metropolitan Greenspaces Master Plan since 1992 to identify, preserve, restore and connect critical damaged or missing armatures – those connective ecological corridors that provide the scaffolding for life to move and evolve - in the regions ecological infrastructure for the benefit of natural systems, wildlife, and the human population.

Today, a unique classification of the metropolitan region's ecologies into relatable 'Naturehoods' (Figure 4) helps to manage and connect people to the natural systems that sustain them.

Figure 2 Park River, Hartford CT
Duncan, S. (2016, May 10). 11 Rivers Forced Underground. Retrieved from https://www.nationalgeographic.com/environment/photos/underground-rivers/.

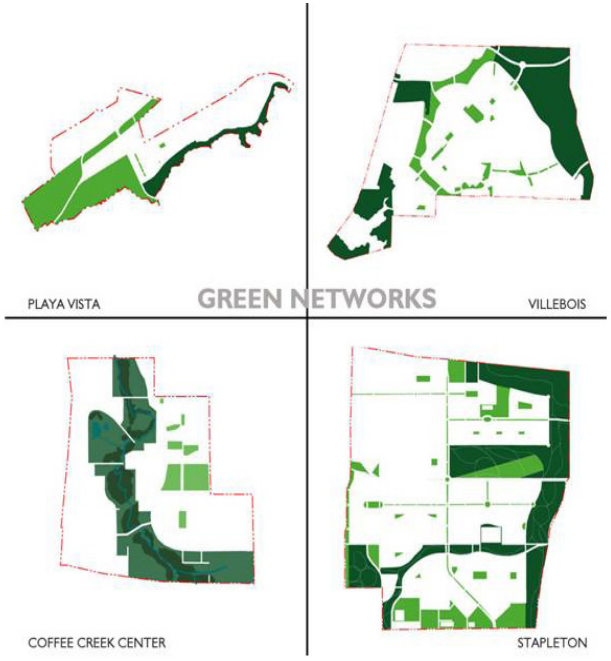


Figure 3 Comparison of Green Networks
Skinny Streets and Green Neighbourhoods. (n.d.). Retrieved from https://www.csla-aapc.ca/awards-atlas/skinny-streets-and-green-neighbourhoods.

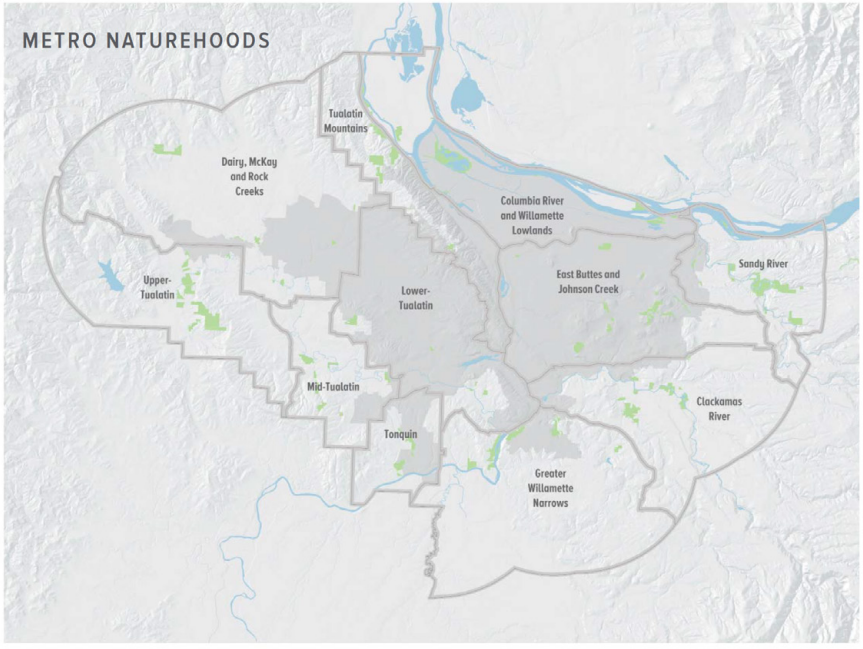


Figure 4 'Naturehoods' in Portland OR
Hughes, T. (2016, December). PDF. Portland, OR. Retrieved from https://www.oregonmetro.gov/sites/default/files/2018/03/23/Parks-and-Nature-System-Plan.pdf

'Urban Villages' for Livability

Responding to perceived and documented failures of the Urban Renewal movement that preceded it, planners and designers came together in 1993 to charter New Urbanism as an approach to city making that might cure the ills of the continued urban social and environmental decline of prior generations. Under the charter, the Congress of New Urbanism declares:

> *"We stand for the restoration of existing urban centers and towns within coherent metropolitan regions, the reconfiguration of sprawling suburbs into communities of real neighborhoods and diverse districts, the conservation of natural environments, and the preservation of our built legacy."*
> *(Summers, 2017)*

Over the past two decades, the New Urbanism movement has developed recommendations and approaches targeted at achieving this mission. In the 2003 book Urban Villages and the Making of Communities, editor, landscape architect, and urban designer Peter Neal and contributing authors make the case for a modeled approach to the organization and construction of a central tenet of the New Urbanism: creating 'Urban Villages' as dense and walkable hubs of life for work and play (Neal, 2003).

The approach builds on the work of activists such as Jane Jacobs, the author and journalist who is credited with helping to rescue Greenwich Village and Little Italy in downtown Manhattan NY from the ravages of freeways and the urban renewal approach. The new approach seeks to identify the elements necessary for piecing together new places that have the potential to become the beloved community centers of tomorrow. The essential elements proposed for sustainable and livable Urban Villages are captured in Figure 5 (2003, page 15).

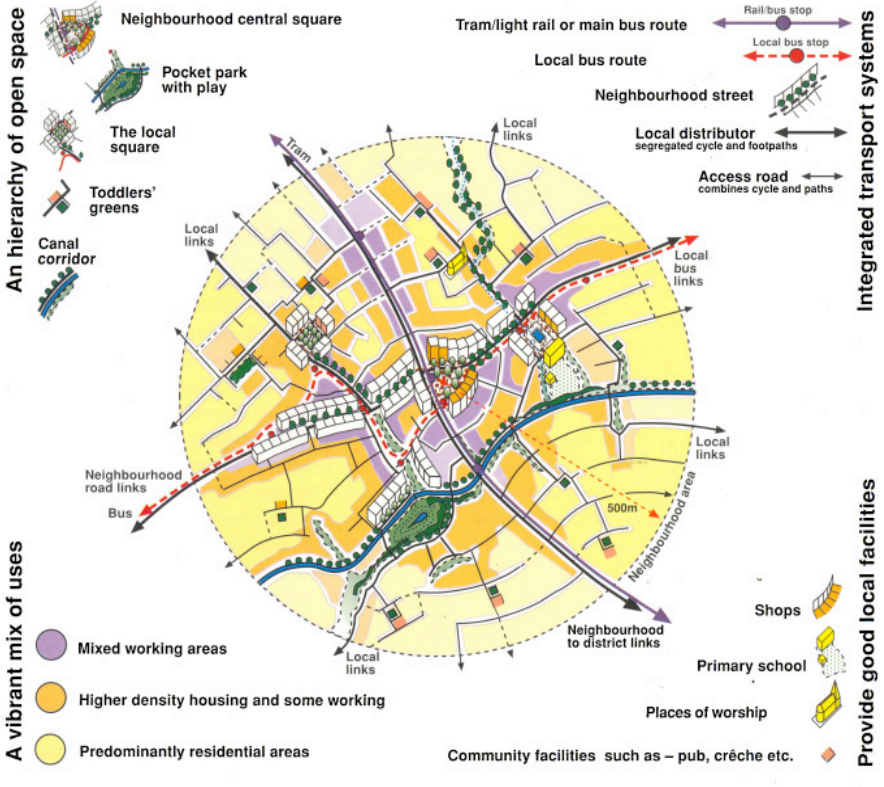


Figure 5 The key components of a mixed-use and integrated neighbourhood Urban Task Force prescription for pyramids of intensity converging on mixed-use neighbourhood streets. (2014). Retrieved from https://www.researchgate.net/figure/Urban-Task-Force-prescription-for-pyramids-of-intensity-converging-on-mixed-use_fig28_263666636

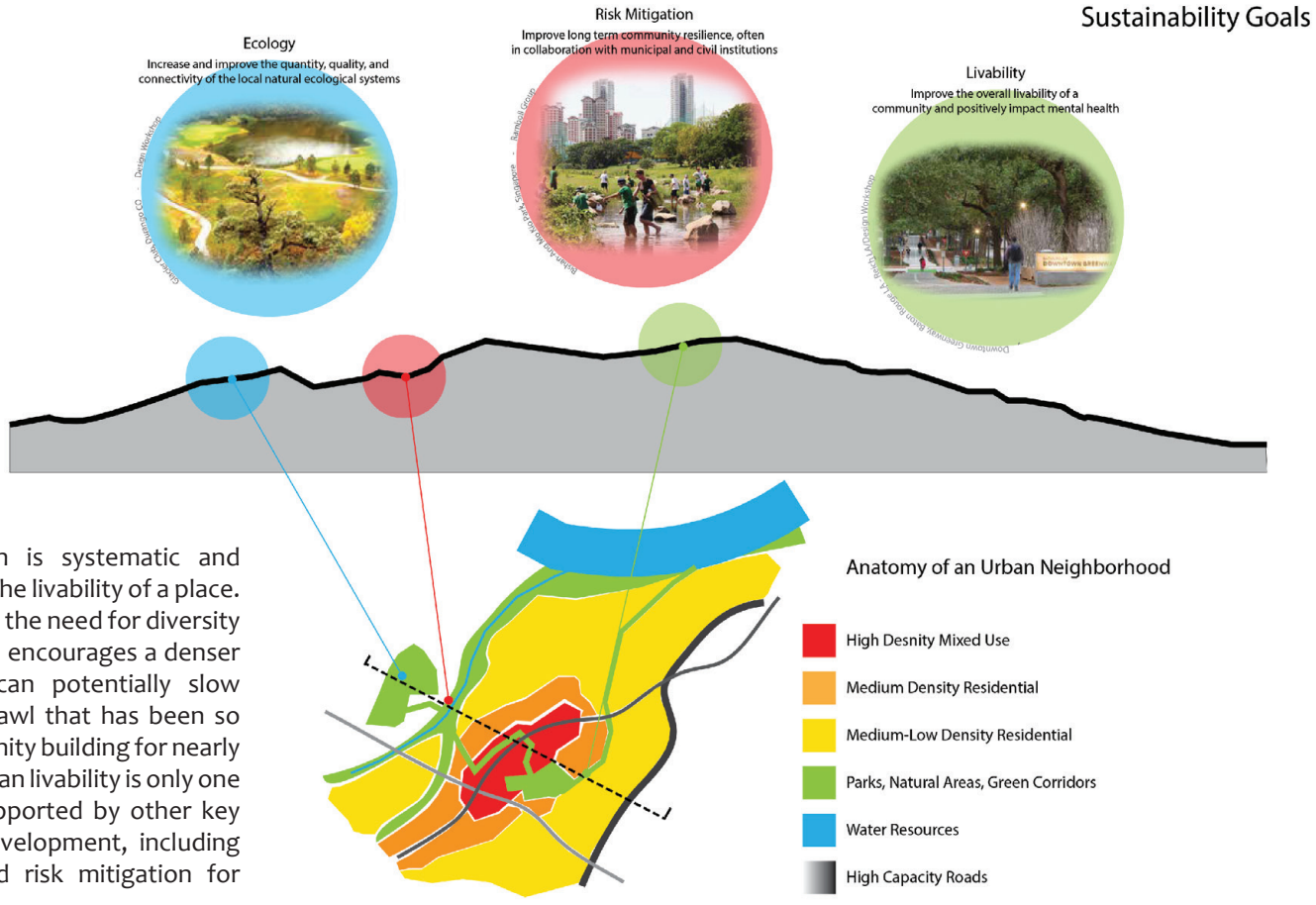


Figure 6 Representative View of 3 Pillars of Sustainable Community - by Author

Laudably, the approach is systematic and wholistic with regard to the livability of a place. The approach recognizes the need for diversity of space and activity and encourages a denser community core that can potentially slow or halt the outward sprawl that has been so prevalent in new community building for nearly a century. However, human livability is only one aspect that must be supported by other key pillars of sustainable development, including functioning ecology and risk mitigation for resilience (Figure 6).

When considering priorities for what the Urban Village concept calls 'Open Space', it is important to consider not just how people can use and interact within the space but also what other functions the space can perform in ecological services and risk mitigation.

Landscape as the Framework for Urban Village Development

Earlier planning approaches, polluting practices, engineering of ecological systems out of sight, and commodification of the land have pushed us out of balance with the landscape that supports us and out of touch with each other.

But now, we understand how to live and work closely to vital and enjoyable waterways without spoiling them. General understanding of the requirements for diversity and connected systems for the health of indigenous flora and fauna, and the benefits they provide to humans, is now widespread. We can evolve in a healthy direction in how we manage our development.

However, simply identifying 'best-practice' and imposing packaged spatial models on a place represents an abstracted system view. While performance and metrics are important as indicators of health and an understanding of how these systems are interacting, they do not make a place unique such that people enjoy living there. The system in the best-practices sense can take any form. From the perspective of modern construction capabilities and systems understanding, we can build just about anything anywhere, beyond constraints. If we understand the systems at play well enough, we can create 'best-practices' that define, for example, what every stormwater BMP must look like, anywhere. Indeed, that is what we have as the predominant 'green infrastructure' approach today.

What was noted by Michael Hough in "Out of Place" (1990) regarding the built environment is just as true today even when modern green infrastructure is considered:

> *"If it were possible to transport a visitor on a magic carpet around the world and set him down in the suburbs of Toronto, Bournemouth, or Chicago, it is quite likely that he would have difficulty knowing where he was." (Hough, 1990)*

With New Urbanism and Urban Villages, as well as any other new trend in planning and what has come to be known as 'placemaking', a trap I believe many well-intentioned professionals, community groups and residents tend to fall into are looking for opportunities to recreate a place in a new image, with a new brand. Rather than carefully filling gaps in or strengthening the social or built fabric of a place, the return on investment and the exciting transaction becomes the making of a clean slate out of a place that is already rich in history, activity, and daily life. The development then further buries the ecological life of the landscape, as well as reduces the complex, messy, but somehow perfect soul of a place to an amusement park for transactions.

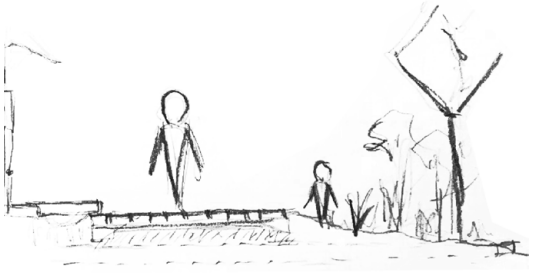


Figure 7 Urban-Ecological Overlap - Sketch by Author

In 'Sustaining Beauty: The Performance of Appearance", Elizabeth Meyer lays out a 'manifesto' for reconsidering the role that deep, place-based 'beauty' or 'aesthetics' play in true sustainability. She states:

> *'I believe that works of landscape architecture are more than designed ecosystems, more than strategies for open-ended processes; they are cultural products with distinct forms and experiences that evoke attitudes and feelings through space, sequence, and form."*
> *(Steiner, 2016)*

It is this cultural view that brings together and creates the overlap between the foundational ecological systems, living plants and animals, and the built human systems that make up a place. Meyer goes on to demonstrate through built landscapes a kind of 'hypernature' that can, through conscious and sublime experiences, cause individuals to recognize inherent interconnections between themselves and their world (Figure 8). It is this mental impact that brings us to the role of individual cognition in the experience of unique places.

Figure 8 Allegheny River Park, Pittsburgh PA (Michael Van Valkenburgh Assoc.) (n.d.). Retrieved from http://www.mvvainc.com/project.php?id=5.

Sarah Williams Godhagen, in her recent book Welcome To Your World: How the Built Environment Shapes Our Lives (2017), draws on the latest understandings from the field of cognitive science to explore how humans as individuals experience and are affected by the environments we build for ourselves and inhabit.

As a foundation for considering the impact of our design decisions, it is imperative that we begin with the understanding that 'cognition is the product of a three-way collaboration of mind, body, and environment.' (Godhagen, 2017). This understanding of 'embodied cognition', that we cannot separate fully our mental experience from our physical experience, demonstrates the tight feedback loop between the places we design and the effect of these places on our experiences. We must design how we want to feel.

I believe that as landscape architects, we should be looking for opportunities to design spaces and approaches to managing natural processes that move development and the public in a direction of consciousness about our connection to and dependence on the world we inhabit. Maybe design can have an impact by placing the individual person, along with their families and communities, at the center of focus again, highlighting their shared responsibilities toward the natural processes occurring more visibly in their daily routines.

To do this we need to challenge norms that have developed in how we manage and live with land, water, and wildlife and reprioritize being in a place over moving through. This thesis explores civic landscape design for modern Urban Villages based on the understanding that all systems – human, non-human, ecological – are 'embodied'. That is, their function and their health cannot be separated from their physical location and history, and indeed benefit greatly from being celebrated as part of a unique place.

The project begins by recognizing an opportunity and posing a question. The opportunity is that inner-ring suburbs of major metropolitan areas such as Washington, DC are either being redeveloped already or are poised to be quite rapidly over the next several decades.

The engineered 'gray' infrastructure networks in these areas, largely put in place between 100 and 75 years ago, are aging and reaching the end of their useful life. New developments are being funded by real estate investment trusts and developers and are being welcomed by municipalities and a public that are often genuinely inspired to create the more livable places of the future.

The question then is, through thoughtful design, how can we take advantage of this opportunity to bring people back into balance with their environment and back into touch with each other? By working with the cultural and built fabric of a place, I propose to reintroduce ecological systems and create places that might not be a perfect clean slate but are somehow just right for the people that live there.

I believe that as landscape architects, we should be looking for opportunities to design spaces and approaches to managing natural processes that move development and the public in a direction of consciousness about our connection to and dependence on the world we inhabit.

Identifying Site: Cultural and Ecological Intersections

As a thesis exploration, the aim of this project is to explore ways in which the design of civic space can incorporate ecologically functional landscape into the built environment when an area begins to redevelop into a modern livable Urban Village core. In order to explore this design goal most fully, the site identified should provide as much opportunity as possible for potential impact compared to the existing conditions with respect to landscape and ecology.

The project proceeds first by developing an understanding of the overall ecological context for each of four primary development corridors in Virginia, west of Washington, D.C. across the Potomac River. Then, key intersections between stream systems and the development corridors are identified and assessed to determine (a) whether any existing landscape framework surrounding the stream feature is in place and (b) whether the amenities necessary to support a walkable Urban Village center are present within a half mile in each direction along the route.

Development Corridors West of Washington D.C.

The land west of Washington D.C. on the Virginia side of the Potomac River includes Arlington and Alexandria counties. All of what is now Arlington and a majority of what is now Alexandria were at one time part of the original 10-mile square boundary of Washington D.C. itself until retrocession in 1846, known initially and singularly as 'Alexandria County'.

As such, these municipalities are prime examples of those communities close to a large city that were developed in the late 1800s and early 1900's as first-ring commuting suburbs to a major city (Figure 9).

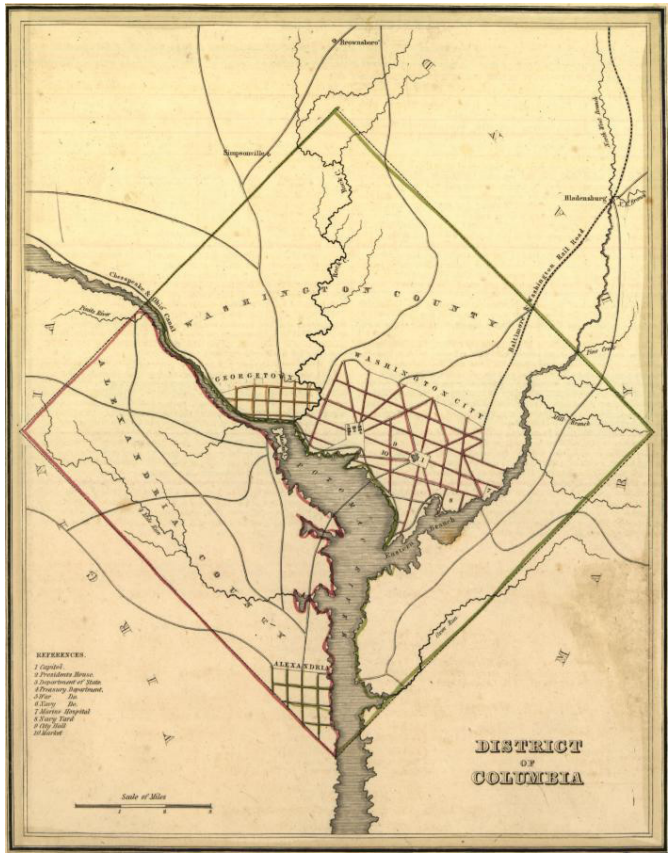


Figure 9 Map District of Columbia. (n.d.). Retrieved from https://lccn.loc.gov/88694084.

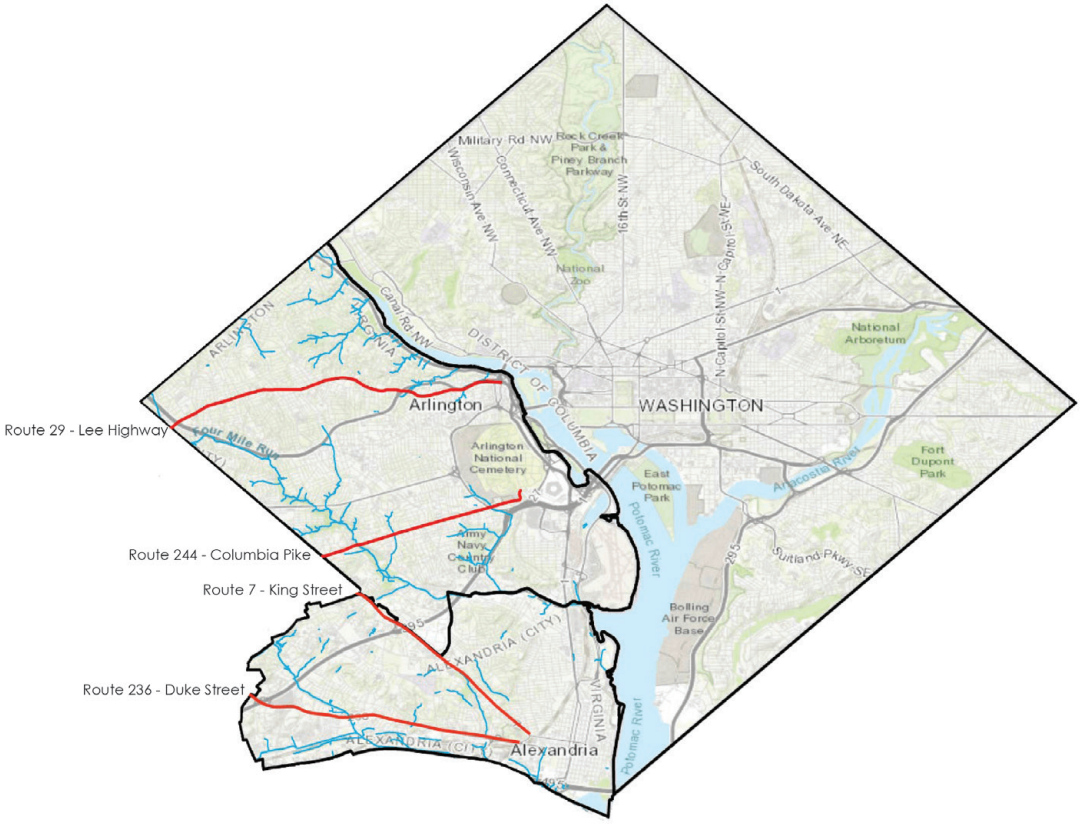


Figure 10 Modern Washington DC area; major east-west development corridors in Arlington and Alexandria VA

Working within the context of these first-ring suburbs of Washington D.C., the primary east-west transportation and development corridors of modern-day Arlington and Alexandria Virginia were identified. Each of these routes represent at the same time a major transportation corridor as well as living and working corridor that developed as the first ring of suburbs to the West of Washington D.C between the mid-19th and 20th centuries.

These are those routes along which redevelopment is now occurring and through which many commuters from farther west continue to move as they travel to and from the city core as secondary routes to Interstate 66 and the Capital Beltway (Interstate 495). These are prime routes along which the increased-density core of the idealized 'Urban Village' may be located as planners seek to implement the new model (Figure 10). The four transportation and development corridors explored include (from farthest north to farthest south):

- Route 29 (Lee Highway) – Arlington, VA
- Route 244 (Columbia Pike) – Arlington, VA
- Route 7 (King Street) – Alexandria, VA
- Route 236 (Duke Street) – Alexandria, VA

Local Ecologies

Arlington and Alexandria fall within the Eastern Temperate Forests Level I 'Ecoregion' as defined by the US Environmental Protection Agency. The region is generally characterized by dense deciduous-canopy forests of different types mixed with evergreen conifers that vary based on elevation. The forests are stratified with canopy tree, shrub, vine and herb layers (Communications and Public Outreach Dept. of the CEC Secretariat, 1997).

'Ecoregions' are ecological regions where "ecosystems (and the type, quality, and quantity of environmental resources) are generally similar." (Communications and Public Outreach Dept. of the CEC Secretariat, 1997) These Level I Ecoregions are then broken down into Levels II, III, and IV to further specify the unique ecological and biological attributes found in different parts of the region, influenced by latitude/longitude, elevation and geological history among many other environmental and climatic factors.

The high-level nested regions that Arlington and Alexandria fall within are (Figure 11):

- Level I – Eastern Temperate Forests
- Level II – Southeastern US Plains
- Level III – Piedmont/Northern Piedmont/ Southeastern Plains

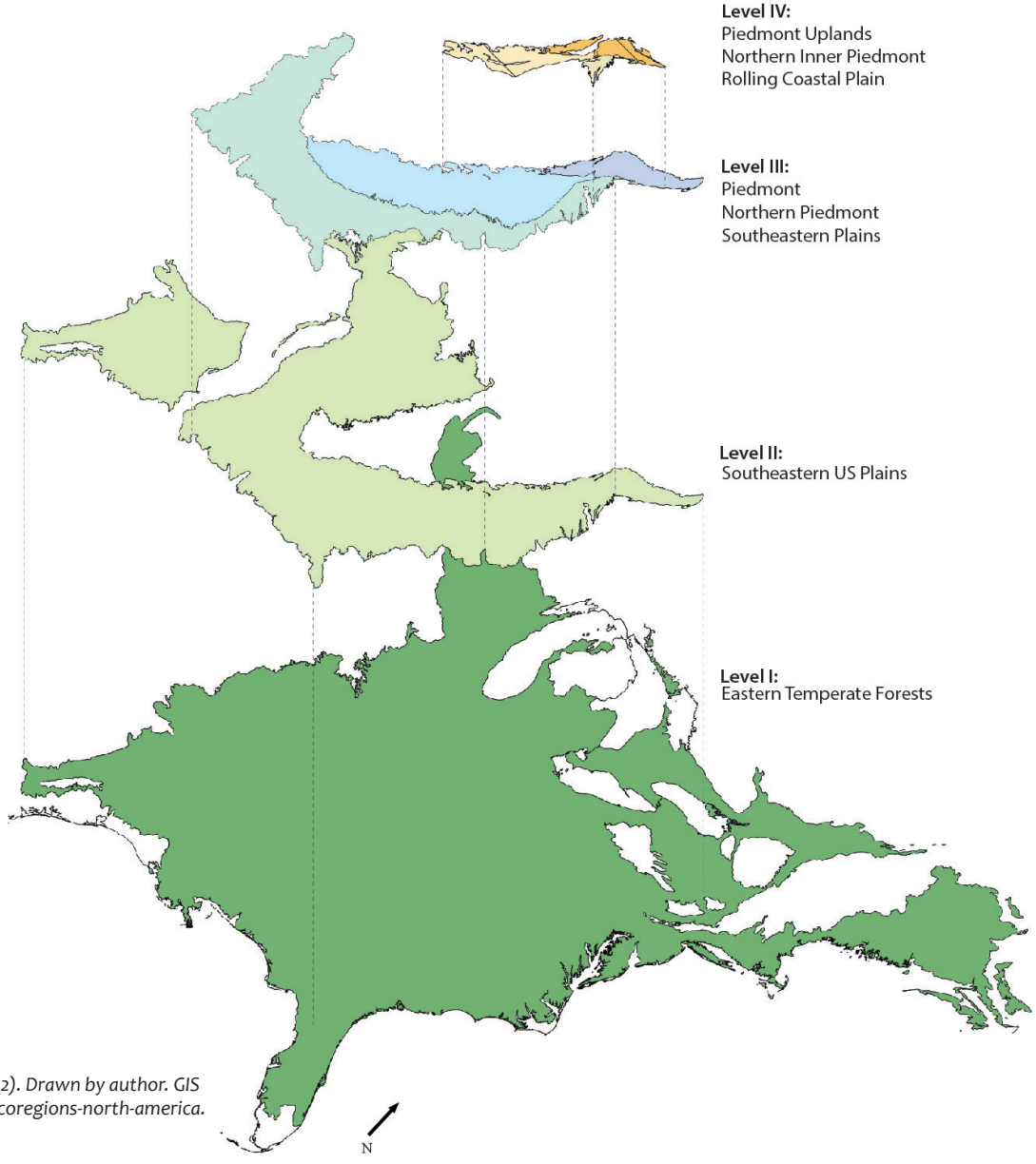


Figure 11 Ecoregions of North America. (2016, November 12). Drawn by author. GIS Data Retrieved from https://www.epa.gov/eco-research/ecoregions-north-america.

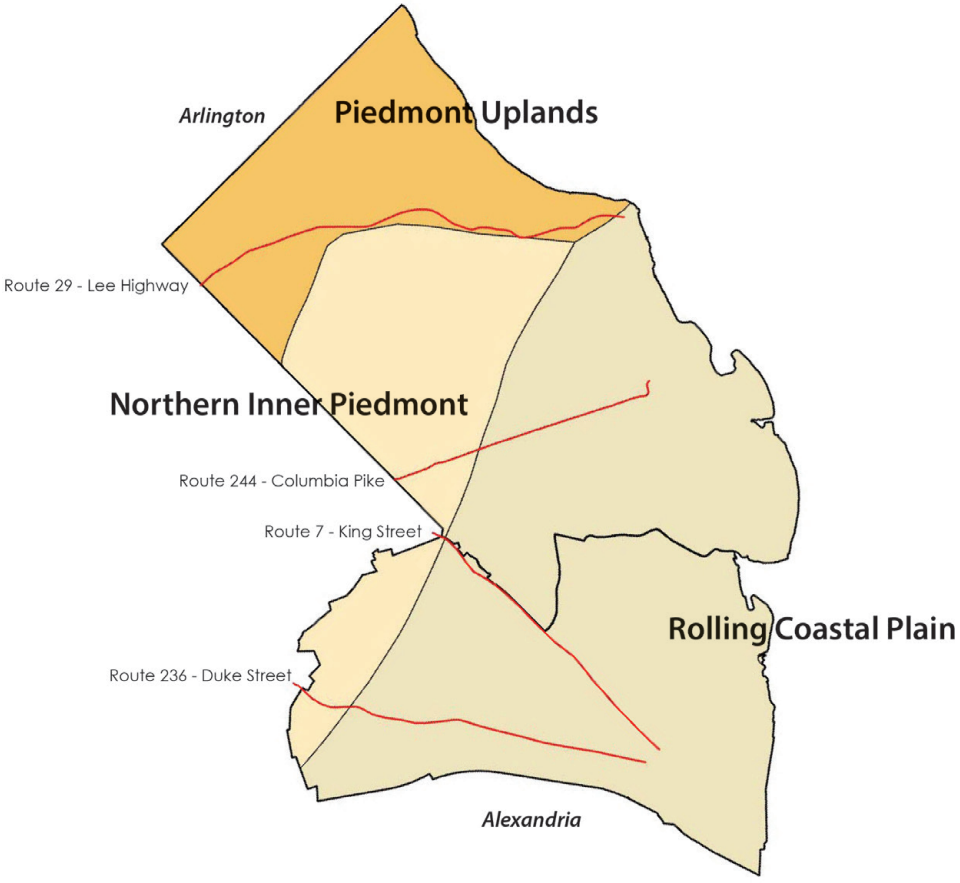


Figure 12 Level IV Ecoregions of Arlington and Alexandria VA with development corridor routes

At the lowest level of definition, the transportation and development corridors being considered in this study fall within or cross three Level IV Ecoregions. These are, in order from what is found at the highest elevations farthest north to the lowest elevations farthest south (Figure 12):

- Piedmont Uplands
- Northern Inner Piedmont
- Rolling Coastal Plain

Duke Street and King Street in Alexandria, and Columbia Pike in southern Arlington all fall primarily within the Rolling Coastal Plain and cross into the Northern Inner Piedmont at their western limits.

These corridors fall within lower elevation areas considered part of the larger Coastal Plain and are adjacent to the shores of the Potomac River. They are all areas low in their respective watersheds, as tributaries carry fresh water to the Potomac River from higher elevations. The soils in both areas tend to support oak-hickory-pine forests such as those shown in Figure 13 (Woods et. al.,1996).

Lee Highway in northern Arlington falls within but follows the edge of the Piedmont Uplands. It skirts the divide between the uplands and the Northern Inner Piedmont at the highest possible elevations before quickly seeking lower elevations by which to cross the Potomac River. This divide between the Piedmont and the Coastal Plains makes up a portion of the Atlantic Seaboard Fall Line; a geological divide that separates the uplands from the coastal plains following a line roughly 900 miles along the Eastern United States. Forests in this region are generally found to be Appalachian Oak Forests dominated by both White and Red Oak overstory trees, such as shown in Figure 14 (Woods et. al.,1996).

Figure 13 Northern Coastal Plain / Piedmont Oak - Beech / Heath Forest on the bluffs of the Occoquan River in Fountainhead Regional Park, Fairfax County.
Fleming, Gary P. (n.d.) Retrieved from https://www.dcr.virginia.gov/natural-heritage/natural-communities/photos/coastal-plain-piedmont-oak-beech-heath-forests/tc8-15-093009d-fountainheadrp020.jpg

Figure 14 Northern Piedmont Small-Stream Floodplain Forest along Little Rocky Run just above its confluence with Bull Run, in Bull Run Regional Park, Fairfax County.
Fleming, Gary P. (n.d.) Retrieved from https://www.dcr.virginia.gov/natural-heritage/natural-communities/photos/piedmont-mountain-small-stream-alluvial-forests/pa6-01-051311e-unionmills011.jpg

Within each ecoregion, there are widespread commonalities in the ecology, plant and animal communities found throughout. There are also unique, rare or isolated micro-habitats that provide the foundation for communities of life that don't exist under the more widespread conditions within the region (Figure 15).

In seeking to design civic spaces that allow for the reintroduction of functional ecological communities, it is important to bear in mind and be guided by both the specific ecological characteristics of the underlying landscape as well as to take into account the broader ecological lesson that these characteristics teach us. That is, there are both widespread commonalities across the given landscape region as well as pockets of diversity within that provide spaces for common and rare plant and wildlife communities to thrive.

Figure 15 Piedmont Upland Depression Swamp (Pin Oak - Swamp White Oak Type) near Sudley Springs in Manassas National Battlefield Park, Prince William County. Fleming, Gary P. (n.d.) Retrieved from https://www.dcr.virginia.gov/natural-heritage/natural-communities/photos/piedmont-upland-depression-swamps/pc5-02-042911-manas-sasnbp016.jpg

Corridor Profiles and Natural Intersections

The investigation proceeds by identifying major intersections between hydrological or geological features along the route of each development corridor (Figure 16). For each intersection, the project highlights those where there is an existing landscape framework surrounding the natural feature that benefits the community and where no such framework exists. The study then identifies the existing development and amenities surrounding the natural features available in those areas. The extent of review covers a half-mile along the development route from the notional 'village center', which is considered to be a reasonable standard for the extent of a walkable Urban Village core.

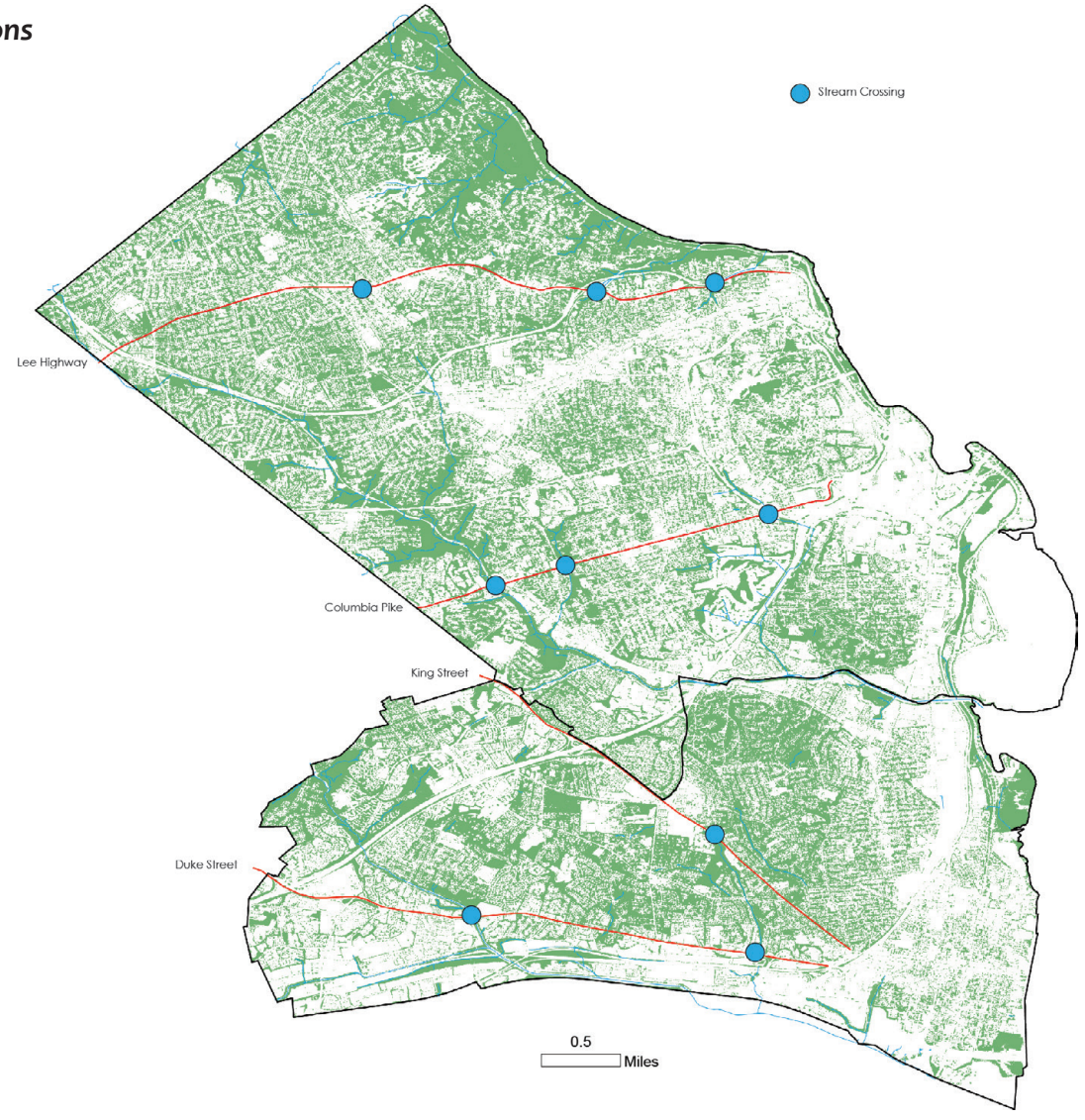


Figure 16 Tree Canopy Coverage in Arlington and Alexandria VA with development corridors and hydrological feature intersections Arlington County, VA - Official GIS Open Data Portal (2019). Retrieved from https://gisdata-arlgis.opendata.arcgis.com/

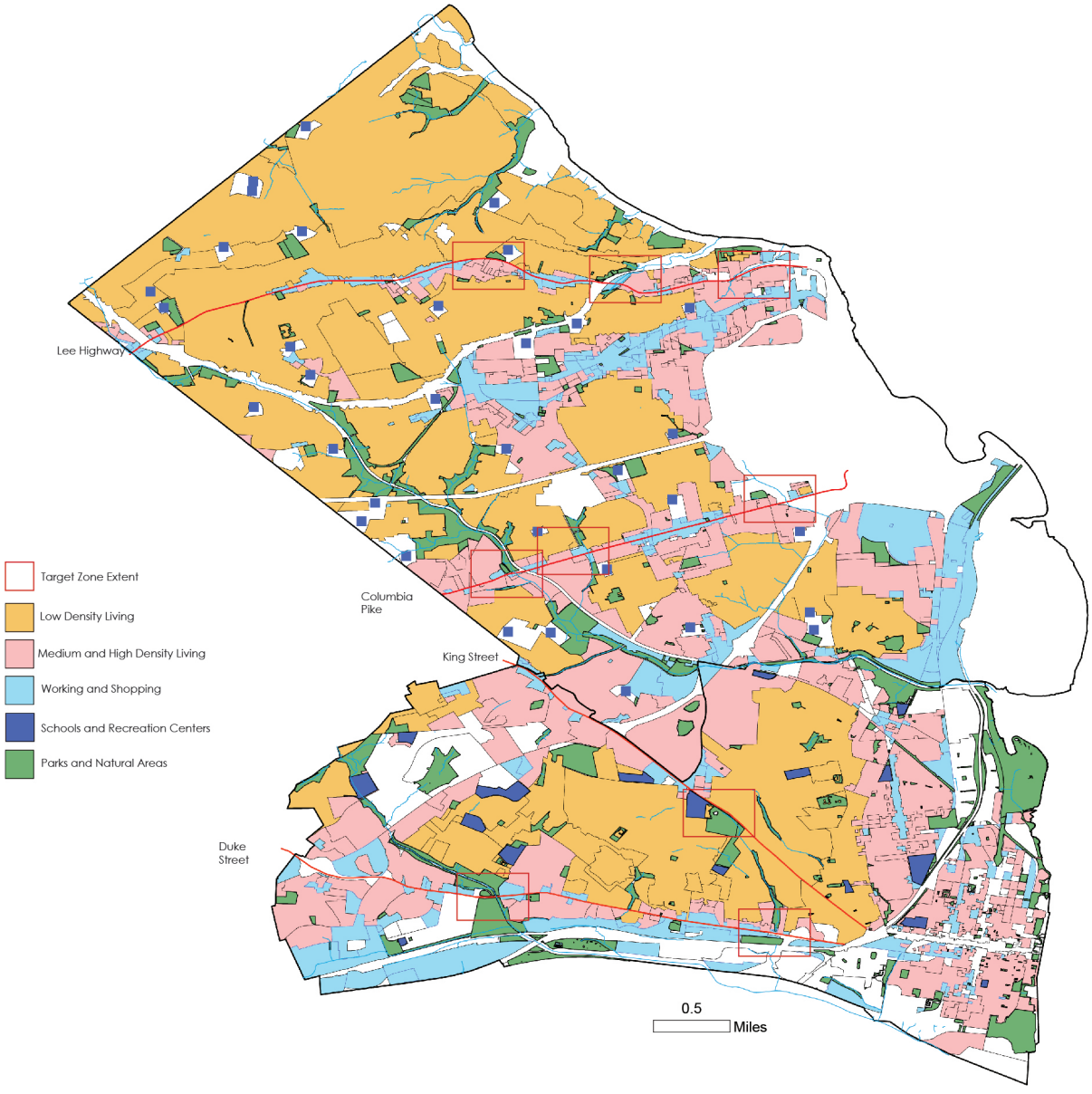


Figure 17 Development Zoning in Arlington and Alexandria VA with development corridors and hydrological feature intersections Arlington County, VA - Official GIS Open Data Portal (2019). Retrieved from https://gisdata-arlgis.opendata.arcgis.com/

Route 29 - Lee Highway

Beginning farthest north, Route 29 in Arlington travels a somewhat meandering east-west route through northern Arlington along the edges of most watersheds that it crosses from the border with Falls Church Virginia in the west to the Rosslyn area of Arlington in the east. The route remains relatively high in elevation, crossing its highest point just over the 400' contour as it crosses the historical path of Spout Run near its headwaters at Lee Heights. It then drops relatively steeply toward the Potomac River, crossing Spout Run again at Lyon Village near 200' in elevation and then Colonial Village Branch at the North Highland neighborhood near 120' in elevation. In the case of Route 29, all intersections with stream valleys (and headwaters in the case of Spout Run) are buried and provide potential for integration of a landscape framework during redevelopment (Figure 18).

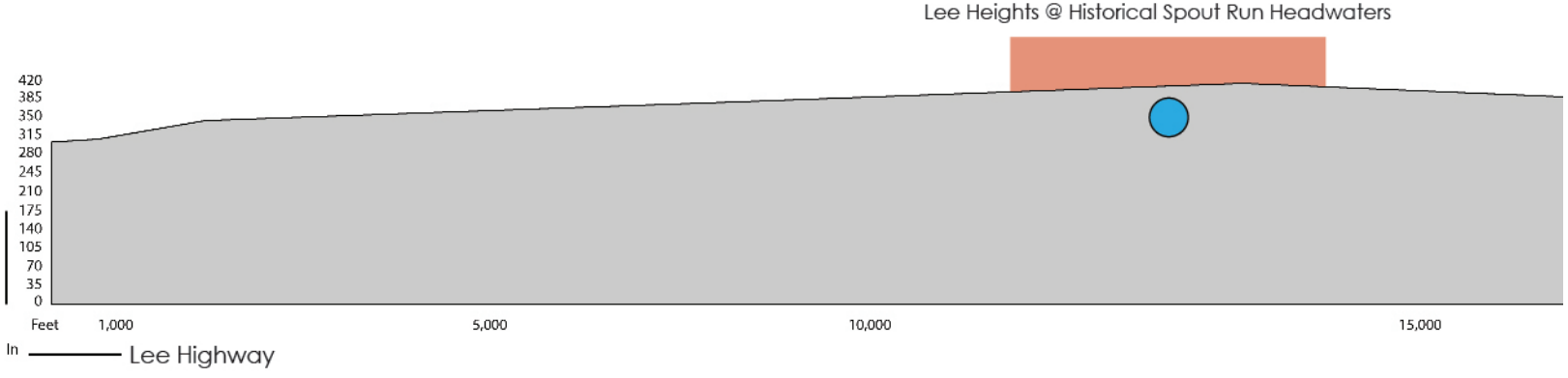
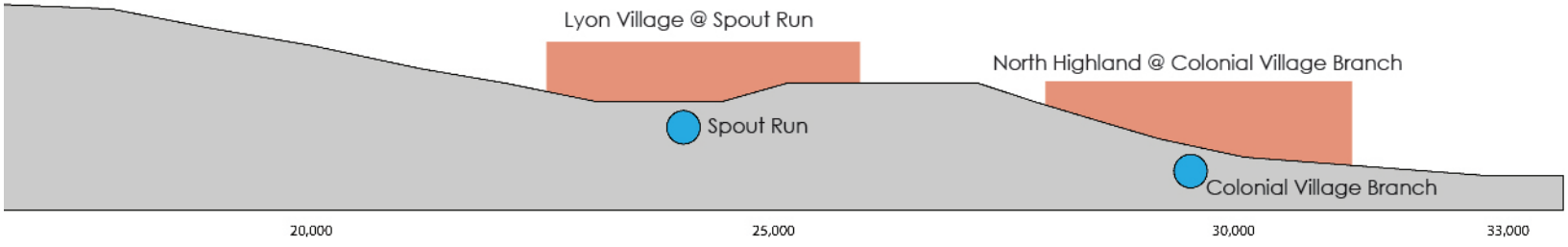


Figure 18 Topographical cross-section of Route 29 (Lee Highway) and hydrological intersections

Figure 19 Amenities at Lee Highway hydrological intersections
Google Earth Pro 7.1.8.3036 (2018, October 30) [38°53'54.68"N/ 77° 7'7.42"W], [38°53'45.41"N/ 77° 5'54.89"W], [38°53'48.47"N/ 77° 4'50.20"W] Landsat/Copernicus

Referencing Figure 17 above, all three of the intersections along the route of Lee Highway offer an existing mix of higher density housing types and commercial activity within the narrow corridor of the route itself, with the majority of the surrounding areas being lower density single-family housing. However, only at the historical headwaters of Spout Run does the surrounding development currently also include many of the social and cultural amenities that are necessary for a walkable Urban Village core. These include a major retail center, public facilities including both a school and a recreation/education center, and public parks. Other than retail opportunities, neither Lyon Village nor North Highland currently offer the same availability of community assets (Figure 19).



Route 244 - Columbia Pike

Figure 21 Amenities at Columbia Pike hydrological intersections
Google Earth Pro 7.1.8.3036 (2018, October 30) [38°51'22.31"N/ 77° 6'39.36"W], [38°51'31.46"N/ 77° 6'4.73"W], [38°51'57.41"N/ 77° 4'25.59"W] Landsat/Copernicus

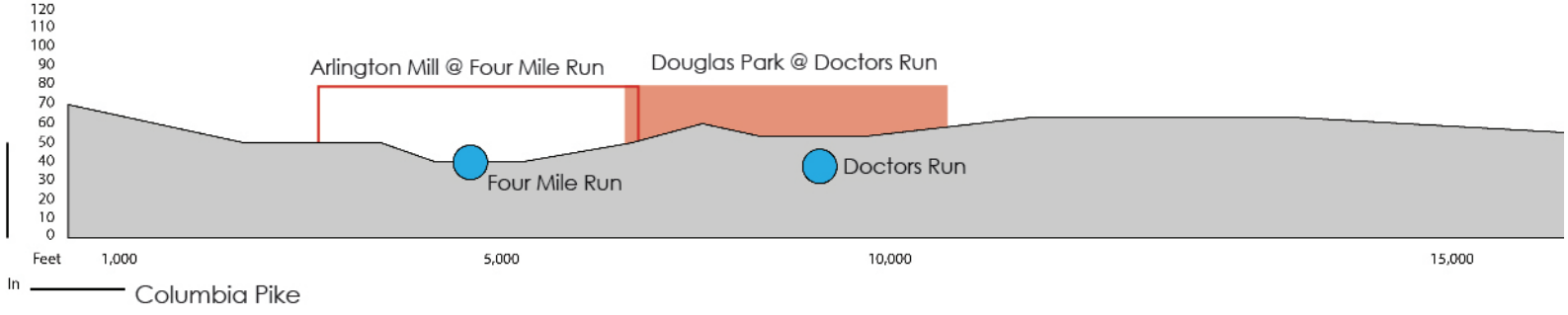
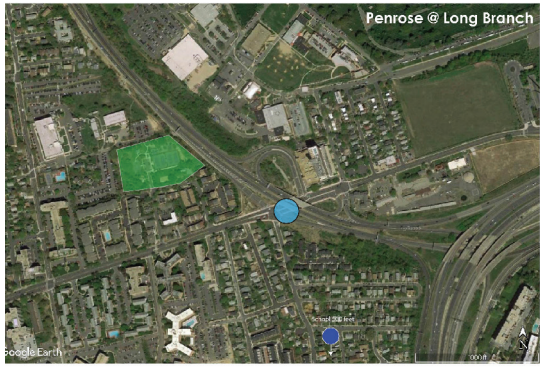
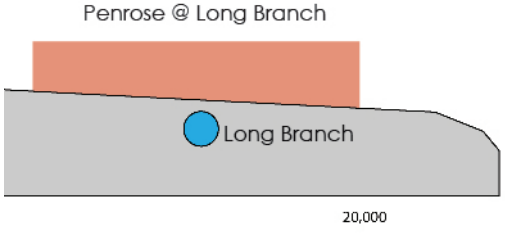


Figure 20 Topographical cross-section of Route 244 (Columbia Pike) and hydrological intersections



Route 244 travels a direct southwest-northeast route through central Arlington county, crossing through watersheds from the Arlington Border with Fairfax County at Baileys Crossroads in the east to its terminus near what is now the Pentagon at its western end. Local elevations along the route are between 70 and 30 feet above sea level. It first crosses Four Mile Run at 40' elevation near the Arlington Mill community center. Four Mile Run is a major tributary to the Potomac River into which many of Arlington's other streams flow. It is managed as an above-ground natural stream with a riparian buffer along most of its length as well as an armored stormwater channel in many areas. It is a dividing border between Alexandria and Arlington. The route then crosses Doctor's Run at the Douglas Park neighborhood near the 50' elevation and Long Branch at the Penrose neighborhood near the same elevation. These two intersections represent a potential for reintroduction of the hydrological systems, while Four Mile Run is already managed as an integral part of the life of the community (Figure 20).

Referencing Figure 17, only the intersections at Arlington Mill and Douglas Park provide an existing mix of both medium to high density living options as well as commercial activity as a foundation upon which to build the core of an Urban Village. In the case of both Arlington Mill and Douglas Park, it appears as well that all the other important public community assets necessary for a walkable Urban Village core are available. At Arlington Mill, Four Mile Run is currently being managed as a functioning ecological feature and community asset along its length as it crosses under an elevated bridge at Columbia Pike. At Douglas Park Doctors Run is managed within a heavily used and beloved linear park to the north. However, it is channeled underground prior to the intersection with Columbia Pike and does not resurface until more than a half mile later. Here there is potential to increase the role that Doctors Run plays in providing a landscape framework for further development (Figure 21).



Route 7 - King Street

Route 7 (King Street) travels a straight northwest-southeast route from its intersection with Route 244 at Bailey's Crossroads in the northwest of Alexandria to the core of Old Town Alexandria in the southeast. Local elevations along the route vary between 70 feet to under 10 feet above sea level where it ends at the Old Town Alexandria waterfront with the Potomac River. The only significant intersection between the route and a natural stream feature is near the Rosemont neighborhood at Taylor Run. Here the stream enters a protected natural area adjacent to Chinquapin Park, Recreation Center, and Aquatics Facility. There are nature trails providing access to the stream for pedestrians along the course of the steam, which connects the community to the Park's community gardens and recreational facilities (Figure 22).

Referencing Figure 17, this intersection occurs entirely within a zone of low-density housing. While it does include public amenities, it does not provide walkable access for populations living in medium to high density housing types (Figure 23).

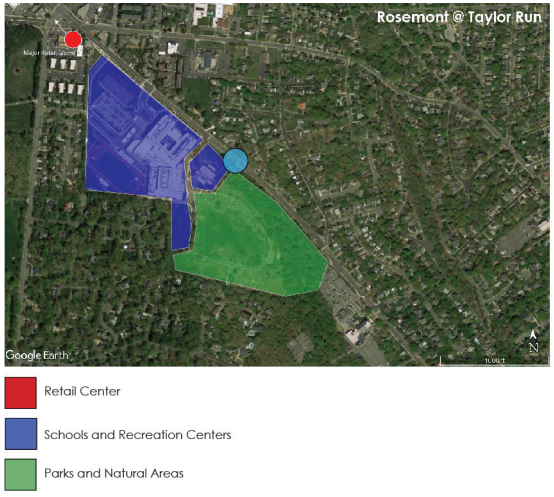


Figure 21 Amenities at Columbia Pike hydrological intersections Google Earth Pro 7.1.8.3036 (2018, October 30) [38°51'22.31"N/ 77° 6'39.36"W], [38°51'31.46"N/ 77° 6'4.73"W], [38°51'57.41"N/ 77° 4'25.59"W] Landsat/Copernicus

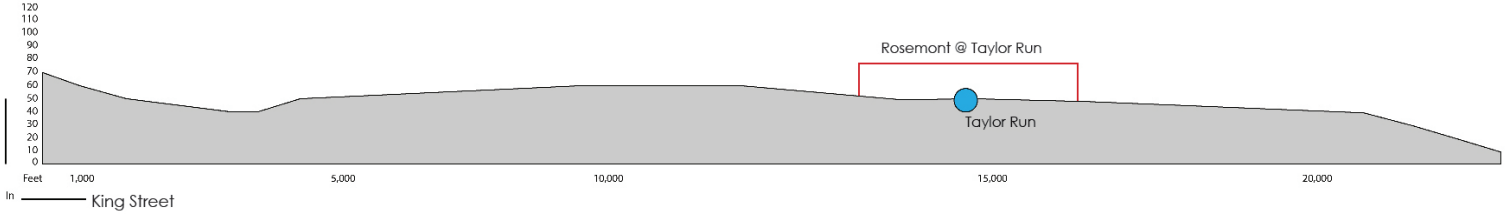


Figure 20 Topographical cross-section of Route 244 (Columbia Pike) and hydrological intersections

Route 7 - Duke Street

Route 236 travels roughly west-east from the western edge of the county to where it parallels Route 7 entering the core of Old Town Alexandria in the east. Elevations vary from 70 feet to 20 feet. The route crosses two significant stream features. The first is Holmes Run in the Landmark neighborhood at the 20' elevation. Here Holmes run is being managed as an integral part of an already redeveloping community, with parks as well as ecologically functional features such as wetlands and stormwater management catchments. The route then crosses Taylor Run at the southern edge of the Taylor Run neighborhood near the 30' elevation. While the stream does enter an underground channel at the intersection with Route 7 where it travels under a municipal and industrial area, to the north it is managed as an above-ground stream channel with a riparian buffer, parks, a parkway road, and pedestrian trails within the community (Figure 24).

Referencing Figure 17, both intersections along the Duke Street corridor occur within areas zoned to include a mix of housing types and commercial activity. In the case of Holmes Run, the intersection occurs within a community that is already seeing increased development while the stream itself is being managed to provide ecological services and community benefits. The area provides other amenities necessary for a vibrant Urban Village core, such as a school and a retail center. In the case of Taylor Run, such amenities are available as well. In addition, the stream corridor is being managed as an accessible asset. However, the stream channel itself is significantly constrained and is channeled underground at its intersection with Route 236 (Figure 25).

Figure 25 Amenities at Duke Street hydrological intersections Google Earth Pro 7.1.8.3036 (2018, October 30) [38°48'42.06"N/ 77° 6'47.23"W], [38°48'24.07"N/ 77° 4'30.53"W] Landsat/Copernicus

Figure 24 Topographical cross-section of Route 236 (Duke Street) and hydrological intersections

Comparison of Three Potential Sites

Figure 26 highlights the location of each of the three most promising intersections between the development corridors and natural stream systems and identifies its location relative to its larger watershed. Figure 26 also highlights the boundaries of the existing neighborhoods that the watersheds intersect with. In the case of Doctors Run and Taylor Run, the intersection occurs near the lowest elevations of the related watershed. In the case of Spout Run, the intersection occurs near the historical headwaters source of the stream, at the top of the watershed. In addition, because the Spout Run intersection occurs near the boundary of the watershed, this view also highlights that the intersection occurs near the boundary of several other stream headwaters as well. The existing conditions at each intersection are illustrated in Figure 27.

A survey of the land cover using the boundaries of the neighborhoods surrounding each location reveals many similarities in the existing conditions as shown in Figure 28. In all cases there is a significant amount of impervious surface and turf cover. The highest intensity of impervious surface is found in the parking lots adjacent to commercial and high-density living areas, and the highest intensity of turf cover is found in the low-density living areas. In the case of Arlington County, the Department of Environmental Services has documented that the most rapid increase in impervious surfaces based on current trends is from Single Family house redevelopment (Arlington County, VA, 2018). While commercial and multi-family development continues as well, it also provides the most opportunity to decrease existing impervious surface during redevelopment.

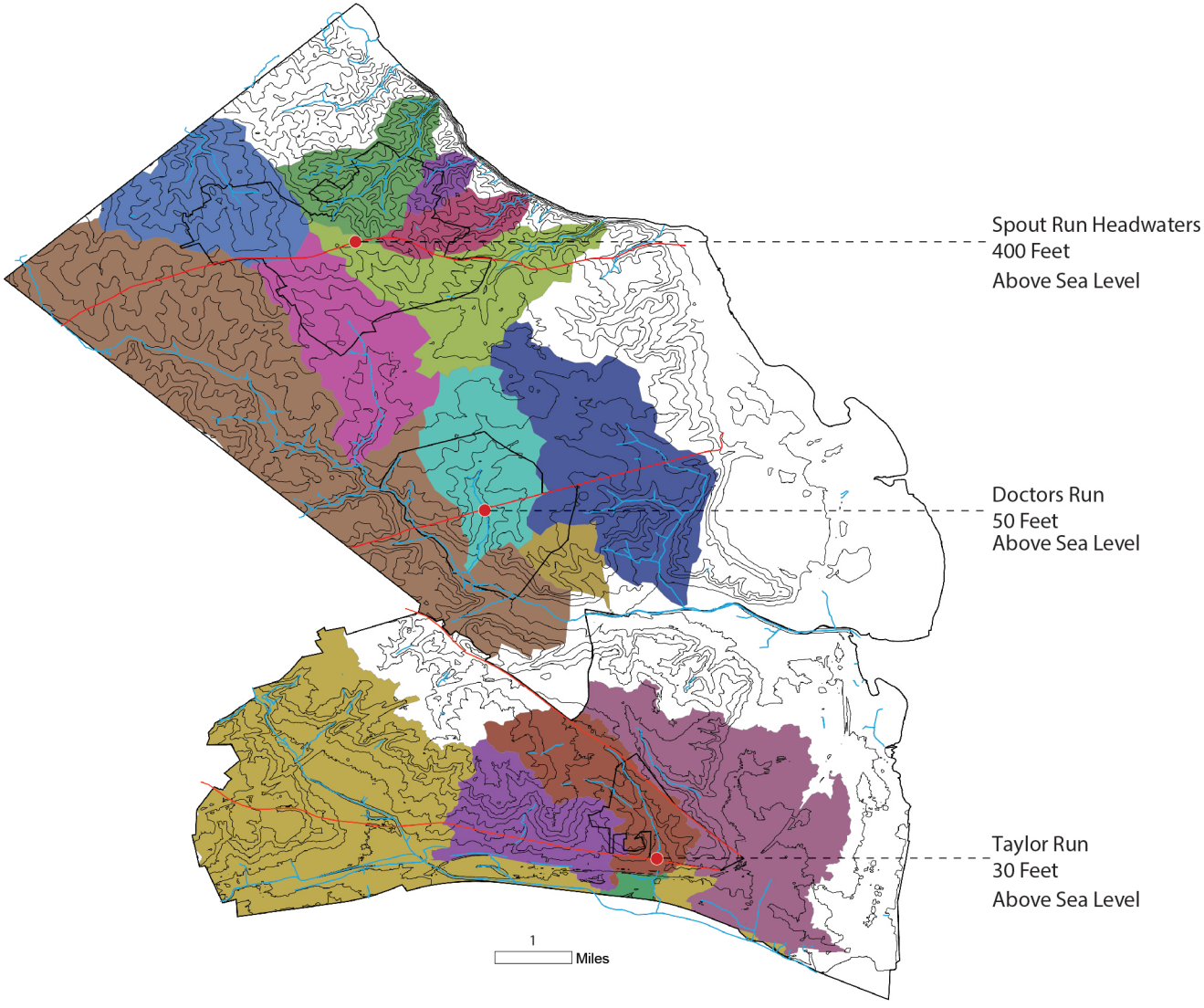


Figure 24 Topographical cross-section of Route 236 (Duke Street) and hydrological intersections

Spout Run Headwaters @ Lee Highway

Doctors Run @ Columbia Pike

Taylor Run @ Duke Street

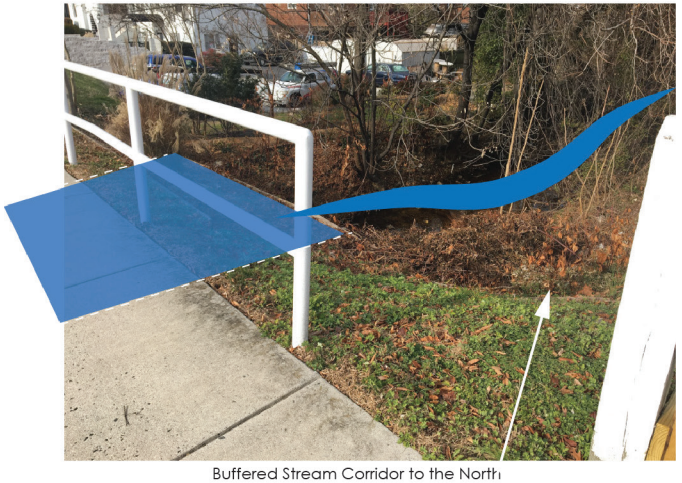


Figure 27 Photographic view of sites at hydrological intersections for 3 potential sites

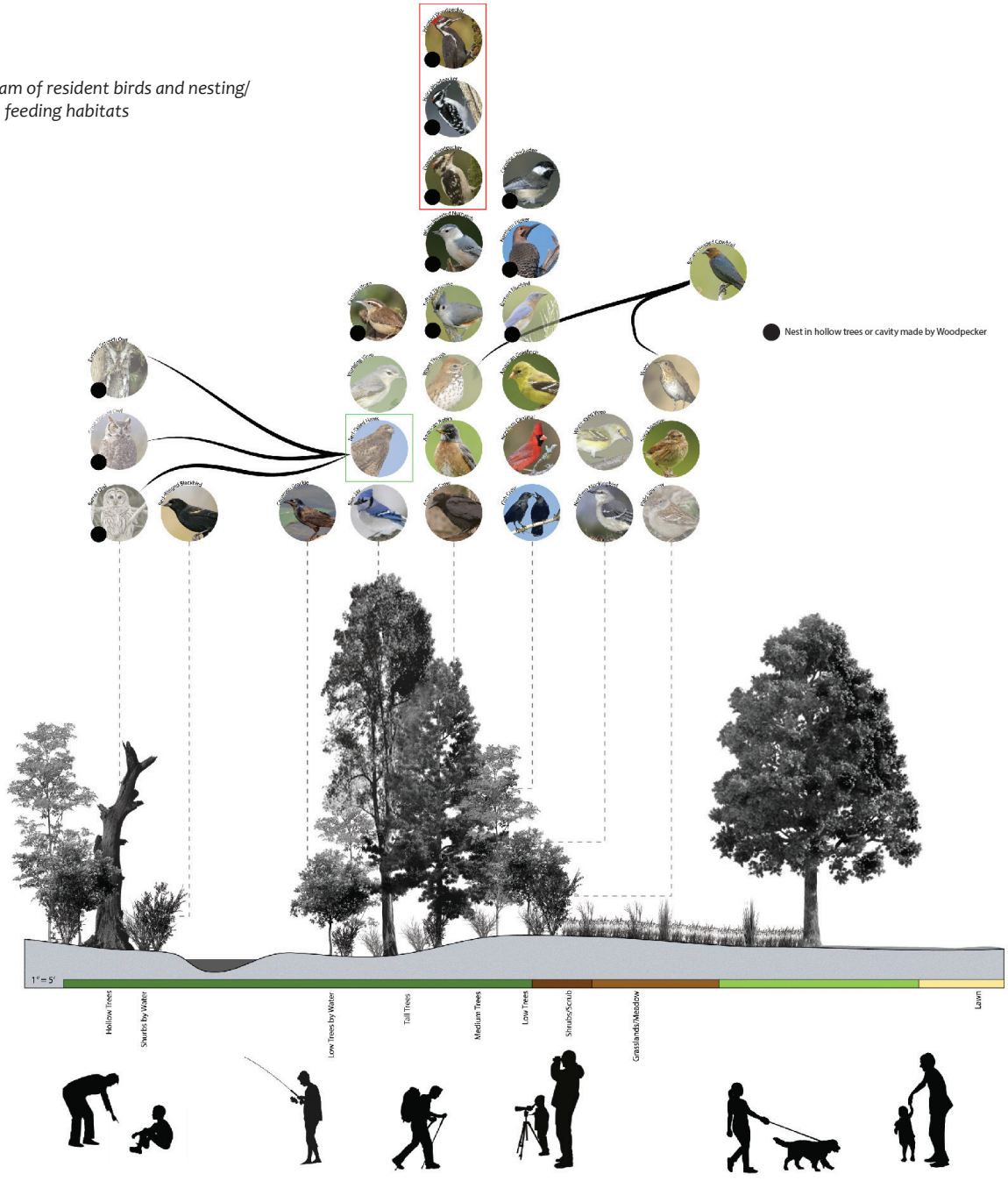
Figure 28 Land cover percentages in neighborhoods surrounding 3 potential sites
Land Cover. (2016). Retrieved from https://www.vita.virginia.gov/integrated-services/vgin-geospatial-services/land-cover/.

As a proxy for ecological diversity, the study then compares the existing land cover statistics to the habitat range required of all birds that nest and breed in the county. The birds that are resident in this part of Virginia are both interdependent on each other, and dependent on a wide range of habitat. Figure 29 provides a list of all species of land birds that both nest and breed in Arlington County (Arlington County, VA, 2011). As Figure 30 identifies, the same range of habitat required for flourishing bird populations of our resident bird species also provide a variety of open spaces beneficial to a vibrant and active Urban Village with access to the outdoors. Also evident from this analysis is that the woodland edges, more than the dense inner woodlands themselves, is where the majority of the resident bird species nest and feed.

Common Name	Species Name	Common/Uncommon	Climate Threatened?	Nesting Habitat	Feeding Habitat	
Carolina Wren	*Thryothorus ludovicianus*	Common	N	Trees - cavity	Brush/Scrub	
Field Sparrow	*Spizella pusilla*	Uncommon	N	Ground or Low Trees - nest	Brush/Scrub/Grasslands	Year-round
Northern Mockingbird	*Mimus polyglottos*	Common	N	Shrubs or Low Trees - nest	Brush/Scrub/Grasslands	
Northern Cardinal	*Cardinalis cardinalis*	Common	N	Shrubs or Low Trees - nest	Brush/Scrub/Woodland Edges	
Song Sparrow	*Melospiza melodia*	Common	N	Ground or Low Trees - nest	Brush/Scrub/Woodland Edges	
Barred Owl	*Strix varia*	Uncommon	N	High Trees - nest; Hollow Trees	Dense Wet Woods	Year-round
Veery	*Catharus fuscescens*	Uncommon	Y	Ground or Low Trees - nest	Dense Wet Woods	
Wood Thrush	*Hylocichla mustelina*	Uncommon	Y	Medium Trees - nest	Dense Wet Woods	
Brown-Headed Cowbird	*Molothrus ater*	Common	N	Parasitic (Veery, Woodthrush)	Meadow/Grasslands	
Common Grackle	*Quiscalus quiscula*	Common	N	Shrubs or Low Trees (Water) - nest	Meadow/Grasslands	
Eastern Bluebird	*Sialia sialis*	Uncommon	N	Low Trees - cavity	Meadow/Grasslands	Year-round
Eastern Screech Owl	*Megascops asio*	Uncommon	N	High Trees - nest; Hollow Trees	Meadow/Grasslands	Year-round
Red-Tailed Hawk	*Buteo jamaicensis*	Uncommon	N	High Trees - nest	Meadow/Grasslands	Year-round
Fish Crow	*Corvus ossifragus*	Common	Y	Low Trees - nest	Water Edges	
Red-Winged Blackbird	*Agelaius phoeniceus*	Common	N	Shrubs (Water) - nest	Water Edges	
Warbling Vireo	*Vireo gilvus*	Uncommon	N	High Trees - nest	Woodland edges	
White-Eyed Vireo	*Vireo griseus*	Uncommon	N	Shrubs or Low Trees - nest	Woodland edges	
Northern Flicker	*Colaptes auratus*	Common	N	Low Trees - cavity	Woodland Openings	
American Robin	*Turdus migratorius*	Common	N	Medium Trees - nest	Woodlands	
Blue Jay	*Cyanocitta cristata*	Common	N	High Trees - nest	Woodlands	
Carolina Chickadee	*Poecile carolinensis*	Common	N	Low Trees - cavity	Woodlands	
Pileated Woodpecker	*Dryocopus pileatus*	Common	N	Medium Tree - cavity	Woodlands	
Tufted Titmouse	*Baeolophus bicolor*	Common	N	Medium Trees - cavity	Woodlands	
White Breasted Nuthatch	*Sitta carolinensis*	Common	Y	Medium Trees - cavity	Woodlands	
American Crow	*Corvus brachyrhynchos*	Common	N	Medium Trees - nest	Woodlands/Grasslands	
American Goldfinch	*Spinus tristis*	Common	N	Low or Medium Trees - nest	Woodlands/Grasslands	
Downy Woodpecker	*Dryobates pubescens*	Common	N	Medium Trees - cavity	Woodlands/Grasslands	
Great Horned Owl	*Bubo virginianus*	Uncommon	N	High Trees - nest; Hollow Trees	Woodlands/Grasslands	Year-round
Hairy Woodpecker	*Dryobates villosus*	Common	Y	Medium Trees- cavity	Woodlands/Grasslands	

Figure 29 List of birds that nest and breed in Arlington County VA. Identified From: Zell, G. (2011, July). PDF. Arlington, VA. Retrieved from https://projects.arlingtonva.us/wp-content/uploads/sites/31/2014/04/Wildlife-of-Arlington-A-Natural-Resource-Heritage-Technical-Report.pdf

Figure 30 Diagram of resident birds and nesting/ feeding habitats



The Case for the Headwaters

In a few of the identified intersections, transformations into Urban Village centers with integrated ecological systems have already begun. In others, the amenities and housing types available do not lend themselves at this point to supporting an active Urban Village center. In the case of the Headwaters on Route 29, Doctors Run at Route 244, and Taylor Run at Route 236, an appropriate mix of housing, commercial activity, and public amenities are available to support redevelopment as the center of an Urban Village. In the case of both Doctors Run and Taylor Run, the stream feature is currently being managed partially as a functioning ecological system as well as a community amenity. In both cases, the stream channel itself would benefit from improved management and the feature could be more fully extended through its intersection with the associated transportation route and commercial areas.

In the case of the Headwaters at Route 29, there is no identifiable landscape framework around natural features. Here, some initial step must be taken to re-introduce ecological function into the redevelopment that is poised to occur throughout the corridor, lest the opportunity be lost for another generation and the underlying landscape be buried further from consciousness. If the development that occurs in this area is to provide a healthy environment for the people and wildlife who live there in a sustainable manner that is resilient when challenged by storms and changes in climate, then ecologically functioning amenities will be necessary. What further recommends this site for the exploration of this thesis and as a priority for development prospects is the fact that it sits high in the watershed of many tributaries to the Potomac River that run through various neighborhoods at lower elevations in both northern and southern Arlington County. Any ecologically productive development in this area not only benefits the immediate neighborhoods as a village center but provides benefit to all of the neighborhoods downstream.


Lee Heights @ Historical Spout Run Headwaters
Google Earth
N

Arlington Virginia's Headwaters Plateau and Spout Run Gap

Having identified the intersection between Route 29 and the historical headwaters of Spout Run as the site to explore relevant design, the project proceeds by developing an understanding of the full context and history of the specific area. There are two significant factors that arise through this review.

The first has to do with the surrounding landscape. The specific intersection between the transportation route and the natural feature is found to be part of a larger geological formation and hydrology system that forms the headwaters not just for Spout Run but also for four other streams that make their way to the Potomac River through both northern and southern Arlington County.

The second has to do with the cultural history of the surrounding development. The intersection of Route 29 and Spout Run is immediately adjacent to the intersection between Glebe Road and Route 29. Glebe Road dates to at least the mid-1700's before the founding of Washington D.C., as the capitol of the United States and was traversed by George Washington when he surveyed the area (see Figure 31). This intersection falls immediately between (1) the historic neighborhood of Halls Hill/High View Park where Freedmen began building a community after emancipation in the mid-1860's and (2) what was initially named the Livingston Heights neighborhood founded around 1907 (now encompassed by the Old Dominion neighborhood within Arlington County). The development of this commuting community was concurrent with the establishment of the Great Falls and Old Dominion railway that provided mass transit access directly to Washington D.C. from 1906 up until 1934.

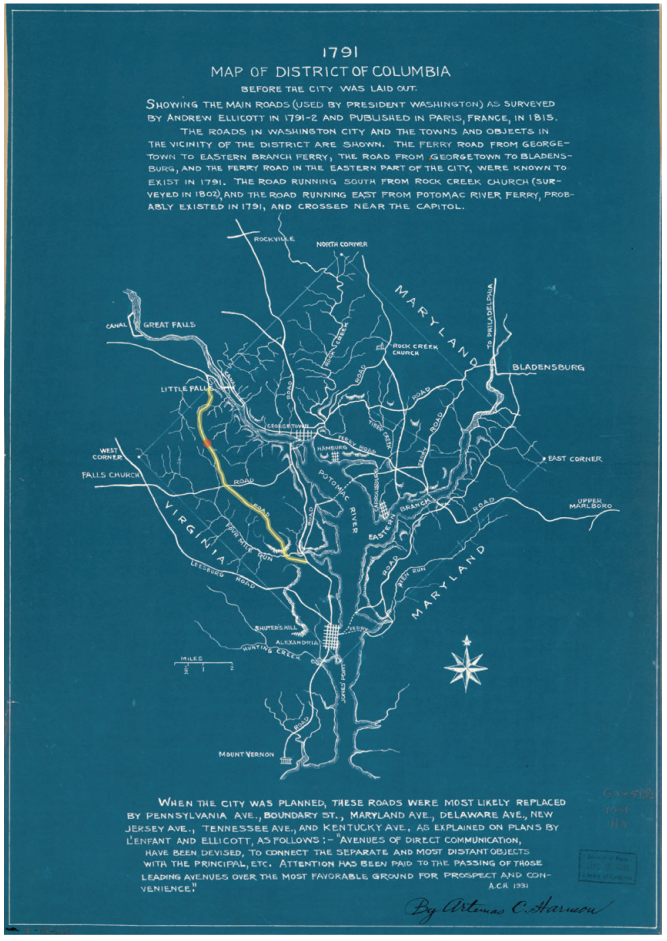


Figure 31 1791 map of District of Columbia, before the city was laid out : showing the main roads (used by President Washington) as surveyed by Andrew Ellicott in 1791-2 and published in Paris, France, in 1815. (n.d.). Retrieved from http://hdl.loc.gov/loc.gmd/g3851p.tr000096.

Geology

Figure 32 shows a geological map of Arlington County. Much of the northwestern half of the county is underlain by metamorphic rock of a type known as the Sykesville Formation (noted as 'Cs'). This region runs along the Atlantic Coast Fall Line, corresponding to the Piedmont Uplands ecoregion as discussed earlier. The southeastern half of the county is underlain primarily by two types of Upland Terrace Deposits ('Tt4' and 'Tt3'), likely resulting from the formation of the Potomac River basin. These areas correspond to the Rolling Coastal Plain and Northern Inner Piedmont ecoregions.

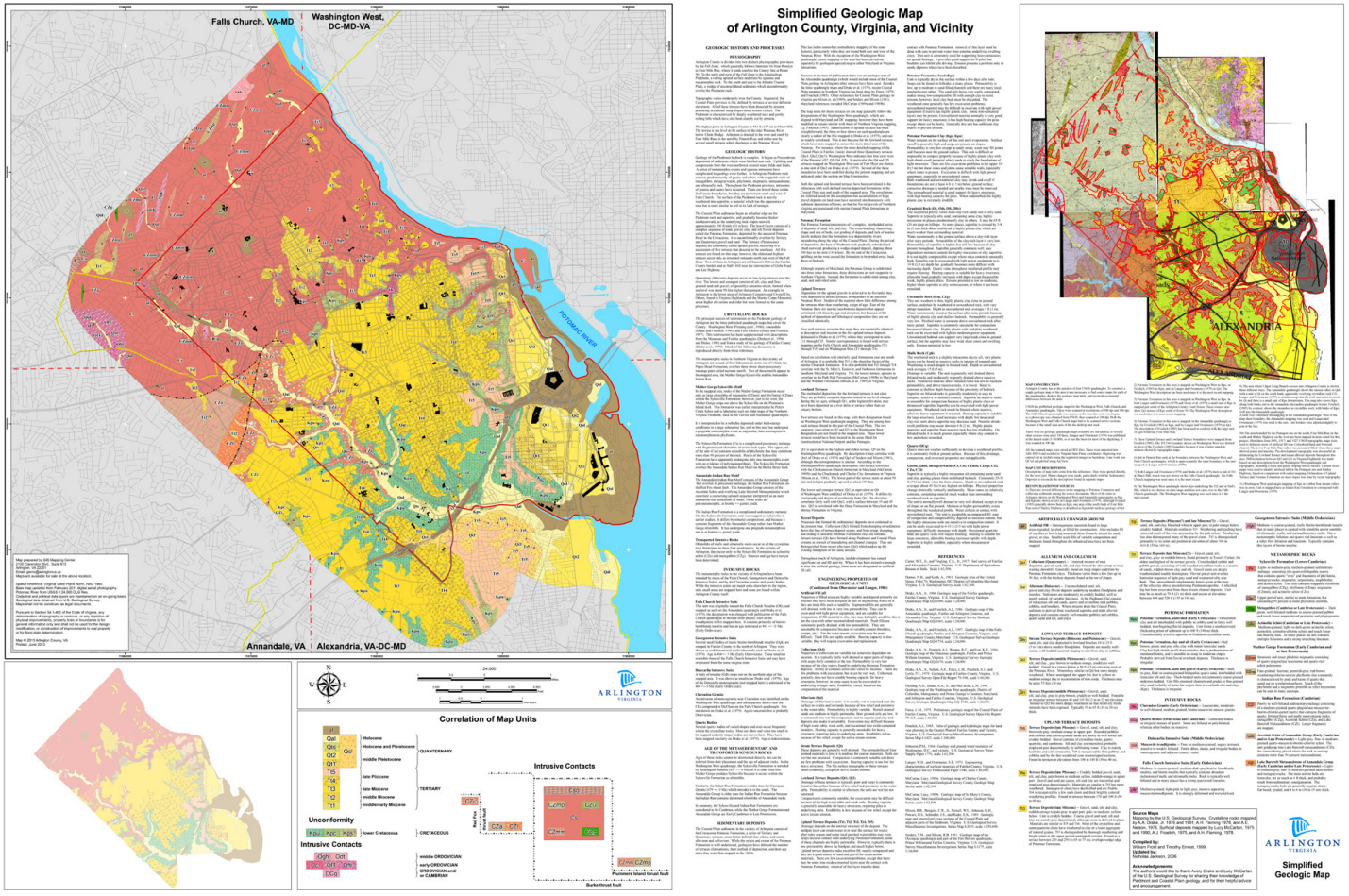


Figure 32 Simplified Geologic Map of Arlington County, Virginia and Vicinity
Jackson, Nicholas (2006). Retrieved from https://gis.arlingtonva.us/Maps/Standard_Maps/Environmental_Maps/Geology.pdf

An interesting revelation based on the geological record is that the intersection identified between Route 29 and the Spout Run headwaters occurs as the route crosses the southern edge of an isolated geological formation of Upland Terrace Deposits of a different type ('Tt2', more weathered and older) than what is found in the southeastern half of the county (Figure 33). This geological anomaly has a unique form that is expressed in the physical topography and function of the hydrologic system. The presence of the formation creates hydrological interactions with the other formations surrounding it.

As noted on the "Simplified Geologic Map of Arlington County and Vicinity", these deposits are generally found, as they are here, at elevations of about 360 feet to 410 feet above sea level. They are made up of a matrix of gravel, sand, silt, and clay. Due to being more weathered than the related Tt3 and Tt4 deposits, they are bleached white in the upper part, and tend to be pale orange below because much of the iron has been removed. Of specific hydrologic interest is that these deposits drain depending on the internal structure and presence of a compacted hardpan layer. There is usually a compacted hardpan layer that can retain water at or near the surface for weeks after rainy season. The map also notes that seeps occur at contact with underlying Potomac Formation and that some of these channels are highly permeable. This interaction is exactly what is found in the transition moving from the Spout Run headwaters on the plateau, to the Potomac Formation found in the stream channel itself, to the underlying Sykesville Formation below.

For this project, this geological formation of Upland Terrace Deposits in northern Arlington has been dubbed the 'Headwaters Plateau'.

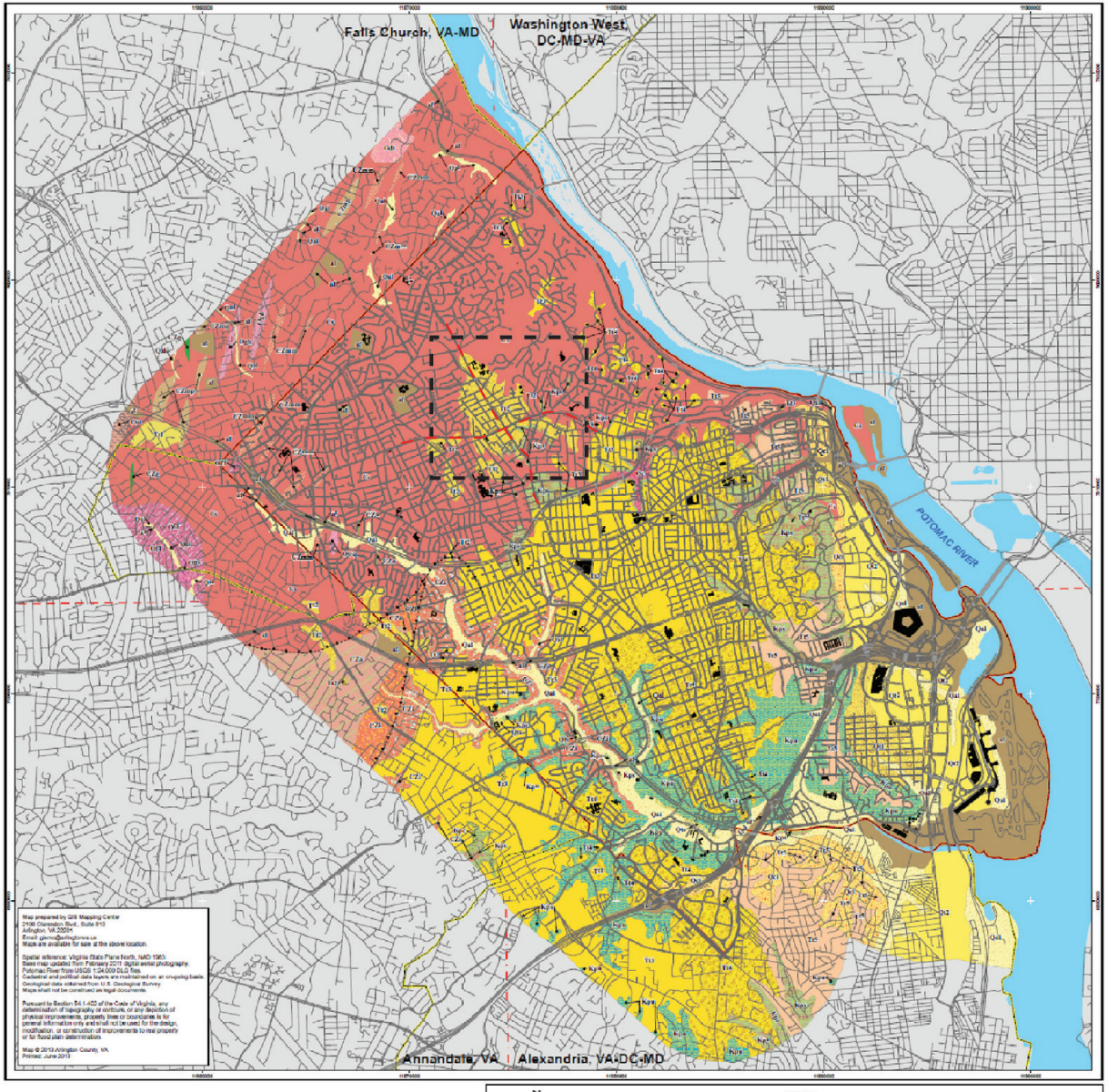


Figure 33 Enlargement - Simplified Geologic Map of Arlington County, Virginia and Vicinity showing 'Headwaters Plateau' in northern Arlington County
Jackson, Nicholas (2006). Retrieved from https://gis.arlingtonva.us/Maps/Standard_Maps/Environmental_Maps/Geology.pdf

Hydrology and Development

In order to understand the related history of the hydrology and development of the surrounding area, historical maps showing development activity and stream systems were used to create a composite view of the extent of the stream systems prior to the primary development period between 1910 and 1960. This analysis shows how the settlement pattern on the Headwaters Plateau and the transportation routes responded to the landscape, and thus how development today relates to the landscape that underlies it.

Figure 34 shows stream networks and development in the Washington area using information surveyed from 1885-1886 and 1895-1897 and published by the US Geological Survey (USGS) in 1900. The topography and streams set the form of the crossroads at Glebe Road and today's Route 29, as both roads seek the high ground between watersheds. The land within the 400-foot contour line (highlighted in grey) shows through as the area from which five streams – Little Pimmit Run, Lubber Run, Donaldson Run, Windy Run, and Spout Run – all emanate. Comparing this information to the existing map of streams in the northern part of the county reveals that the headwaters of only one of these streams – Donaldson Run, is intact today (Figure 35).

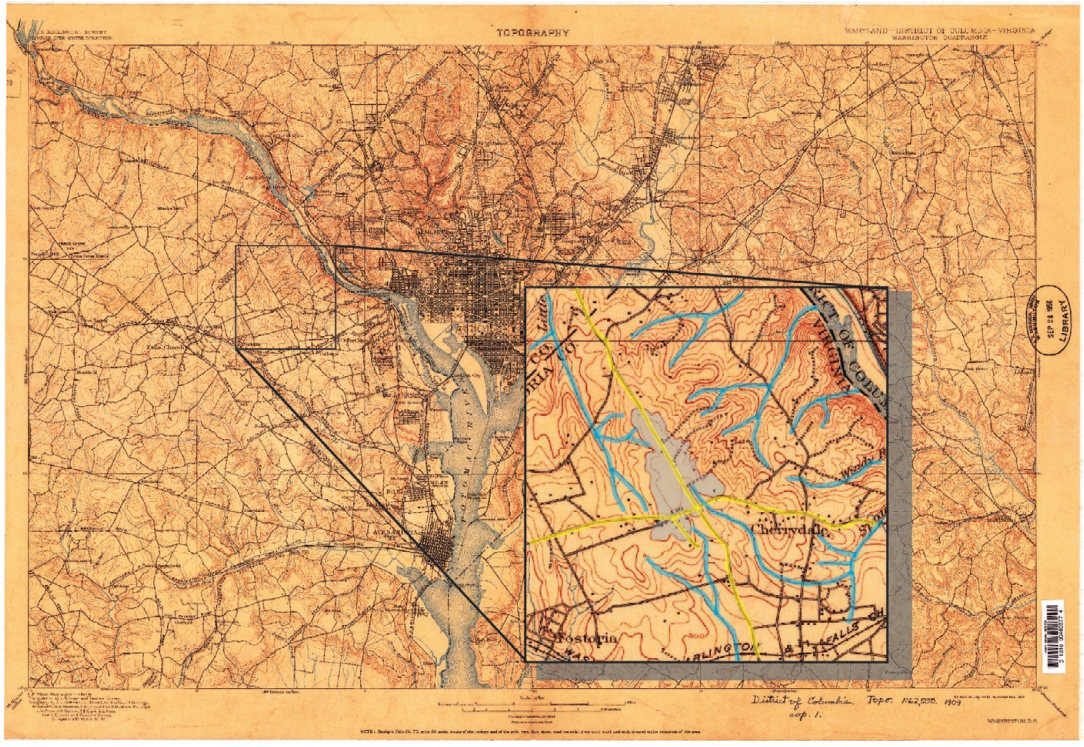


Figure 34 US Geological Survey - Topography of Washington D.C. and surrounding areas of Maryland and Virginia - Printed 1900
USGS 1:62500-scale Quadrangle for Washington, MD 1900. (2018, August 17). Retrieved from https://catalog.data.gov/dataset/usgs-1-62500-scale-quadrangle-for-washington-md-1900.

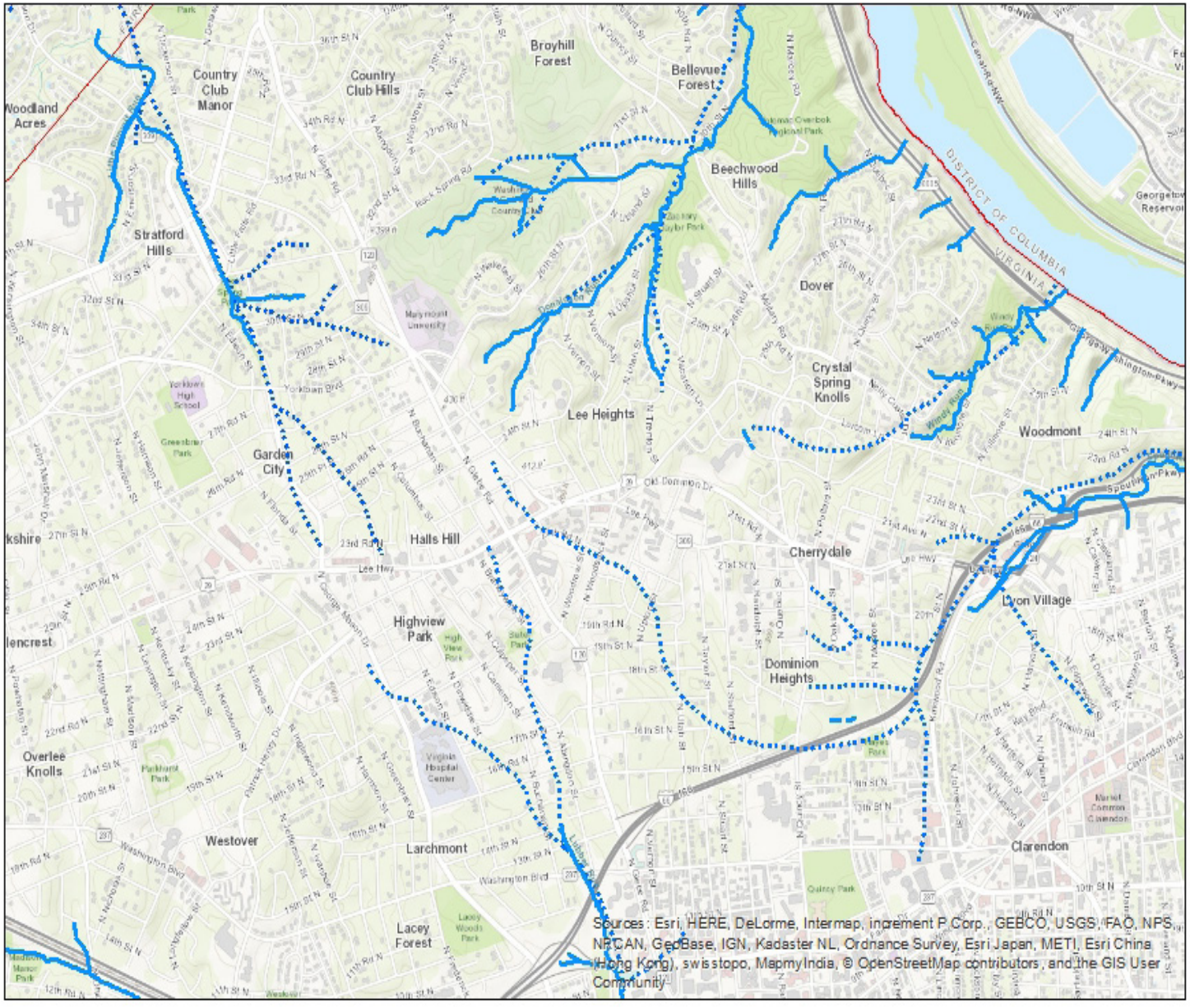


Figure 35 North Arlington County, VA modern streamlines from Arlington County public GIS with georeferenced streamlines from 1900

Figure 36 shows a map produced by the Virginia Title Company in 1900 showing specific land parcel ownership in relation to existing roads and streams. The form of the High View Park neighborhood just south of Halls Hill is clearly visible, with the same road layout that is present today. The neighborhood is nestled between two branches of the headwaters of Lubber Run, as if cradled by them purposefully. No doubt fresh water at high elevation played a role in the suitability of the location for settlement by the Freedmen.

The next map is from 1907 (Figure 37). At this point in time, the Livingstone Heights neighborhood is taking shape, and the Great Falls and Old Dominion rail line is shown, extending from what is now McLean to the north and intersecting with Route 29 near the Glebe Road intersection. The eastern border of the neighborhood runs along the plateau immediately up to what is marked as the source of three different branches of the headwaters of Donaldson Run. Of particular note, the rail line crosses Glebe Road near the northern tip of the Headwaters Plateau and proceeds south separately, clearly straddling the area earlier identified in the USGS map in Figure 35 as the source of Spout Run. However, in this map, the starting point of the Spout Run stream on the map is moved so that it is shown south of what is now Route 29. In addition, the eastern branch of the Lubber Run headwaters that High View Park was situated between is no longer represented. It appears that the landscape and hydrology is in the process of being buried, but the form and location of the development echoes it into the future.

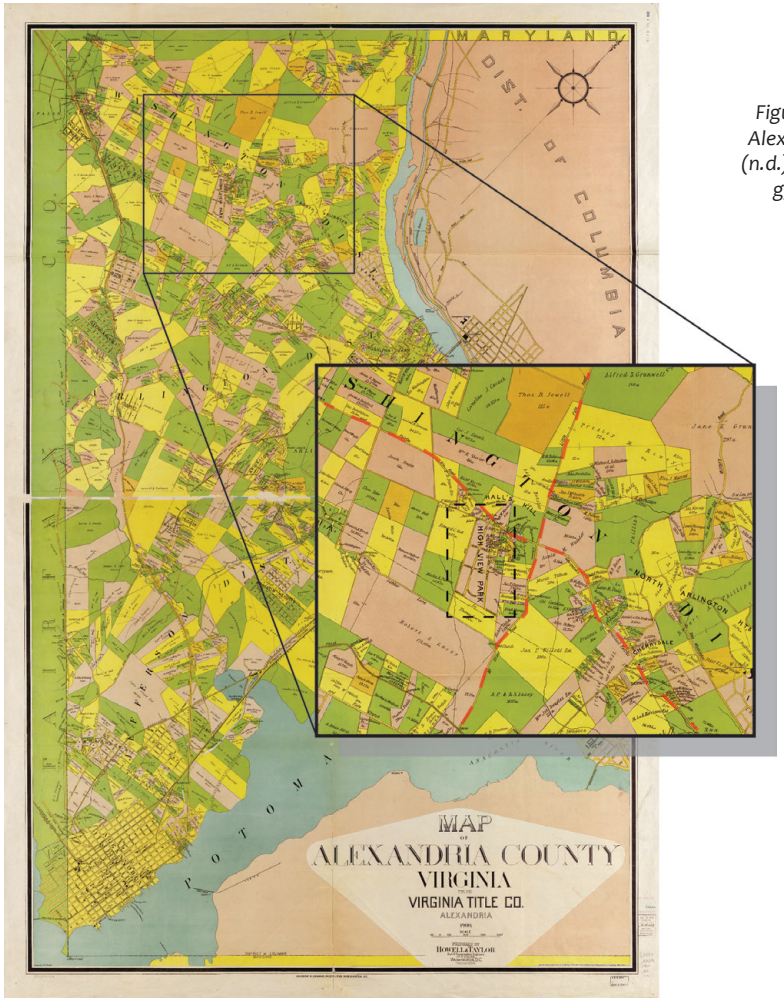


Figure 36 1900 Alexandria County VA - LoC Map of Alexandria County, Virginia for the Virginia Title Co. (n.d.). Retrieved from https://www.loc.gov/resource/g3883a.ct002287/?r=0.331,0.593,0.562,0.272,0

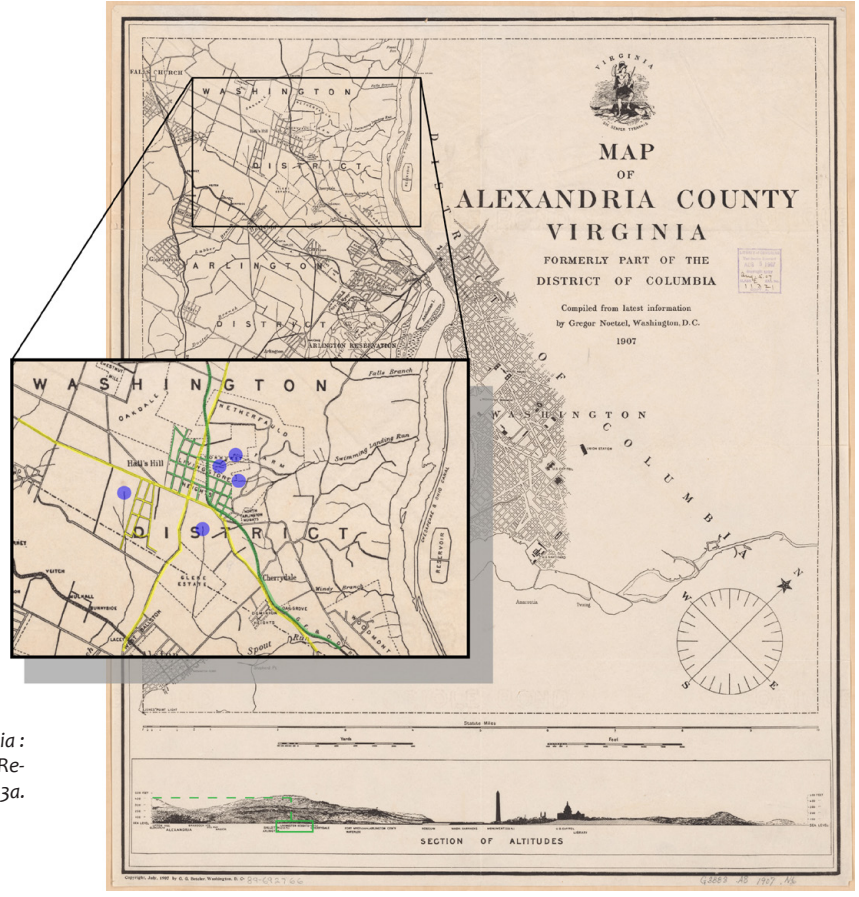


Figure 37 1907 - Map of Alexandria County, Virginia : formerly part of the District of Columbia. (n.d.). Retrieved from https://www.loc.gov/resource/g3883a.ct009226/.

Based on these maps, the extent of stream systems after intensive farming but prior to suburban development could be georeferenced against the current urbanized development pattern. It is immediately apparent, of course, that the stream systems were much more extensive at the time than they are today. In addition, the analysis shows that development was beginning to gain speed in the late 1800s to early 1900s. The information surveyed just a few years earlier by USGS does not show what was clearly in place by 1907 as the local road networks associated with both the Halls Hill/High View Park and Livingston Heights neighborhoods that still endure today.

A composite birds-eye view of the juxtaposition between the topography of the Headwaters Plateau, the stream network as of 1900, the road networks in place as of 1900, and the road networks in place today is shown in Figure 38.

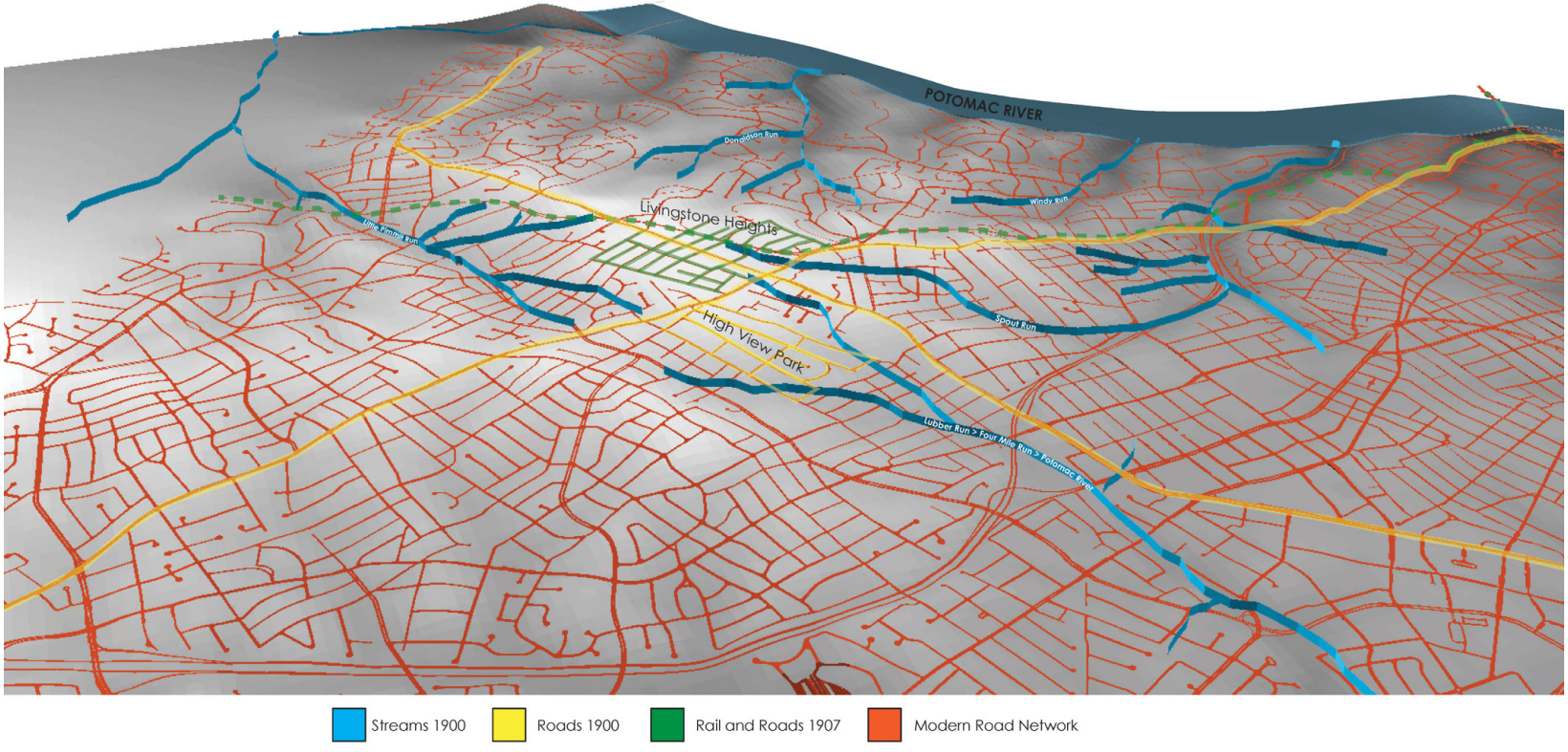


Figure 38 Composite Birds-eye View - North Arlington streams and roads 1900, 1907, Current

Focusing in on Spout Run Gap

The Headwaters Plateau is a landscape that has shaped the development around it, and that has an ecological legacy impacting the hydrologic system for miles beyond its immediate contours. It can no longer provide the same level of ecological service that it once did, covered in primeval forest. Nor can it perform the level of service it may have retained when settled by Native Americans, or during European settlement and the farming era. It is not a recommendation of this proposal that development necessarily be halted or reversed. This place is now a unique joint venture between the human settlement and the underlying landscape. But the plateau deserves to be recognized as a wholistic system – a district made up of a continued human settlement and a functioning water filter for the steams it feeds.

Under the planning process taking place concurrently with this project, Arlington County, supported by consultants and in partnership with citizen groups, are considering redevelopment priorities for the corridor along Route 29 from its western boundary with Falls Church to its eastern terminus at Rosslyn. The point at which Route 29 crosses the historic headwaters of Spout Run sits at nearly the immediate center of this planning corridor, where Route 29 crosses its highest elevation. Figure 39 provides a rendered view of the plateau itself. The highlighted area shows the gap in the 400-foot contour originally back-cut by the Spout Run stream channel into the underlying geologic formation. Figure 40 provides an overview of how the plateau relates to the modern planning corridor.

This is truly a multi-faceted intersection. It is the intersection between the development corridor and the landscape. It is the intersection between two historic routes through Arlington County, one running east-west and the other north-south, both winding their way carefully through the associated watersheds. It is the intersection sandwiched between historically segregated populations of High View Park and Livingstone Heights. It is the location within the Headwaters Plateau where the most intensive development will occur, and it is this intersection where the design exploration for this project focuses.

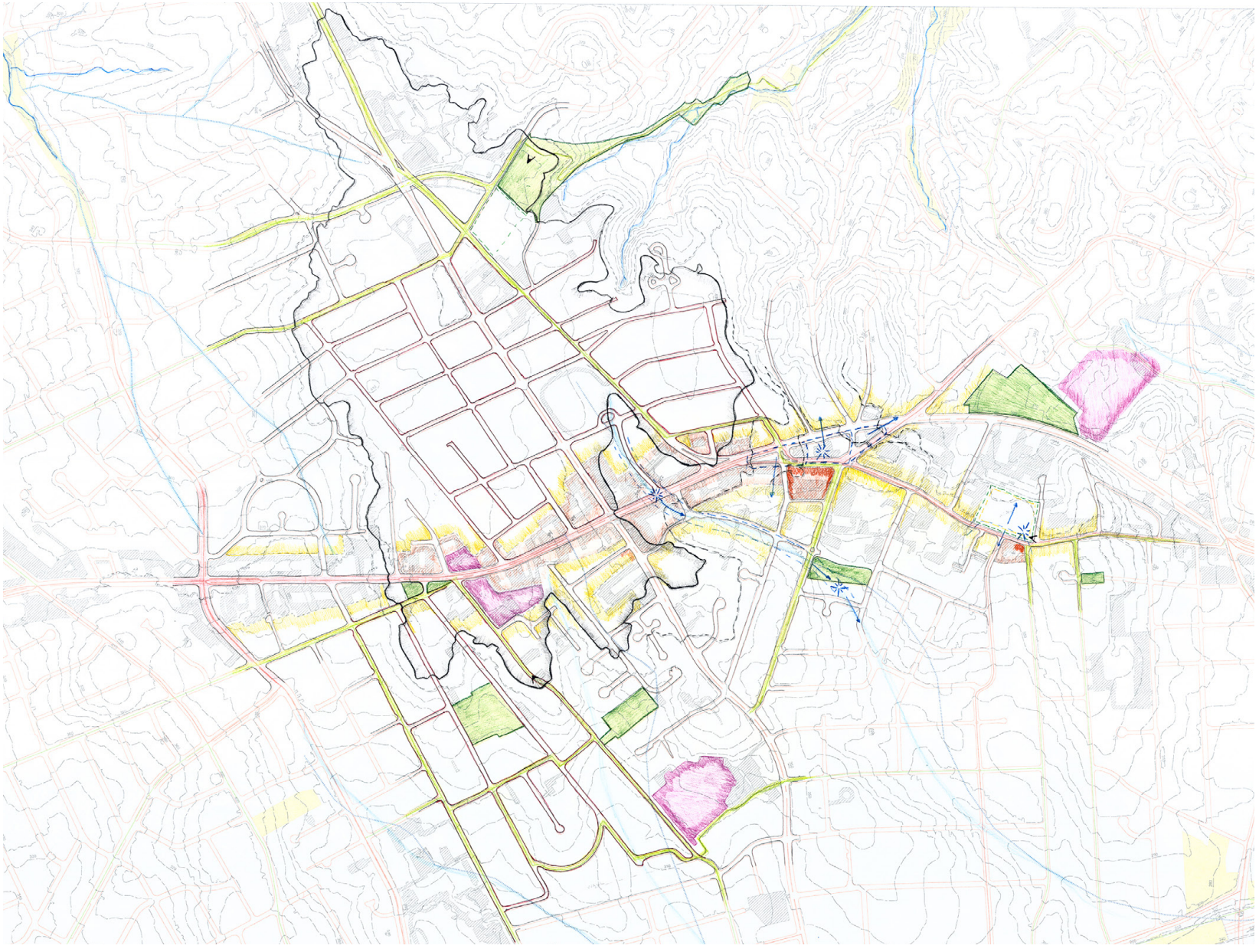


Figure 39 Rendered view of 'Headwaters Plateau', Arlington VA

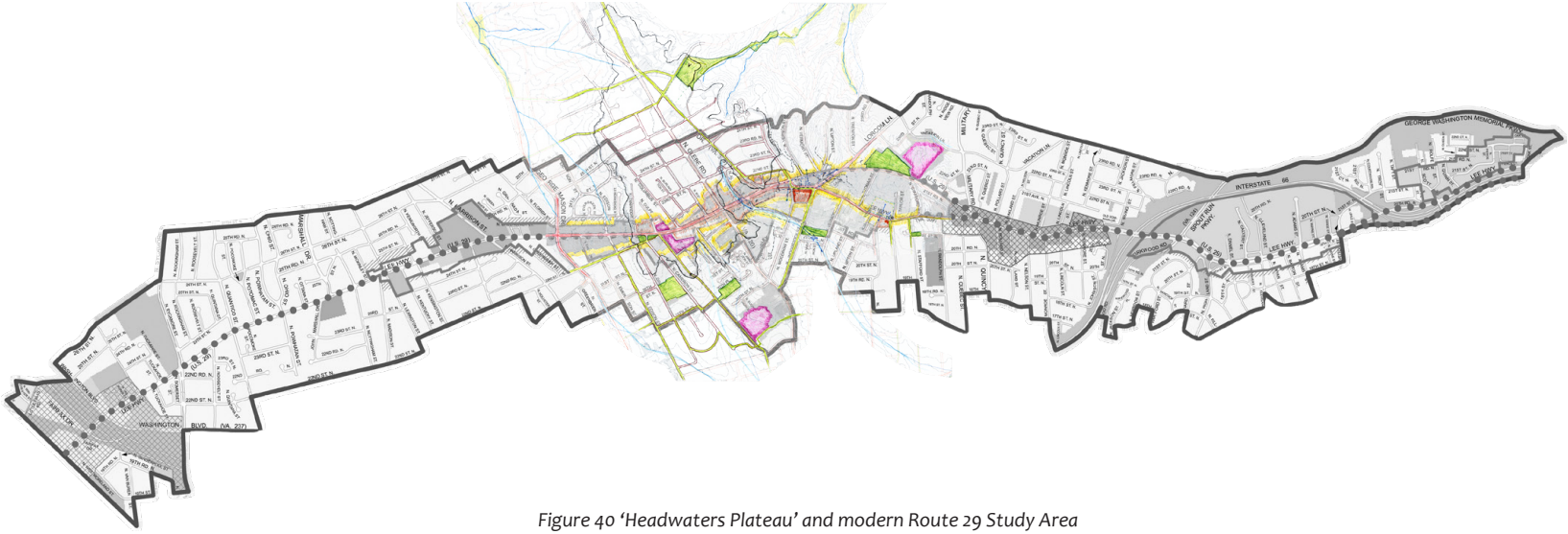


Figure 40 'Headwaters Plateau' and modern Route 29 Study Area
Alfonso-Ahmed, N. (2019, January 30). PDF. Arlington, VA. Retrieved From: https://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/31/2019/02/PlanLeeHighway_KickoffPresentation_2019-0130.pdf

Design Proposal

This project proposes to design an ecologically beneficial amenity in the area where Route 29 crosses the historic headwaters of Spout Run, or 'Spout Run Gap'. There is currently no landscape framework associated with the historic presence of this headwaters stream and the water that continually flows in the pipes below the surface. The design seeks to demonstrate the concept that increased density during redevelopment can be achieved in concert with improvement of the landscape infrastructure while retaining a form that is unique to the place itself.

The design process begins with a formalization of objectives. With these objectives in mind, it is important to proceed by reviewing existing conditions to identify potential intervention strategies and opportunities to achieve the desired outcome. Through both mapping and observation of the detailed conditions and activities of people around the site, important opportunities related to form and function were identified. In addition, two critical technical factors related to the stormwater management system within the site were identified that had significant implications for the design approach.

First, it was found that the stormwater sewer mains immediately downstream from the headwaters section of Spout Run have been deemed critically below capacity. Arlington County has plans to replace those mains with larger pipes. This prompted an initial design strategy for developing an approach that would provide supplemental relief to the overburdened pipe system through a pooling channel that would only operate as catchments during storm conditions.

However, through observation of accessible sewer nodes within the site, it was found that a continuous flow of water persists within the stormwater mains even in drought conditions. The source of this flow is unknown. This discovery led to a new design strategy, one that would accommodate both continuous flow and storm conditions.

As such, the overall design concept was then developed drawing on observed opportunities, considering the relationship to the existing built environment of the surrounding context, reviewing case studies from other interventions around the country, and employing design principles for streets and human biophilia. Specifically, the strategy identified provides the necessary elements for (a) human access, circulation, and socialization, (b) increased diversity and quantity of ecologically valuable vegetation for wildlife, (c) accommodation for continuous water flow and stormwater flow conditions, and (d) continued circulation of vehicular traffic.

Design Objectives

As plans are made for redevelopment in the Spout Run Gap area of Route 29, it is important to recognize three mutually reinforcing factors in what make this place unique and to incorporate these into the design.

First the landscape has had a hand in shaping the unique form of the roads and buildings in the area. The built environment, one generation of development removed from the farming era, still retains a form that began as a response to the landscape's characteristics.

Second, there is an absence of the underlying hydrology on the surface of the developed area. It is important to consider how the ecological legacy of the place might be at least partially restored and brought back into service for the benefit of both the landscape and of those people who live here now and those who will come after.

Third, the path of the historic channel of the Spout Run headwaters is uniquely located. The path follows almost perfectly what is now 20th Street North from Route 29 to a dead-end at Woodstock Park (Figure 40). As a standard 35-foot road, the path acts as a stark and barren 'hard' boundary between market rate and low-income multi-family living complexes and single-family residential areas. The commercial and retail center along Route 29 along with Woodstock park serve as points of potential social integration between the historically segregated areas of High View Park and Livingstone Heights.

The objective of this design exploration is to honor and satisfy these three mutually reinforcing factors. The path of the historic Spout Run channel can be brought to life as an armature, or scaffolding, around which a productive ecological feature and socially appreciated space can be created that knits together the various socio-economic populations and the associated commercial activity. The design will take a unique form honoring the form of the built environment around it which, in a twist of recursive irony, was itself originally shaped by that same underlying landscape.

Existing Conditions

The location where Route 29 crosses the historic path of the Spout Run headwaters stream is more than a single point in space. It represents the intersection of systems:

- First, the hydrologic system that feeds the stream and its path downstream toward the Potomac River.
- Second, the built environment around it that provides places for residence, work, play, and commerce.

These systems provide for both ecological and human processes. The location is already a vibrant place for life. As redevelopment occurs the existing systems should be understood. To support this, a review of elements of each of these systems is necessary to inform this design. This includes a review of the existing layout of buildings and circulation, topography, water, people's activities, and details of the condition of the built environment.

Layout and Circulation

The current layout of the area shows that there is no single existing social hub where the community may come together. While the surrounding area does provide many public amenities necessary for a walkable village center, it is split between two perceived 'hubs' of activity. The vehicular intersection at Glebe Road and Lee Highway on the west side of the Spout Run Crossing is one. Intersections between major roads have traditionally acted as meeting places and centers of activity. However, the location of the Lee Heights shopping center to the east, at the intersection between Old Dominion Road (previously the route of the Great Falls & Old Dominion Railroad) and Lee Highway acts as a secondary hub of activity on the other side of the Spout Run crossing.

These two hubs are connected not just by the automobile-centric Lee Highway "frontage" but by residential roads connecting them from behind. The historic path of the Spout Run headwaters, 20th Street, is a spine directly in between. From this perspective, a vision of a pedestrian-oriented connection, secondary to the busy travel lanes of Route 29, begins to emerge (Figure 41). Such a connection, quieter and able to be closed to traffic for special events and social gatherings may be the missing link between the poles of activity in the surrounding area. The walkable quarter-mile radius connects residents from all housing types and demographics in high-density, medium-density, and low-density housing. This includes both the historic neighborhoods of High View Park and Livingstone Heights.

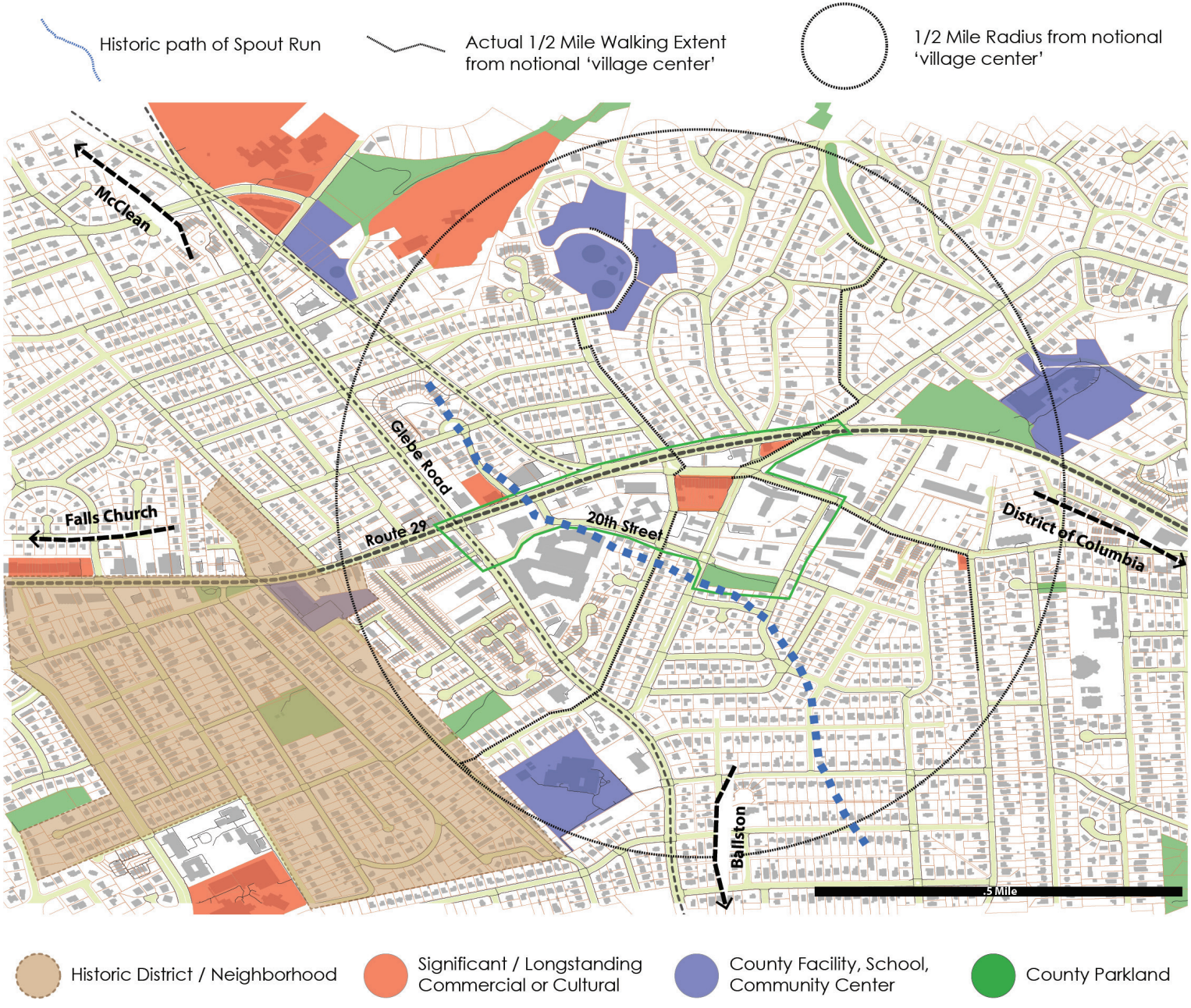


Figure 41 Area Layout and Amenities at Spout Run Gap

Topography

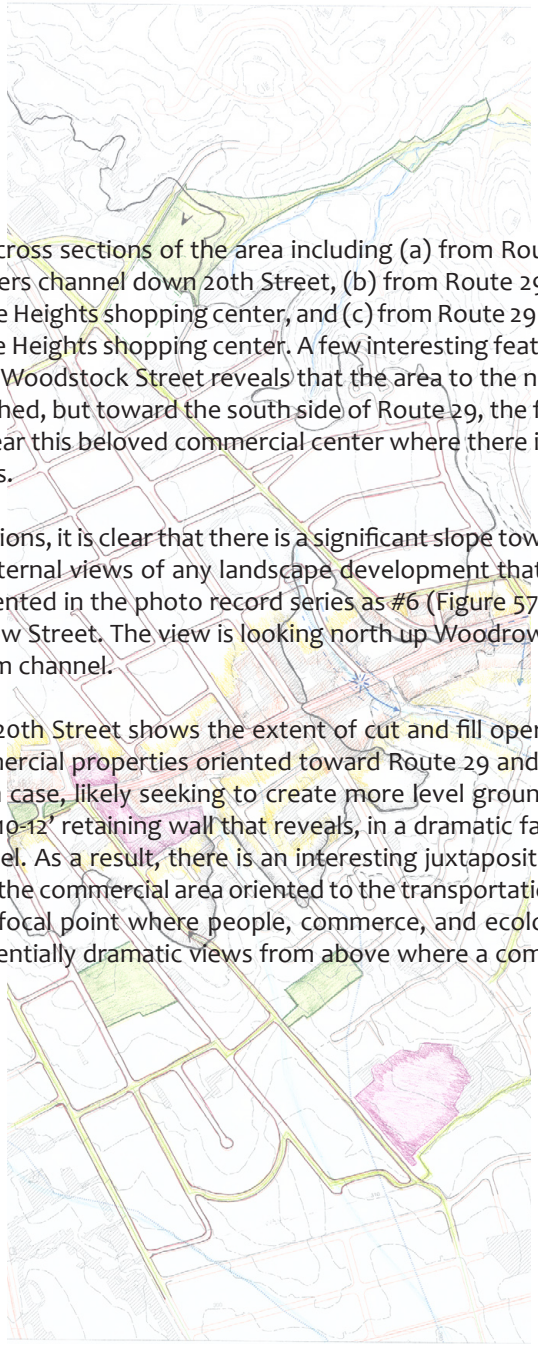


Figure 42 shows topographical cross sections of the area including (a) from Route 29 following the path of the historic Spout Run headwaters channel down 20th Street, (b) from Route 29 following North Woodrow Street on the west side of the Lee Heights shopping center, and (c) from Route 29 following North Woodstock Street on the east side of the Lee Heights shopping center. A few interesting features emerge from this view. First, the cross section of North Woodstock Street reveals that the area to the north of the shopping center drops toward a different watershed, but toward the south side of Route 29, the flow is toward Spout Run. In fact, there is a particular spot near this beloved commercial center where there is a divergence between the headwaters of three watersheds.

Second, from all three cross sections, it is clear that there is a significant slope toward the stream channel that provides potential for linking internal views of any landscape development that occurs within the channel. These internal views are represented in the photo record series as #6 (Figure 57) at the intersection of 20th Street North and North Woodrow Street. The view is looking north up Woodrow Street toward Lee Heights shopping center from the stream channel.

Finally, the cross section along 20th Street shows the extent of cut and fill operation that must have taken place from either or both commercial properties oriented toward Route 29 and the multi-family residences oriented to 20th Street. In each case, likely seeking to create more level ground for development, the cut and fill operations resulted in a 10-12' retaining wall that reveals, in a dramatic fashion, the slope of the land along the historic stream channel. As a result, there is an interesting juxtaposition between the residential area oriented to the stream and the commercial area oriented to the transportation route. This topographical feature is an opportunity for a focal point where people, commerce, and ecology all come together, with protected space below and potentially dramatic views from above where a commercial bank property now sits.

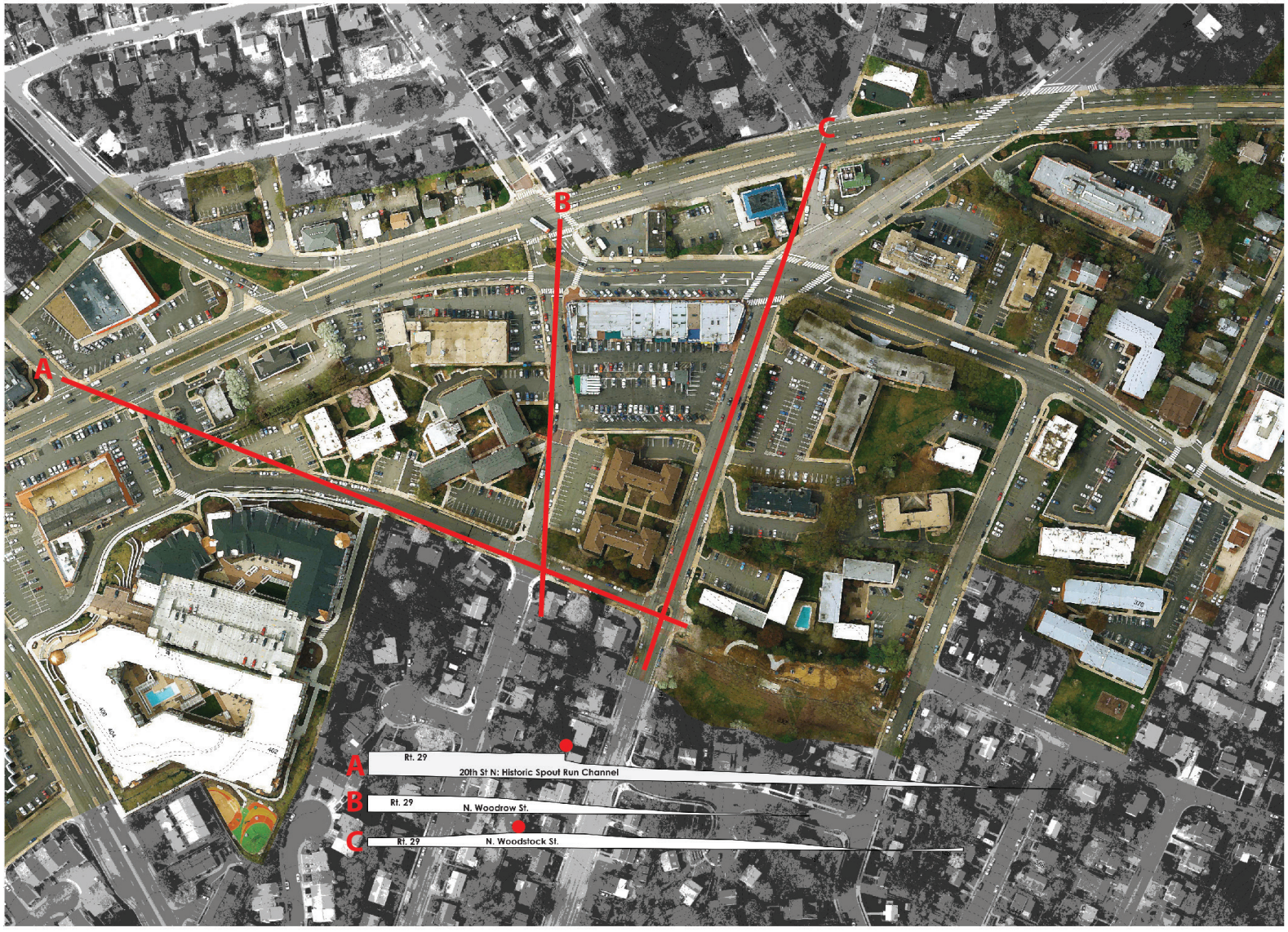
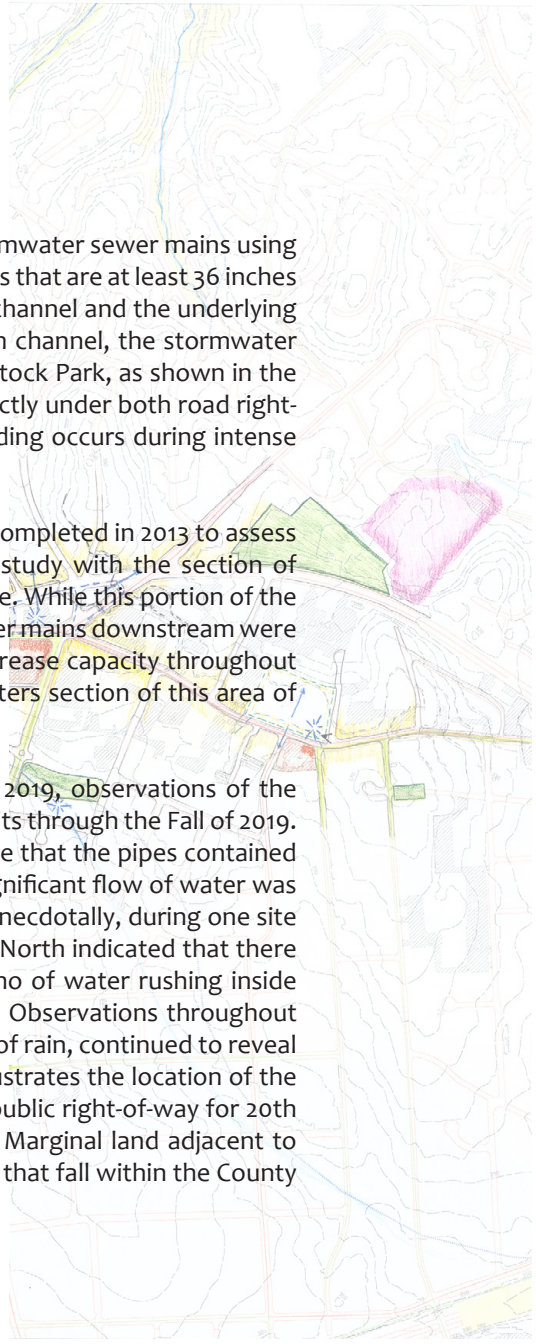


Figure 42 Area Layout and Amenities at Spout Run Gap

Water



Review of the water system within the site begins with mapping the existing stormwater sewer mains using GIS data provided by Arlington County. The data provided shows stormwater mains that are at least 36 inches in diameter. Figure43 shows a plan and cross section of the buildings within the channel and the underlying geological formations along with the stormwater mains. Like the historic stream channel, the stormwater mains follow the path of 20th Street North to a large stormwater inlet at Woodstock Park, as shown in the photo record series #12 (Figure 63). From that point on, the sewer mains run directly under both road right-of-way and residential properties in the Waverly Hills Neighborhood where flooding occurs during intense storms.

Research on the Arlington County stormwater system revealed that a study was completed in 2013 to assess the county's stormwater sewer capacity. Figure 44 shows a sample from the study with the section of stormwater sewer mains and nodes along 20th Street North within the project site. While this portion of the sewer system at the top of the watershed was found to be within capacity, all sewer mains downstream were deemed to be deficient. Two of the eight identified 'High Priority' projects to increase capacity throughout Arlington County are for sections of sewer main immediately below the headwaters section of this area of Spout Run.

After data was obtained for the stormwater mains under the site in Spring of 2019, observations of the conditions within accessible nodes at the site were made as part of several site visits through the Fall of 2019. The first site visit was shortly after a rain event, and so it was not surprising to see that the pipes contained a steady flow of water at that time. What was surprising, however, was that a significant flow of water was present during all site visits, whether a rain event had occurred recently or not. Anecdotally, during one site observation a resident at the corner of North Woodstock Street and 20th Street North indicated that there had never been a time, in his 28 years of residence, when the sound of the echo of water rushing inside the inlet node across the street from his house at Woodstock Park was absent. Observations throughout September of 2019, a period when the County received less than a total of ½ inch of rain, continued to reveal a continuous flow of water within the stormwater mains in this site. Figure 45 illustrates the location of the current stormwater sewer mains against the surrounding properties where the public right-of-way for 20th Street as well as the stormwater sewer nodes where observations were made. Marginal land adjacent to the right-of-way is mostly parking lots. The highlighted properties are all of those that fall within the County planning boundaries for the corridor.

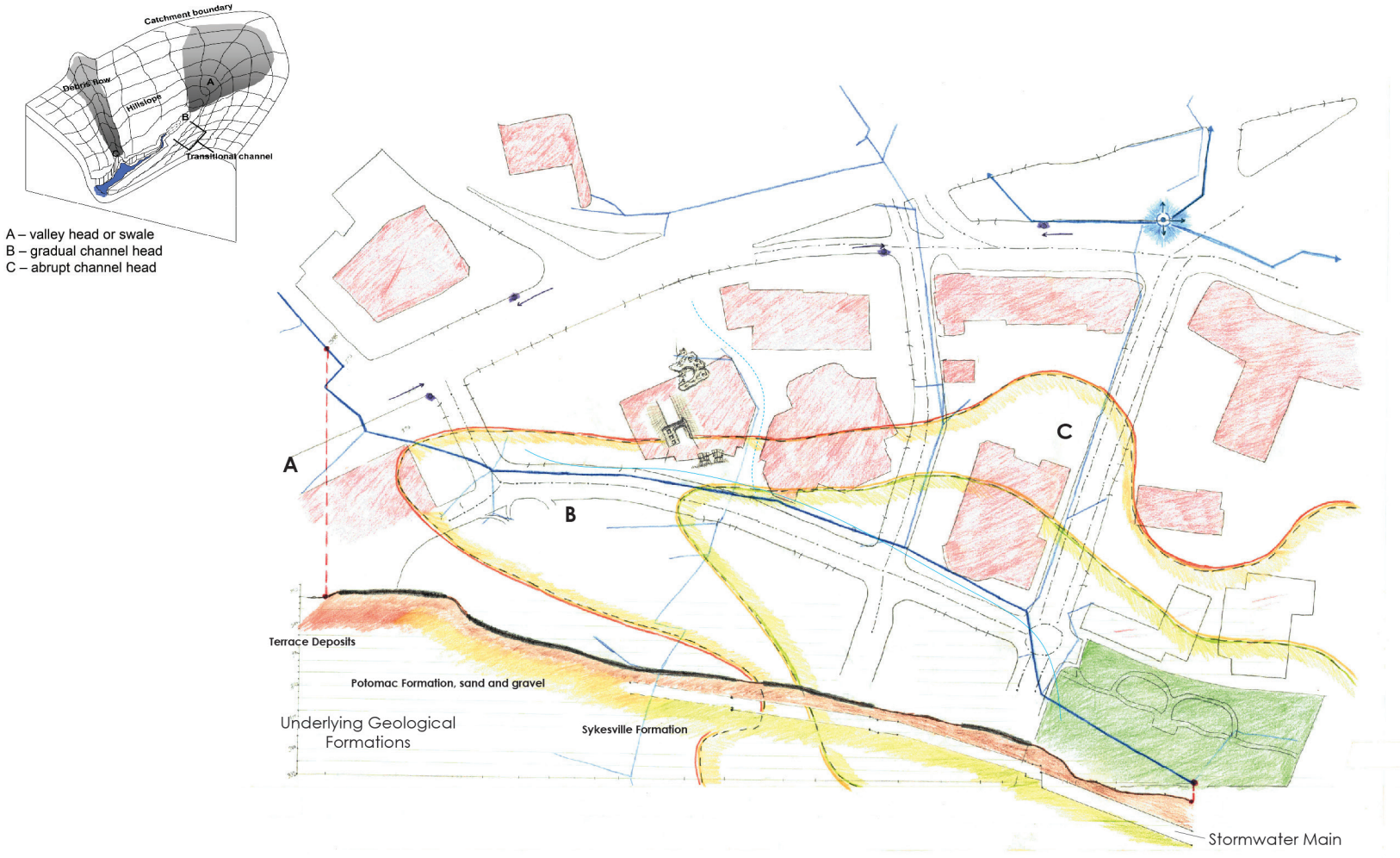


Figure 43 Geological formations, Stormwater Mains, Building Layout at Spout Run Gap

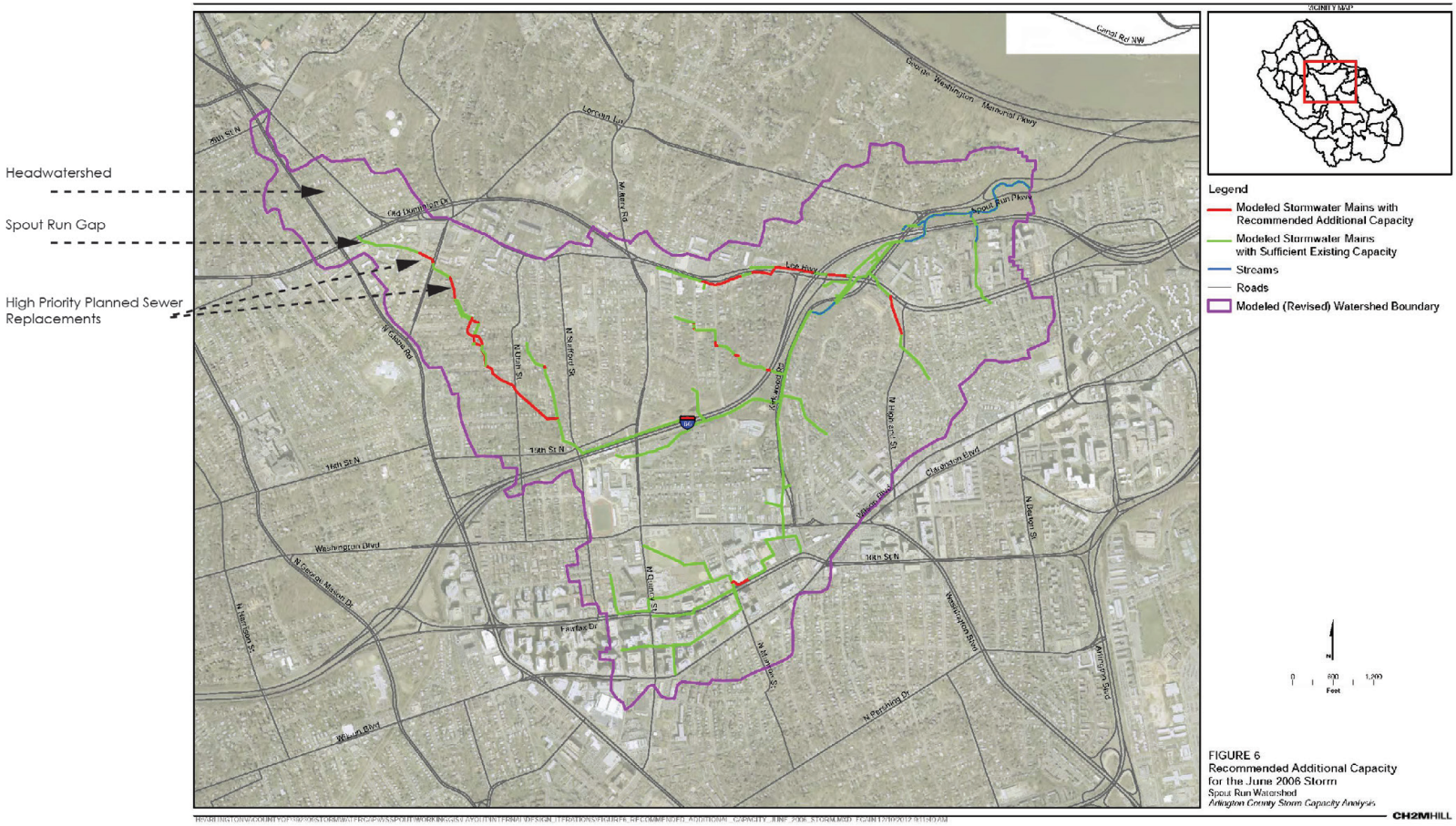


Figure 44 Stormwater Capacity Analysis for Spout Run Watershed - Page 35 PDF. (2015, March 31). Arlington, VA.

"In my 28 years of living in this house, I've never NOT heard the water rushing in that sewer."

Figure 45 Sewer and Land Use Analysis for Spout Run at Lee Highway
Google Earth Pro 7.1.8.3036 (2019, February 1) [38°53'54.68"N/ 77° 7'7.42"W] Landsat/Copernicus
Arlington County, VA –Stormwater Sewer Main GIS Data – Provided by Department of Environmental Services

People

Site observations of the area indicate that the route along 20th Street North is a collector for pedestrians coming from across Route 29 as well as within the adjacent residential areas from all directions to access both the Lee Heights shopping center and Woodstock Park. Pedestrians use sidewalks on both sides of the street, such as shown in Figure 46 where young adults seen leaving the market-rate apartments at the top of 20th Street North are headed to play basketball at the park. While the majority of area that may be available to supplement the right-of-way for creation of the designed intervention lies along the north side of the street under multi-family housing parking lots, it is important to maintain pedestrian walkways on both sides of the street where users can travel across intersections in any direction.

On the south side of the street, single-family residential properties display a mixed orientation toward the street and buildings across the way. Several houses have plantings that appear to be intended as screening or full privacy fencing, while others retain a more open orientation. On the north side of the street, residents of the multi-family buildings seek outdoor space for relaxing and for self-expression in the semi-public areas of the properties. As shown in Figure 47, residents create temporary seating areas to enjoy good weather and picnic in the small open areas around the parking lots where plots of turf allow. Figure 48 is an interesting topiary display that appears to reflect on architectural symbolism in an adjacent breezeway shown in Figure 49. Residents appear to care for, and cultivate, plantings around the buildings, beyond any industrial landscape operations that may be provided for the property. The street and sidewalks, while functioning for circulation, do not provide the kind of shared boundary that may be more appropriate for a zone such as this, where multi-family and single-family residences come together with retail and commerce. The boundary may be able to act as a bridge instead of a chasm if it is treated as a shared and interesting asset rather than a utilitarian throughway.

Figure 46 Pedestrians using Sidewalk - photo by Author

Figure 48 Topiary and Ornamental Gardening - photo by Author

Figure 47 Temporary Outdoor Space - photo by Author

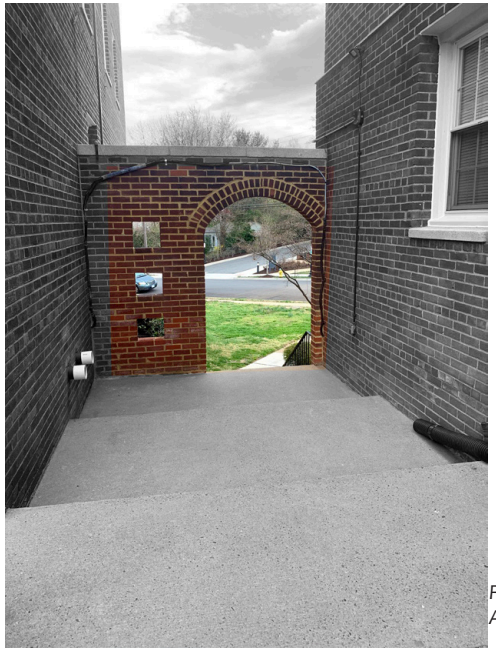


Figure 49 Unique Architectural Accents - photo by Author

Built Conditions

The photo record series in the following pages helps to reveal the current experience of a pedestrian moving through the historic stream channel from Route 29, down the access road (North Albemarle Street), and along 20th Street North to the terminus at Woodstock Park.

Figure 50 Photo Record Series Existing Conditions Plan View
Google Earth Pro 7.1.8.3036 (2019, February 1) [38°53'54.68"N/ 77° 7'7.42"W] Landsat/Copernicus

Figure 51 shows view #1. This is what a pedestrian currently sees when walking past the intersection with North Albemarle Street and Route 29 or waiting at the bus stop in the same location. As shown here, the road is a 35-foot right-of-way with 3.5-foot and 4-foot sidewalks on both sides. The road currently allows parking on both sides with room for two cars passing in either direction. The parking obscures the view of the retaining wall drop-off that so dramatically highlights the drop in topography into the historic stream channel. This view also illustrates the relatively steep incline into the area, which measures an average of 10% slope before reaching the bottom of the retaining wall, highlighting the need for a strategy to allow for accessibility for pedestrians with differing abilities.

Figure 51 Photo Record Series Existing Conditions - #1 - photo by Author

As the pedestrian reaches the intersection with 20th Street at the bottom of the initial incline, the view opens down the street following the historic stream channel as shown in Figure 52 (view #2). Moving a bit further and looking left, the pedestrian has a view directly down the retaining wall line in Figure 53 (view #3). Here, the potential for a protected and peaceful place below the drop is revealed. The space is now more than 10' below the direct sound emanating from the Route 29 traffic, and partially protected from winds. The open space available is minimal in the current configuration, but possibilities emerge for a water-source and public space if the road right-of-way were to be slightly smaller. Figure 54 (view 3a) shows the view from above the retaining wall, looking down the stream channel. The internal prospect that this view provides is rare in the built and densifying corridors of urban places. This view is one that should be protected and celebrated. However, it currently can only be appreciated by a user of the bank on the property, on the edge of the parking lot where no other pedestrian was ever observed to venture during site visits. Currently the view is dramatic, but relatively uninspiring as a standard street and sidewalk design with little else of interest to contemplate.

Figure 52 Photo Record Series Existing Conditions - #2 - photo by Author

Figure 53 Photo Record Series Existing Conditions - #3 - photo by Author

Figure 54 Photo Record Series Existing Conditions - #3a - photo by Author

As the pedestrian moves down the channel along the street and toward the first intersection with North Woodrow Street (as shown in Figures 55 and 56), the view highlights the relatively large amount of space dedicated to the roadway width.

Figure 55 Photo Record Series Existing Conditions - #4 - photo by Author

Figure 56 Photo Record Series Existing Conditions - #5 - photo by Author

At the intersection with North Woodrow Street, the internal prospect provided by both sides of the stream channel become evident. Figures 57 (view #6) and 58 (view #7) show that the user has a clear sensation of being cradled by the topography, at a low point where water will naturally gravitate. From this location, the pedestrian has views back up toward Route 29 to the west, up to Lee Heights shopping center to the north, and down to Woodstock Park to the east. Such a location conjures the vision of an open social corner celebrating the meeting of people with the confluence of water flow from several directions.

Figure 57 Photo Record Series Existing Conditions - #6 - photo by Author

Figure 58 Photo Record Series Existing Conditions - #7 - photo by Author

The wide road continues (Figure 59, view #8) to the next intersection with North Woodstock Street, where a vegetated traffic circle is used to regulate traffic flow for the larger two-lane road crossing (Figure 60, view #9).

Figure 59 Photo Record Series Existing Conditions - #8 - photo by Author

Figure 60 Photo Record Series Existing Conditions - #9 - photo by Author

The view is now of the entrance to Woodstock Park. To the left is the high ground, where 20th Street used to continue, with playgrounds and basketball courts. As the pedestrian moves toward the park, Figure 61 (view #10) reveals a drop-off in the topography to the right, where the hillside is eroding between existing canopy trees of Sycamore and White Oak along the rim of the hillside. Any intervention should be careful to retain the existing trees to the extent possible, while at the same time the need to direct water flow and deter erosion is obvious. Figure 62 (view #11) shows the hillside continuing toward a large sewer inlet close to the rear property line of several single-family residences (Figure 63, view #12).

Figure 61 Photo Record Series Existing Conditions - #10 - photo by Author

Figure 62 Photo Record Series Existing Conditions - #11 - photo by Author

This terminal location for stormwater overflow from the areas above currently acts as a multi-functional space. Children sled on the hillside in the winter, play games rolling down the hill, or pick-up football in the basin when it isn't saturated. This space is an extension of the active program of the park above, providing simple open space for creativity and socialization. These activities should continue to be accommodated in any intervention, with inspiring additions to the possibilities of unscripted play.

Figure 63 Photo Record Series Existing Conditions - #12 - photo by Author


Rt. 29
20th St N: Historic Spout Run Channel
Rt. 29
N. Woodrow St.
Rt. 29
N. Woodstock St.

Design Proposal

The design approach proposed seeks to satisfy the stated objectives of the intervention by capitalizing on the opportunities identified through existing conditions and the previously documented research and analysis. The approach to creating forms for the design can be captured by the following statement that was laid out at the beginning of the design phase as a guiding principle:

As the natural environment placed constraints on early development which resulted in a visible vernacular honoring the place, so now the built environment can be the guiding constraints that maintain a history and form that is recognizable and unique as redevelopment finds new common ground with ecological systems. (Emphasis added by author).

The design approach proposes the following strategic moves:

1. **Convert 20th Street North from 35' to a 20' Yield Street.**
2. **Combine recovered 15' of space with setbacks on apartment properties.**
3. **Divert perennial flow in sewer mains near Route 29 to continuous flow channel.**
4. **Decommission sewer inlets at channel core and allow stormwater to flow to new detention basins.**
5. **Place pedestrian walkway and channel together, between basins and densely planted buffer strips.**

The resulting layout for the full channel from Route 29 to the terminus at Woodstock Park is shown in red linework in Figure 64. The design establishes an alternative type of 'complete street'; one that accommodates a stream channel and stormwater as well as protected and permeable pedestrian circulation with integrated social spaces while still allowing two-way traffic to continue to use the road for access to residences and multi-family parking lots. The layout has a dual orientation, much as the existing built environment does. On one axis, the road winds along the historic stream channel. On the other, buildings are oriented to the transportation corridor of Route 29. In the proposed design, the road axis has planted levee strips that are oriented to the stream channel and road. On the building axis, shallow detention basins for stormwater are oriented and planted to the buildings and Route 29 corridor.

While the proposed layout restricts on street parking, only a total of four surface parking spaces have been removed from the large lots serving the apartment buildings to accommodate a detention basin at the intersection of 20th Street North and North Woodrow Street. On the opposite side of the street, single-family residences that have road frontage on 20th Street have curb cuts to allow for visitor parking. A layby has been provided where three different sidewalks provide egress from the apartment buildings. At the intersection with Route 29, the entrance slope provides accessible ramps decreasing the slope from over 10% to 8% or less. The ramp opens onto the Source Plaza where a fountain feeds the continuous flow stream from a settling cistern behind the existing retaining wall. At the intersections with North Woodrow Street and North Woodstock Street, the space is open with furnishings provided for socialization.

Figure 64 Proposed Layout Plan

The system of linear layers that make up the design are deconstructed in Figure 65. The layers include planting buffers, pedestrian path and open spaces, furnishings, a continuous flow stream channel, retaining walls and weirs that contain and slow the flow of the continuous stream channel, and detention basins that detain and slow the flow of stormwater from the northern areas between Route 29 and 20th Street North. One key design decision is to bring pedestrians close to the water channel by combining the pedestrian path and the channel in between the protective planting areas and basins that help to slow, detain, and infiltrate stormwater. Another key decision is to use part of the recovered space from the roadway, along with setbacks on the apartment building properties to create planted detention basins, shallow enough to be accessible when not inundated, in the existing open areas in front of the buildings. What emerges are semi-private front yards for the residents, cool in the summer and protected from traffic.

Figure 65 Proposed Layout Diagram

The architectural foundation of the planting scheme for the proposed design includes a selection of long-lived native canopy trees found in stream channels and natural river levees throughout the Piedmont Uplands and Northern Inner Piedmont ecoregions. The trees, highlighted in Figure 66, are planted to reinforce the dual orientation of the new layout toward both the historic stream channel and the buildings oriented toward Route 29. Platinus occidentalis (American Sycamore) are planted at 15' spacing within the roadway levee buffer strips, oriented along the access of the channel. Quercus bicolor (Swamp White Oak) are planted at 20' spacing in the detention basin levee strips, oriented along the axis of the apartment buildings and Route 29 above. At the entrance from Route 29 to the center of the Source Plaza Fountain, fragrant Sassafras albidum (Sassafras) line the ramped sidewalk and provide a unique and rare sighting of a native tree not often experienced in the area anymore but which provides abundant fruit for resident birds wintering over.

Figure 66 Planting Layout

Proposed Tree Plantings

Platinus occidentalis

Quercus bicolor

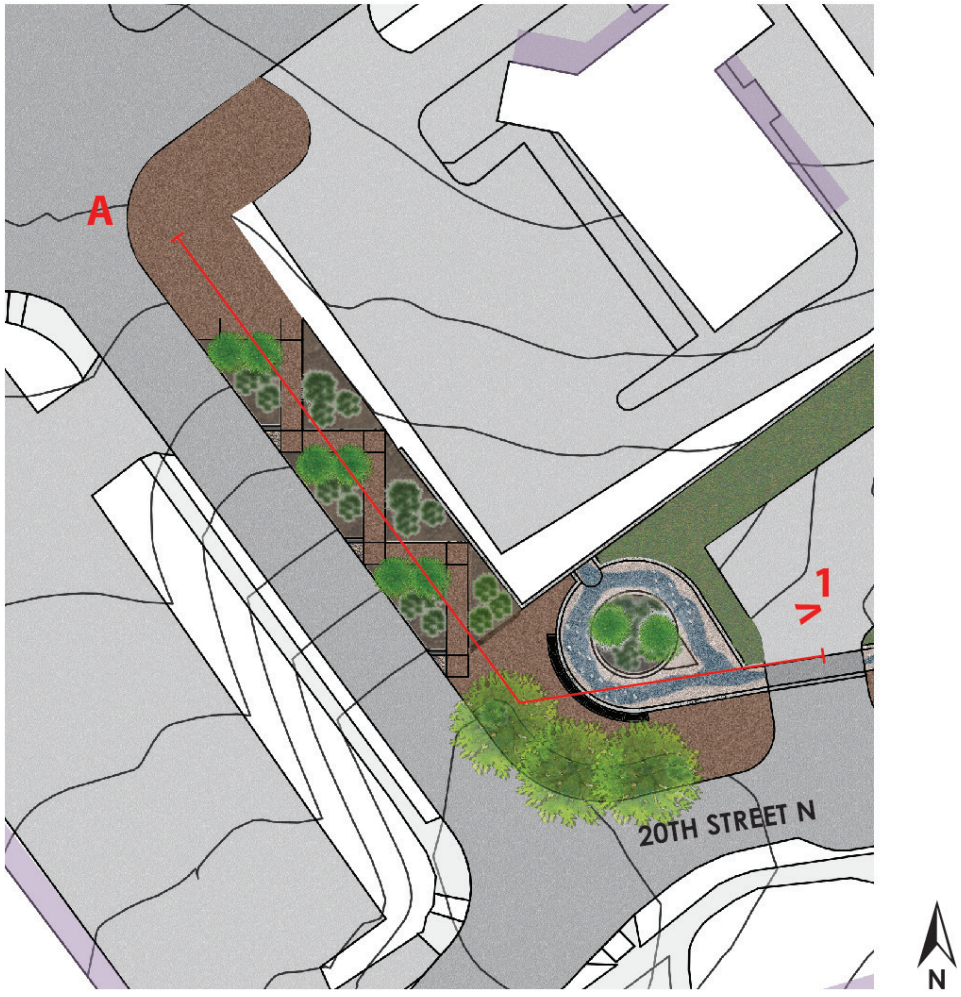
Sassafras albidum

Figure 67 Tree Planting Recommendations Tree Species. (n.d.). Retrieved from https://caseytrees.org/tree-species/

Design Closeup: Spout Run Source Plaza

The central feature of the Spout Run Source Plaza is a fountain where water, diverted from the continuous flow inside the storm sewer, is released from a settling cistern behind the retaining wall. The fountain provides an element of sound and air conditioning as it cascades down in the protected space below the 10' wall. The location provides prospect for users down the street and channel toward Woodstock Park and a view up to Route 29, while at the same time being protected from the rush of heavy traffic. The entrance ramps leading from Route 29 down to the plaza on the north side playfully zigzag through planting areas with native grasses and fragrant Sassafras trees. At the bottom of the ramp the plaza opens to the sound of the fountain under the shade of the Sycamore trees.

Spout Run Source Plaza



Plan Enlargement

Figure 68 Plan Enlargement - Spout Run Source Plaza

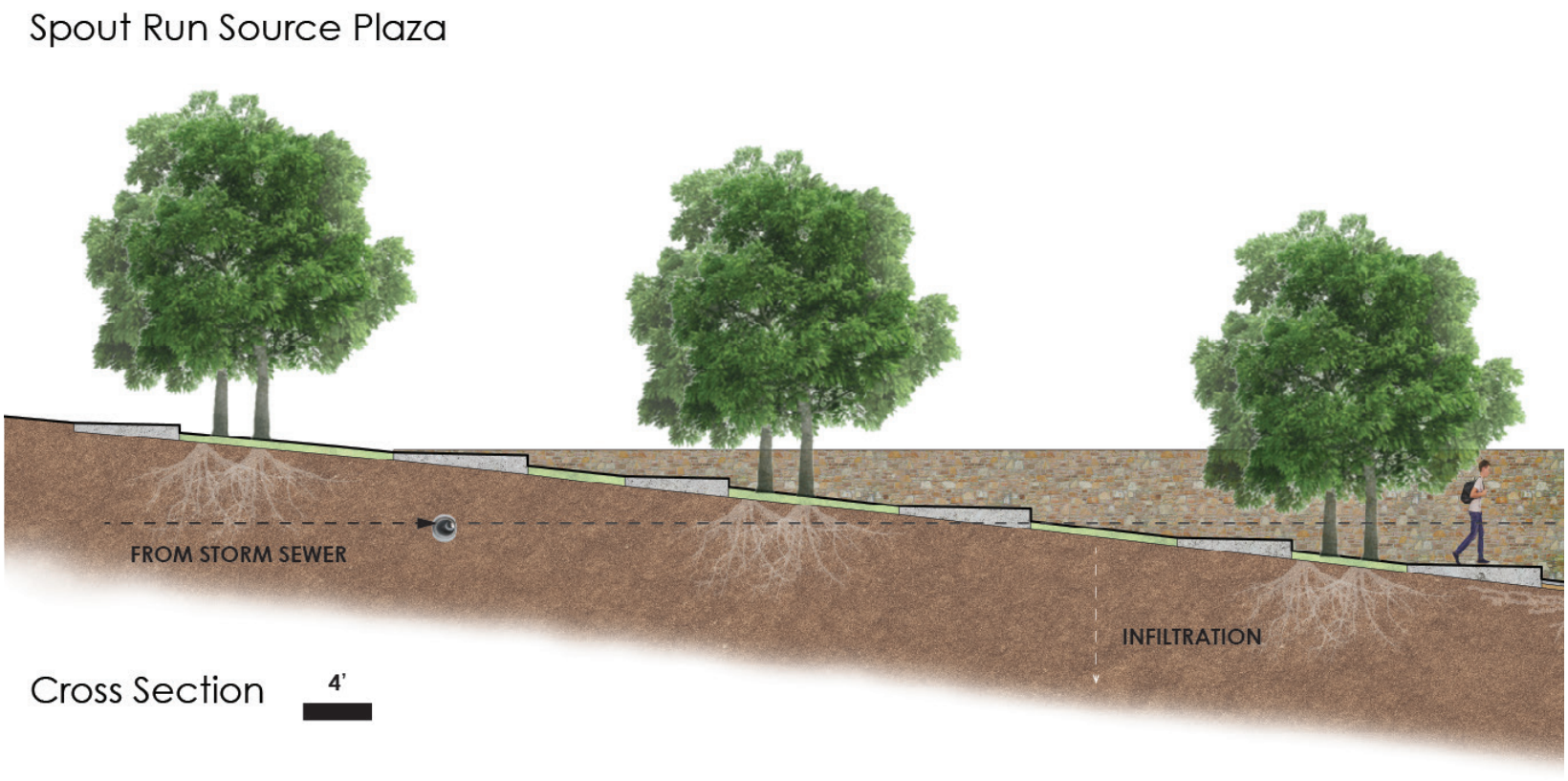
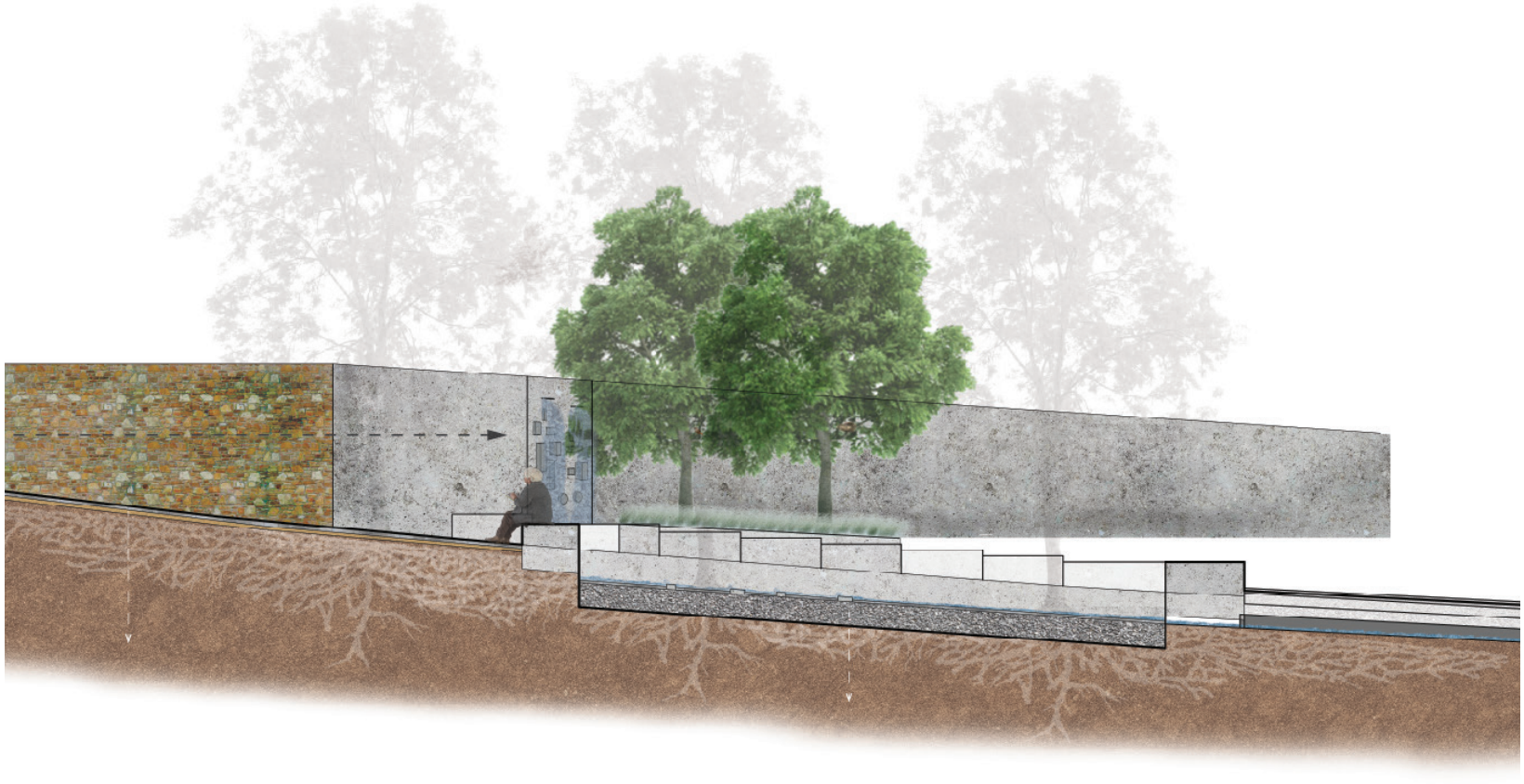


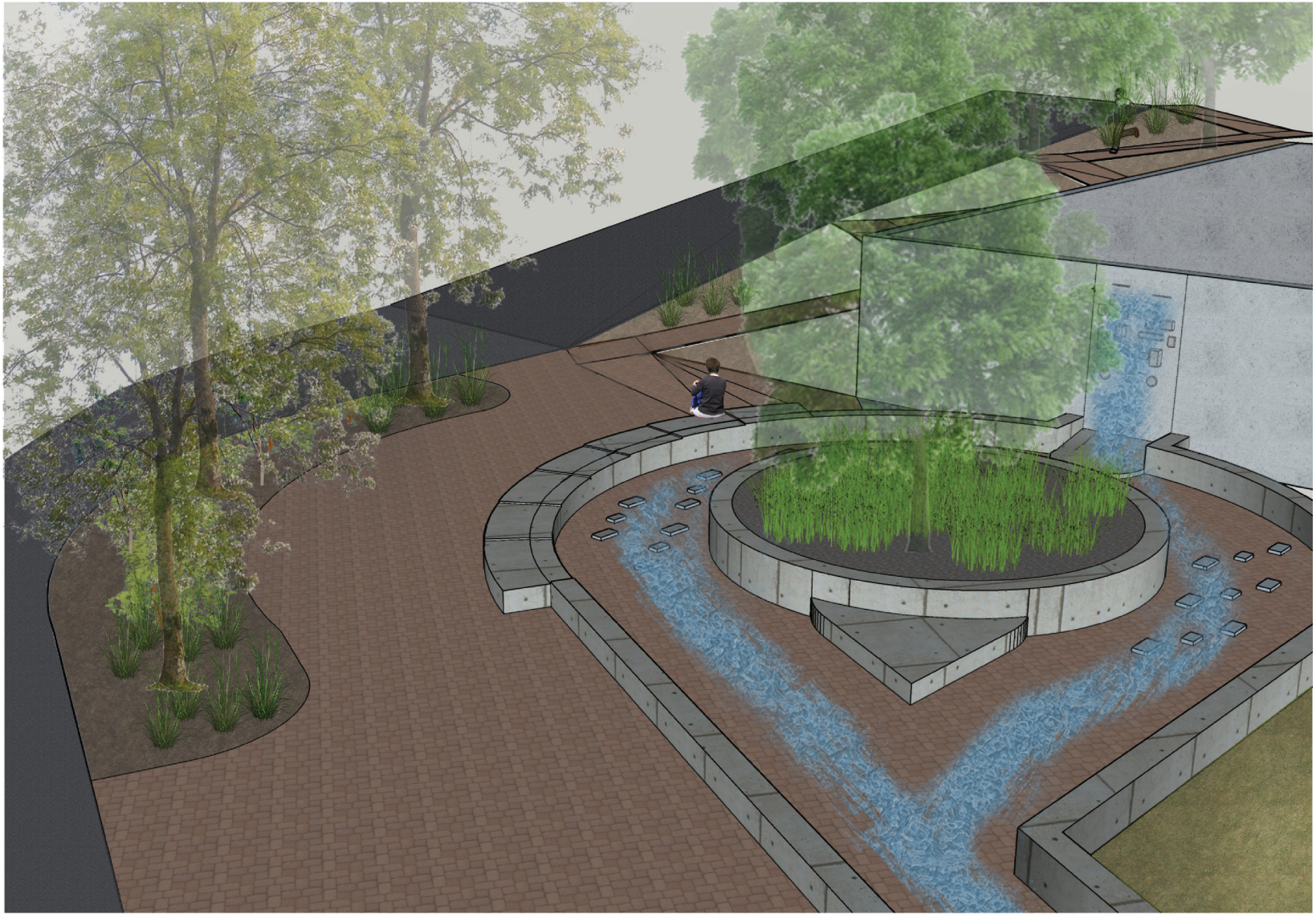
Figure 69 Cross Section A - Spout Run Source Plaza

The fountain is contained within 18" tiered retaining walls that follow the shallow slope of the channel, with seating on the 20th Street North side. The fountain separates pedestrians from the adjacent apartment parking lot, while a wide expanse of paving provides space for movement and lingering separated from traffic by the planted levee strip along the street. Paving here, and continuing down the extent of the site, is proposed to be permeable unit pavers for both the pedestrian pathway and the continuous flow stream channel to allow for maximum potential infiltration of water flowing across the surface, feeding the roots of the trees below.



The circular fountain provides a planting zone in the middle with a 7-foot “moat” around which the waters flow. The design discourages feral and outdoor cats from disturbing birds that may choose to nest within the branches of the Sassafras trees. At the same time, the design spreads the water widely to encourage pedestrians to venture in on hot days.

Spout Run Source Plaza



Modeled Perspective

Figure 70 Modeled Perspective View 1 - Spout Run Source Plaza

Design Closeup: Spout Run Headwaters Detention Basins

Along the path of the channel, custom detention basins take the form of the environment around them to create an opportunity for private enjoyment of the outdoors for apartment residents. At the same time, the basins also detain and infiltrate the first ½ inch of rain that falls on the surrounding areas. Space for mowed turf is maintained for picnicking, and furnishings are provided beyond the edge of a planted levee strip helping to slow and filter water as it enters the basin.

Figure 71 Plan Enlargement - Spout Run Headwaters Detention Basins

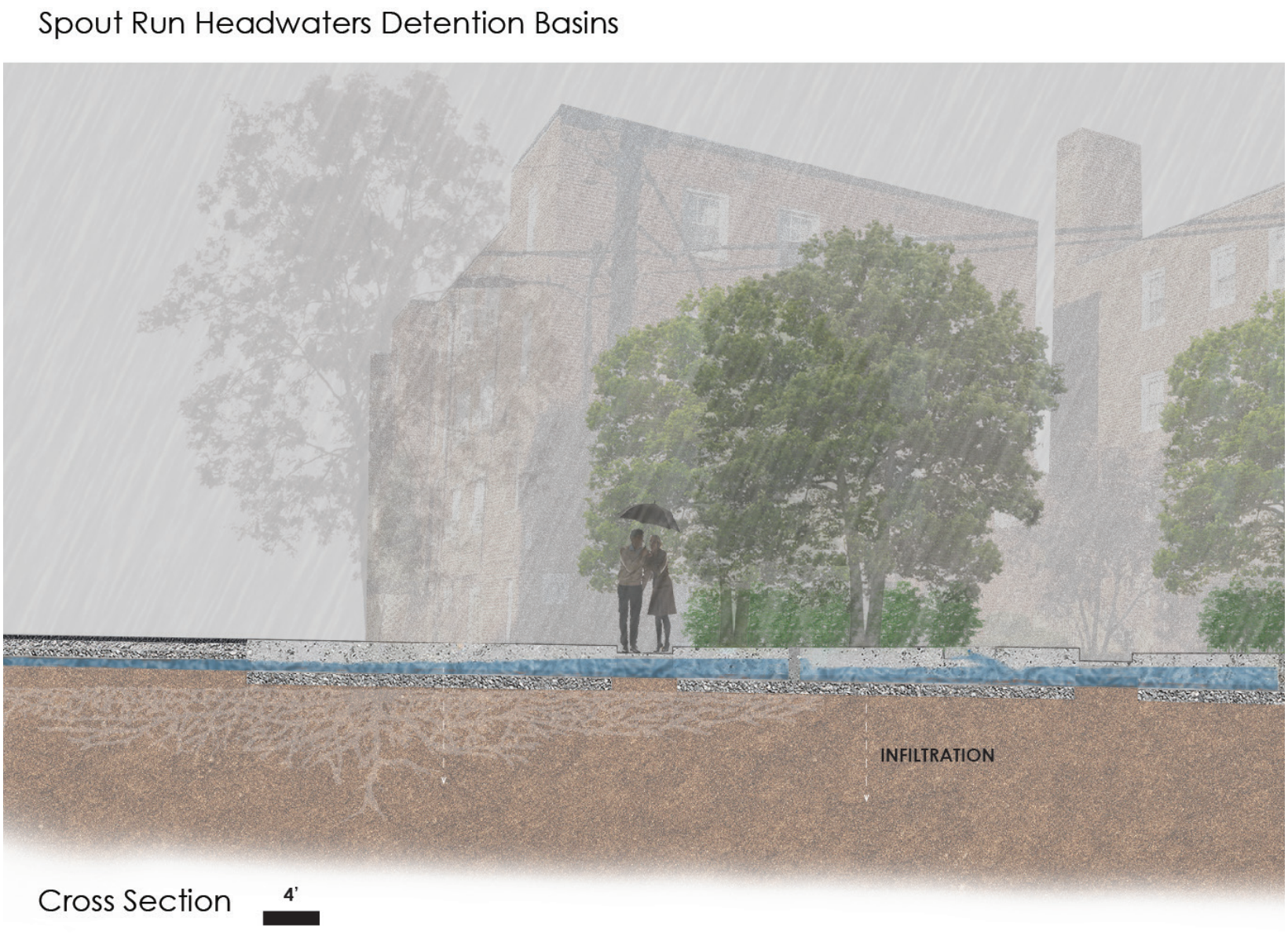


Figure 72 Cross Section B - Spout Run Headwaters Detention Basins

Retaining walls run along the length of the north side of the channel, beginning near grade and rising against the existing topography to where they reach a maximum of 18 inches above-grade. At the point where the basin location ends, a retaining wall arm extends perpendicularly to form the basin itself. While this creates the necessary detention areas on one side of the wall, it also creates an interesting structural feature that highlights the steady topographical flow of the channel toward the terminus with emphasis at the basins. The height is chosen to allow the structures to be accessible for play and exploration, without posing high risk. The walls could be higher, and the basins could be cut, or a combination of both to increase the capacity of each. However, the design intent is to create an infrastructure that is at the same time functional for the natural system as well as relatable and accessible for the people who live here.

Figure 73 Modeled Perspective View 2 - Spout Run Headwaters Detention Basins

Water is captured at an angle to the stream channel, using the form of the properties oriented toward the buildings which are in turn oriented to Route 29. Therefore, as water is captured in the basins, it's form mimics the building alignment. Overflow from the basins is metered through a drain hole that shifts the water to its new course down the channel. The south side of the stream channel is combined with the north side of the pedestrian path using an 18-inch step down into the channel. The design further encourages access and exploration, and hopefully a sense of heightened awareness and shared responsibility toward the water.

Proposed Shrub and Groundcover Plantings

Lindera benzoin

Aronia arbutifolia

Carex vulpinoidea

In addition to the trees planted throughout the proposed site, additional understory and shrub plantings are suggested within both the levee strip along the roadway and the detention basins themselves. Within the roadway planting strip and the levee strip bordering the basins, Lindera benzoin (Spicebush) are recommended to create a dense understory fill along with naturalizing Carex vulpinoidea (Fox Sedge) as a groundcover. Both are native to wet areas in local forests, and the Spicebush provides additional berries for wildlife. Within the basins themselves, it is recommended to plant Aronia arbutifolia (Red Chokeberry) and allow large thickets to naturalize with maintenance to include pruning enough for access paths to the basin outlets.

Figure 74 Shrub and Groundcover Planting Recommendations
Spicebush. (n.d.). Retrieved from http://nursery.dnr.maryland.gov/product-p/spicebush.htm
Brilliant Red Chokeberry. (n.d.). Retrieved from https://www.monrovia.com/plant-catalog/plants/111/brilliant-red-chokeberry/
(https://www.northcreeknurseries.com), N. C. N. (n.d.). Carex vulpinoidea. Retrieved from https://www.northcreeknurseries.com/plantName/Carex-vulpinoidea-

Design Closeup: Spout Run Headwaters Terminus at Woodstock Park

The stream channel surfaces from under North Woodstock Street and enters the open space and hillside adjacent to Woodstock Park. It cascades through a series of detention basins with outlets that meter the flow under non-storm conditions. Under storm conditions, the basins fill and overflow in series until the basin at the bottom of the hill overflows into a sewer inlet. The design of the basins is intended to allow for continued use of the space for other activities, including sledding on either side, while creating a new feature that is of a scale that it is safe to be explored.

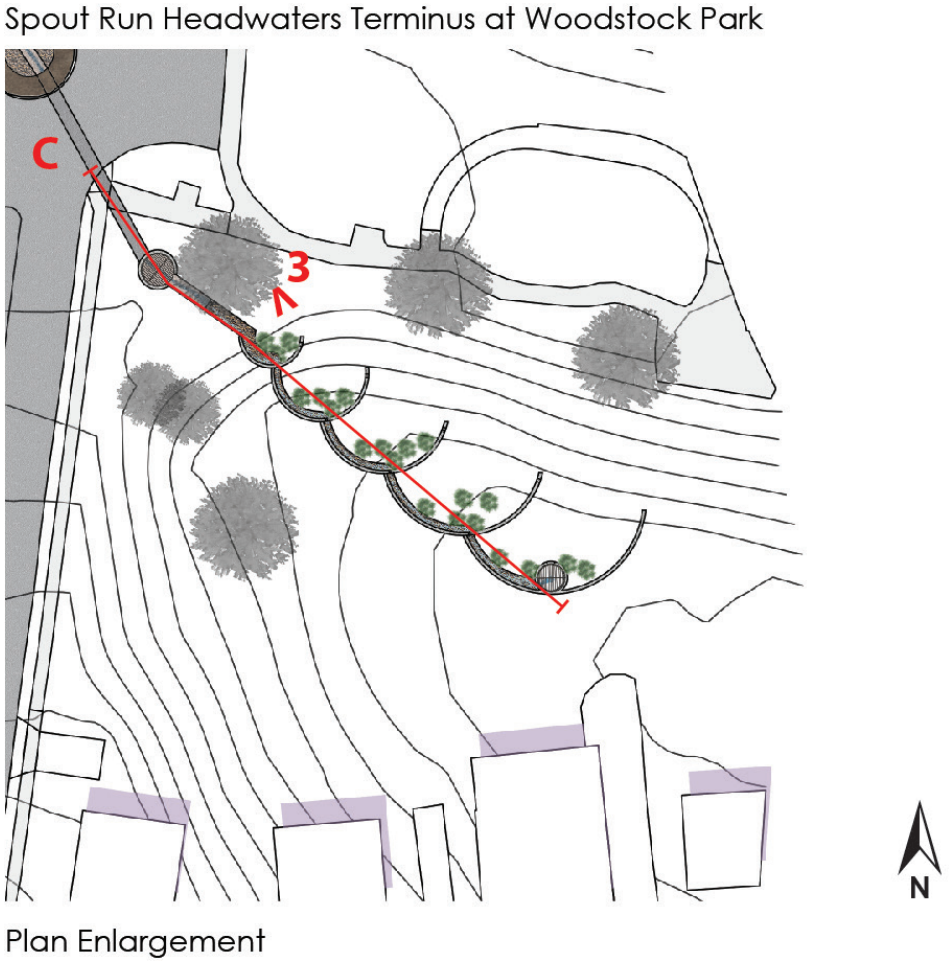


Figure 75 Plan Enlargement - Spout Run Headwaters Terminus at Woodstock Park

Spout Run Headwaters Terminus at Woodstock Park

Modeled Perspective

Figure 76 Modeled Perspective View 3 - Spout Run Headwaters Terminus at Woodstock Park

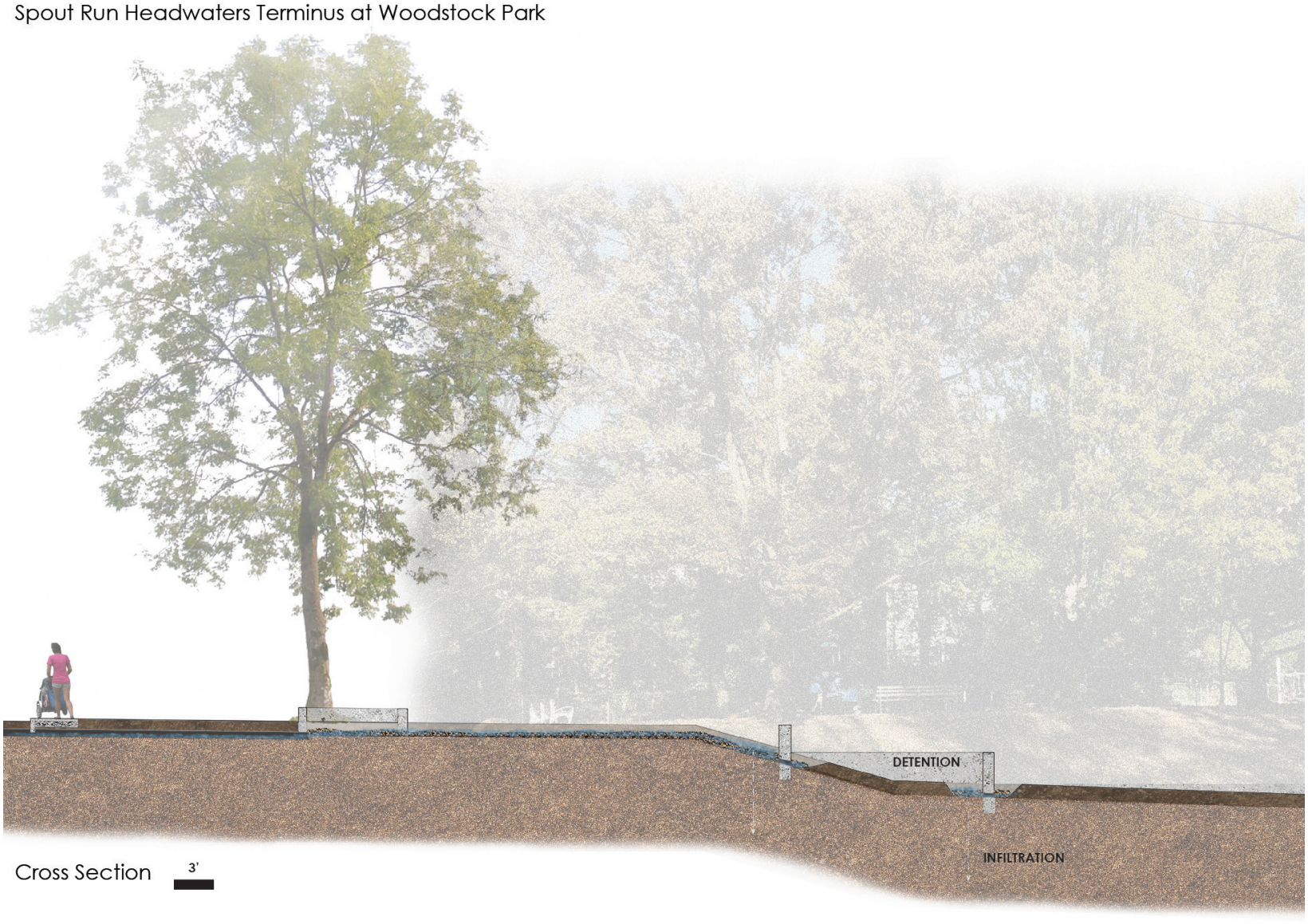


Figure 77 Cross Section C -Spout Run Headwaters Terminus at Woodstock Park

The basins are designed so that the height of the highest retaining wall is no more than 3.5 feet where the slope of the hillside is steepest. As with the basins in the channel above, the scale is intended to be functional and accessible, not industrial. The orientation of the basins is toward the park, facing away from the single-family residential properties. The intention is to bring a sense of control and safety to management of the stormwater, rather than allowing it to flow across the full hillside and continue to erode.

The critical design feature of the terminus is that here, the continuous flow channel and the detention basins come together before finally re-entering the existing stormwater sewer infrastructure. Rather than attempting to create a single, possibly higher capacity basin within which to capture stormwater, the series of basins is intended to be inspiring and to invoke shallow cascading waterfalls in local woodlands.

By decommissioning certain storm sewer inlets within the stream channel corridor, stormwater from the land area served by those inlets can be diverted to the detention basins along the north side of the channel as well as the series of basins at the terminus. As a supplemental system, these basins, combined with the others higher in the channel, help to increase the relative capacity of the existing stormwater sewers to handle more runoff from areas downstream where flooding is known to occur. The series of basins at the terminus provide the bulk of the capacity. All taken together, the capacity of the basins is found to be more than what is required to detain the first ½ inch of rain that falls in the commercial and multi-family living areas to the north of the channel.

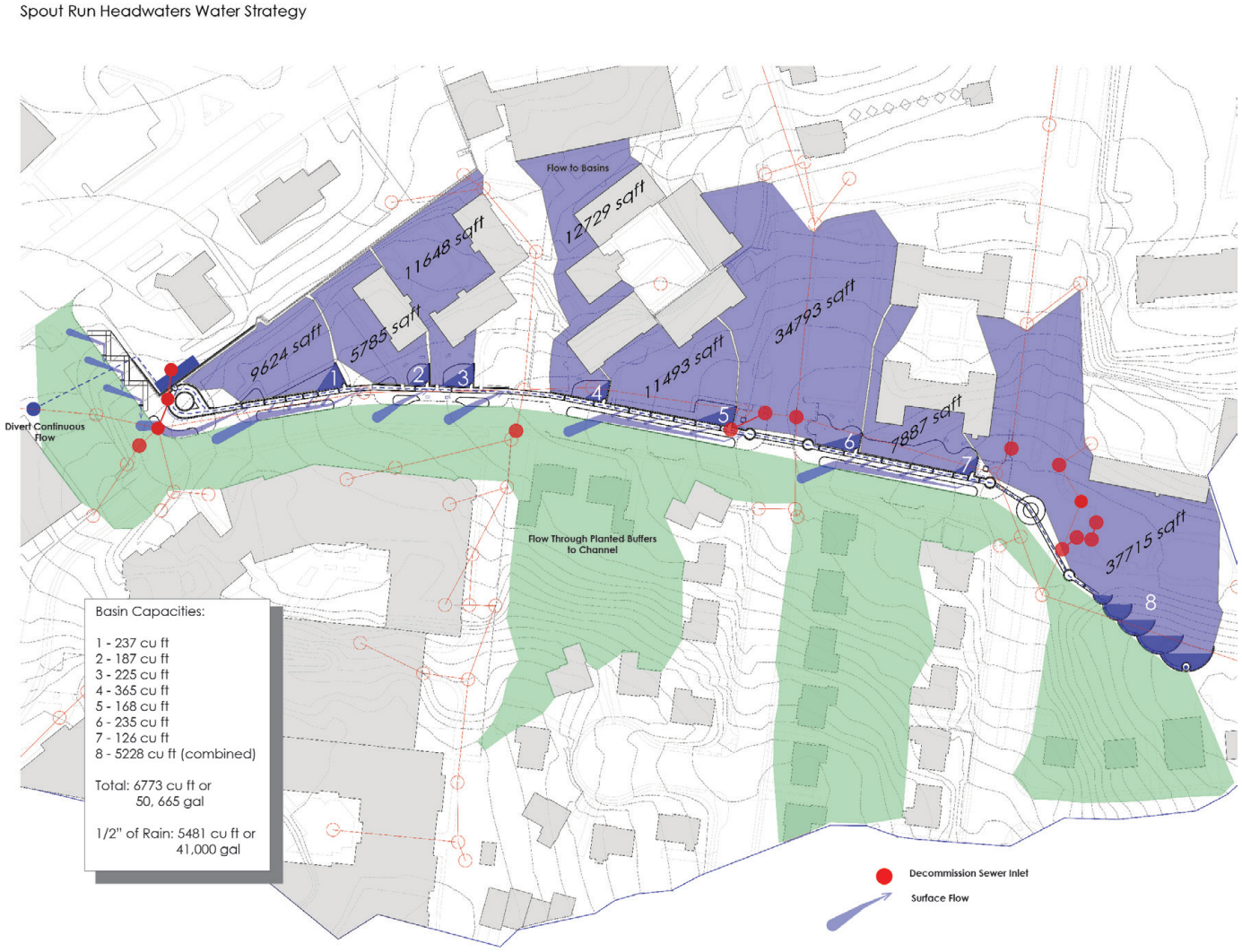


Figure 78 Spout Run Headwaters Water Strategy

Conclusions and Closing Thoughts

The premise of this project was that it is possible to apply landscape-based design approaches to redevelopment occurring in and around densifying areas in the country and, through design, show how these approaches can help define and better integrate a specific place with it's natural and built environs. The simple conclusion is that this premise proved correct within the context of the development corridors in Virginia just outside Washington D.C., and therefore, likely to be true in other metropolitan areas as well. In a few lucky places, some integrity in the natural systems has been maintained where our urban living areas overlap. In other places, a bit more investment can bring what is partially preserved fully into the service of the local ecology and the people of the community. It is those places where only the faintest of whispers of the ecological legacy of a place can still be heard where it is most important to take an initial step toward letting the landscape speak again.

In the case of the Headwaters Plateau and Spout Run Gap at Route 29 in Arlington VA, the ecological legacy under the surface of the development stretches far beyond the contours of the hills and the consciousness of most residents. While it is imminently important to bring this legacy back to life and into awareness, it is not necessary or possible to rezone large swaths of existing housing or commercial areas to carve out what might ideally be imagined as large 'open space'. Where available, preservation and conservation of remaining lands are important. But, where the layers of our history in a place have accumulated into densifying development, finding creative ways to make space where there seemingly is none becomes the critical task.

It is entirely possible that larger plots of adjacent land including the surface parking lots that take up so much of the space within the stream channel will eventually no longer be necessary. These can be aggregated over time, negotiated between landowners and public agencies in a process of reverse development. This may help in adding to the space available within the stream corridor for both enjoyment and for ecological health. Beyond the stream channel, the plateau is full of similar opportunities to help the landscape perform its historic function. It is possible that these opportunities begin to take hold of the community's imagination once the possibilities and benefits are known; and even smaller changes like the proposal in this project are the first step in igniting those sparks. To be sure, that process is less likely to ever take place where it is needed if the voice of the landscape is not reasserted on some level, before new layers of development forever quiet the whispers of what once was.

Regarding the form of the design devised for this project, it is of course but one of an infinite number of possibilities. What the project shows is that two things are of considerable importance, regardless of any final design form. First, that an intervention is appropriate here. The history of settlement is unique, and the location of this historic stream feature happens to be at a place where integration of people and of land uses is needed. Stark separation of zones, with populations staring across barren streetscapes at each other and imagining cross purposes is not what is needed in our communities. Integrative development, where soft boundaries of shared and unique places provide for both coming together and being apart in peace, is what is needed. The second important consideration is that form can, and should, arise from aspects that are unique to the place as it already is. The landscape and the built environment have had a hand in shaping the other, and multiple generations of people have come to know the place as it is. It is fine and interesting to see the ways in which this has happened through historical research, but it can be enriching to the continuing lives of the people and the space they inhabit to reinforce these aspects further through deliberate design. In doing so, unique forms, and perhaps more importantly, unique connections, can emerge that you would not find anywhere else in the world except right there at that site. Clearing the slate and implementing boilerplate solutions accomplishes function but does so without the potential to create the spark needed for people to love a place and connect, whether consciously or subconsciously, with the people they share it with.

Figure 79 Shared Spark of Unique Places – Sketch by Author

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Appendix A: Design Concept Sketches

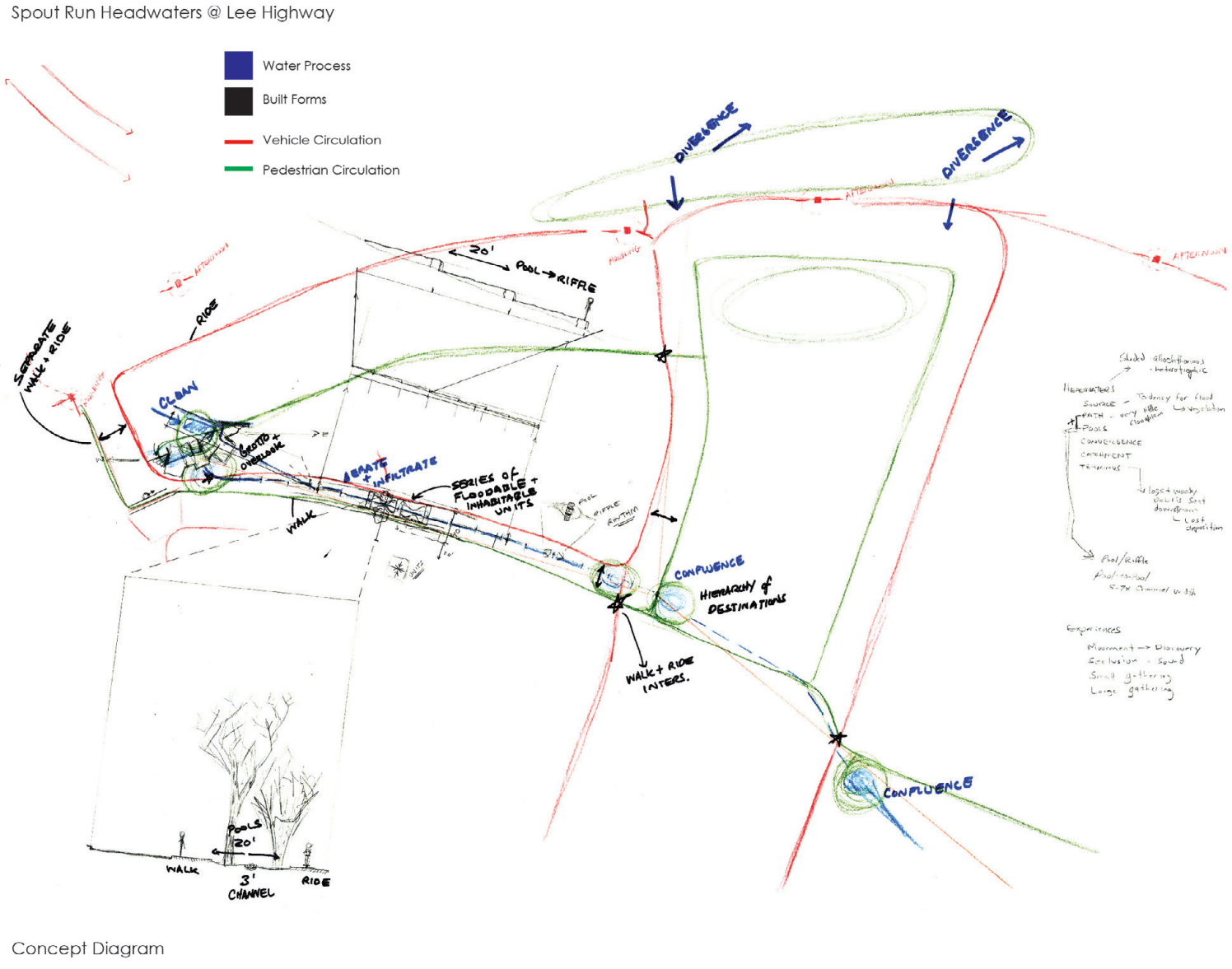


Figure 80 Spout Run Headwaters Channel Concept Diagram

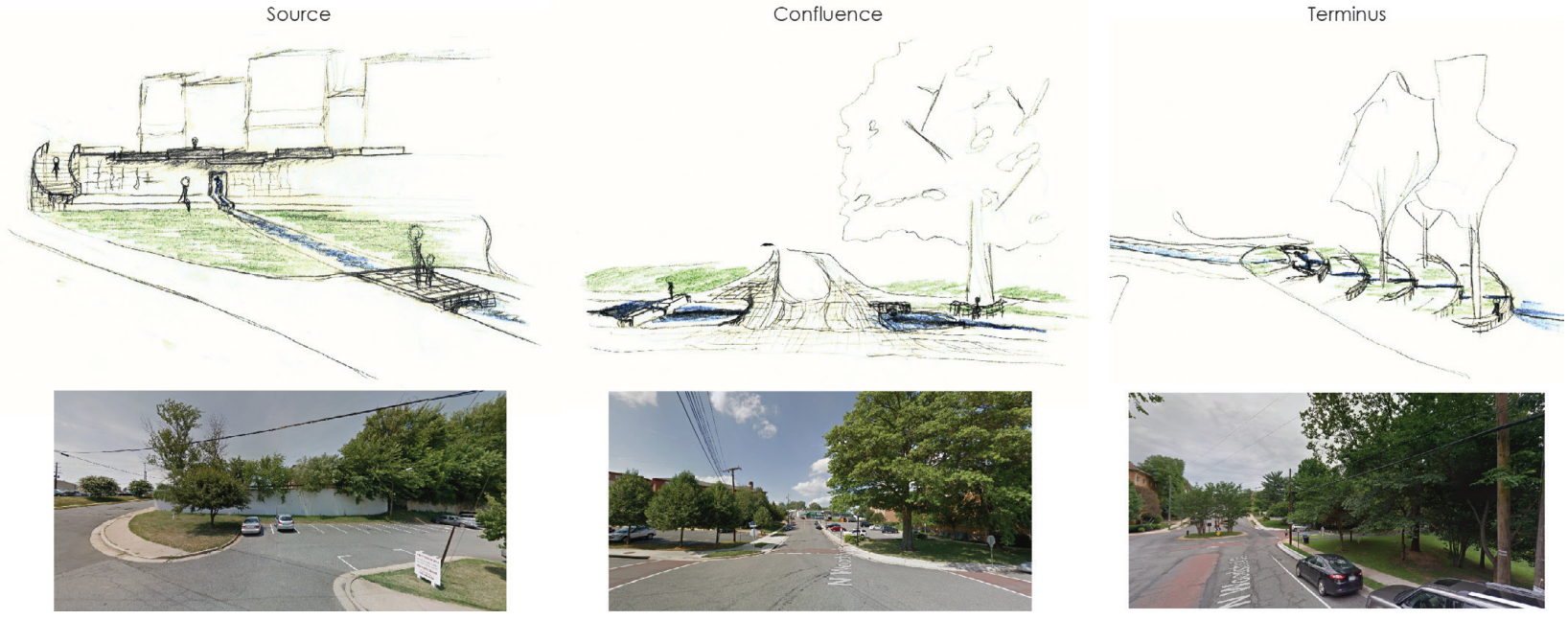


Figure 81 Spout Run Headwaters Concept Sketches - Source, Confluence Intersection, Terminus

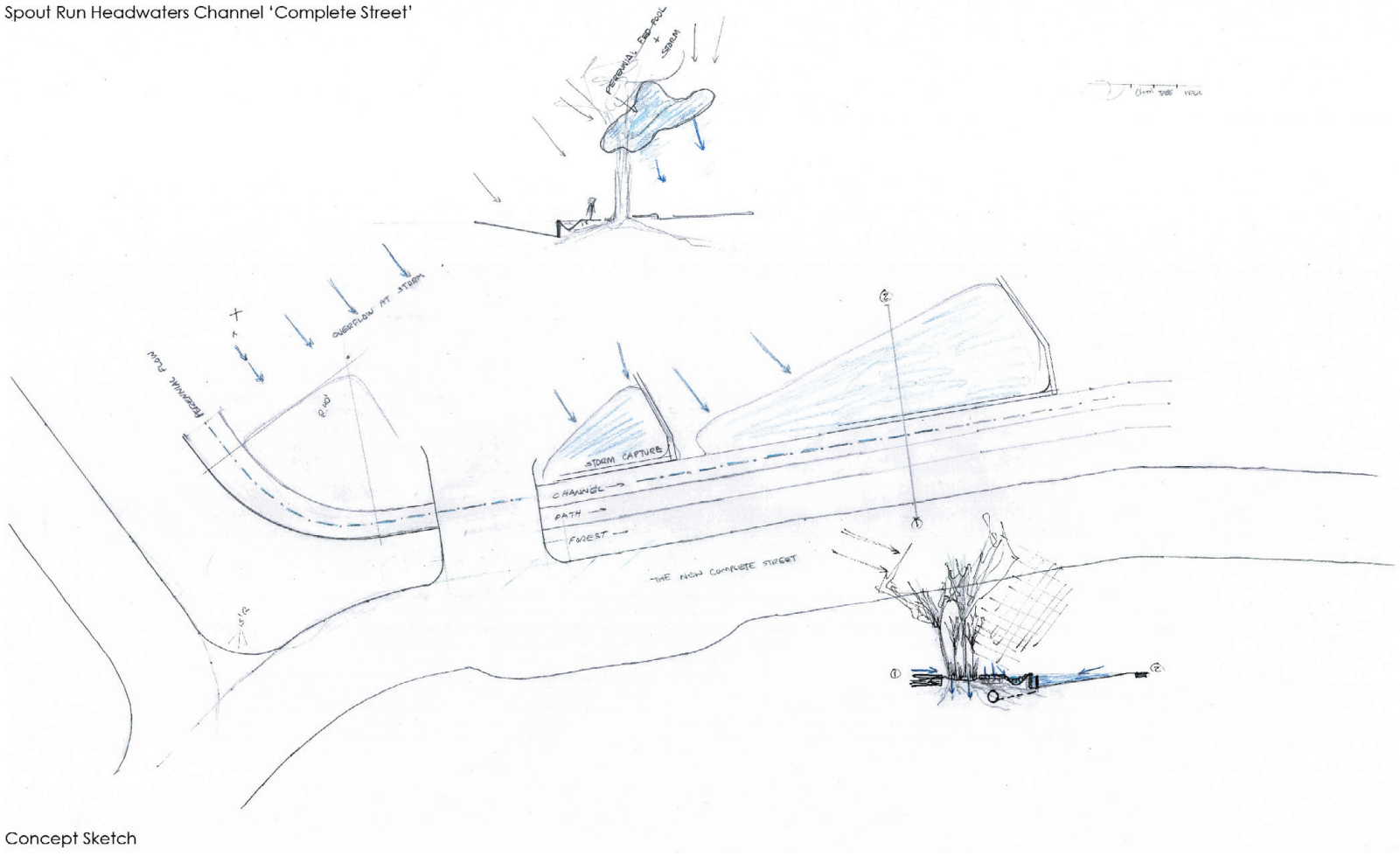
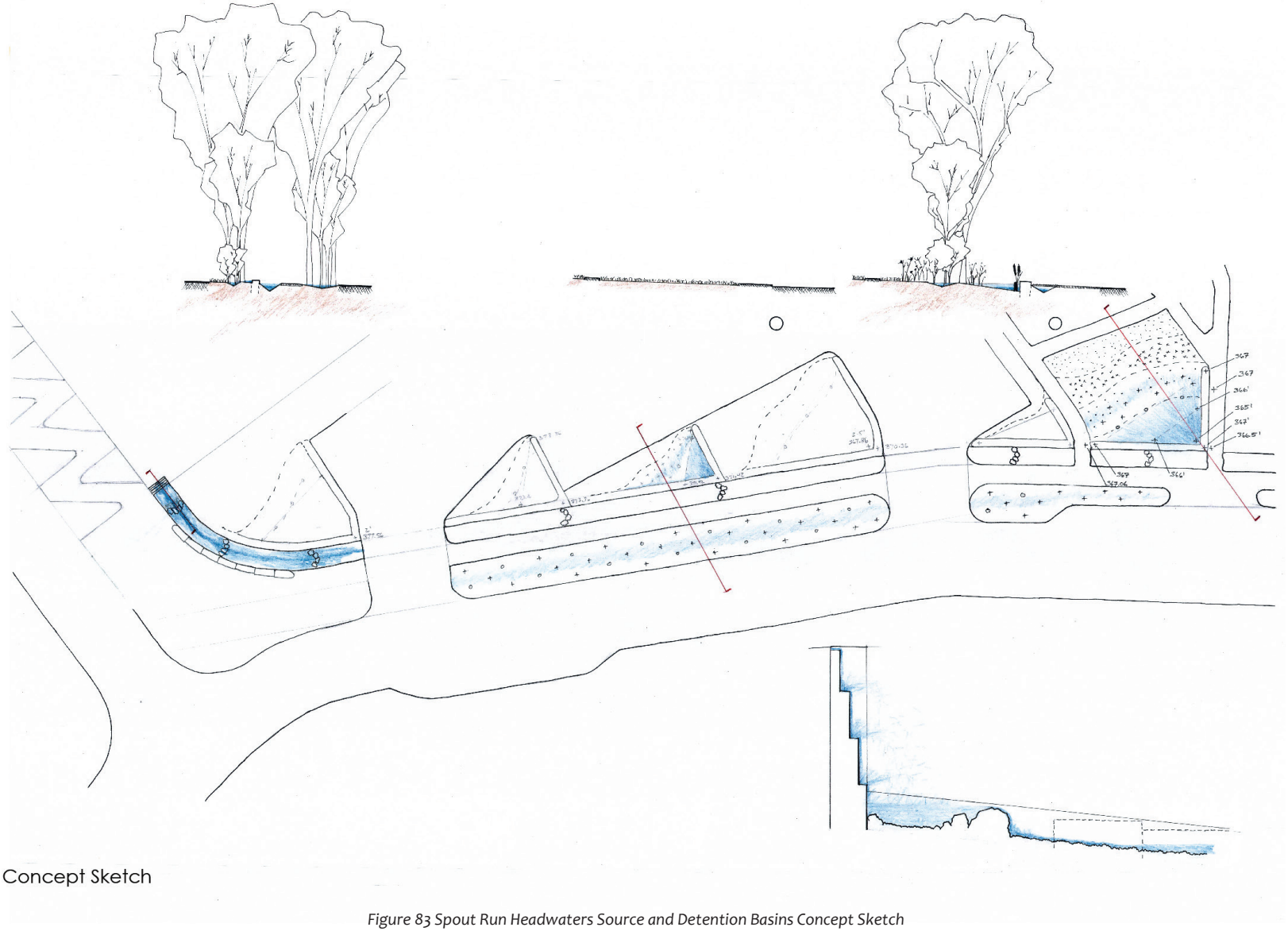


Figure 82 Spout Run Headwaters 'Complete Street' Layout Concept Sketch

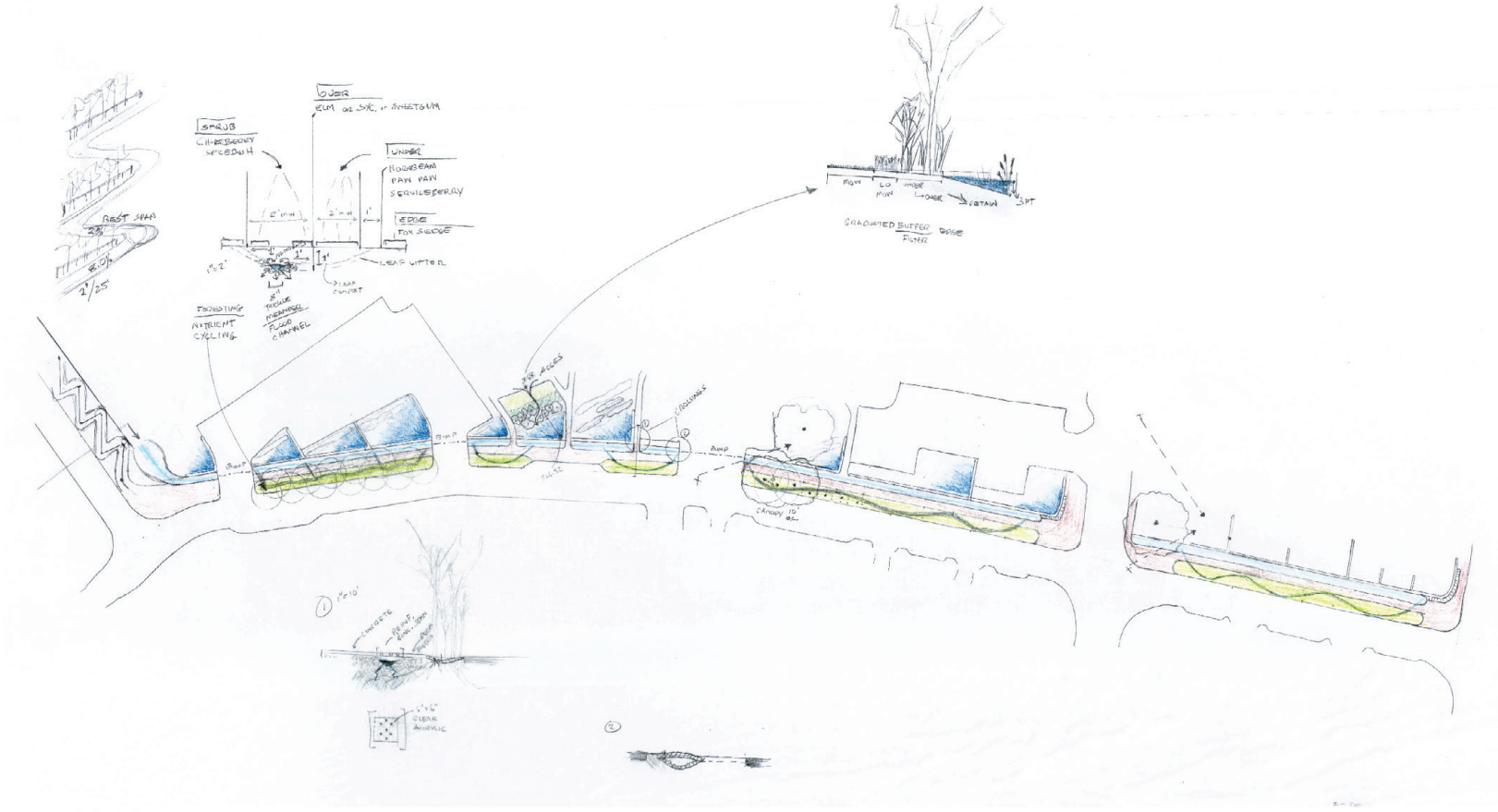
Spout Run Headwaters Source and Detention Basins



Concept Sketch

Figure 83 Spout Run Headwaters Source and Detention Basins Concept Sketch

Spout Run Headwaters Core Channel



Concept Sketch

Figure 84 Spout Run Headwaters Core Channel Concept Sketch