

Path to Flood Resilience West Columbia Pike

Flood Resilient Arlington

October 5, 2022



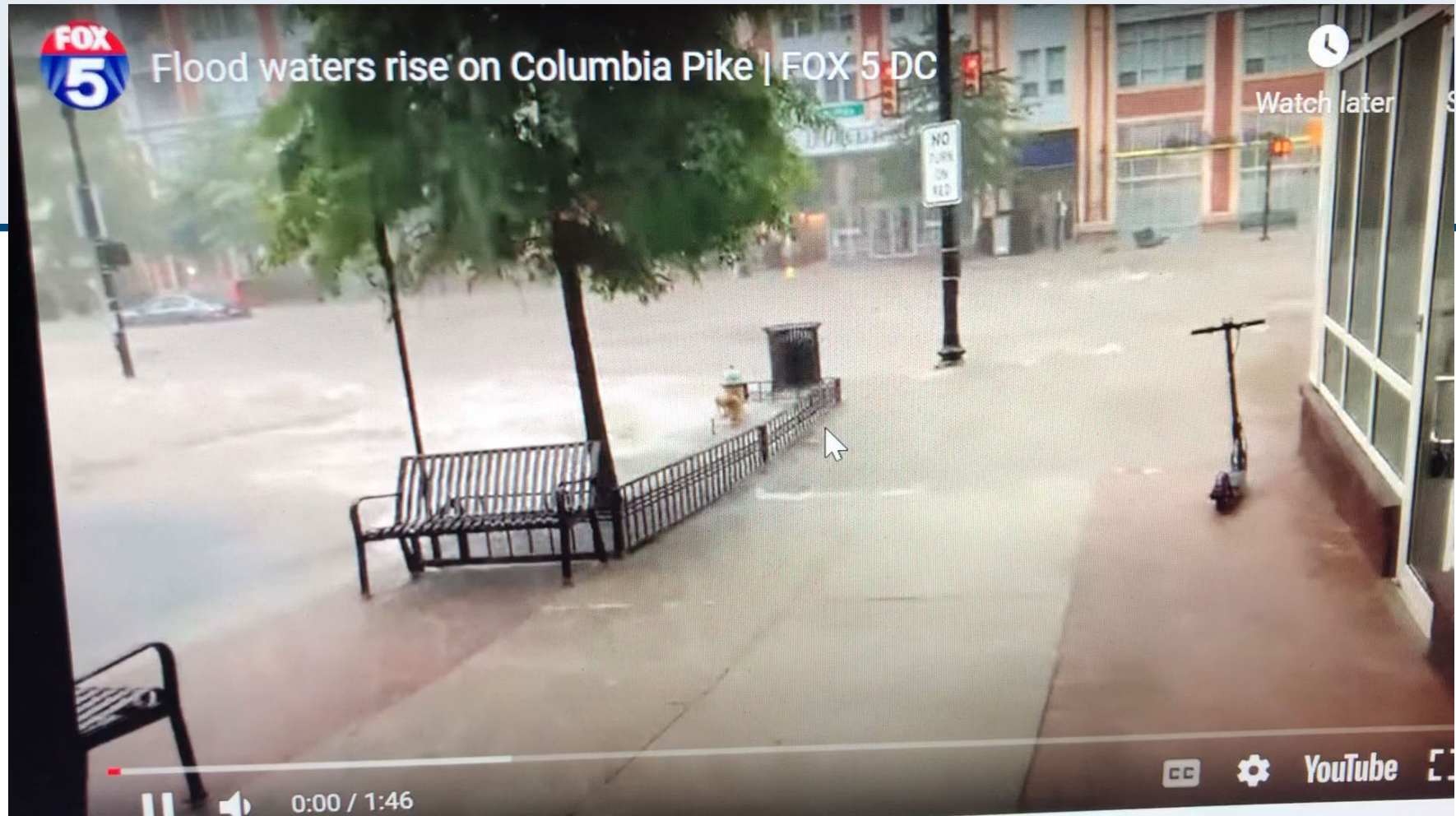
ARLINGTON
VIRGINIA



Agenda

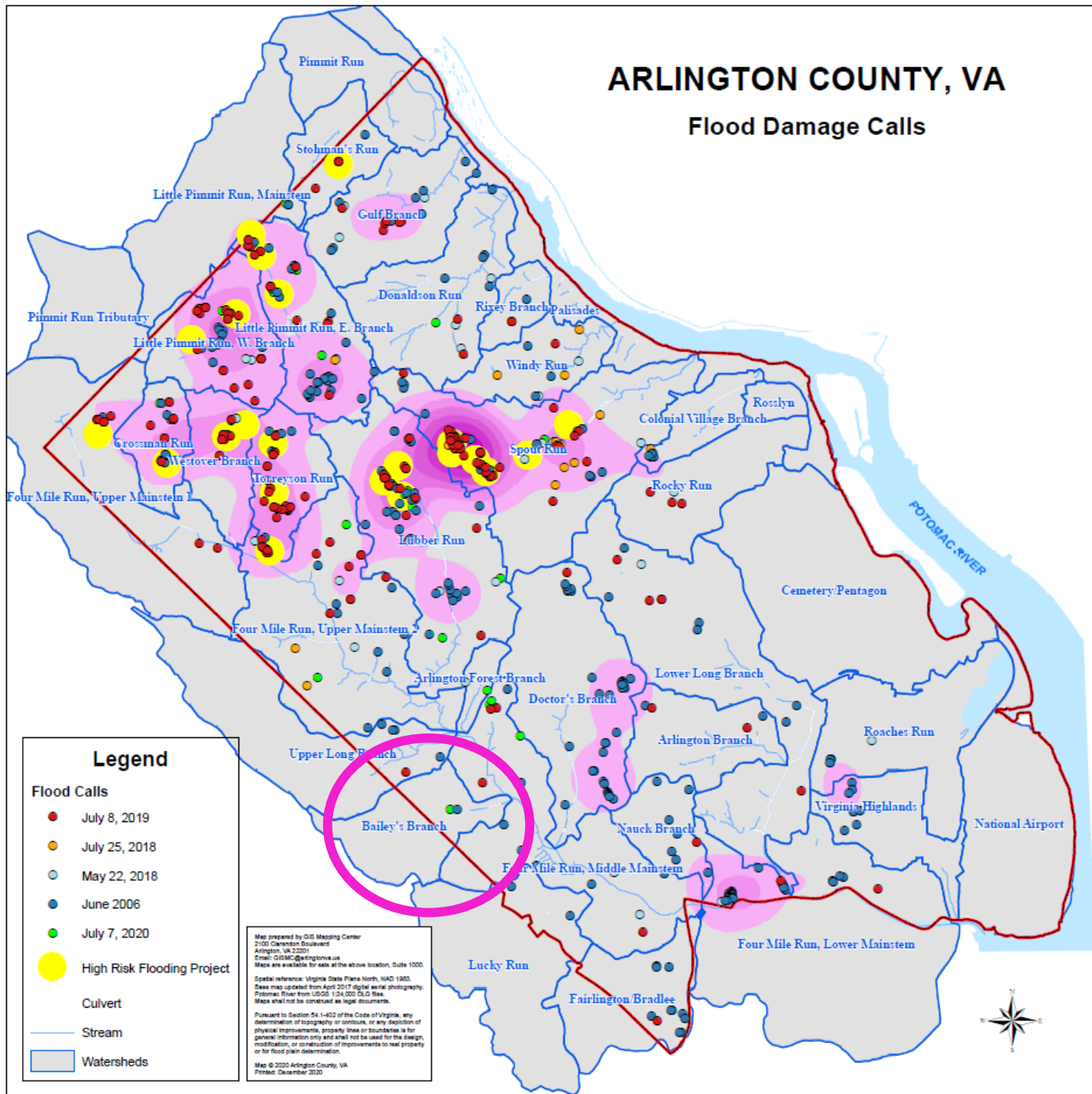
- Why are we having this discussion?
- Flood Resilient Arlington
- Resilience
- Causes of Flooding and Overland Relief
- Progress since last meeting
- CIP Funding
- Discussion of Conceptual Design Options
- Brief Updates on other Initiatives
- Questions



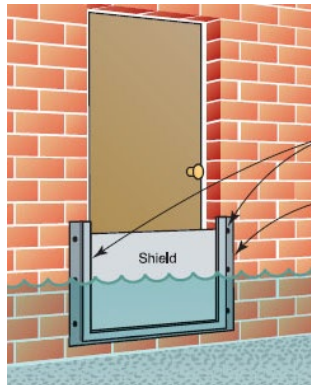


- Reminder for why we are having this Discussion – video of flooding in the intersection of Columbia Pike at S. Greenbrier St.
- In addition to the street flooding, buildings were also flooded.

Note: Bailey's Branch is not one of the 5 critical watersheds, but the severity of the flooding in the intersection of Columbia Pike and S. Greenbrier St. has caused the County to prioritize the area for storm drainage improvements plus a high-water detection system (discussed later in the presentation).



Key Elements of Flood Resilient Arlington



Analytics and Data Assessment

New Types and Locations for Capacity Projects

Increased Stormwater Requirements

Increased Funding

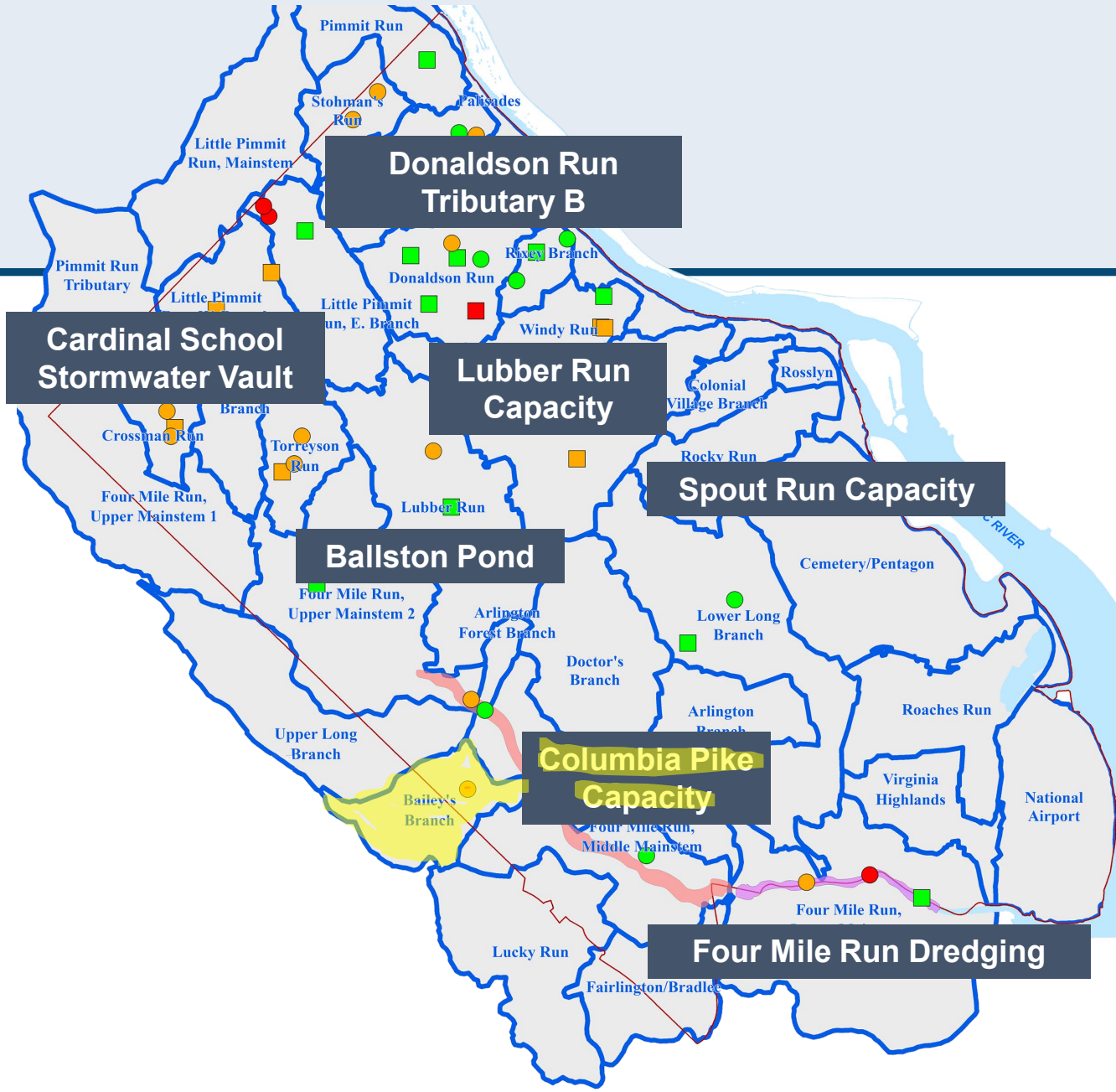
Voluntary Property Acquisition

Floodproofing Outreach

Mapping Program Investments

Legend

- Watersheds
- Storm Water Management Projects**
- Program / Status**
- Capacity Complete / Under Construction
- Capacity / Planned
- Maintenance Capital / Complete
- Maintenance Capital / Planned
- Water Quality / Complete
- Water Quality / Planned
- Past Storm Water Management Initiatives**
- Flood Control 1984
- Flood Plain Aquisition 60's-70's
- Other Map Elements**
- County Line
- Potomac River



County Watersheds

ARLINGTON COUNTY, VIRGINIA Watersheds

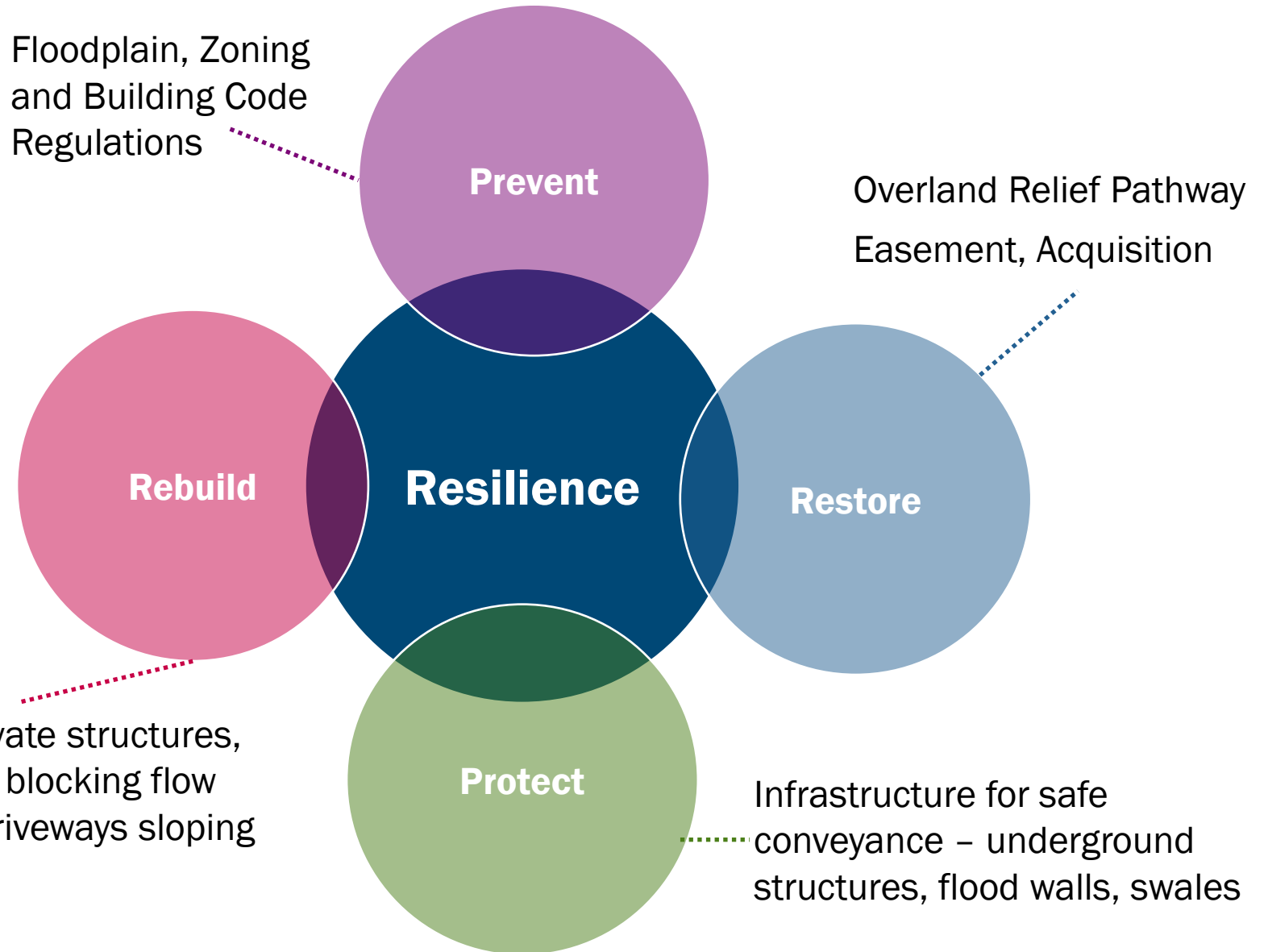
Legend

- Watershed Boundary
- Stream and Open Channels
- Landmark Buildings
- Major Roads
- Potomac River
- County Line

★ Target program areas for Capacity Improvements program



Balancing Stormwater Priorities and Issues



The Stormwater Team is working on all of these priorities and has multiple initiatives underway

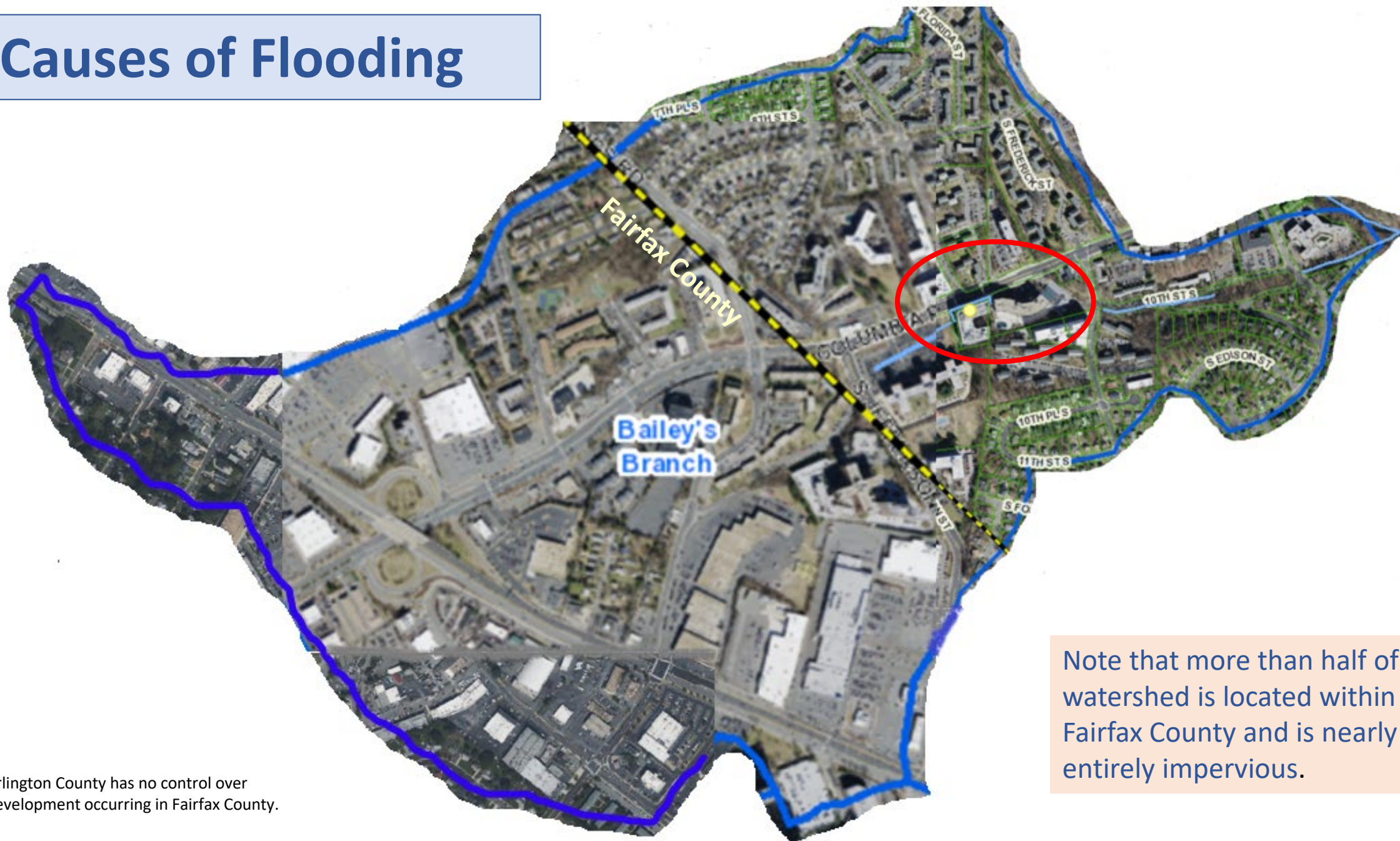


Some properties are at a higher risk of flooding due to their location in former stream valleys.

Causes of Flooding

- During Arlington's early development, there were no stormwater management regulations, and standards for storm systems were less rigorous than today.
- Streams were buried in stormwater pipes and homes and businesses were built within the former floodplains.
- Given the low topography in these former stream valleys, these areas remain at higher risk of flooding despite the presence of the underground stormwater pipes.

Causes of Flooding



Arlington County has no control over development occurring in Fairfax County.

Note that more than half of the watershed is located within Fairfax County and is nearly entirely impervious.

Stormwater System Design Standards and Overland Relief

- Over time, the US government has collected rainfall data. This database of storm events is used to define the likelihood of a storm occurring.
- The 10-year storm is defined as having a 10% chance of happening each year, 100-year storm a 1% chance.
- Currently, stormwater systems are designed for a 10-year storm, with the assumption that there is overland relief present for larger storms.
- Overland relief is a safe pathway for stormwater to flow for storms greater than the 10-year storm.



Goal = 10-Year storm + Overland Relief

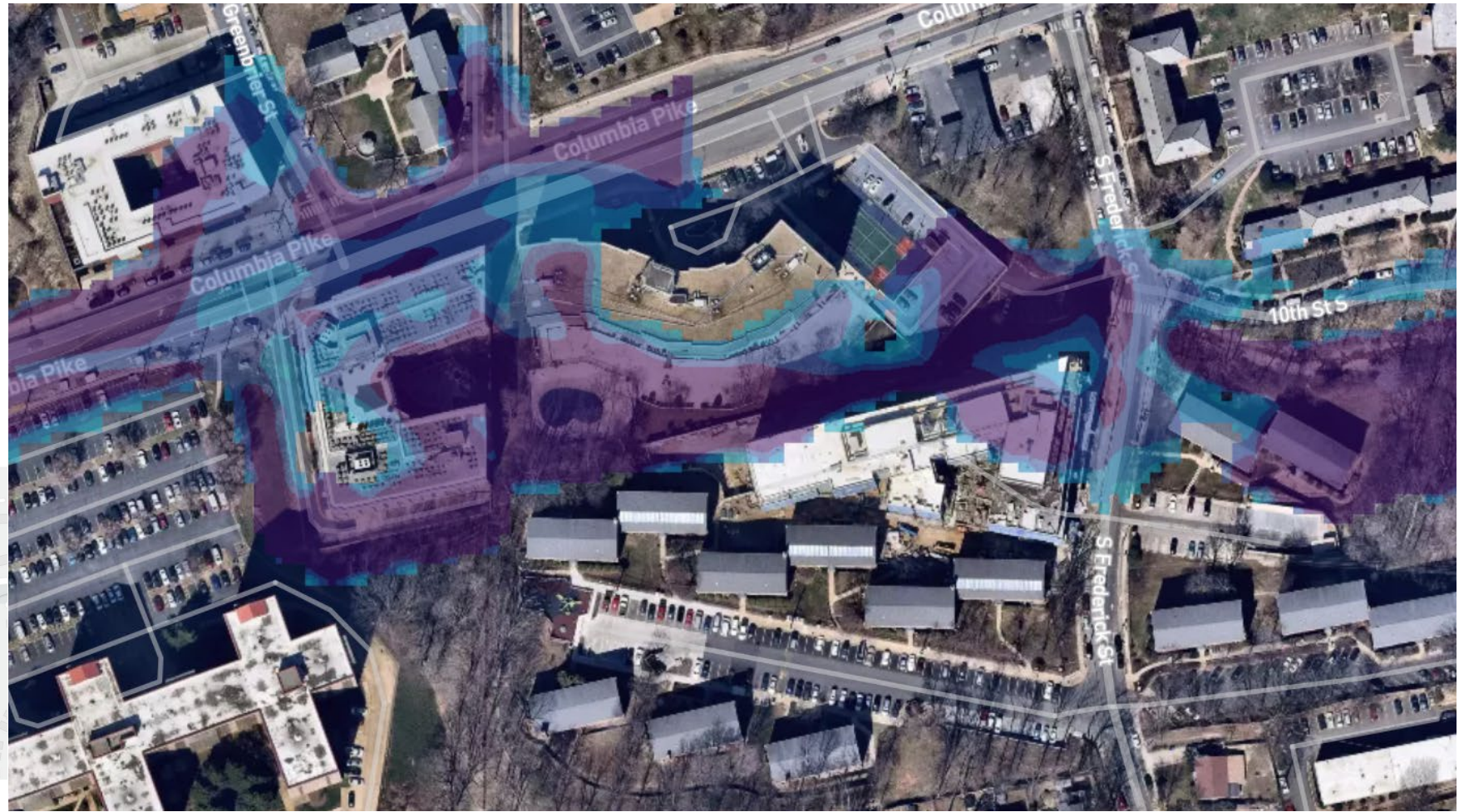
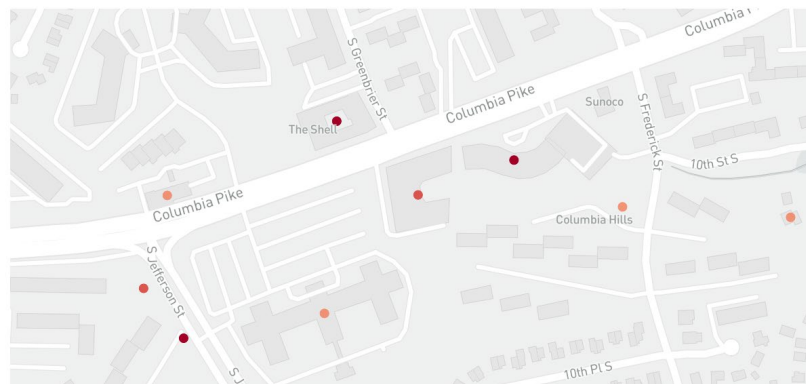
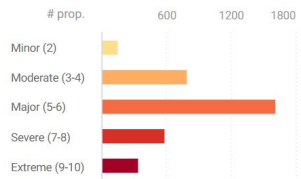
Overland relief does not exist for this area!
This area will always have some flood risk.

Know Your Flood Risk

Filter properties by Flood Factor:

- All
- Minimal (1)
- Minor (2)
- Moderate (3-4)
- Major (5-6)
- Severe (7-8)
- Extreme (9-10)

Distribution of properties at risk in Arlington County



[Riskfactor.com](https://www.riskfactor.com)

Riskfactor.com provides risk assessment information to the public and is being promoted by major real estate listing websites such as Redfin, Zillow, etc.

Progress since November 8, 2021 Meeting



- Secured substantial CIP funding – see next slide on CIP funding
- Developed PCSWMM model of entire watershed
- Included area in RAMP
- Initiated Conceptual Study of watershed options
 - Still working on technical challenges
- Cost analysis of options not completed yet



CIP Funding for Columbia Pike @ Greenbrier

Adopted FY 23 – FY 32 CIP

10 YEAR CATEGORY SUMMARY (in \$1,000s)

	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	10 Year Total
4. Columbia Pike at Greenbrier	1,300	1,155	775	8,240	4,770	0	0	0	0	0	16,240

Note that this FY is for design work, which is on-going.

Note: The proposed level of funding for this projects begins to approach the funding levels for stormwater that sister jurisdictions already provide.

Options for Bailey's Branch

PROPOSED SHORT TERM SOLUTION

PURPOSE:
INSTALL ADDITIONAL CURB INLETS TO INTERCEPT STORMWATER

BENEFITS:

STORMWATER ENTERS THE SYSTEM EARLIER, PROVIDING RELIEF FOR EXISTING SUMP STRUCTURES LOCATED AT THE INTERSECTION OF GREENBRIER AND COLUMBIA PIKE

REDUCE THE AMOUNT OF CARRYOVER FLOW THAT ULTIMATELY FLOWS TO THE INTERSECTION OF GREENBRIER AND COLUMBIA PIKE

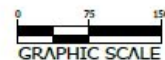
POTENTIAL ISSUES:

EXISTING UNDERGROUND UTILITIES MAY LIMIT THE LOCATION OF PROPOSED INLETS

EXACT LOCATIONS MAY CAUSE DAMAGE TO EXISTING TREES AND LANDSCAPES

DOES NOT ADDRESS HGL ISSUES

★ PROPOSED LOCATIONS OF INLETS



Option 1: Add Inlet Capacity

- Can be accomplished short term
- Should reduce nuisance flooding from smaller storms by intercepting stormwater sooner, so that it cannot run downhill and pond in the intersection.
- Will not address pipe capacity or overland relief

PROPOSED SHORT TERM SOLUTION

PURPOSE:
INSTALL ADDITIONAL CURB INLETS TO INTERCEPT STORMWATER

BENEFITS:

STORMWATER ENTERS THE SYSTEM EARLIER, PROVIDING RELIEF FOR EXISTING SUMP STRUCTURES LOCATED AT THE INTERSECTION OF GREENBRIER AND COLUMBIA PIKE

REDUCE THE AMOUNT OF CARRYOVER FLOW THAT ULTIMATELY FLOWS TO THE INTERSECTION OF GREENBRIER AND COLUMBIA PIKE

POTENTIAL ISSUES:

EXISTING UNDERGROUND UTILITIES MAY LIMIT THE LOCATION OF PROPOSED INLETS

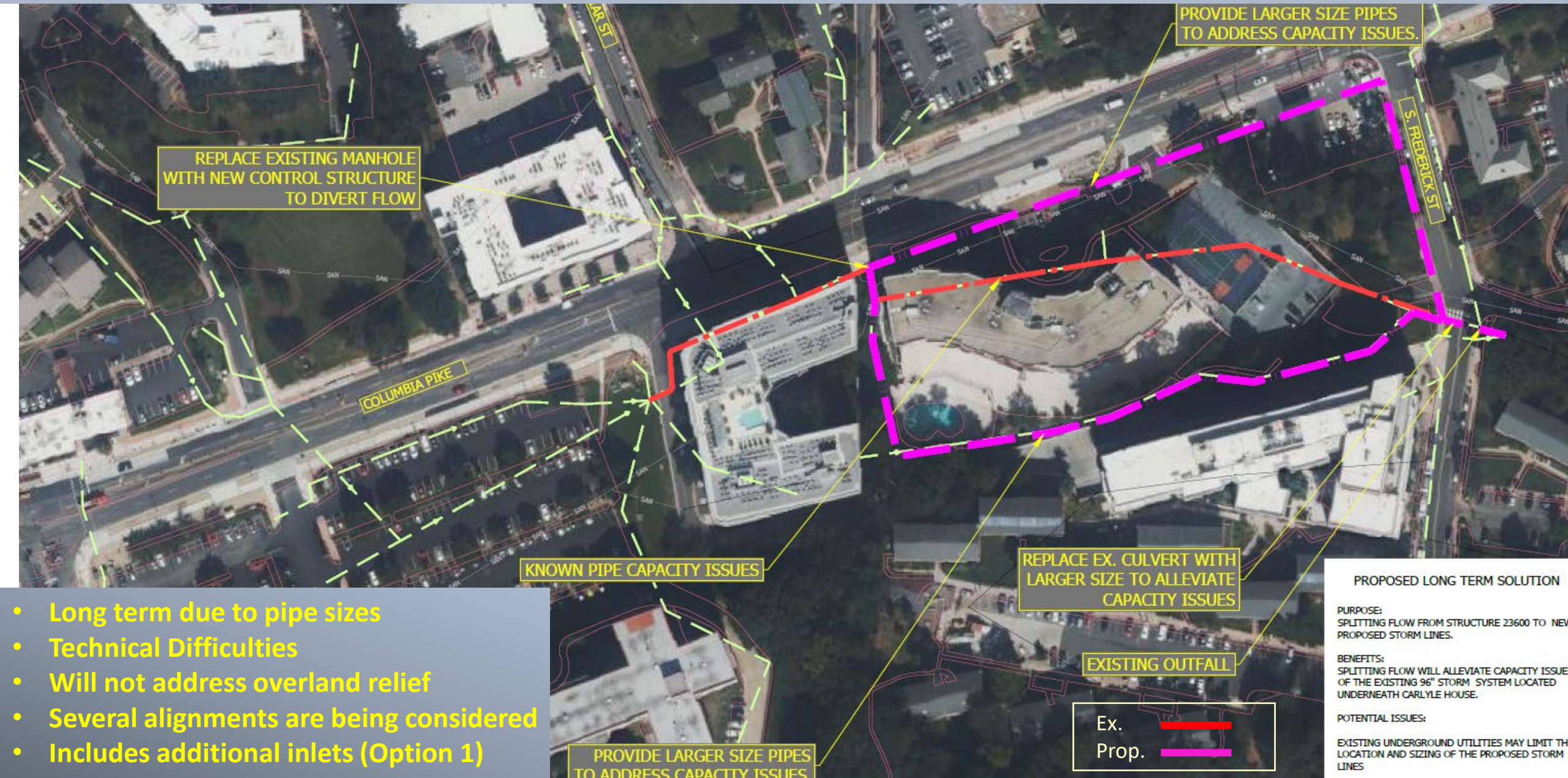
EXACT LOCATIONS MAY CAUSE DAMAGE TO EXISTING TREES AND LANDSCAPES

DOES NOT ADDRESS HGL ISSUES

★ PROPOSED LOCATIONS OF INLETS

0 75 150
GRAPHIC SCALE

Option 2: Reroute Storm Drains



- Long term due to pipe sizes
- Technical Difficulties
- Will not address overland relief
- Several alignments are being considered
- Includes additional inlets (Option 1)

PROPOSED LONG TERM SOLUTION

PURPOSE:
SPLITTING FLOW FROM STRUCTURE 23600 TO NEW PROPOSED STORM LINES.

BENEFITS:
SPLITTING FLOW WILL ALLEVIATE CAPACITY ISSUE OF THE EXISTING 96" STORM SYSTEM LOCATED UNDERNEATH CARLYLE HOUSE.

POTENTIAL ISSUES:
EXISTING UNDERGROUND UTILITIES MAY LIMIT THE LOCATION AND SIZING OF THE PROPOSED STORM LINES

Option 3: Looking for Suitable Sites for Upstream Detention

- Long term solution due to sizes required
- Extremely limited locations (no public spaces)
- Most locations are Privately owned
- Would Require Permission from Property Owners
- No contact with any owners to date
- Will not address overland relief
- Includes Option 1 inlets

Note Amount of Impervious area in the Upstream watershed located in Fairfax County

Arlington has no control over development in Fairfax County.



Option 4: Combination = Inlets + Pipe Upgrades + Detention

- Long term solution due to sizes required
- Extremely limited locations (no public spaces)
- Most locations are Privately owned
- Would Require Permission from Property Owners
- No contact with any owners to date
- Will not address overland relief
- Includes Option 1 inlets



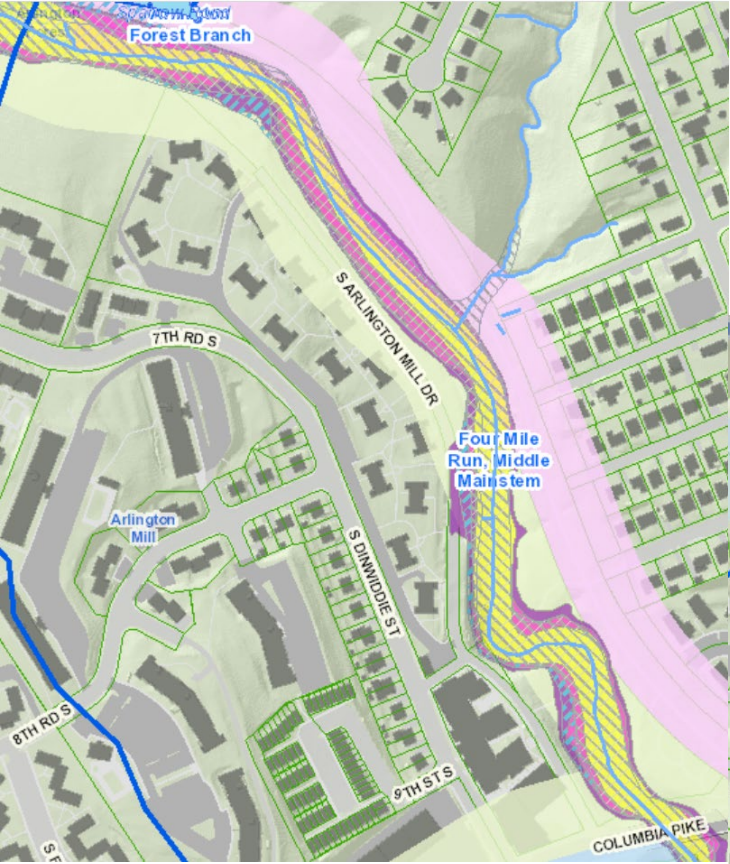
Updates on Other Stormwater Initiatives

- FEMA FIRM update
- Arlington County Floodplain Ordinance update
- Stormwater Utility Update
- RAMP update
- High Water Detection Sensors
- LDA 2.0
- Zoning Study
- Flood Resilient Design and Construction Manual



FEMA Floodplain Map Update

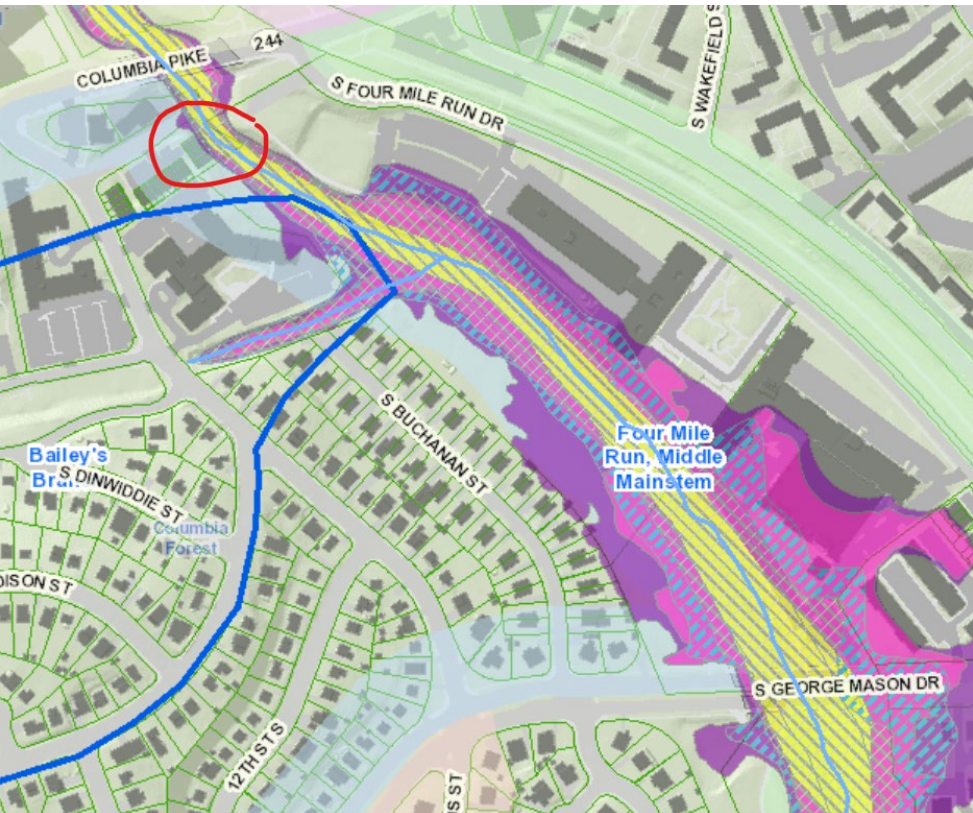
Detail of Preliminary floodplains



No Buildings impacted in Arlington Mill CA

- A,
- AE,
- AE, FLOODWAY
- X, 0.2 PCT ANNUAL CHANCE

Overall view of Arlington Mill CA and Columbia Forest CA Preliminary floodplains

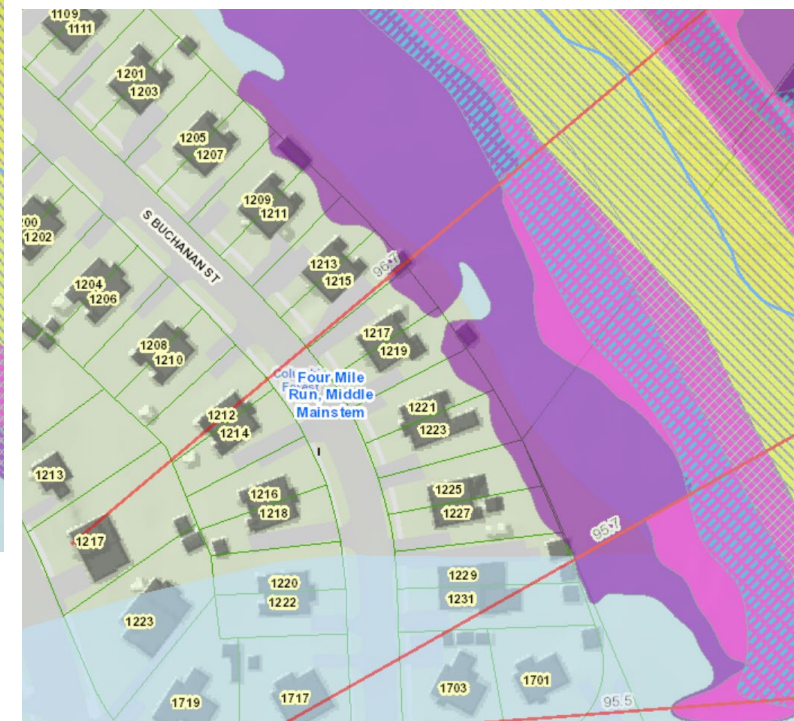
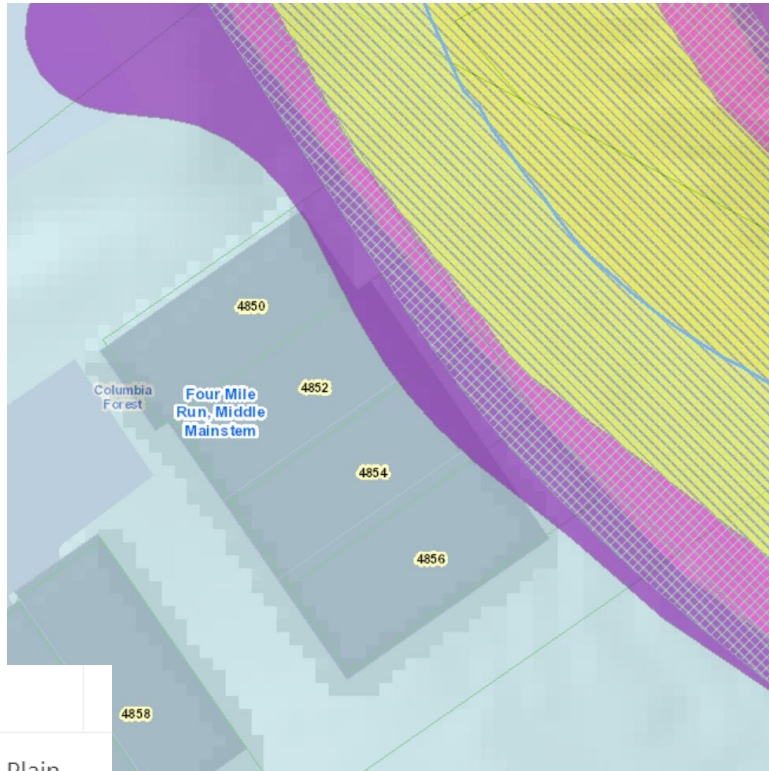
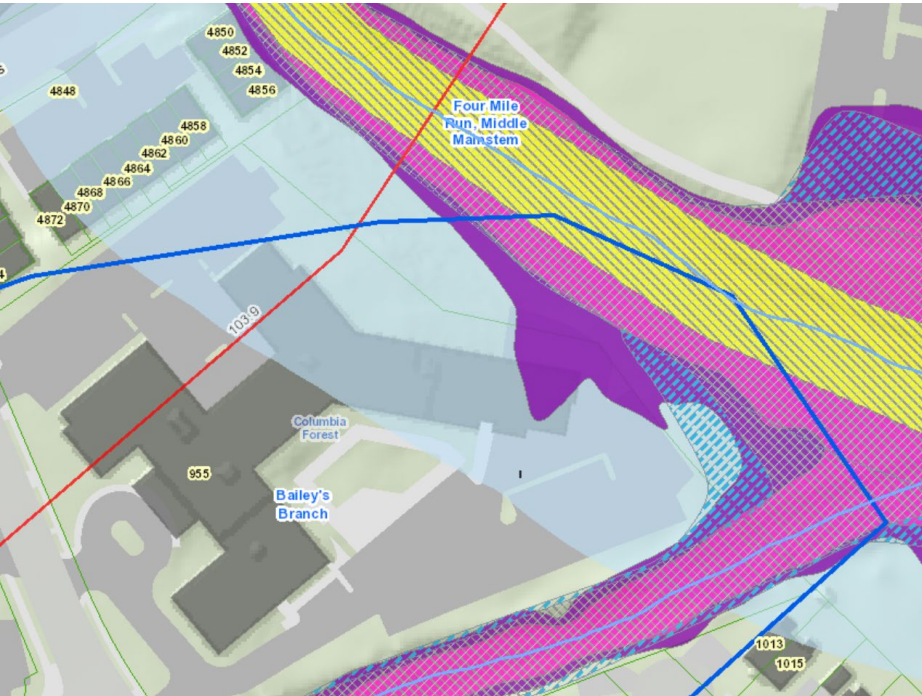


Most properties and buildings in Arlington Mill and Columbia Forest CA's are not impacted.

FEMA Map Update Details

Note:

- Buildings are in 0.2% chance flood zone (500 year return period).
- Impacts are Minimal.
- These areas are on Panels 76D, but this panel was not revised as a result of the County Appeal.
- 90 Day appeal of three revised panels begins October 6 –doesn't affect these CA's



Preliminary Flood Zones (2022)

- A,
- AE,
- AE, FLOODWAY
- X, 0.2 PCT ANNUAL CHANCE

FLOOD HAZARD

Effective Flood Zones

- Effective Base Flood Plain
- 0.2 % Annual Chance Flood Hazard

Panel 76D



Unincorporated Areas
515520

Preliminary FIRM



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
ARLINGTON COUNTY, VIRGINIA
(All Jurisdictions)
PANEL 76 of 83

Panel Contains:
COMMUNITY NUMBER PANEL SUFFIX
ARLINGTON COUNTY 515520 0076 D

PRELIMINARY
9/18/2020

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT [HTTPS://MSC.FEMA.GOV](https://MSC.FEMA.GOV)

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
OTHER AREAS OF FLOOD HAZARD		Regulatory Floodway
		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee See Notes, Zone X
OTHER AREAS		Area with Flood Risk due to Levee Zone D
		NO SCREEN Areas of Minimal Flood Hazard Zone X
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
		18.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.6 Coastal Transect

VERSION NUMBER
2.6.4.6
MAP NUMBER
51013C0076D
MAP REVISED

Tentative Schedule for updated FIRM and Floodplain Ordinance:

Step / Milestone	Start Date	End Date	Notes
Revised Preliminary Issued	04/29/2022	n/a	County received / downloaded files
30-Day comment period	04/29/2022	05/29/2022	County provided comments to FEMA
Prep work for Appeal Start	June 2022	July 2022	FEMA's contractor will begin prep work for the Appeal Period*
FR notice prepared, submitted, and published	July 2022 (submitted)	08/02/2022 (published)	FEMA's contractor will prepare and submit the <i>Federal Register</i> notice for publication
Newspaper publications (2)	09/29/2022 (tentative)	10/06/2022 (tentative)	FEMA's contractor will contact local newspaper and arrange for 2 publications
Appeal Period (90 days)	10/06/2022 (tentative)	01/06/2023 (tentative)	FEMA's contractor will mail out the Appeal Start letter
Prep work to ready the study for LFD	Jan. 2023	Mar. 2023	FEMA's contractor will begin prep work for completing the study*
Study is independently reviewed by another contractor	May 2023	June 2023	Independent contractor has 60 days to review and approve the study
Letter of Final Determination	June 2023	Nov 2023	Independent contractor has 60 days to review and approve the study
New Study Effective Date	Dec. 2023	n/a	County will receive new products

Floodplain Ordinance Update

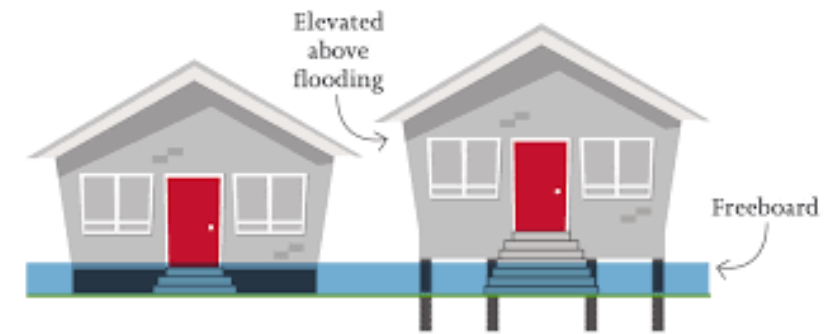
- Required due to FIRM updates
- Must be approved by DCR and FEMA
- Must conform to model ordinance
- Must be adopted within 6 months after Letter of Final Determination (LOD) or approximately December, 2023

Overall, proposed changes are minor



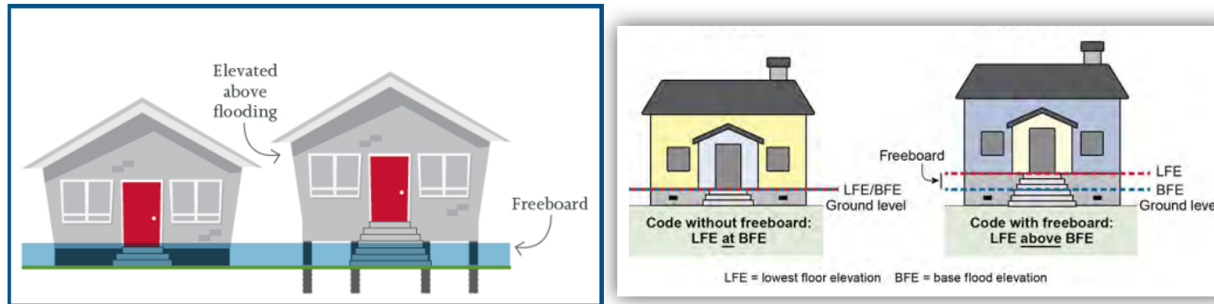
Proposed changes to Floodplain Ordinance

- Increase in required freeboard (distance above base flood elevation) from 12 to 18 inches, or
- Buildings in 100-year floodplain must be watertight 2 feet above the base flood elevation (previous requirement 1 foot)
- Accessory structures can not be larger than 600 feet
- No emergency service records, medical records or government records can be stored in 500 year floodplain



Summary of Proposed Changes to Floodplain Ordinance

Freeboard Update



When the base flood elevation data is utilized, the lowest floor shall be elevated to or above the base flood level **plus eighteen (18) inches**. The additional elevation is called 'freeboard', which provides an added margin of safety to address the flood modeling and mapping uncertainties associated with FIRMs.

Residential Construction Freeboard Update



New construction or substantial improvement of any residential structure in Zones AE and A with detailed base flood elevations shall have the lowest floor, including basement, elevated to a minimum of **eighteen (18) inches above the base flood level**. *The previous minimum elevation was one (1) foot.*

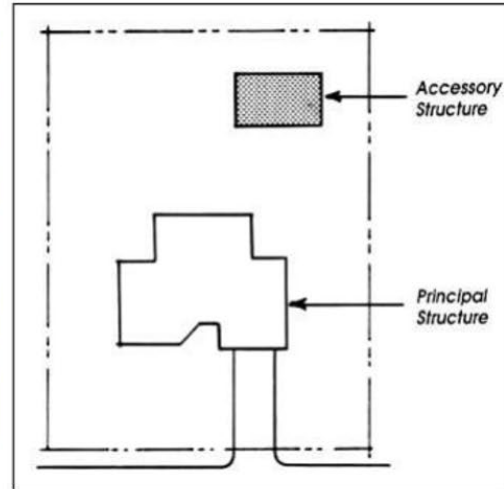
Non-Residential Construction Freeboard Updates

New construction or substantial improvement of any commercial, industrial, or non-residential building shall have the lowest floor, including basement, elevated to or above the base flood elevation (BFE) **a minimum of eighteen (18) inches**. *The previous minimum floor elevation was one foot above the BFE.*

Buildings located in Zone AE may be flood-proofed in lieu of being elevated provided that all areas of the building components below the **BFE plus two (2) feet** are watertight with walls substantially impermeable to the passage of water and use structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. *The previous requirement was the BFE plus one (1) foot.*

Appurtenant or 'Accessory Structure'

Summary of Proposed Changes to Floodplain Ordinance



Appurtenant or 'Accessory Structure'

- **Structure Size** - the footprint of the structure can be no greater than **600 square feet in area**
- **Characteristics** –
 - Not be used for human habitation
 - Be useable only for parking of vehicles or limited storage
 - Be constructed with flood damage-resistant materials below the base flood elevation
 - Be constructed and placed to offer the minimum resistance to the flow of floodwaters
 - Be anchored to prevent flotation
 - Have electrical service and mechanical equipment elevated to or above the base flood elevation



Summary of Proposed Changes to Floodplain Ordinance

0.2 Percent Annual Chance Flood Hazard Area

The mapped floodplain includes the districts designated as having a 0.2 percent annual chance of flooding as shown on the Flood Insurance Rate Map.

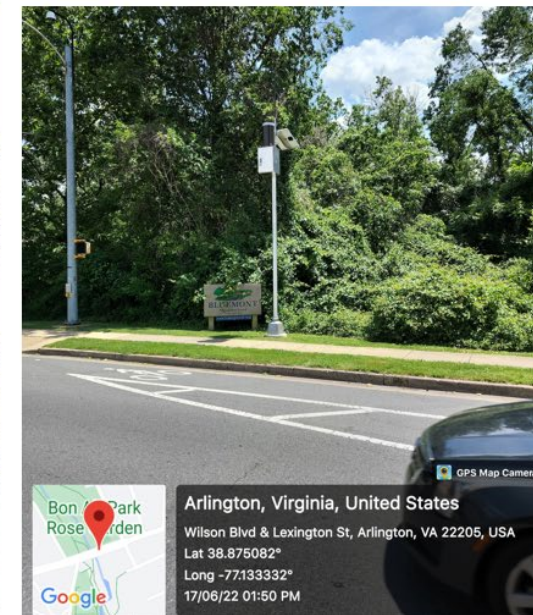
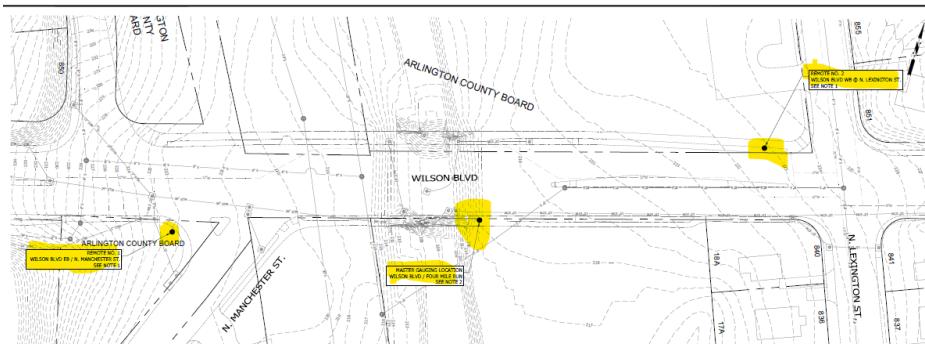
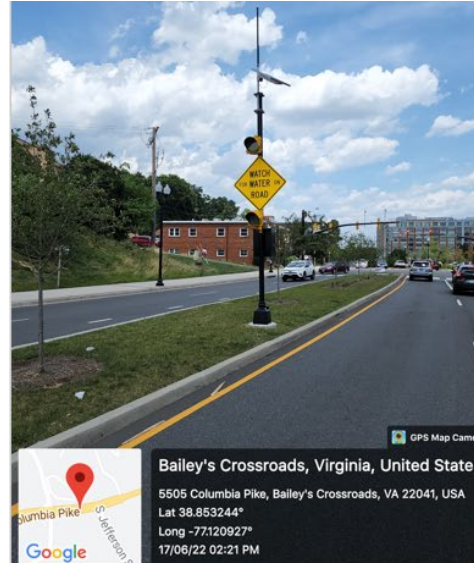
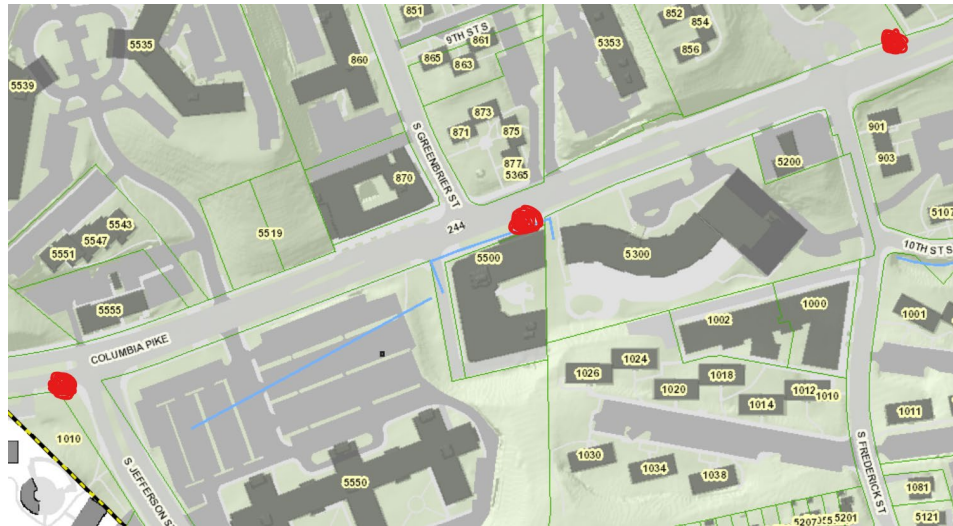
In this district no emergency service, medical service, or governmental records storage shall be allowed, except by special exception using the waiver process.



High Water Detection Devices

Two high water detection devices installed

Location #1: Columbia Pike near S Greenbrier St.



A third set of devices is slated for Kirkwood Rd.
 @ Langston Blvd.

Location #2 Wilson Blvd. near N Lexington St. and N Manchester St. ³⁰

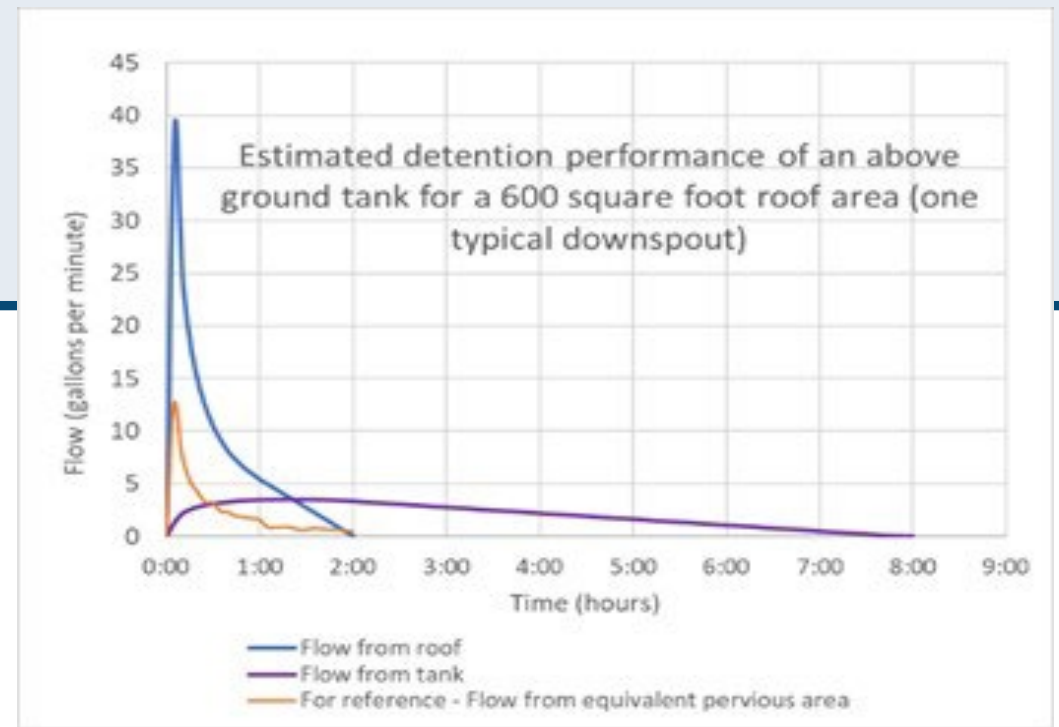
LDA 2.0 - Increased Stormwater Management Requirements

LDA = Land disturbing activity permit

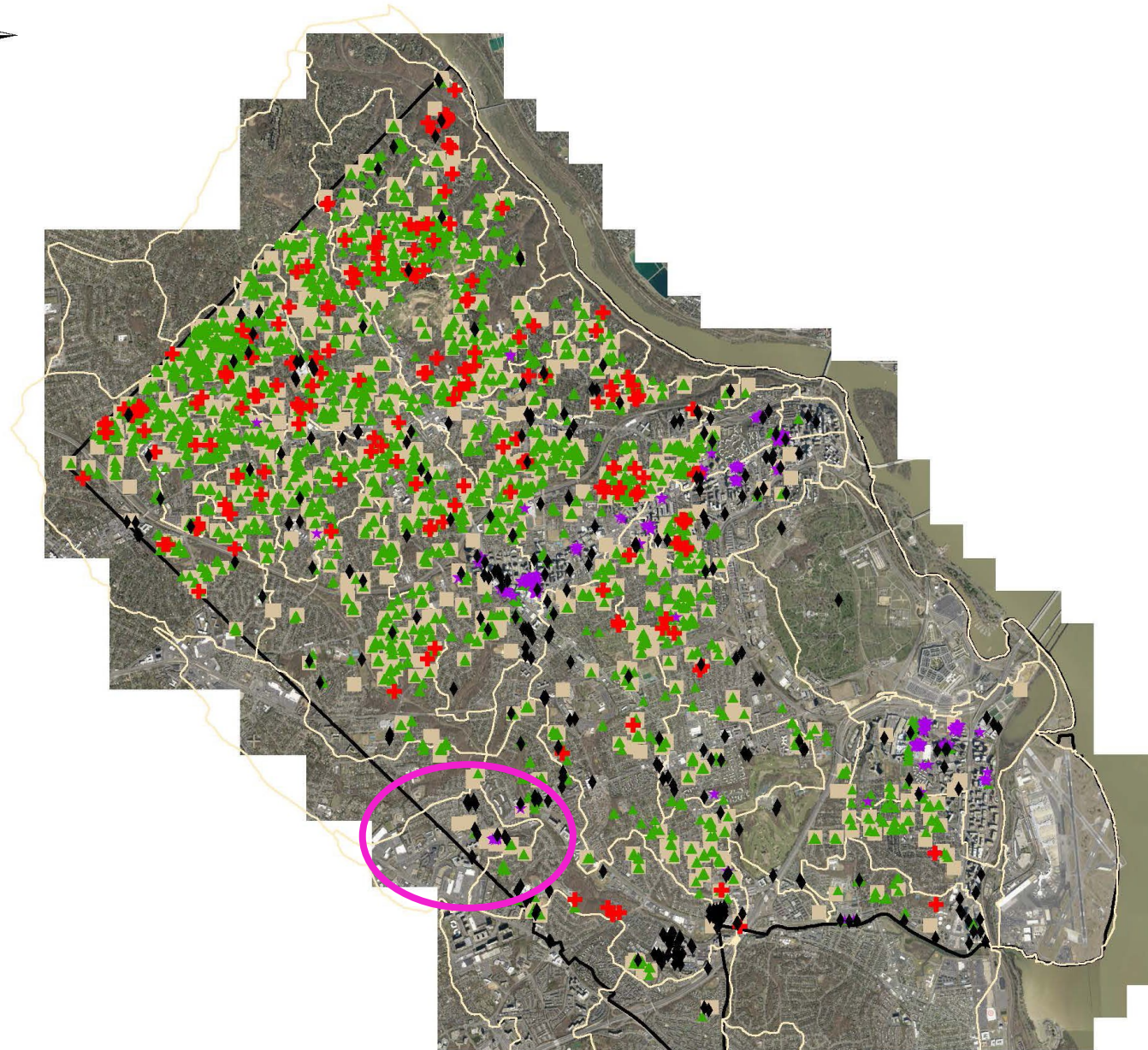
With LDA 2.0, the County has increased stormwater management requirements for single-family home projects to reduce impacts to neighboring properties.

Took effect September 2021

Requirement to detain up to 3 inches of runoff from new impervious area on site and restore soil permeability after construction



Stormwater Management Facilities in Arlington County

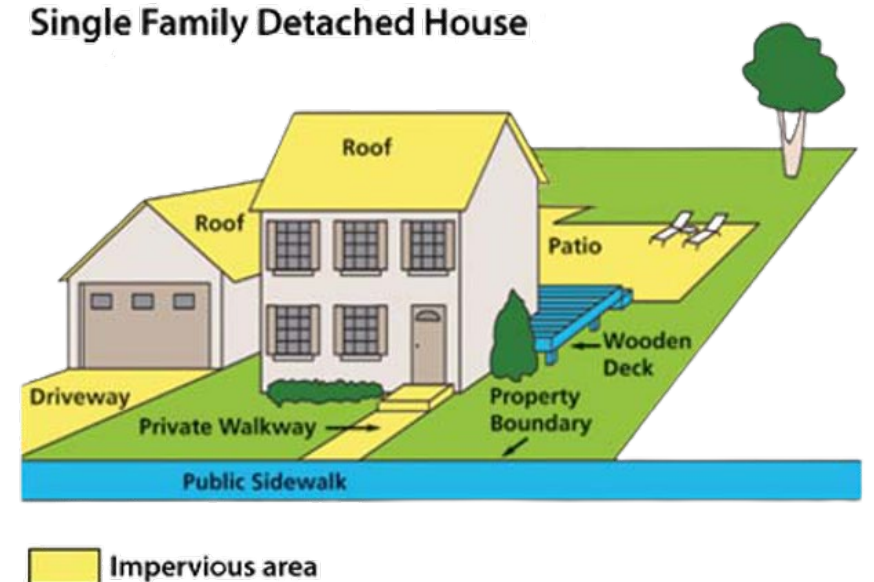


Legend

- ▲ Bioretention
- Permeable Pavement
- ✚ Infiltration Trench
- ★ Green Roofs
- ◆ Other
- Watersheds
- Arlington County

Stormwater Utility

- County is considering changing to a stormwater utility for funding the stormwater program
- Currently, property owners pay a stormwater tax based on property assessment
- Stormwater utility fee would instead be based on impervious cover on the lot (yellow areas on the diagram)
- Credit would be offered for actions taken to reduce runoff
- More information and resources on the web page



<https://bit.ly/ArlingtonStormwaterUtility>

Risk Assessment and Management Plan (RAMP)

- Will deliver updated rainfall curves, 10 year design standard and 2040 and 2070 climate projections
- The RAMP maps critical community facilities in all sectors, to support vulnerability and risk assessments, and allow mitigation planning.
- Map County's "urban" floodplains (outside FEMA floodplains)
- Measures both Flooding and Sea Level Rise/Storm Surge Risks
- Define and value risks from flooding
- Informs flood resilient design and construction standards



Upcoming Zoning Study for Stormwater Facilities

Improve Consistency: The Zoning Ordinance treats stormwater systems differently for public zoned sites (ex., parks, schools) and also differs from how other water utilities are treated

Add Flexibility: The current zoning regulations do not readily enable the use of certain stormwater stormwater system components

- **Zoning study will take place over the next 6 months.** Public meeting tentatively planned for late October/early November.
- Unrelated to this study, we are beginning work on a Flood Resilient Design Manual as well

Path to Flood Resilience West Columbia Pike

Questions?

