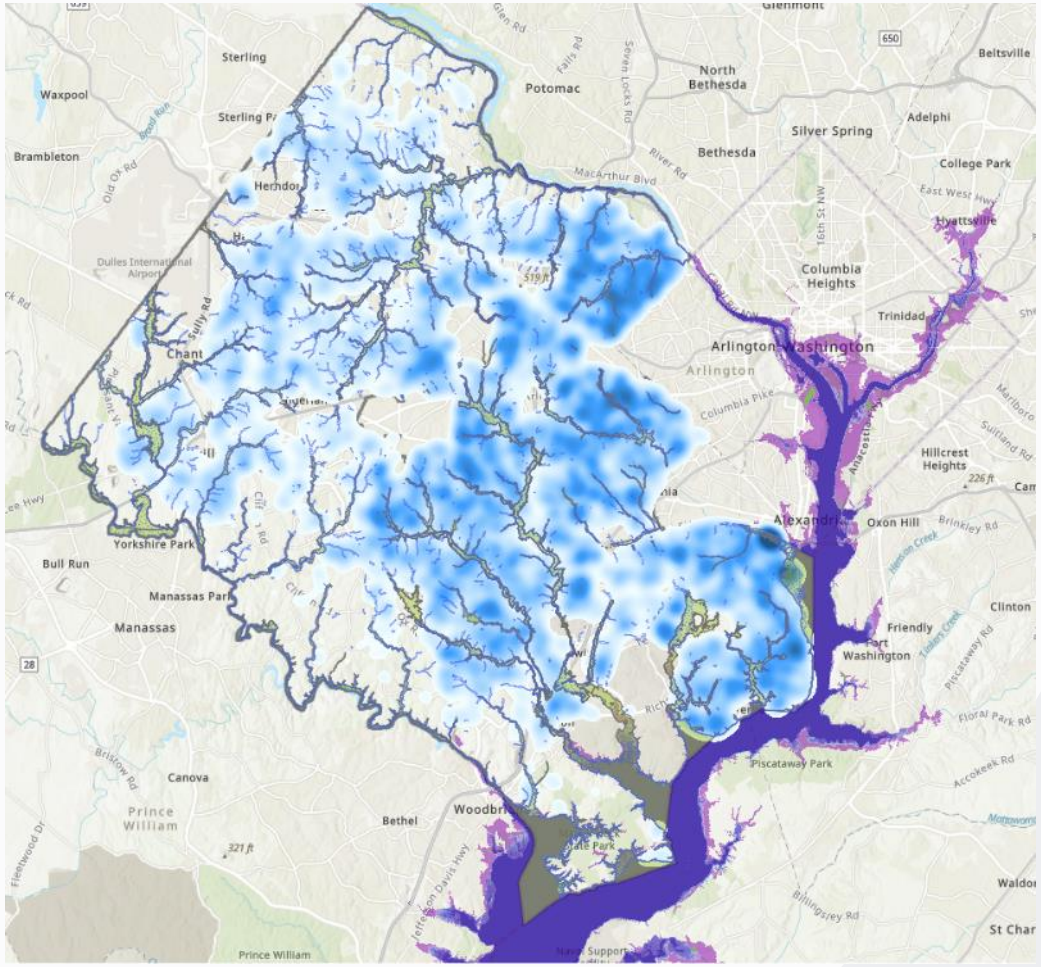


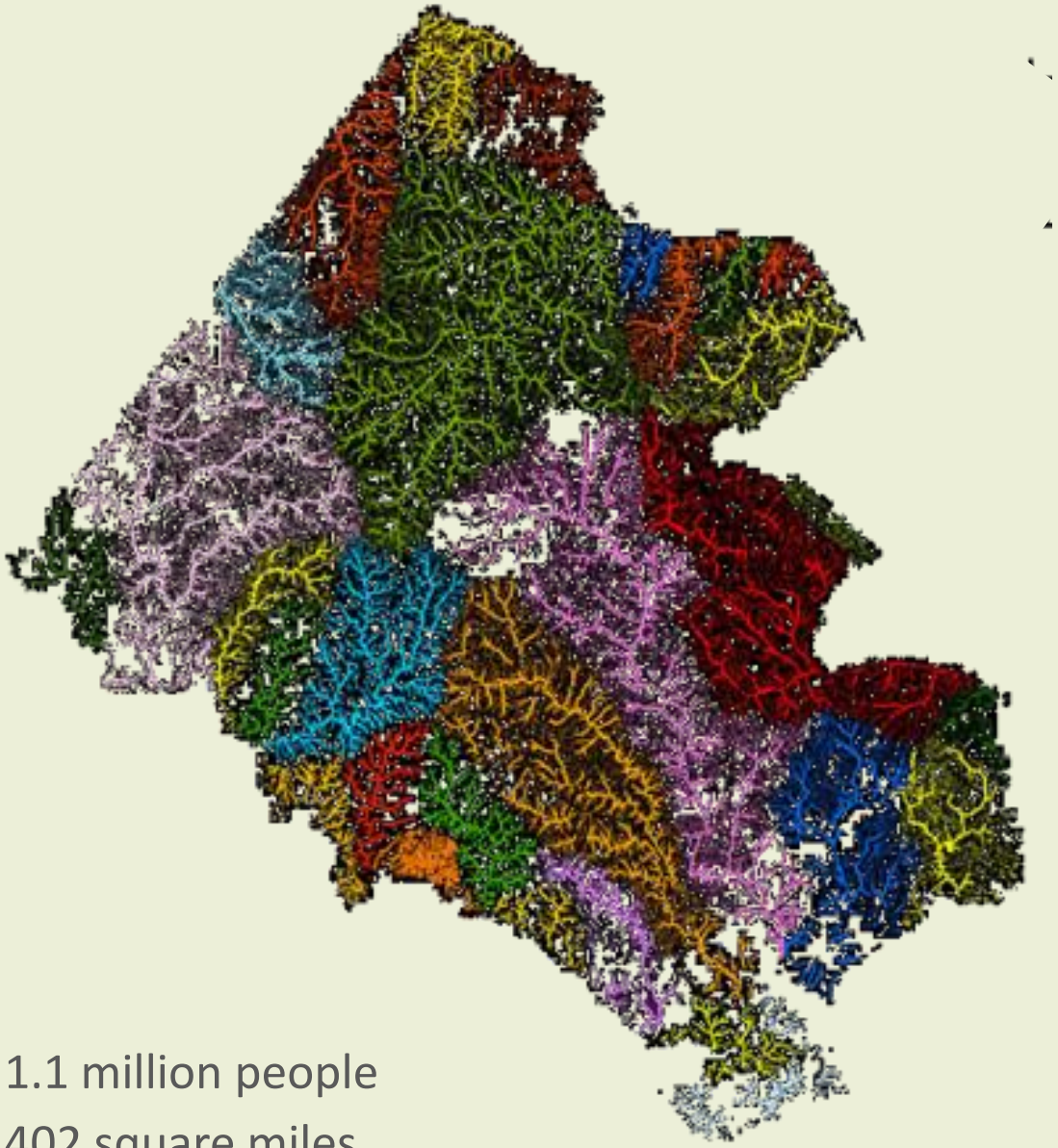
Fairfax County's Approach to a Resilient Fairfax

Department of Public Works and Environmental Services

Office of Environmental and Energy Coordination

MWCOG Water Resources Technical Committee

A Fairfax County, VA, publication
November 5, 2021



1.1 million people

402 square miles

1,600 miles of streams and associated channels

Fairfax County Agencies Focused on Community Flood Mitigation and Resilience

- Department of Public Works and Environmental Services
- Office of Energy and Environmental Compliance
- Department of Land Development Services
- Department of Planning and Development

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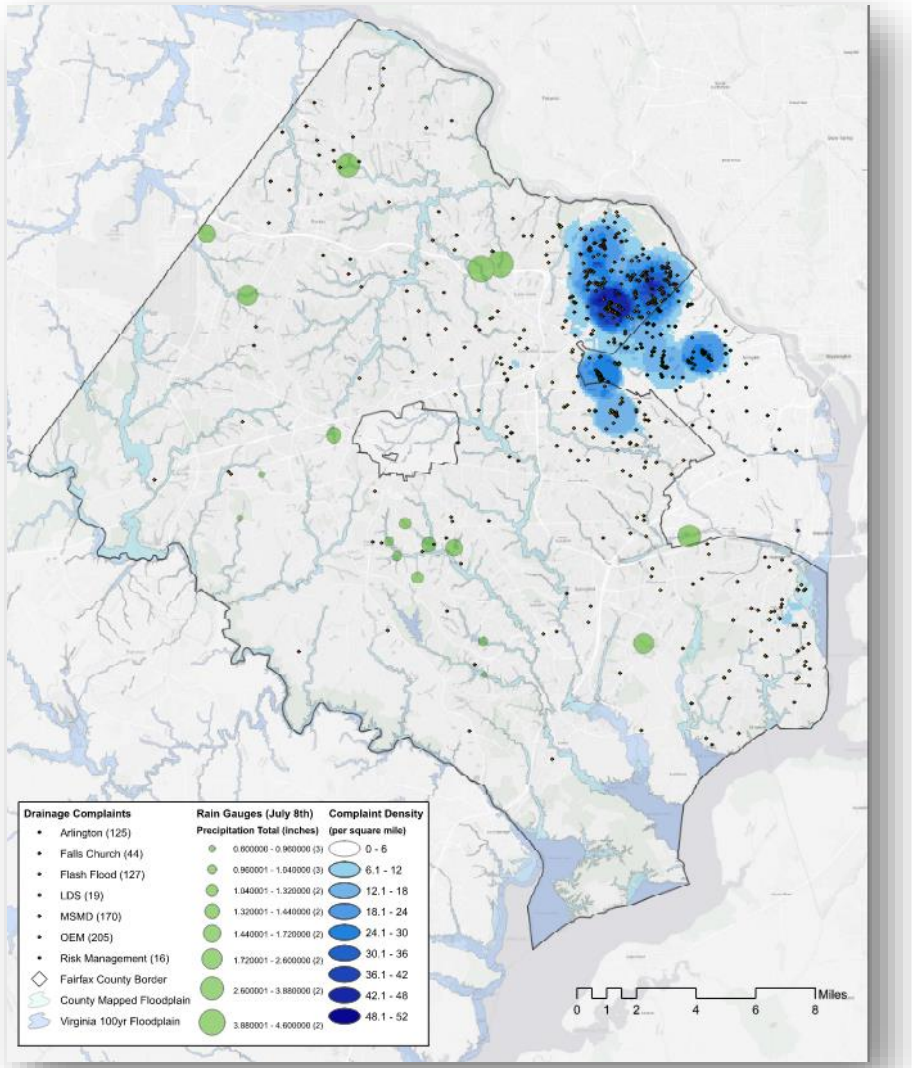
Resilient Fairfax: Climate Adaptation and Resilience Plan

Background:

- Board of Supervisors
  - Environmental Vision
  - Fairfax Green Initiatives Board Matter
  - To address increasing storm severity, flooding, extreme heat, sea level rise and other effects already seen in the county



July 8, 2019: Storm Response

Resilient Fairfax: Background

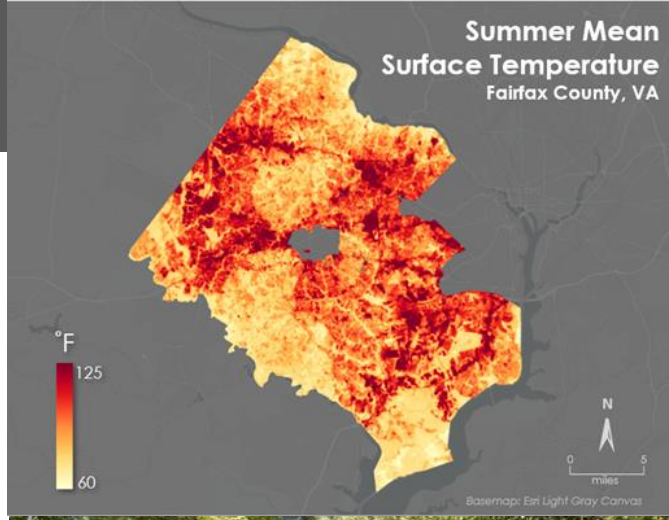
1. What climate conditions and hazards do we face now? In the future?
- Climate Projections Report
- Temperatures, precipitation, flooding, storm severity, drought

2. Where are we vulnerable?
- Climate Vulnerability and Risk Assessment
- Homes, businesses, neighborhoods, infrastructure, services & operations, people in path of climate effects

3. How are we currently doing in terms of resilience?
- Audit of Existing Policies, Plans, and Programs
- Which programs are working well? Where do we have gaps?

4. Which strategies will strengthen our resilience?
- Adaptation and Resilience Strategies
- Physical upgrades, policies, design standards, services, staffing, procedural changes, agency coordination, etc.

5. What is the path to implementation?
- Implementation Roadmap
- Funding sources, staffing, timelines



Climate Change in Fairfax County

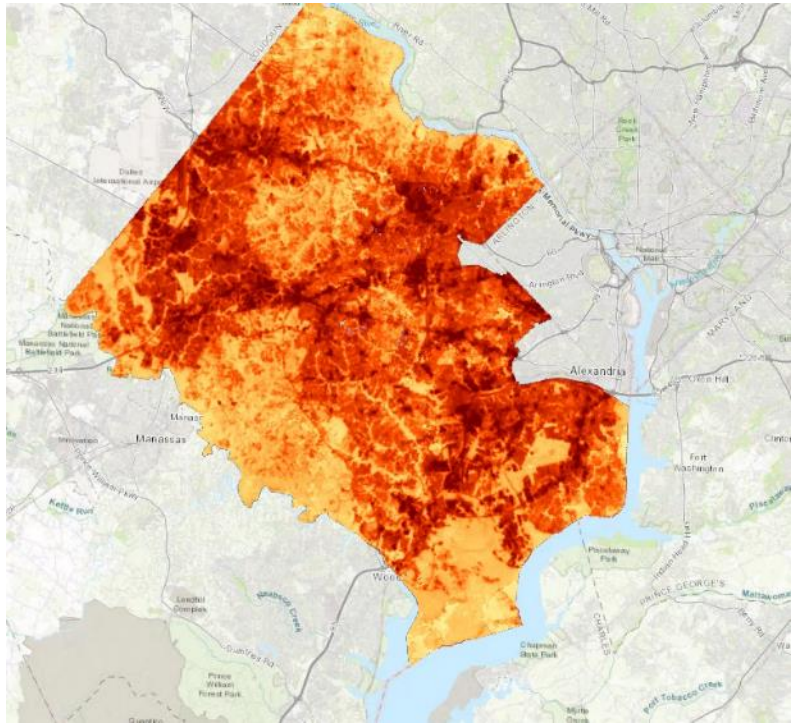
In the coming decades, Fairfax County will experience

Warmer, Wetter, *Weirder*

climate conditions.

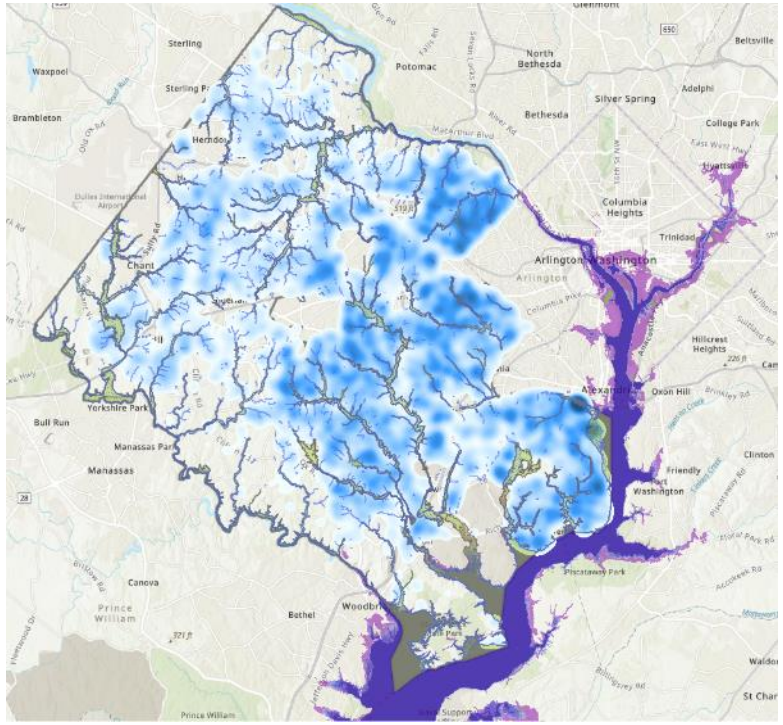
Climate Change in Fairfax County

Warmer



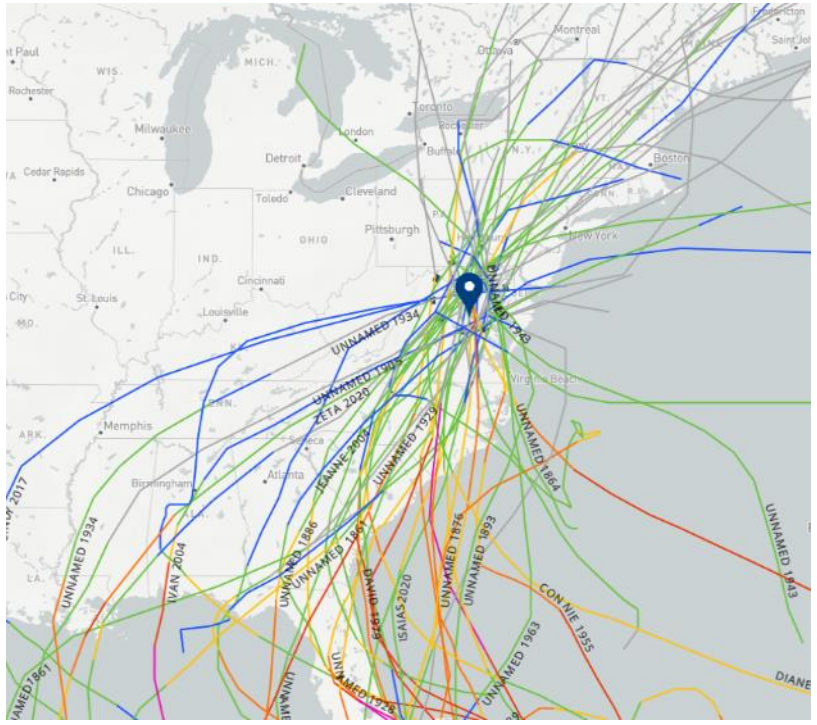
- **Annual temperature** rise 4.4 – 8°F by 2085
- **Extreme heat days** projected to increase from 7 to 70 days per year by 2085
- **Urban Heat Island Effect** on top of temperature increase

Wetter



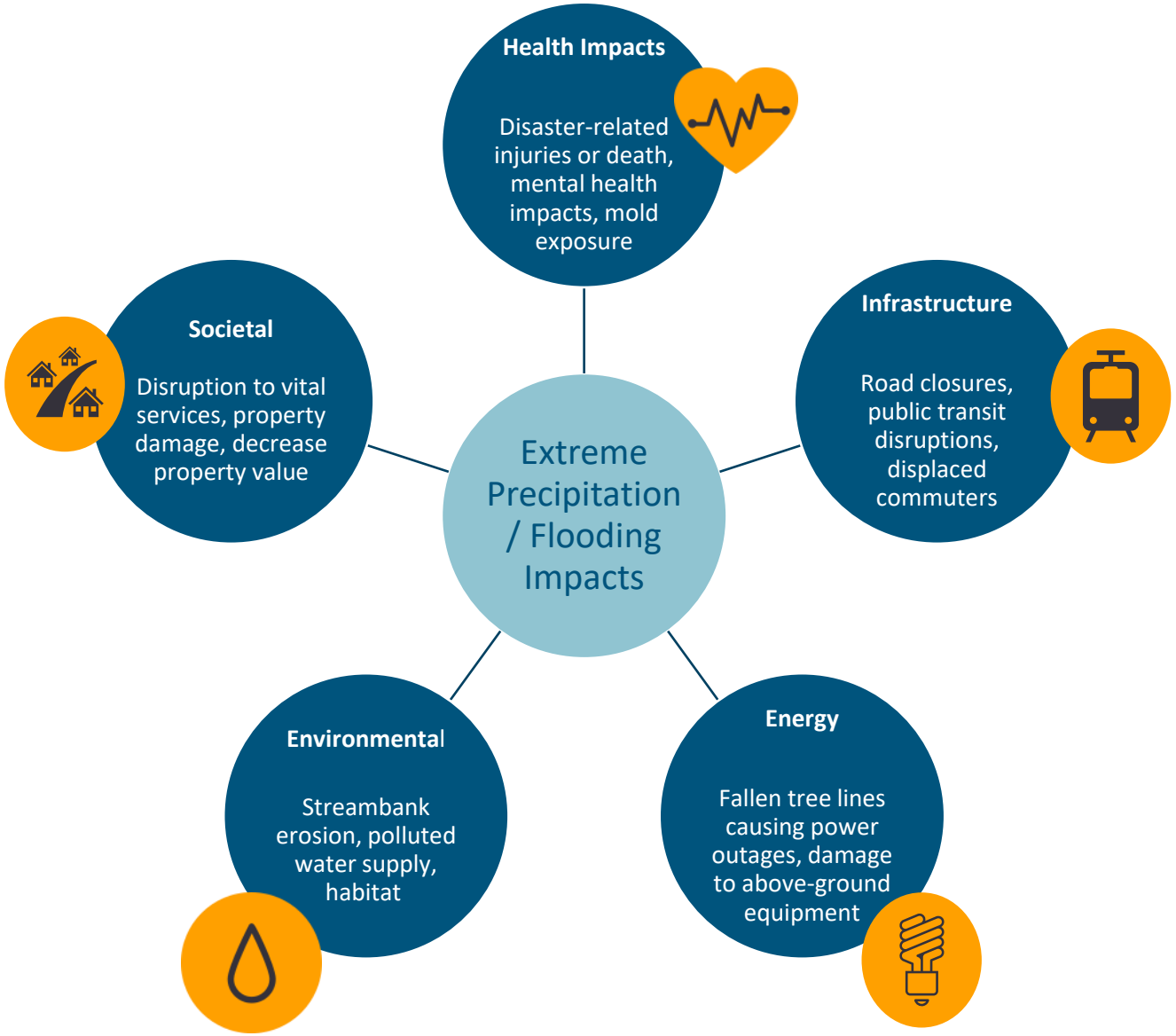
- **Annual and seasonal precipitation** increase
- **Precipitation intensity** increase across all return periods
- **Sea level rise** of 3 feet --> Potomac River

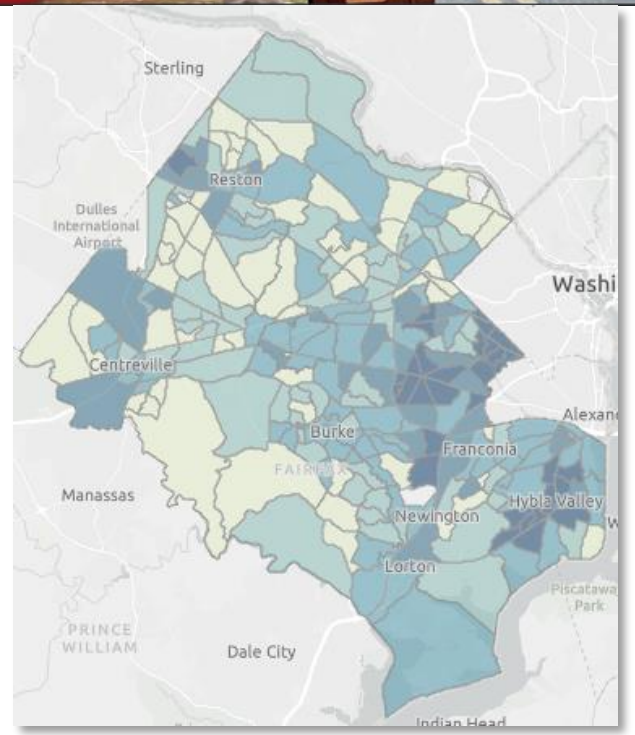
Weirder



- **Severe storm strength** increase, including tropical storms, derechos, hurricanes, nor'easters
- **Unseasonably warm/cool** temperatures
- **Periods of no precipitation followed by sudden, heavy precipitation**

Wetter & Weirder: Impacts





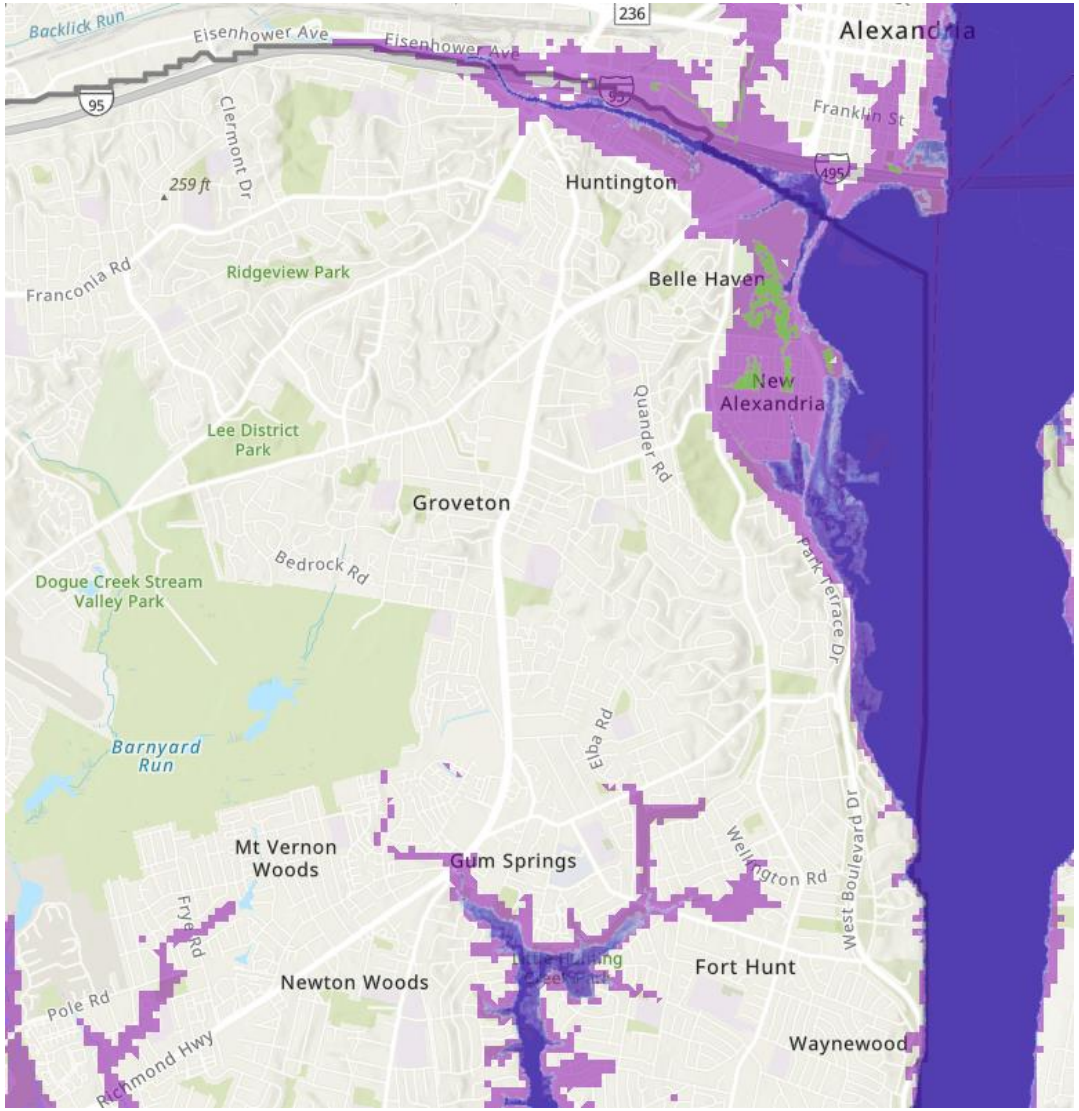
[One Fairfax Vulnerability Index]

Flooding Types

There are 4 major types of climate-related flooding in Fairfax County

INLAND FLOODING		COASTAL FLOODING	
1. Stormwater Issues Heavy rain overwhelms stormwater infrastructure	**2. Floodplains** Heavy rain makes rivers and streams overflow	**3. Sea Level Rise** Rising sea means rising Potomac River	**4. Coastal Storm Surge** Hurricanes, tropical storms, etc. push water on shore
			

Coastal Flooding

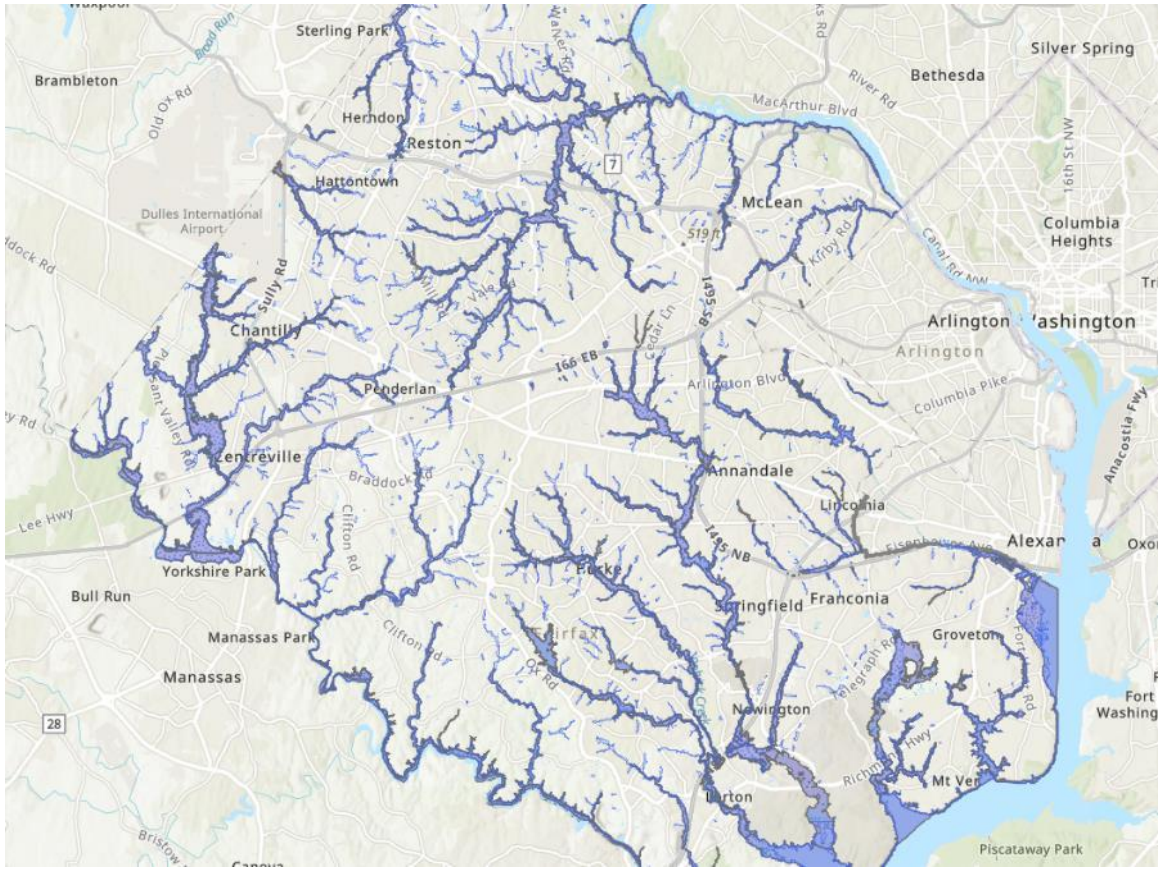


Sea Level Rise and Storm Surge

Huntington Levee

New Alexandria/Belle View

Inland Flooding

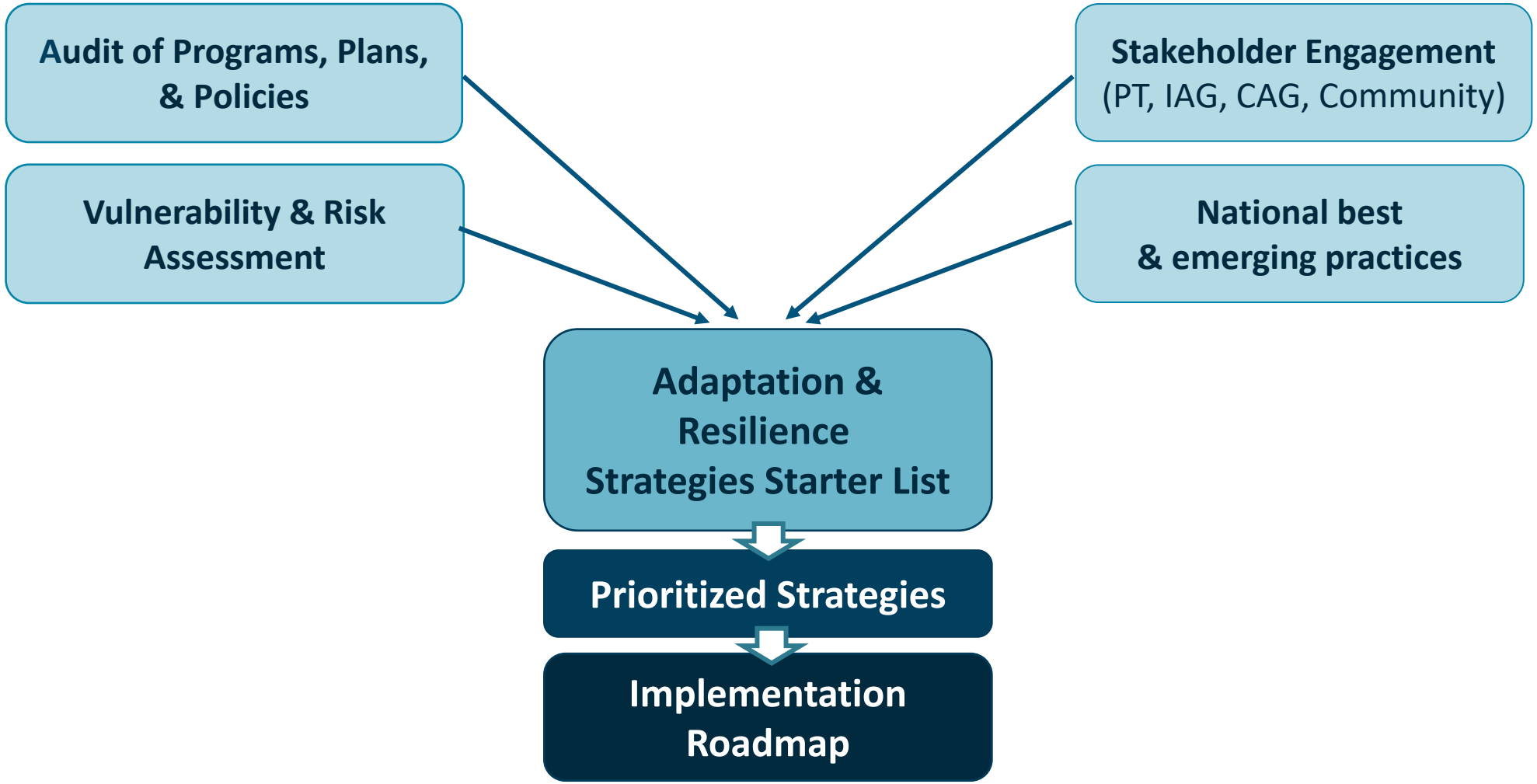


Floodplains

Interior Flooding
Older Neighborhoods and Roads

What do we do about it?

Strategy Development Approach



Regulation and Policy Drivers: Developers v. County

Infill Development

New Development:
By-right v. Entitlement

Water Quality Needs

Existing Neighborhoods
Lacking Infrastructure

Partnerships:
VDOT & FCDOT & FCPS

Increasing Precipitation
Intensity

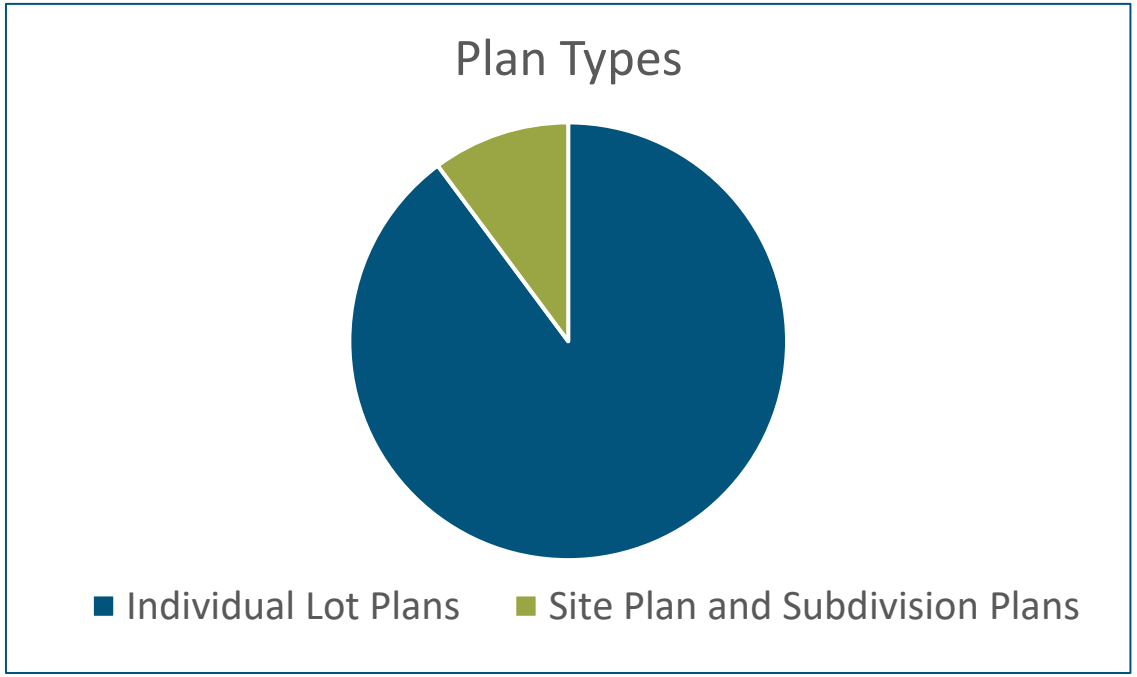
GOAL: Balance community needs with “no regrets” choices and agility

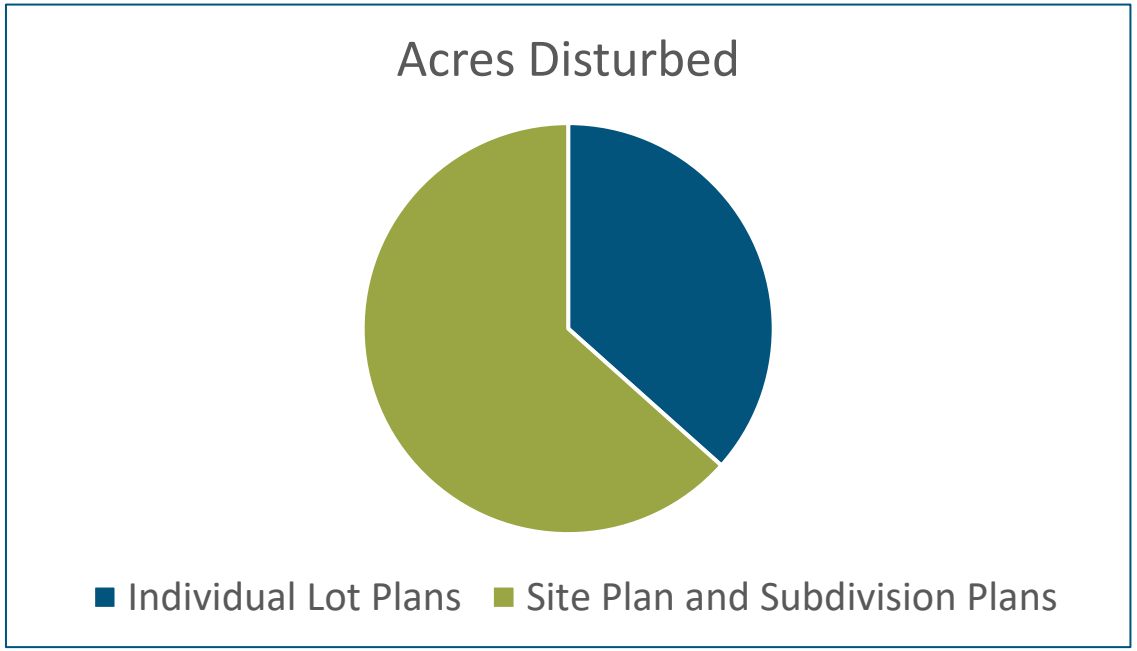
Current County Stormwater Regulations

- Chapter 124 – Stormwater Management Ordinance (SWMO)
- Chapter 118 – Chesapeake Bay Preservation Ordinance (CBPO)
- Chapter 122, Article 5105 – Zoning Ordinance
- Chapter 104 – Erosion and Sediment Control Ordinance
- Public Facilities Manual

Which Matters More? Infill or Major Development?

- Individual lot plans: about 90% of the plans submitted in Fairfax
- Site Plans and Subdivision Plans account for more acres disturbed
- Approximately 1/3 of Infill Lot Grading Plans are exempt from the SWMO
  - Previously, this exempted them from most detention requirements
  - Now, required to evaluate on a case-by-case basis





Individual Lot Grading Plans exempt from SWMO?

NOT EXEMPT: All projects discharging concentrated flow (124-4-4.B & C)

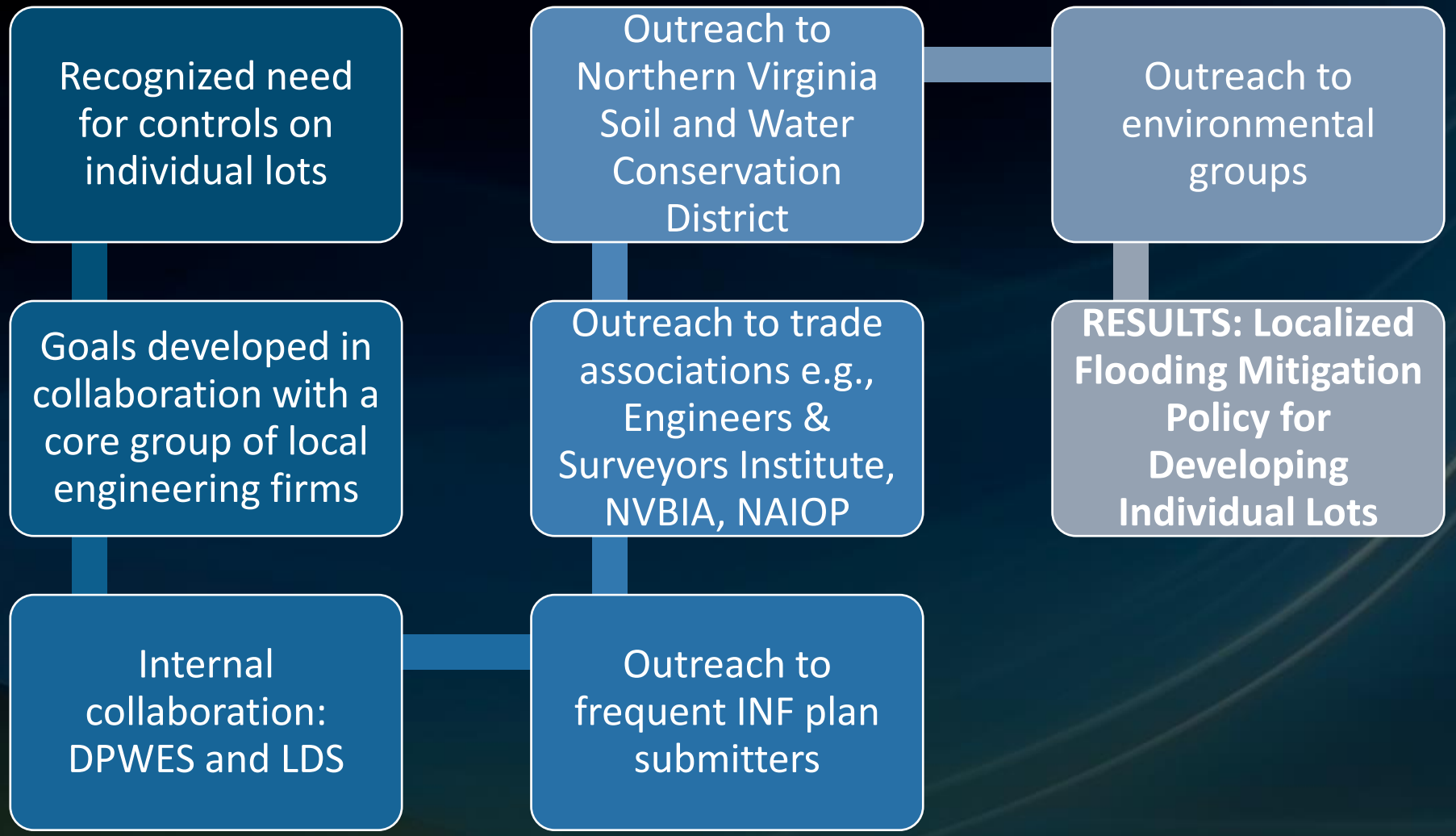
NOT EXEMPT: Projects without concentrated flow but with known downstream issues (124-4-4.E) *Review policy changed 2017 – 2021*

EXEMPT: Lots < 18% or 2,500 square feet impervious area, and lots < 0.5 acre adding < 500 square feet impervious area (§ 124-1-7.3.b)

OVERALL: Approximately one-third of Infill Lot Grading Plans are exempt from the SWMO

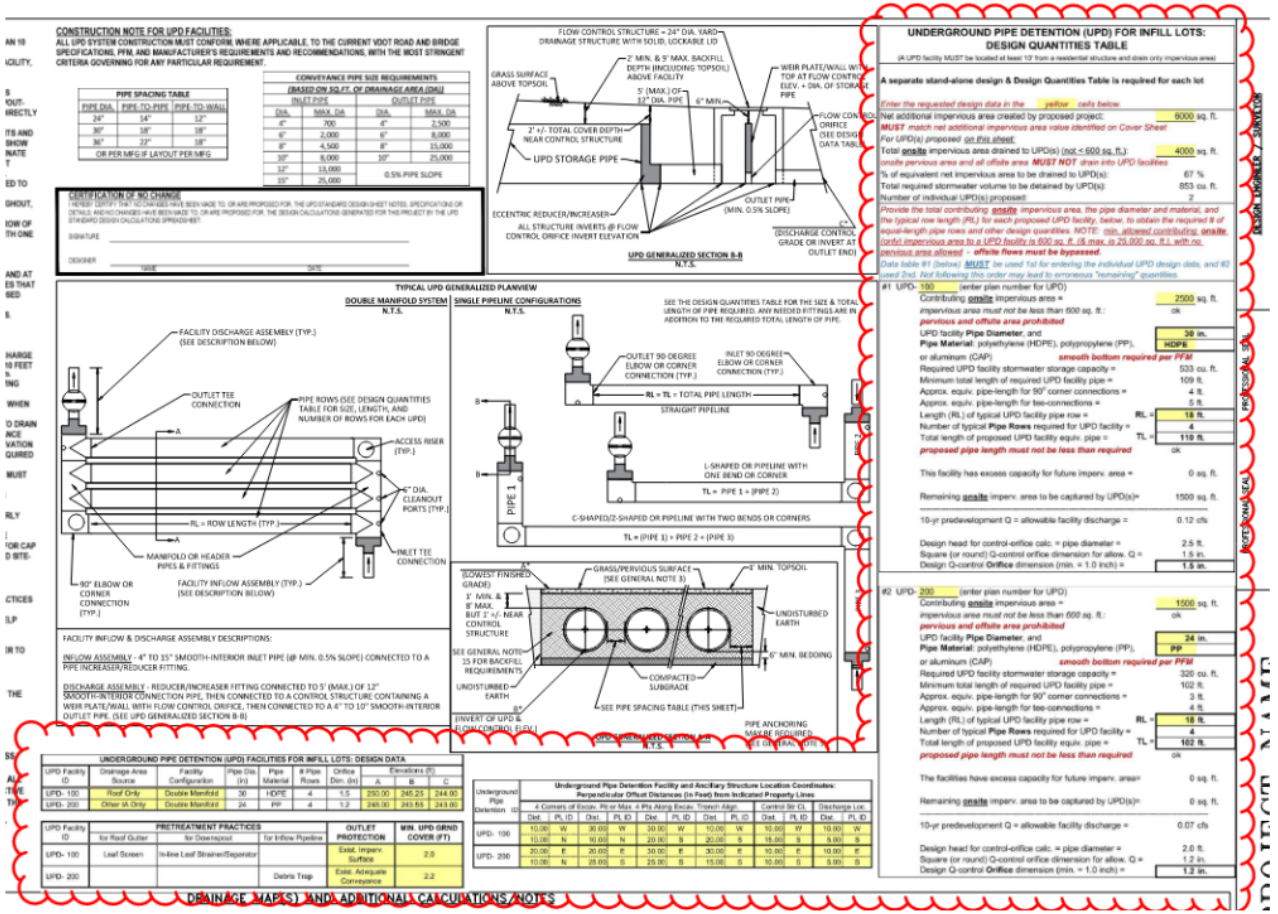
NO REGRETS SOLUTION: SWMO-exempt projects now required to provide detention based on different authorities on a case-by-case basis

How much is reasonable to put on an individual lot?



Localized Flooding Mitigation Policy Compliance Tool

- Example: template design & calculations sheet for detention “plug and play” calculations
- Benefits:
- Minimizes future flooding
- Standard methods speed design and review
- Standard facilities speed installation and inspection
- Maintainability was a primary design consideration



Almost Final: Localized Flooding Mitigation Policy

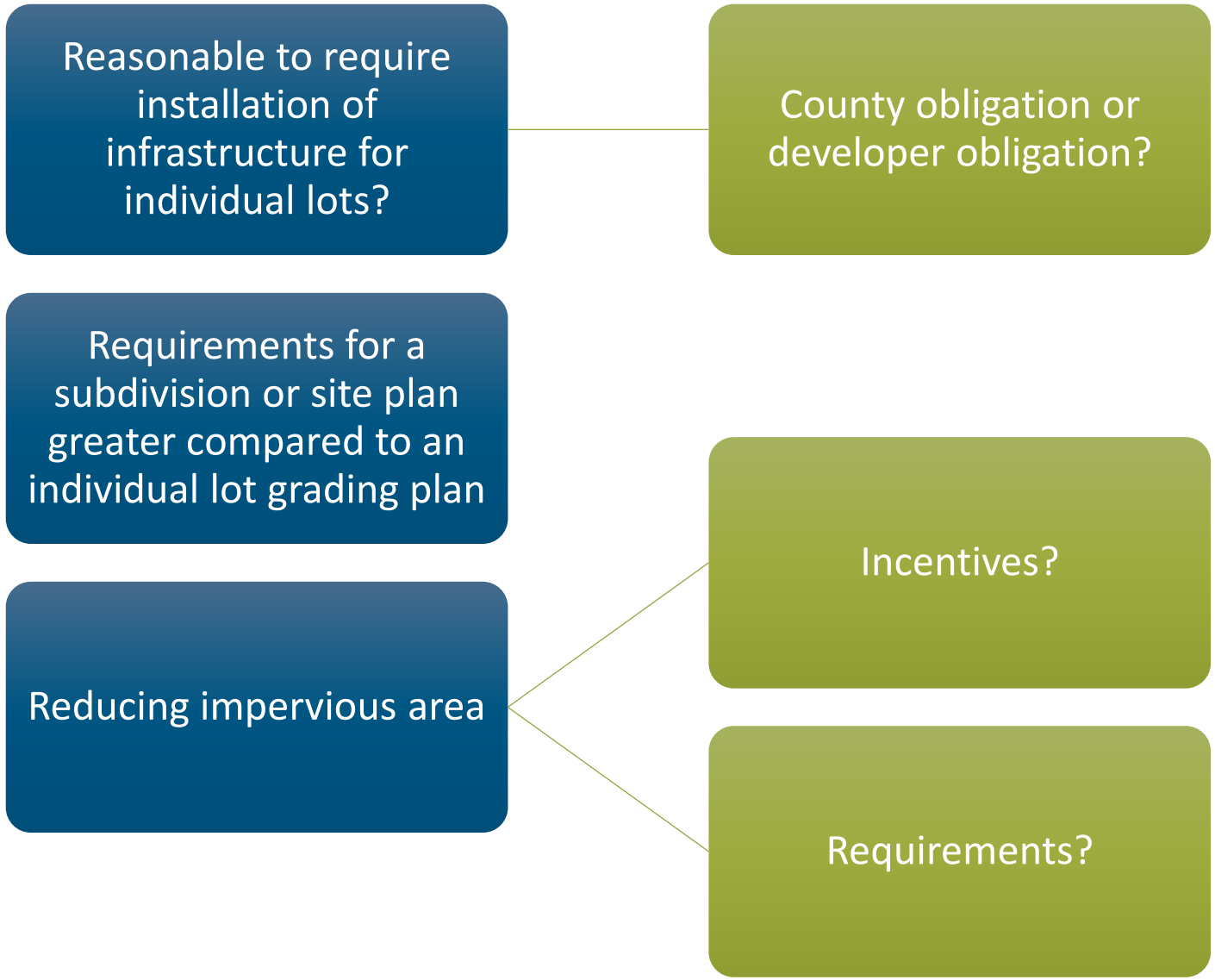

Land Development Services

Technical Bulletin

Subject: Localized Flooding Mitigation Policy for Residential Infill Development-Detention Requirements Date: No.:

- Acknowledges known drainage issues
- Reiterates SWMO requires detention when downstream issues exist
- Reaffirms detention requirement for drainage to inadequate systems in all cases
- Provides compliance tools: template detention facility designs, and calculation spreadsheets
- Will be issued in upcoming Technical Bulletin

Is that the best we can do for infill development?

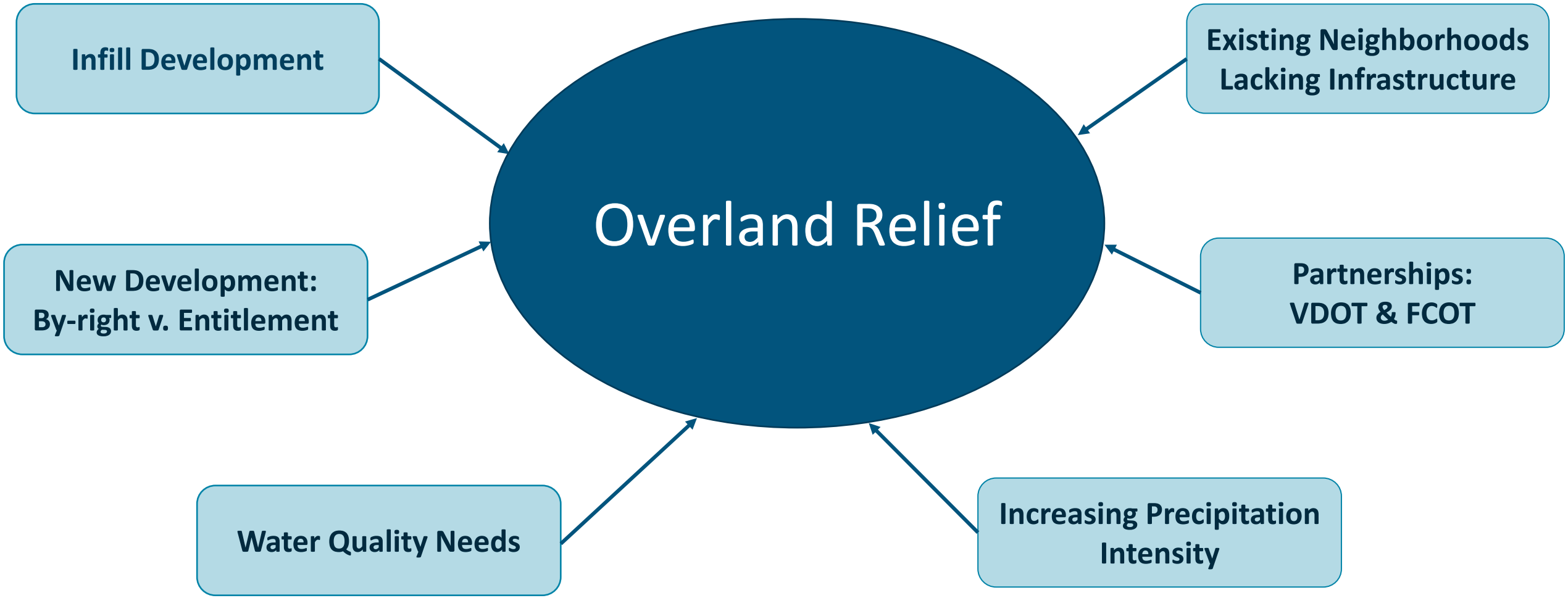


Regulation and Policy Drivers: Developers v. County

- Infill Development
- New Development: By-right v. Entitlement
- Water Quality Needs
- Existing Neighborhoods Lacking Infrastructure
- Partnerships: VDOT/FCDOT
- Increasing Precipitation Intensity

GOAL: Balance community needs with “no regrets” choices and agility

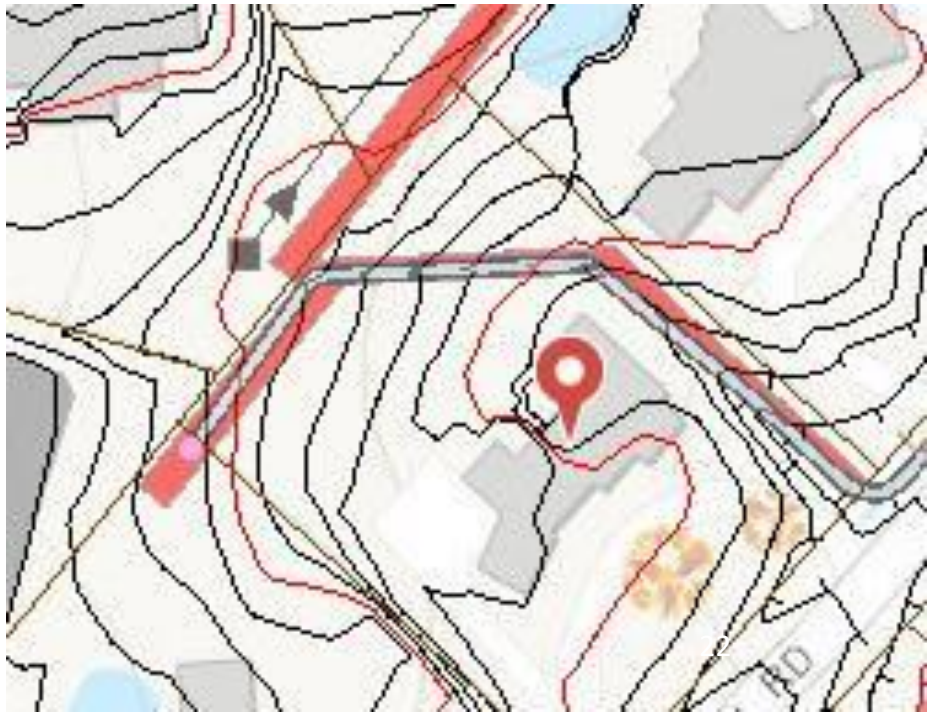
Overland Relief is Common Element



Prospective Development Goal: Increase overland relief

Importance of Overland Relief: Bigger Storms Overpower Minor Systems

- Photo shows addition placed where overland relief used to be
- Dwelling flooded through walkout basement door
- Construction w/o permits



Basements – Most of Fairfax County's Structural Flooding

FAIRFAX COUNTY'S PUBLIC FACILITIES MANUAL

4-0000 GEOTECHNICAL GUIDELINES

4-0300 GEOTECHNICAL REPORT

4-0305 Setting Basement or Lowest Finished Floor Elevation Above the Groundwater Table for Residential Structures.

4-0305.1 For construction of residential single-family detached and attached dwellings, including stacked townhouses, where the results of a geotechnical investigation and/or report must be submitted for approval, design engineers must evaluate the proposed basement floor elevation or the lowest finished floor elevation as compared to the seasonal high water table (SHWT) elevation and include appropriate mitigation on the plans to address potential problems with groundwater intrusion into basements or lowest finished floors and its impacts on the site and adjacent or downstream properties. The required groundwater mitigations depend on the freeboard outlined below. Freeboard is defined as the distance between the SHWT and the basement or lowest finished floor elevation.

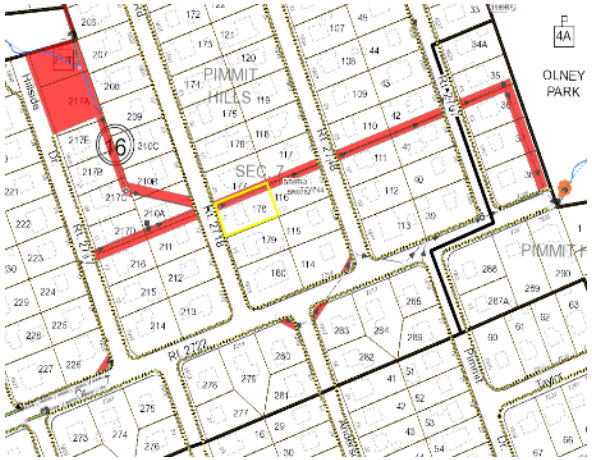
A. Case 1: Freeboard is greater than 2.5 feet (SHWT is more than 2.5 feet below the basement or lowest finished floor elevation). For this case:

- Public Facilities Manual design standards
  - Effective October 2020
  - For some soil types, places lowest finished floor elevation 2.5 feet higher
- Push back from the development community on time and expense of groundwater investigation and building height restrictions
- Even in problem soil areas, still getting basements (set higher)
- This was a no-regrets first step

Overland Relief Enters Basement

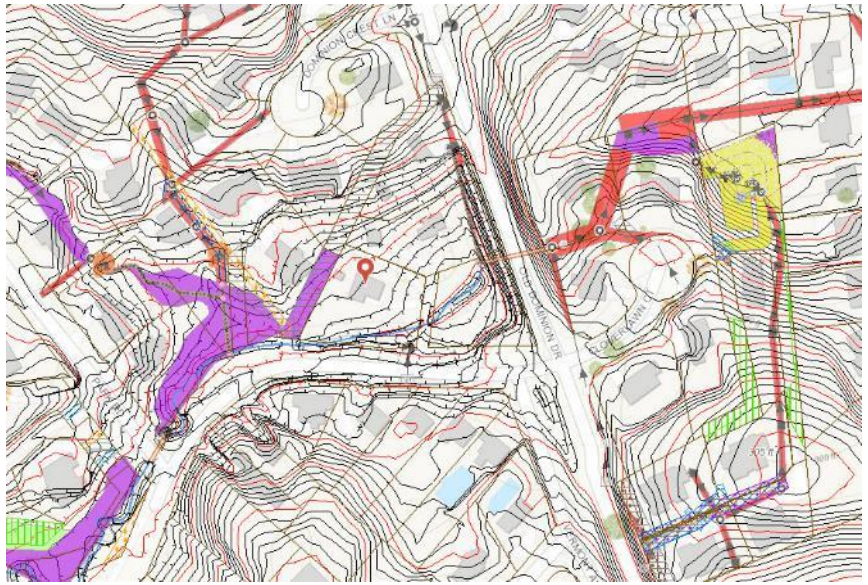
- Drainage analysis on INF said 3.7 acres but it's >80 acres
- No easement over minor floodplain (subdivision predates requirement)
- Floodplain setback not met
- Flooding occurred through areaway – changed sides during construction

Old Infrastructure, Insufficient Overland Relief



- Undersized infrastructure from 1950s
- Runoff entered the property from the street
- Overtopping flow eroded curb inlet
- Lot lacks overland relief
- Point of entry: on-grade window wells

Dwelling in Overland Relief Path without Storm Drainage Easement



- No SDE on or adjacent to lot
- Dwelling flooded through garage and into basement
- Open channel and culvert on lot overwhelmed
- Site sits in a sump

Next Steps – Regulatory and Project

Prospective Development: Developers

Additional standards in Public Facilities Manual?

- Right sizing “C” coefficients
- Overland relief requirements (freeboard?), basements
- Precipitation intensity updates
- Minimize impervious area

State and local regulation updates: SWMO and Ches Bay Preservation Ordinance

Existing Infrastructure: County

Continue known project needs: individual lot, neighborhood

County-wide project effort:

- Floodplain mapping, county-wide flood risk identification and prioritization
- Partnering with VDOT

Understanding Flood Risk

Reactive

Complaint Driven

Lot Scale Projects

TO

Proactive

Flood Prone Properties and Neighborhoods Map

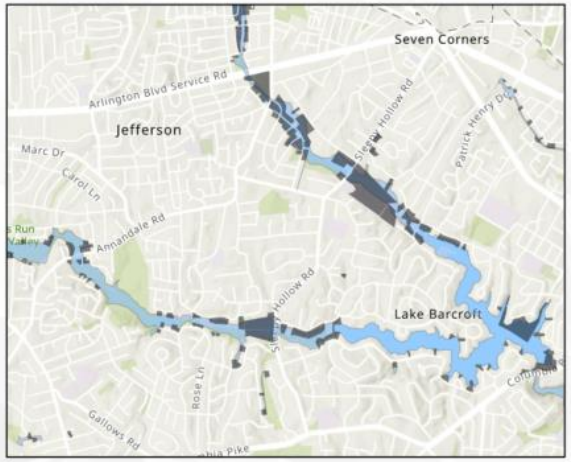
Flood Prone Properties and Neighborhoods Map

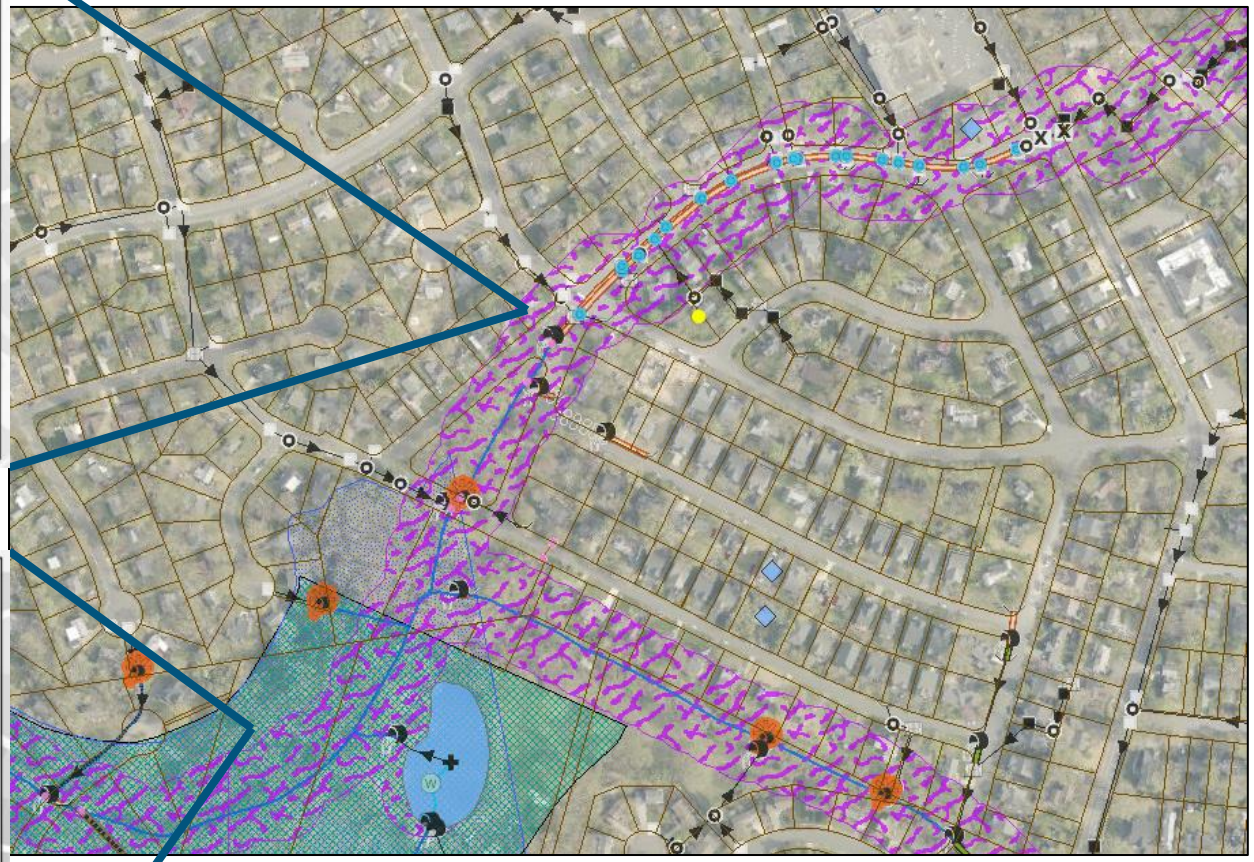
Structure in 25 foot stream buffer

Buildings intersecting streams draining a watershed with a drainage area of greater than 70 acres.

Structures within 30 feet of FEMA Floodplain

Buildings intersecting the approximate location of the 100 year floodplain based on recorded easements 30 foot buffer.





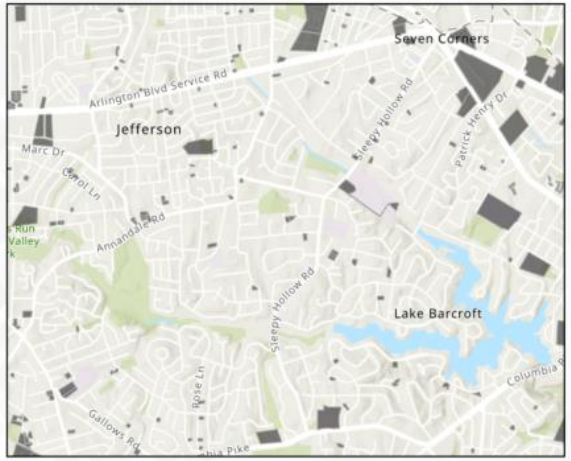
Flood Prone Properties and Neighborhoods Map

Parcel in Sump

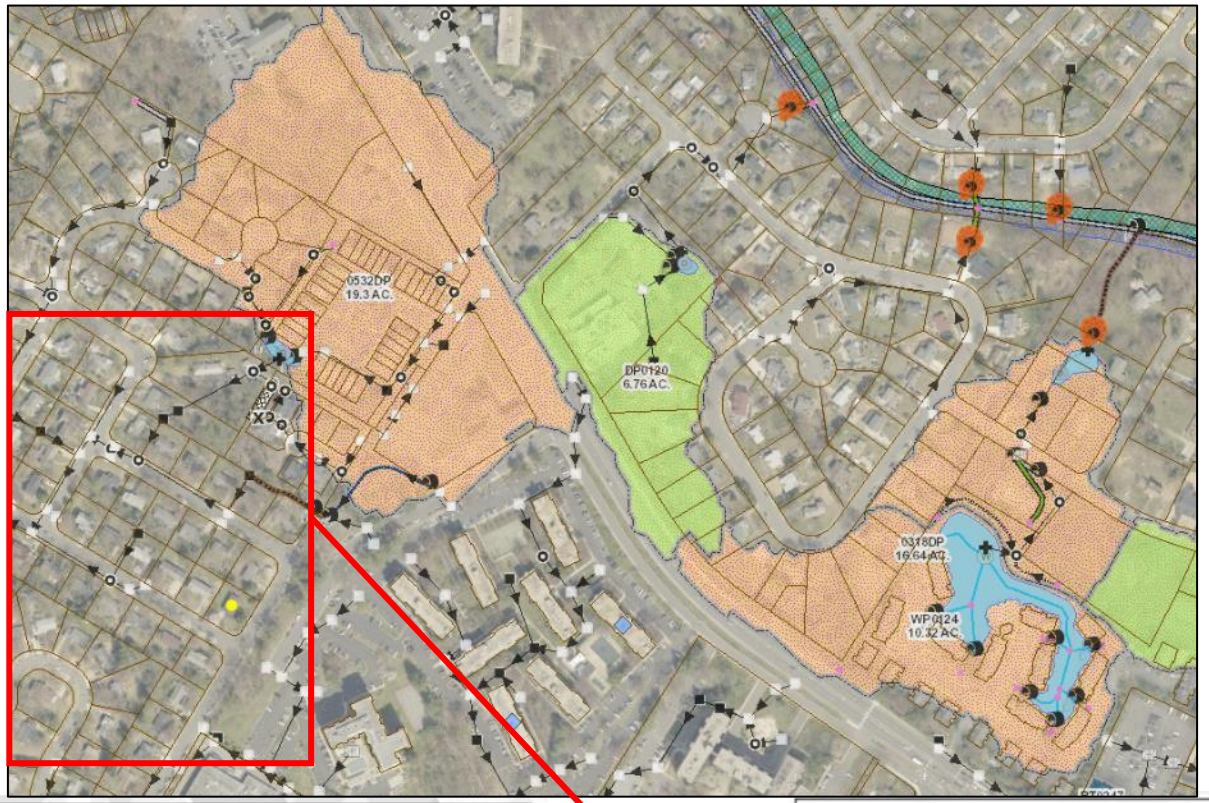
Parcels with a stormwater "pit" that holds all runoff before it drains away through the connected drainage pipes or overland relief path.

Structure in Sump

Buildings intersecting a stormwater sump that holds all runoff before it drains away through the connected drainage pipes or overland relief path.



Flood Prone Properties and Neighborhoods Map



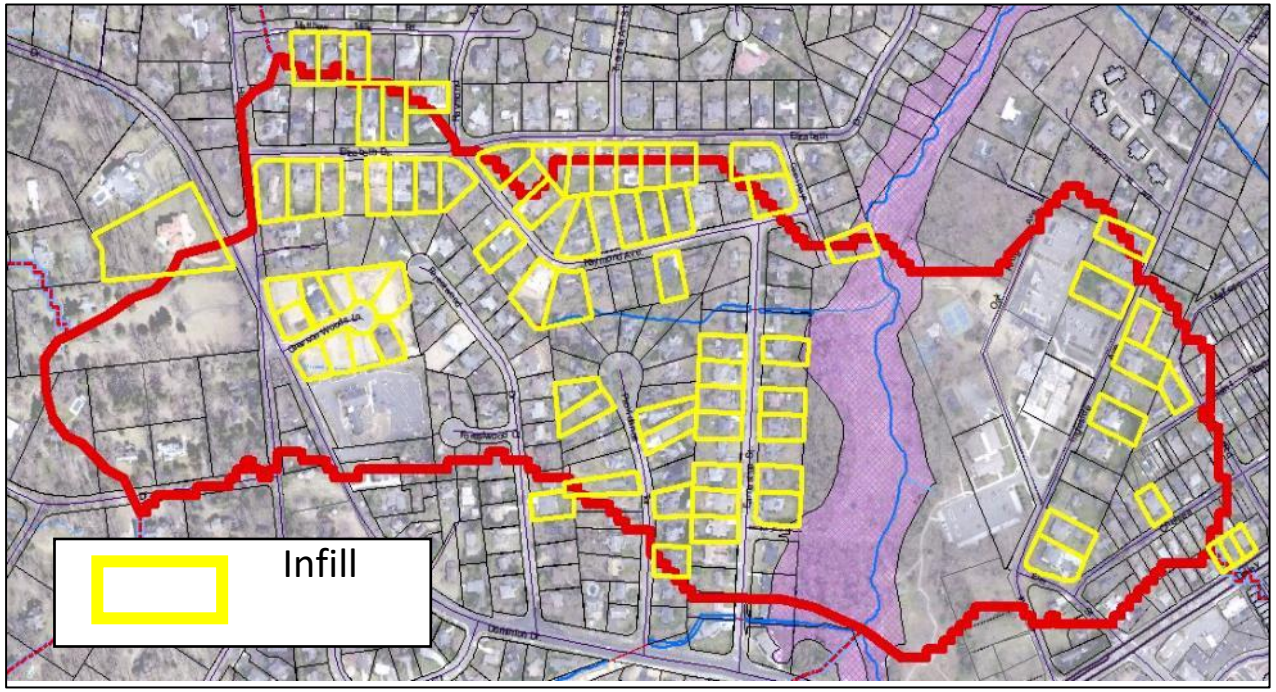
Subdivision Age older than 1972

Subdivisions built before most modern ordinance requirements, including stormwater quality and quantity control standards.

Subdivision outside Facility Drainage Area

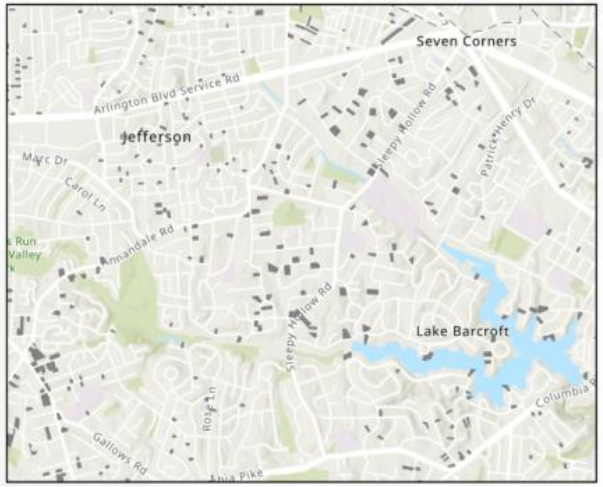
Subdivisions outside of stormwater management facility drainage areas which control stormwater runoff in Fairfax County.

Flood Prone Properties and Neighborhoods Map

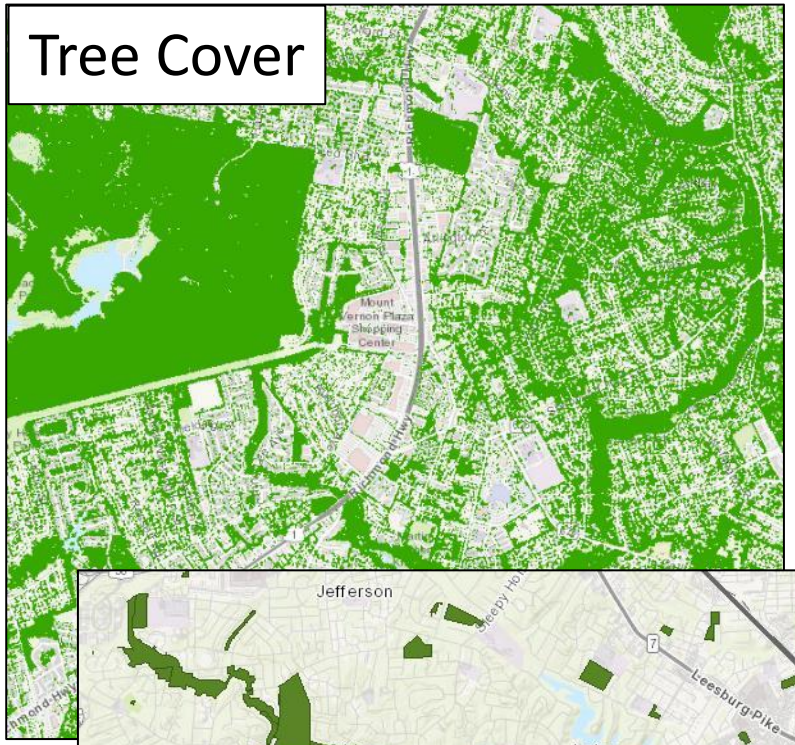


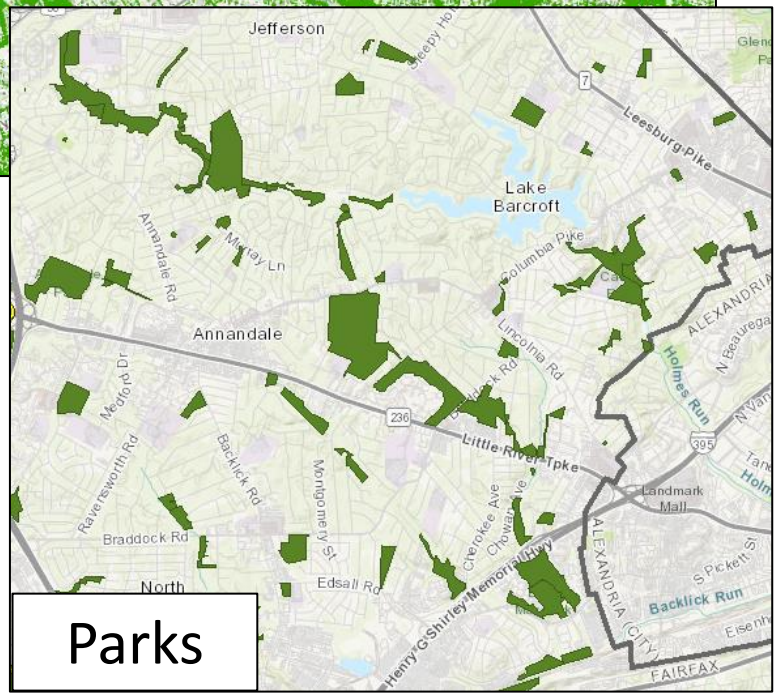
Infill Lots

Residential development that has occurred proximate to, or within, already established neighborhoods had been referred to as "infill" development.



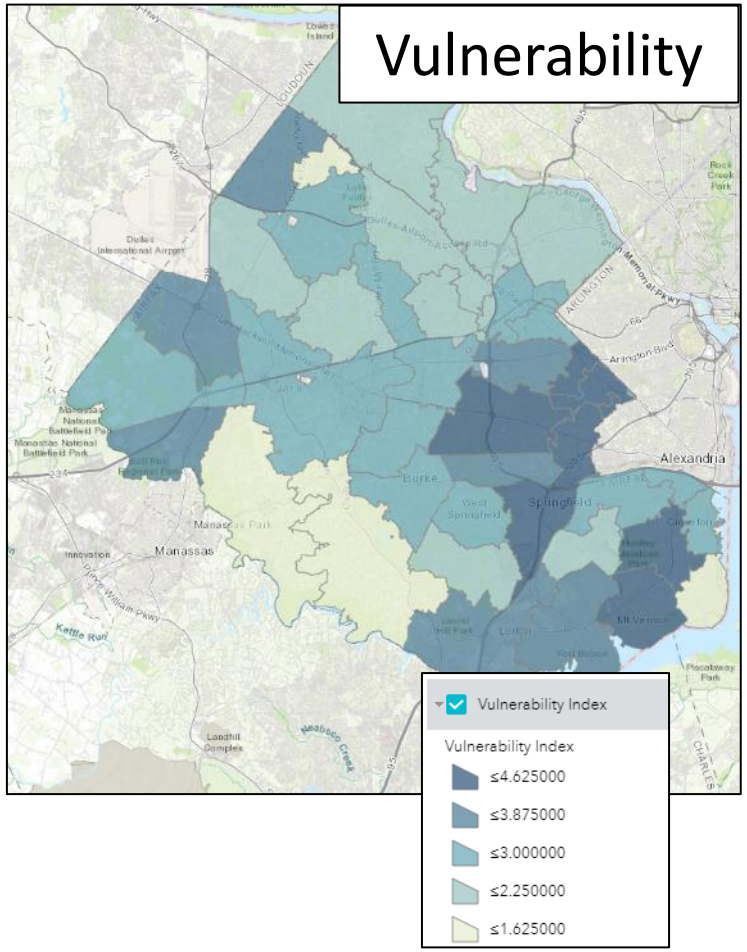
Flood Prone Properties and Neighborhoods Map





The Flood Prone Properties and Neighborhoods Map will:

- Provide a comprehensive and objective look at flood risk
- Align flood resiliency with other county initiatives
- Incorporate equity into project selection and prioritization
- Plan for future development and climate change

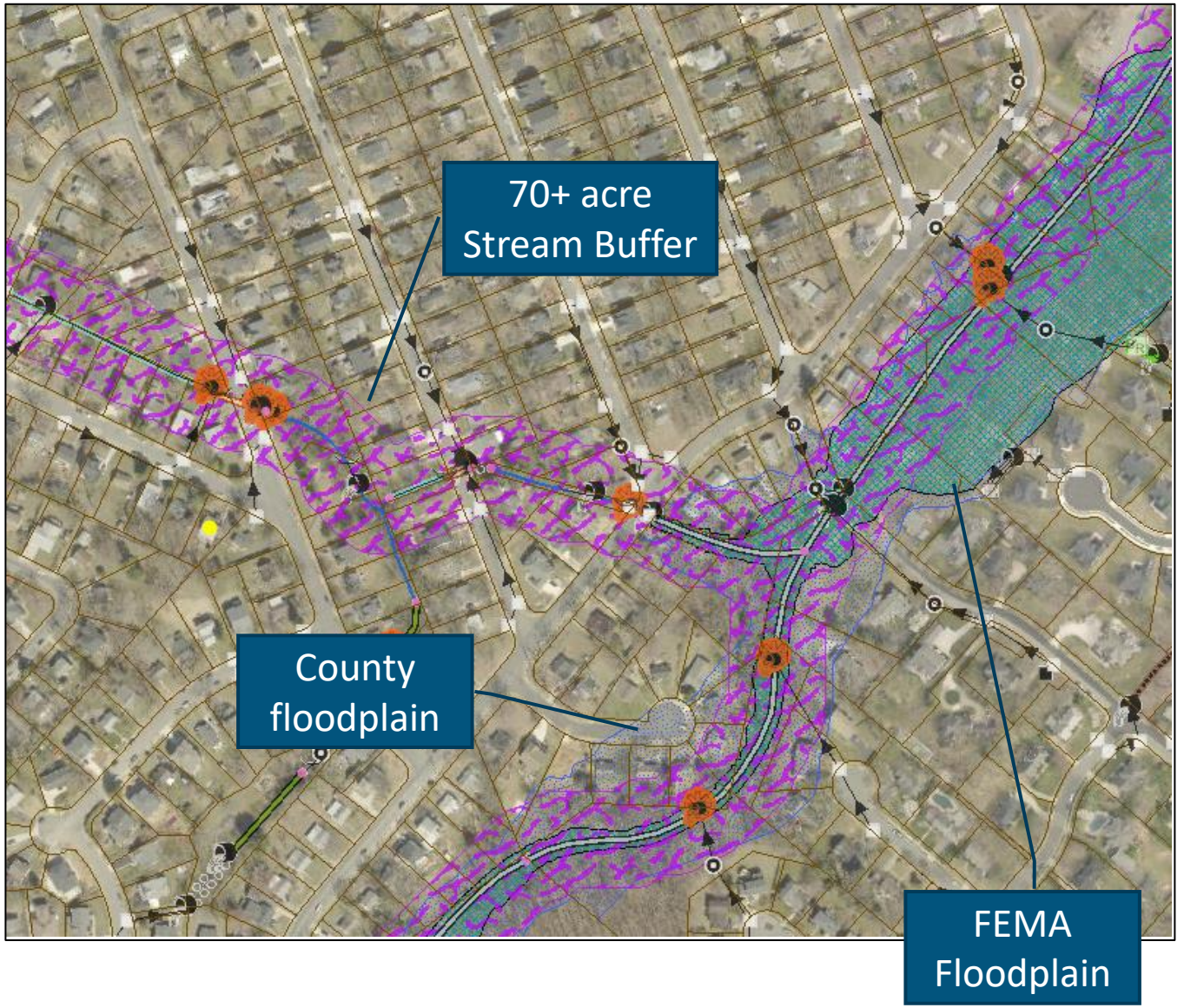


County Regulated Floodplain Map Updates

Minor- > 70 acres

Major- ≥ 360 acres

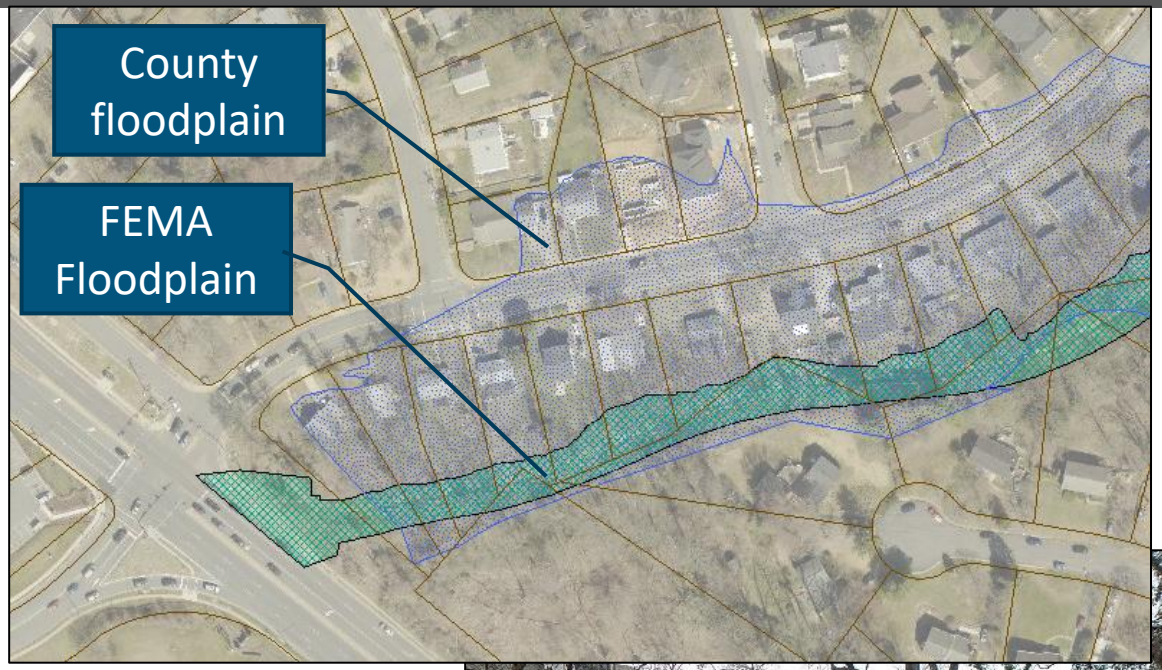
FEMA- > 1 square mile



County Regulated Floodplain Map Updates

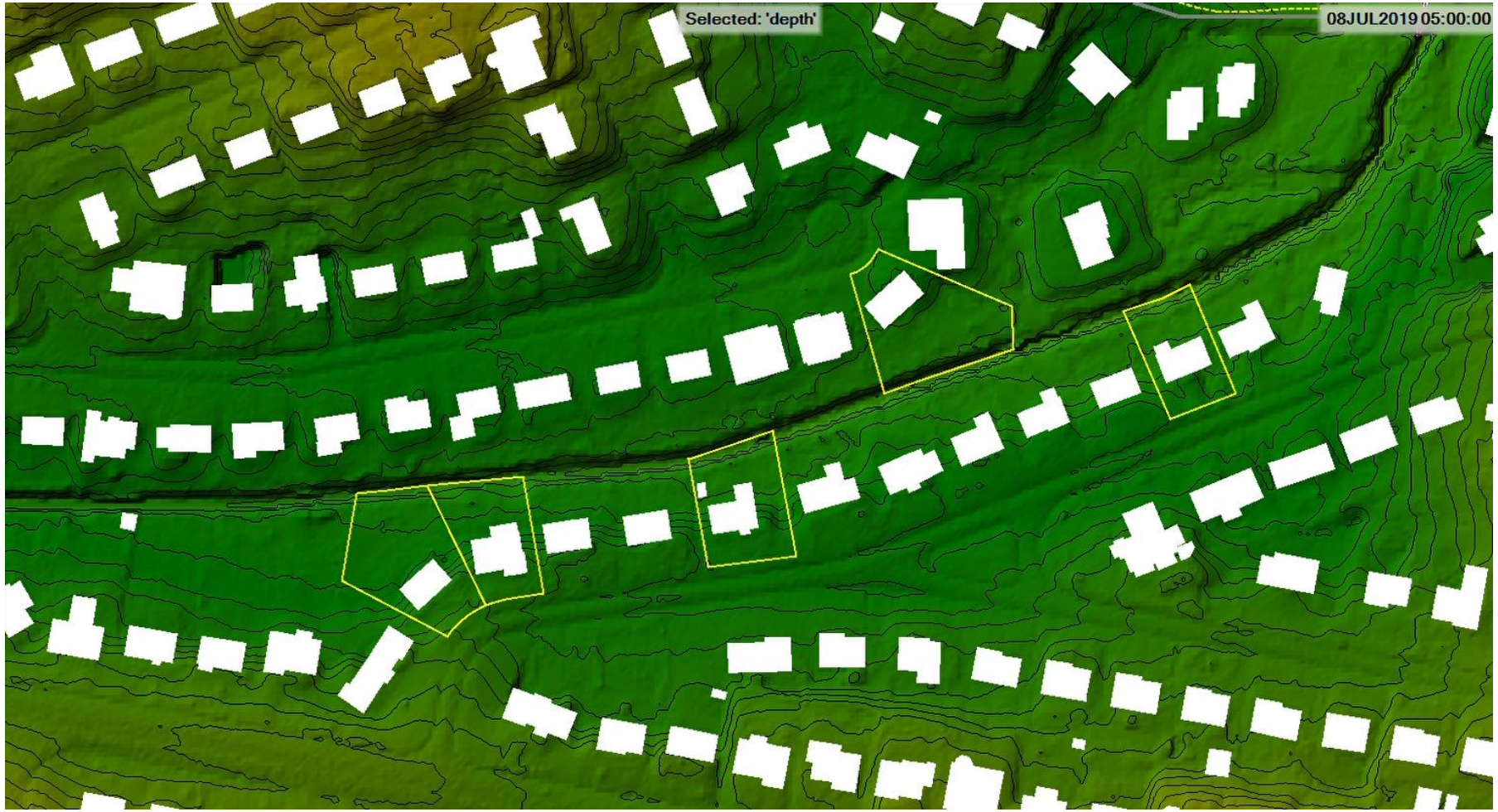
County regulated floodplain map updates will:

- Develop a comprehensive regulated floodplain map with clear and consistent base flood elevations
- Map unmapped portions of the regulated floodplain
- Increase community flood risk awareness
- Allow for the incorporation of future climate projection conditions



Flood Response: Rain-on-Grid Analysis

Simulated July 8, 2019 storm event and 100-year



Funding Sources

County Stormwater Budget: Special Revenue Fund

Always Seeking Grants

ARPA, Infrastructure, VA Community Flood Preparedness

Harder to get the benefit:cost ratio > 1 for FEMA/VEMA's BRIC funding

FEMA HMA within Special Flood Hazard Area

Prospective Development

Existing Undersized Infrastructure

Partner with VDOT on areas of shared concern

Questions?

▼

The Good News

- 1959 Floodplain laws protected much of the county
- We regulate to the 70-acre drainage size
- Newer neighborhoods have fewer drainage issues
- Prospective Infill will contribute less to drainage issues

The opportunities

- Older, undersized infrastructure
- Countywide flood mapping
- Preparing for precipitation intensity increase
- Proactive flood response
- Bigger picture of new development and redevelopment