

Floodplain Discussion

City Council

City of Takoma Park

What is a Flooding

It all depends who you ask.

- Wet Shoes
- An Inconvenience
- Property Damage
- Catastrophic Loss of Property or Loss of Life
- Montgomery County Code Article III.
Floodplain District Requirements. **Sec. 19-36. Definitions.**
 - **Flood:** A temporary inundation of normally dry land areas.



What is a Floodplain (Sec. 19-36. Definitions.)

Floodplain: (a) A relatively flat or low land area adjoining a river, stream, pond, stormwater management structure, or watercourse subject to partial or complete inundation; or

(b) An area subject to unusual and rapid accumulation or runoff of surface water as a result of an upstream dam failure.

Floodplain district: Any area specified in Executive regulations that is subject to inundation in a 100-year storm. This includes any waterway with a drainage area of 30 acres or larger.

100-year flood: A flood that has a one percent chance of being equalled (sic) or exceeded in a given year. Unless otherwise stated, this calculation is based on the contributing watershed being completely under existing zoning.



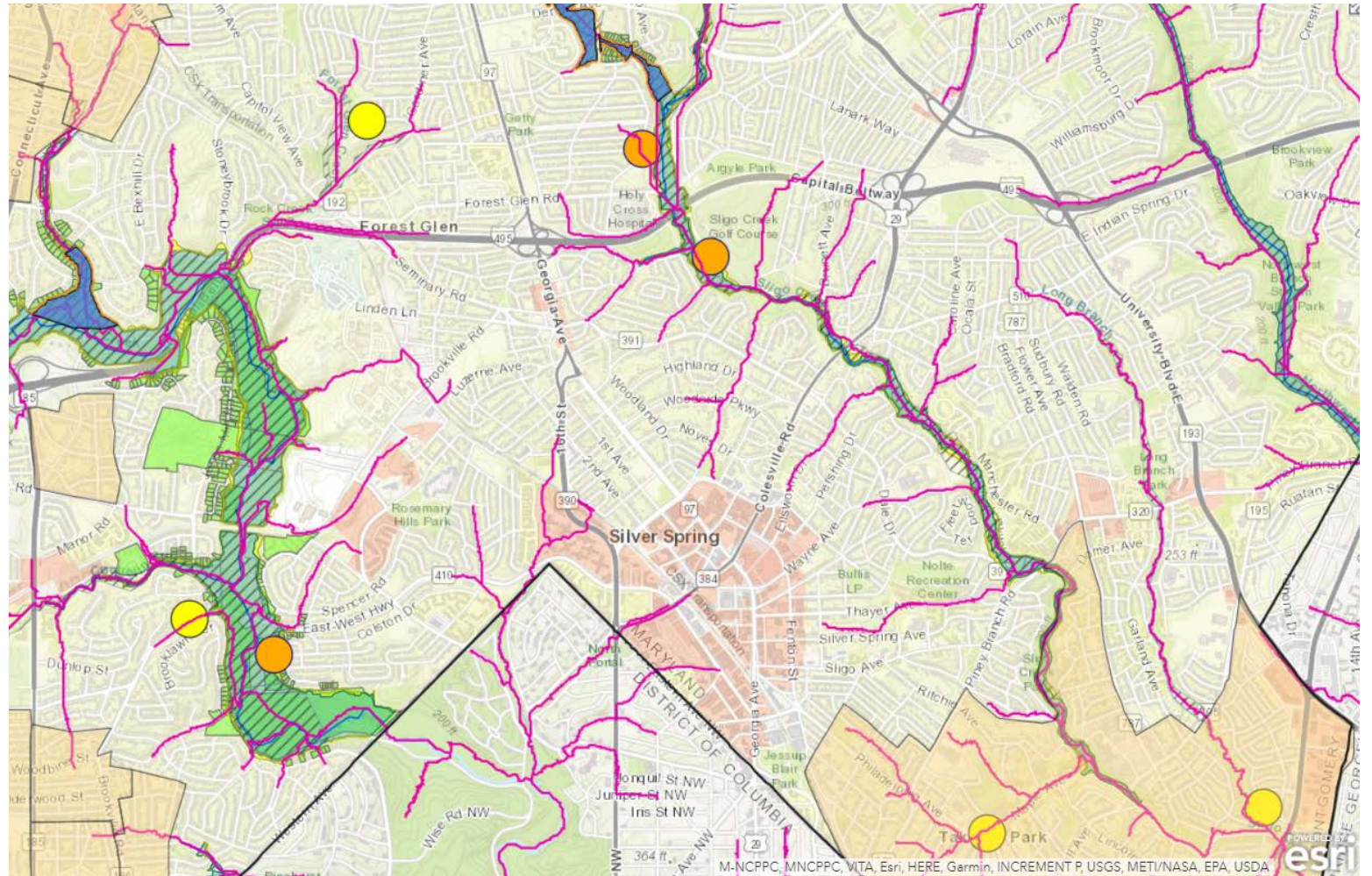
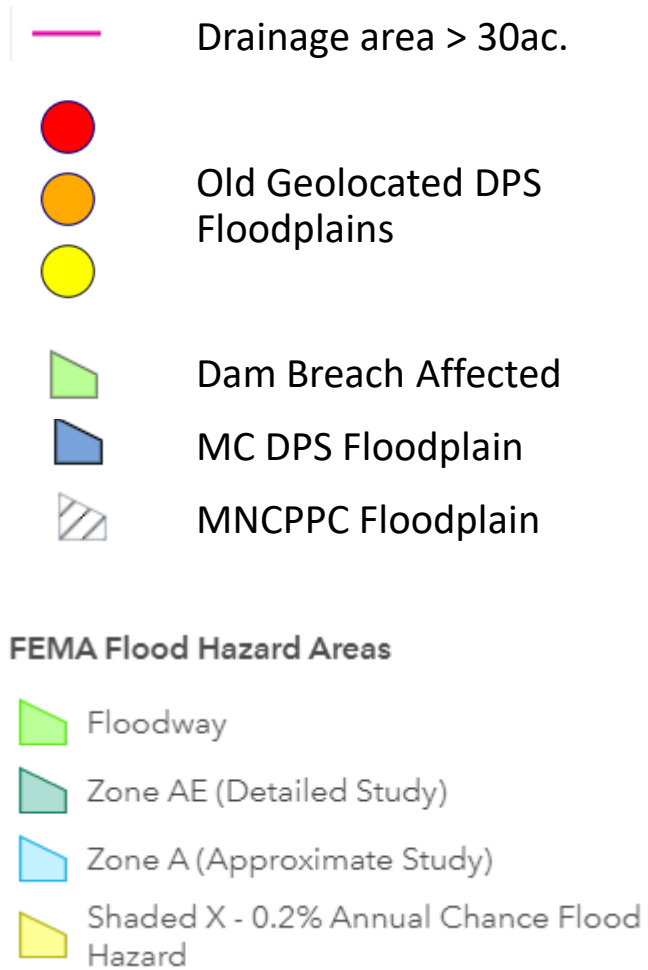
When is a Permit Required?

Sec. 19-37. When a floodplain district permit is required.



- A permit is required for most land disturbing activities within a floodplain district or for temporary or permanent construction involving placement of a structure, regardless of size of the disturbed area.
- Minor land disturbing activities that disturb less than 5,000 square feet; are promptly stabilized to prevent erosion and sedimentation; and, do not substantially block or impede the flow of water or change the cross section are exempt.
- A permit is not required if the land disturbing activity is for agricultural practices; except for the construction of agricultural structures.
- A permit is not required for nursery operations related to the removal or transplanting of sod, shrubs, or trees.
- Although a permit may not be required, any activity within a floodplain district is subject to DPS review.

Montgomery County 30 Acre Drainage



What is a 100yr Event Storm, Flooding, or Otherwise.



“100-year storm” refers to the estimated probability of a storm event happening in any given year.



A 100-year event has a 1 percent chance (or 1-in-a-100 chance) of occurring in any given year. The term “100-year flood” allows us to place a particular weather event in context with other similar events.

24hr Design Events for Montgomery County:²

<i>1yr.</i>	<i>2.6”</i>
<i>2yr</i>	<i>3.2”</i>
<i>5yr.</i>	<i>4.2”</i>
<i>10yr</i>	<i>5.1”</i>
<i>25yr.</i>	<i>5.6”</i>
<i>50yr.</i>	<i>6.3”</i>
<i>100yr.</i>	<i>7.2”</i>



Replaced by NOAA Atlas 14: Precipitation-Frequency Atlas of The United States For Stormwater Management



Basic Probability / Risk



- A building mapped in SFHA is five times more likely to sustain flood damage than to experience a major fire.¹
- There is 26% chance of one or more event (flood) meeting or exceeding the 100-year magnitude event in a 30-year period.
 - (26% / 30yr) (14% / 15yr) (10% / 10yr) (5% / 5yr)

For reference the probably of flipping 2 coins heads two times in a row is 25%

$$P_e = 1 - \left[1 - \left(\frac{1}{T}\right)\right]^n$$

MATH:

The probability P_e that one or more floods occurring during any period will exceed a given flood threshold can be expressed, using the binomial distribution, as

- T is the threshold return period (e.g. 500-yr, 100-yr, 50-yr...)
- n is the number of years in the period
- P_e the exceedance probability is also described as the natural, inherent, or hydrologic risk of failure.

Sources of Floodplain Delineations



Acceptable sources:

- FEMA "Flood Insurance Rate Maps" (FIRM) or "Flood Boundary and Floodway Maps"
- Approved Engineered Floodplain Studies by the
 - Department of Permitting Services DPS
 - Maryland-National Capital Park and Planning Commission (M-NCPPC) ultimate Development 100 Year Floodplain Map.
- For single family homes in with an undelineated floodplain the engineer's opinion of the floodplain delineation represented on the record plat may be accepted.

Unacceptable / Unofficial floodplain sources:

- "I've lived here for ## years and it never/always floods."
- "Floodplains" or "Floodplain Easements" represented on another document (e.g. Plats, State Highway hydraulics studies, Natural Resource Studies, Forest Conservation Plan, Site Plans) without reference to a FEMA, DPS, or MNCPPC floodplain study identification.

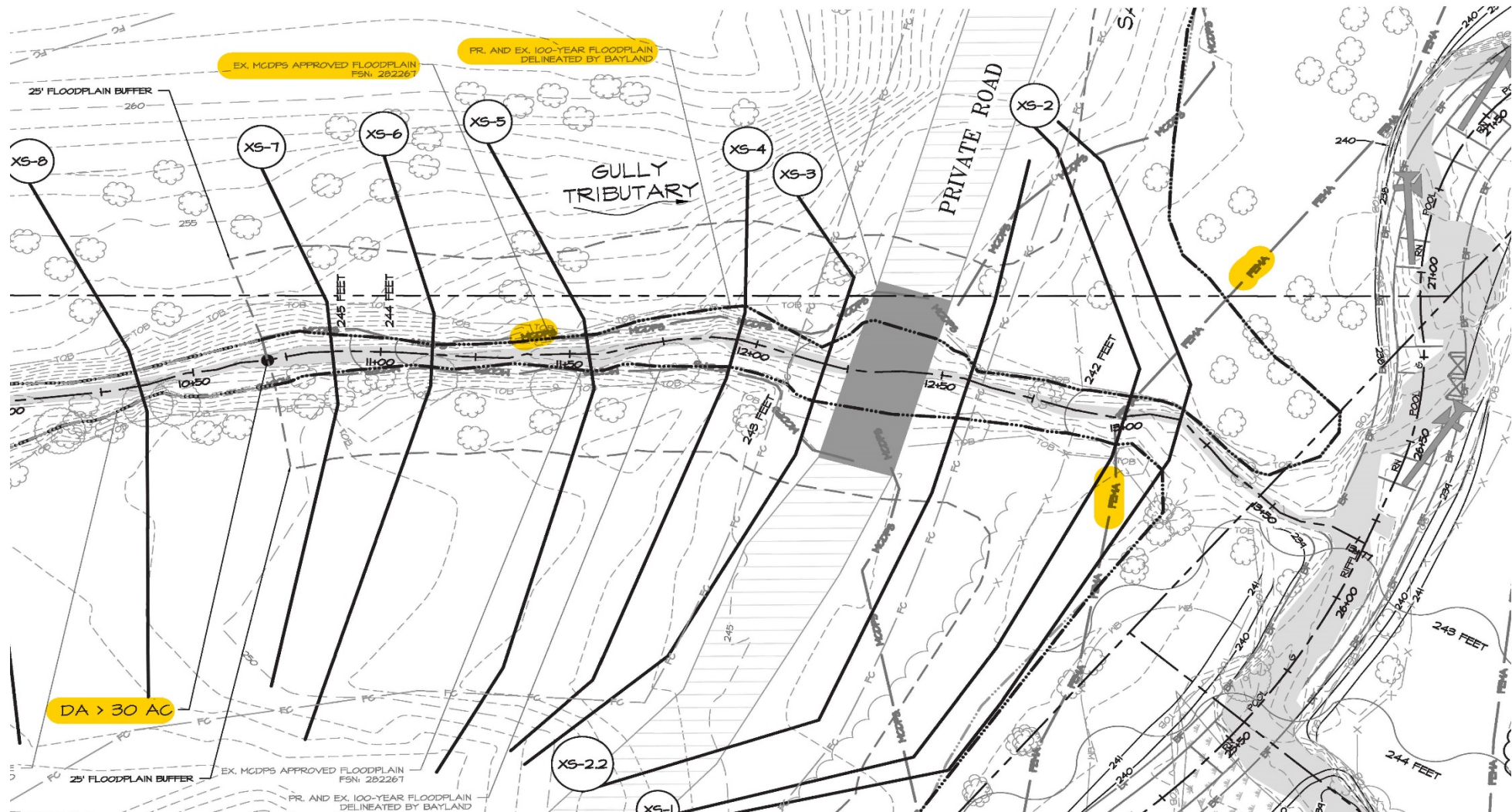
How is a Floodplain Delineated

- In Montgomery County: A floodplain is that water surface elevation of a drainage course with a drainage area of 30ac. or more, generated by the 100yr. design event, modeled by a professional engineer and approved by the appropriate authority. (COMCOR 19.45.01.03 Establishment of Floodplain District)
- Water surface profiles computed using an energy balancing method, showing the invert elevation of the stream bed, water surface elevations, and water velocity, by segment, associated with the 100-year frequency flood events, for both the presently existing and proposed conditions, at each cross-section. Cross sections shall be taken at appropriate intervals to a point, both downstream and upstream of the proposed project, where the presently existing and proposed water surface profiles coincide. MD Code 26.17.04.07 A. 9c.
- The hydrologic calculations shall be based on the ultimate development of the watershed, assuming full developed to existing zoning (MD Code 26.17.04.04F) using TR-55, TR-20, HEC-1, or the Rational method (the use of the Rational method will be subject to prior approval by DPS). Site specific rainfall precipitation frequency data recommended by the U.S. National Oceanic and Atmospheric Administration Atlas 14 (NOAA 14) must be used for estimating depth of rainfall. MC DEP 04/09/91 Guidelines for 100yr Floodplain Determination
- The hydraulics and water surface elevations for 100-year ultimate floodplain elevation must be determined using HEC-2, HEC RAS, or WSP-2. MC DEP 04/09/91 Guidelines for 100yr Floodplain Determination



How is a Floodplain Delineated

(COMCOR 19.45.01.03 Establishment of Floodplain District)



What is Floodplain Study?

(English)

A floodplain study is an if/then scenario. If this proposed construction is implemented, then the 100yr floodplain would look like this.

Primary purpose of flood impact review are to assure that:

1. Flood hazards are not increased

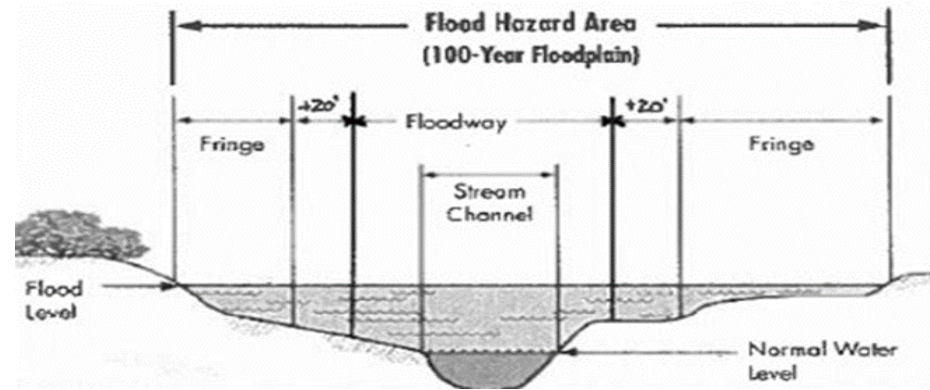
- a. No increase flooding of existing structures or adjacent properties without consent.
- b. Vacant or undeveloped land within the 100yr floodplain is not adversely impacted by proposed activities or mean an effective limitation of others developable rights.

2. Activities are constructed to withstand the passage of the 100yr flood

3. Aquatic resources are adequately protected

Stream degradation is minimized and science, wildlife, and recreational functions are preserved. *(Sec. 22A-12. Retention, afforestation, and reforestation requirements – Administered by MNCPPC)*

When is a Revised Floodplain Study Required?



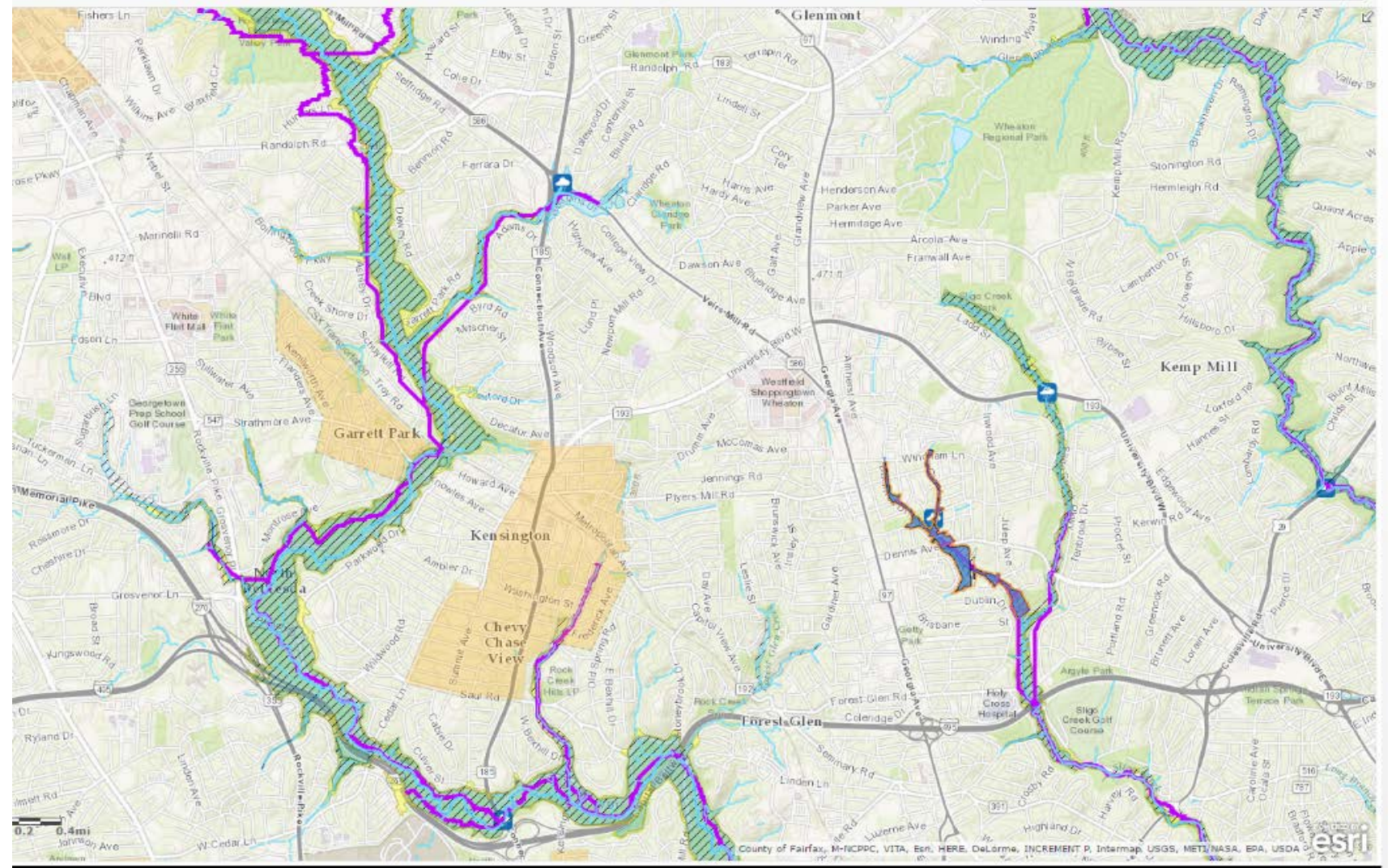
- Any disturbance in the floodplain where it is not patently obvious the effects on the floodplain would be de minimis
- All work in the floodway. (Also requires FEMA CLMOR)
- Approximate Floodplain (*COMCOR 19.45.01.04 A16*)
 - Stream Valley Protection Setback Requirement - A minimum 100 foot stream valley setback shall be maintained from the edge of the banks of any watercourse delineated as having a floodplain on the official floodplain maps except where the floodplain limit is less than 100 feet from the banks, then the minimum stream valley protection setback must be the floodplain limits. activities in . Approximate Floodplain
 - An Approximate Floodplain Determination Study using a simplified hydrologic and/or simplified hydraulic methods may be acceptable in areas when the limits of Floodplain Delineation is not required to clearly demonstrate that the Floodplain its form and function are protected and that no neighboring properties developable rights are affected COMAR 19.45.01.04B. Approximate studies are generally only acceptable when used to show a property is not in a neighboring unmapped floodplain or when the approximate floodplain is located such that proposed development would have a de minimis effect of the floodplain.
- Exemptions from study requirements maybe granted for public bridge and culvert replacement per Maryland Department of Natural Resources, Water Resources Administration Operational Policy 93-1 for In-Kind Replacement of Bridges & Structures

Citations / References

1. Rebecca Quinn, Floodplain Manager's Notebook, The Insider, July 2015, pg. 10.
2. Technical Paper No. 40 - U.S. Department of Commerce-Weather Bureau, Exhibit 2-3A

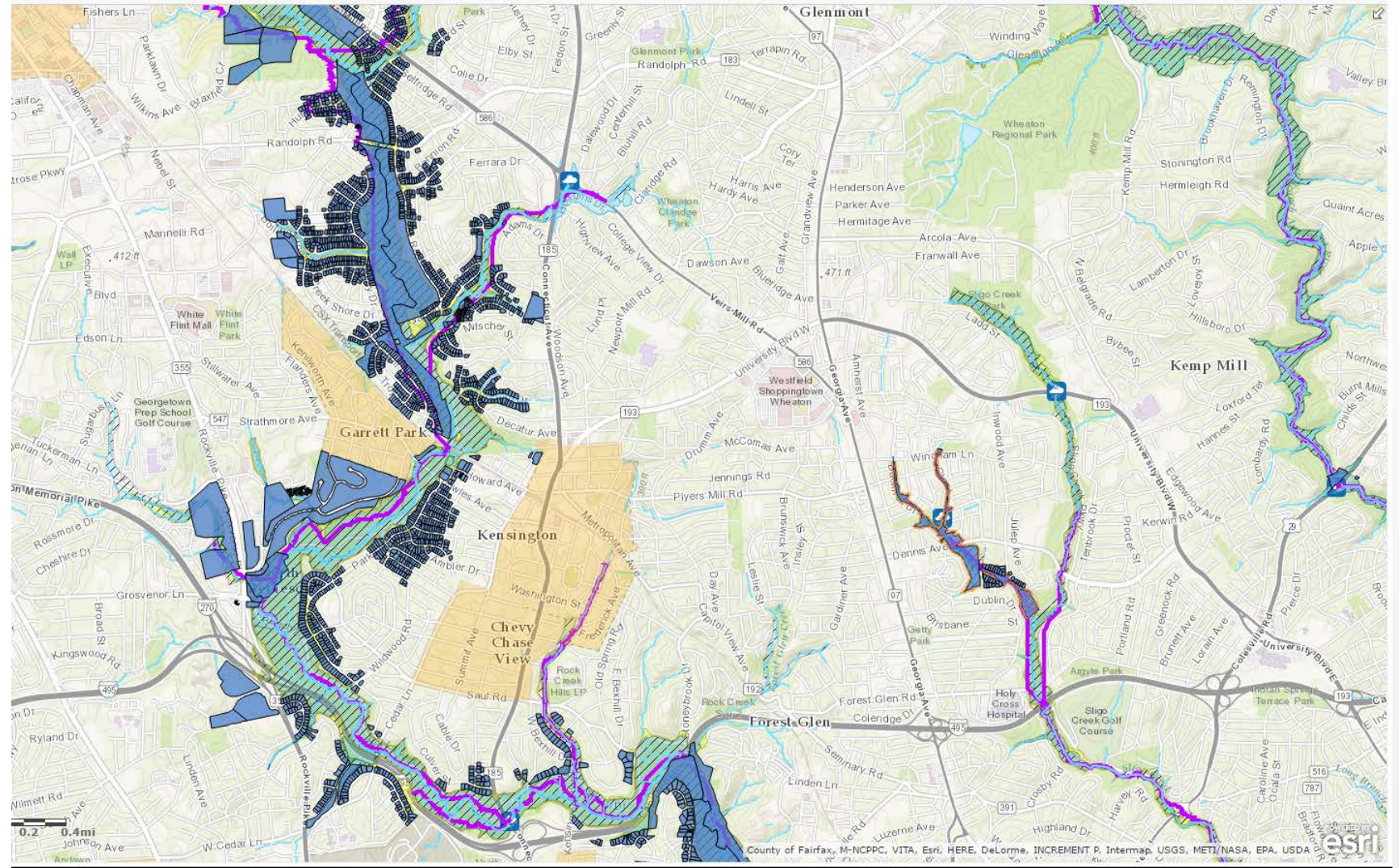
1 sq. mile (640-acre) Drainage Areas

- 640-acre Drainage – purple lines
- MNCPPC – hatched area
- FEMA – blue shade



Dam Impacted Properties

- Properties Identified as Impacted by



Dam Emergency Action Plans

- 24 Dam Emergency Action Plans analyzed for list of impacted properties.
 - Ashton, Brighton, Burnt Mills, Crabs Branch, Fairfield East, Falls Road Golf Course, Gulesky Pond, Gunners Lake, Inspiration Lake, Bernard Frank, Lyette, Needwood, Nirvana, Placid, Walker, Whetstone, Seneca, MC College, Pine Lake, Railroad Branch, Rattlewood, Rolling Hills, Seneca Creek – Copper Lake, & Summit Hill Park
- **Appendix B-5: Flood Inundation Information**
 - The numbers in Table B-5-1 are based off the dam breach with during the PMF.
- PMF Inundation Limits show the extent of flooding due to a PMF flood. It is intended to be used in the evacuation of the public during a Level 3 Emergency.

Appendix B–5

Residents/Businesses/Highways at Risk

A major flood caused by a sudden breach of the dam is estimated to inundate one business and flood three roads. This one business (marked on the evacuation map) is located east of MD Rt.28 in Gaithersburg, MD.

House / business no.*	Resident/business	Address	Phone no.	Distance downstream from dam (ft)	Travel time ** (hr)	Max water depth above first floor (ft)
	Montgomery County Public Safety Headquarters Building	100 Edison Park Dr.	911	1560	0.03	3.49
Main Street				610	0.03	0.14
Edison Park Drive				2335	0.07	2.11
MD Rt. 28				3050	0.13	0.0

* See Appendix B–4.

** Estimated time for breach wave (peak) to travel from dam to downstream locations

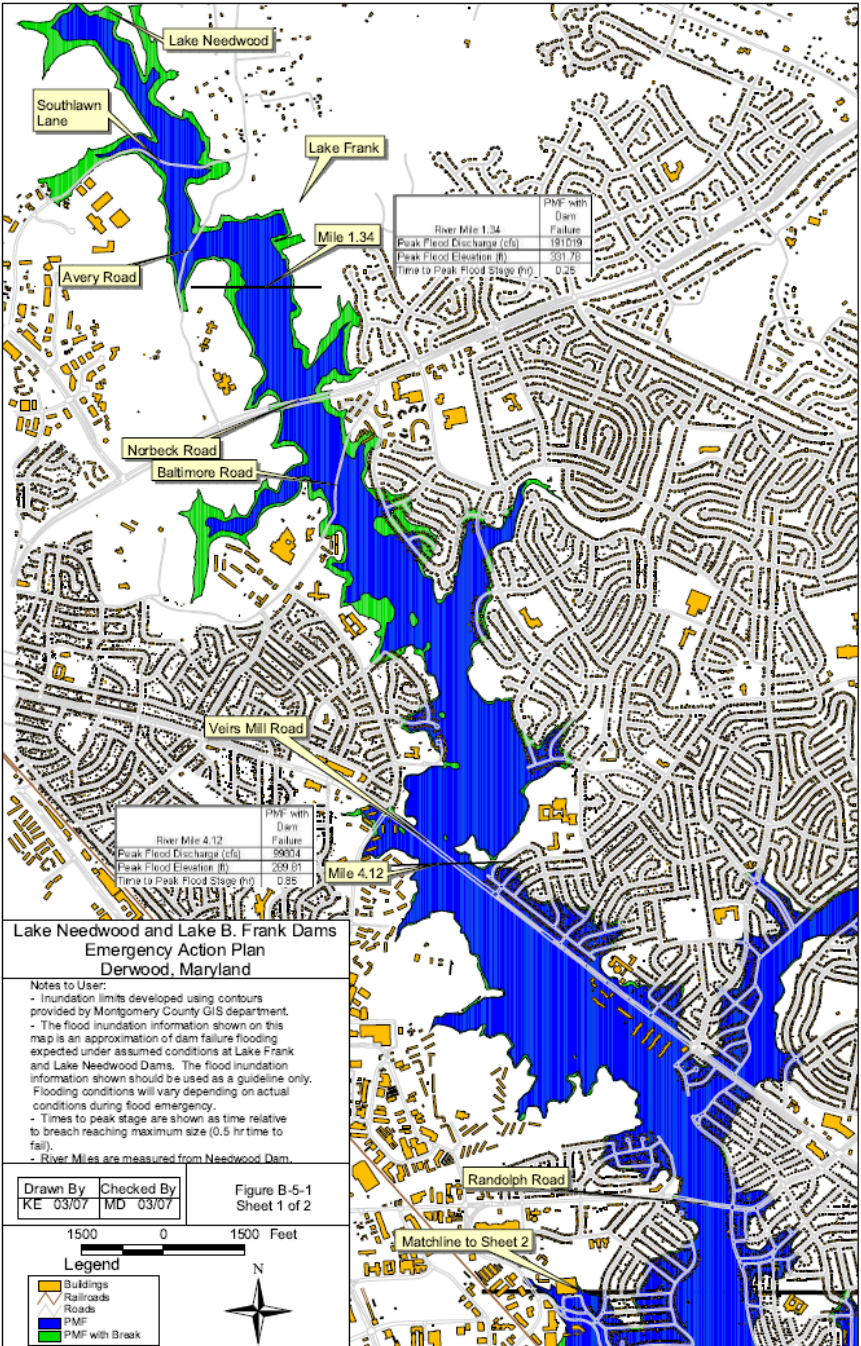
Basis for computation of evacuation area and flooding depths

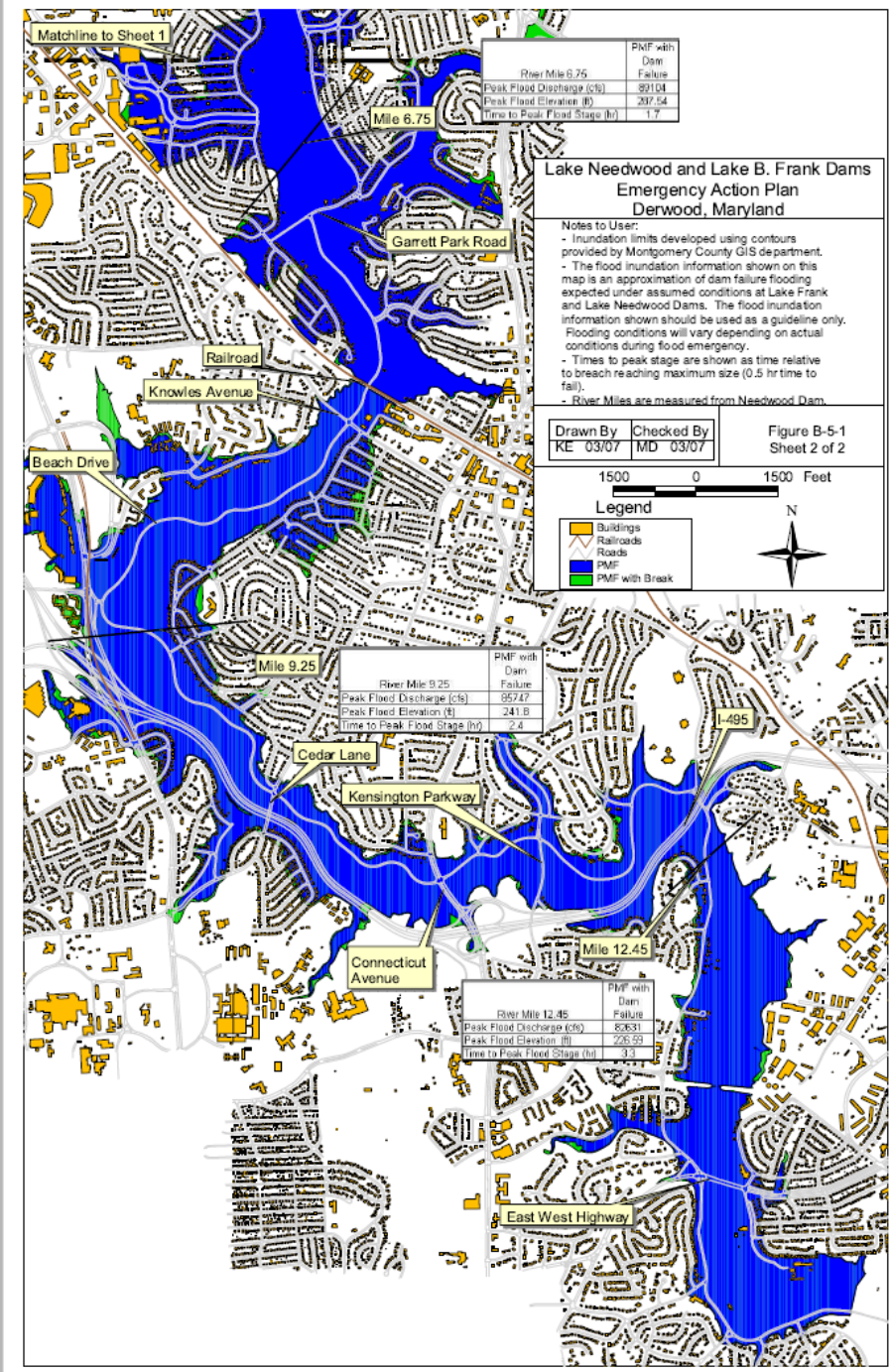
Breach inundation study completed by Charles P. Johnson & Associates, Inc. (2007)

Hydraulic model used: HEC-1

Model assumptions:

- PMF Breach
- Water surface elevation in reservoir prior to breach = 395.97
- Total volume of breach hydrograph = 475 acre-ft
- Height of water at time of breach = 35.58 ft
- Peak breach discharge = 27,278 ft³/s
- Downstream area defined by field surveys consisting of 6 cross sections





Flood Related Costs

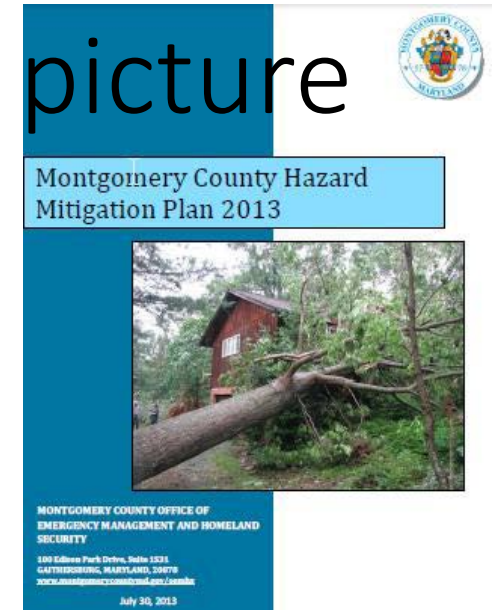
- Between 1980 and 2013, the United States suffered more than \$260 billion in flood-related damages.
- On average, more people die annually from flooding than any other natural hazard.
- Severe weather is the leading cause of business disruptions and property damage in the U.S.
- With climate change, we anticipate that flooding risks will increase over time.

<https://www.fema.gov/news-release/2015/02/05/federal-flood-risk-management-standard>

Flash flood at Candy Cane Park, Montgomery County, MD by woodleywonderworks

NFIP claims may show only part of the picture

- Many homes and businesses are under insured e.g., business continuity insurance does not cover flooding as a peril.
- Off-plain (local) flooding losses may exceed National Flood Insurance Program (NFIP) claims. A study in Chicago found:
 - Only 8% of total payouts for flood losses came from the NFIP
 - There was no correlation between damage payouts and location in a flood plain.



Baker Flooding Summary

• **Flooding is one of the most common disasters in the County, with notable events including:**

- Hurricane Floyd – 1999
- Tropical Storm Isabel – 2003
- June 2006 Flooding

Total Flood Events 1993-2010	
Total Events	112
Annualized Events	6.22
Flash Flood Events	57
Flash Flood Annualized	3.17

NFIP Policy Information	
# Policies in Force	2,019
Coverage Value	\$522,941,700
Annual Premiums	\$937,038
Number of Claims	408
Claims Value	\$1,929,185
Average Claim	\$4,728

