ELLICOTT CITY NONSTRUCTURAL FLOOD PROOFING STUDY

OUTBRIEF

USACE Project Team

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21 February 2018

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

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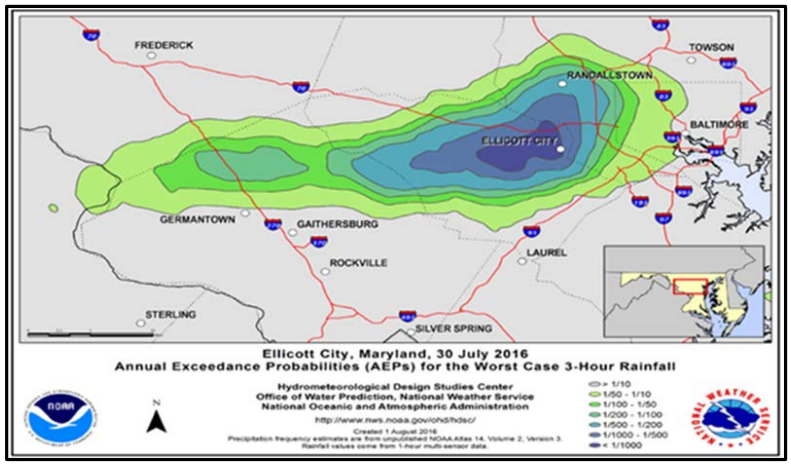
SCOPE OF THE STUDY

- Agreement signed under *Flood Plain Management Services (FPMS) Program- 29* September 2016

  - **TASK 1:** Data Collection
  - **TASK 2**: Assess Flood Proofing Applicability
  - **TASK 3**: Building Surveys
  - **TASK 4**: Evaluation of Flood Proofing Measures
  - **TASK 5**: Preliminary Economic Analysis
  - **TASK 6**: Flood Action Plan
  - **TASK 7**: Outreach



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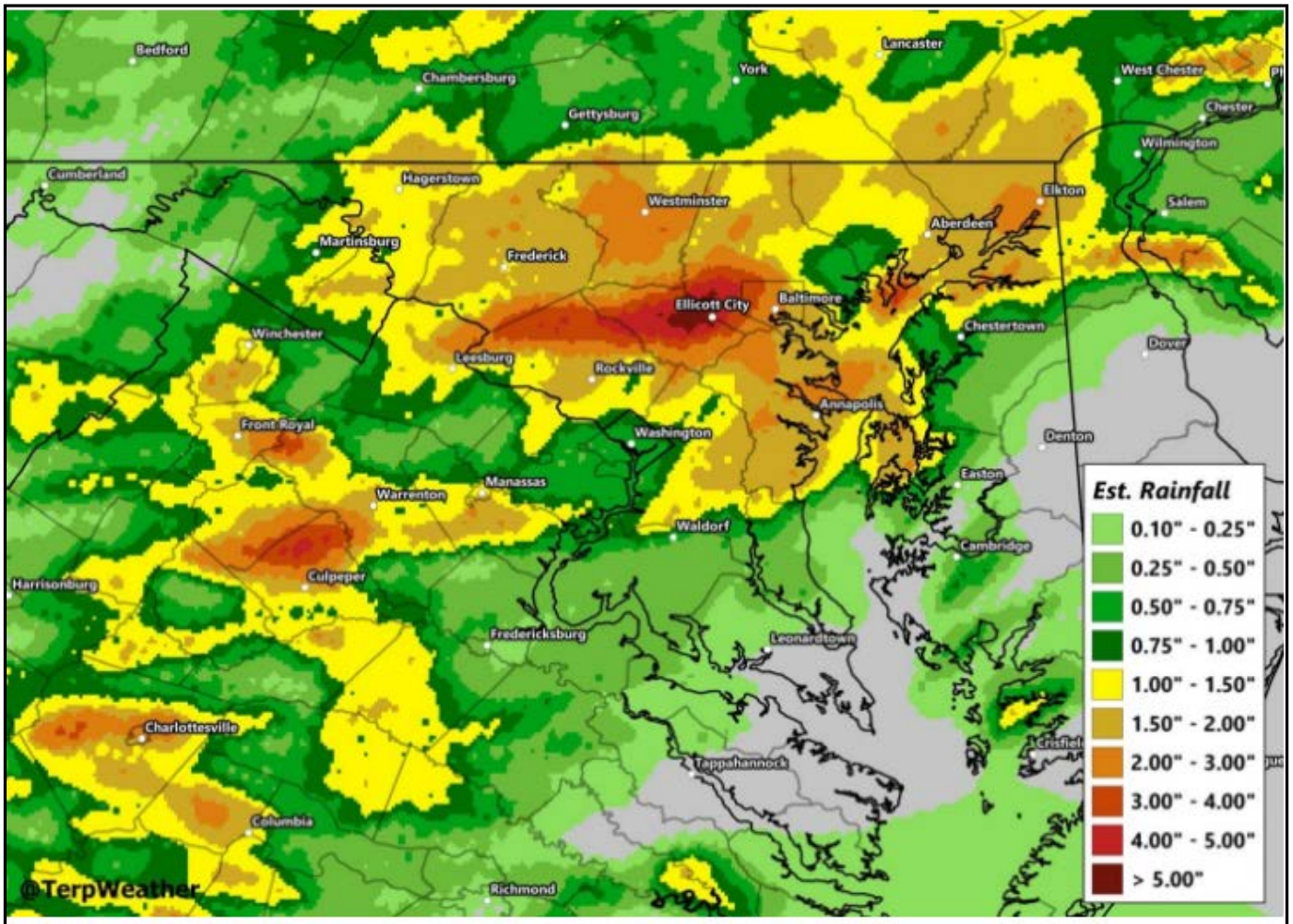
30 JULY 2016 STORM



Doppler estimated rainfall for flash flood event July 30. (Jordan Tessler)

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RAINFALL AND FLASH FLOODING SATURDAY NIGHT

Duration	Rainfall Total	Time
1 minute	0.20"	7:51-7:52 pm
5 minutes	0.80"	7:50-7:55 pm
10 minutes	1.44"	7:50-8:00 pm
15 minutes	2.04"	7:46:8:01 pm
20 minutes	2.48"	7:44-8:04 pm
30 minutes	3.16"	7:36-8:06 pm
60 minutes	4.56"	7:30-8:30 pm
90 minutes	5.52"	7:00-8:30 pm
2 hours	5.92"	6:45-8:45pm

The storm total rainfall at Ellicott City was 6.50 inches. Based on the preliminary precipitation frequency estimates in NOAA Atlas 14 from the nearest location, the rainfall amounts with duration 10 minutes to 2 hours statistically have a less 0.1% chance of occurring in any given year, or a 1 in 1000 year event.

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WHAT IS NONSTRUCTURAL FLOOD PROOFING?

Physical:

- Elevation, Relocation, Buyout / Acquisition, Dry Flood Proofing, Wet Flood Proofing

Nonphysical:

- Flood Warning Systems, Flood Insurance, Floodplain Mapping, Flood Emergency Preparedness Plans, Land Use Regulations, Zoning, Evacuation Plans, Risk Communication

FOCUS ON REDUCING CONSEQUENCES, NOT PROBABILITY OF FLOODING

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DRY FLOOD PROOFING

- Outer barrier to prevent water from entering building
  - *Typically 3-4 ft. max*

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DRY FLOOD PROOFING: *DOOR CLOSURES*

Flood Doors

Door Panels

Window Panels

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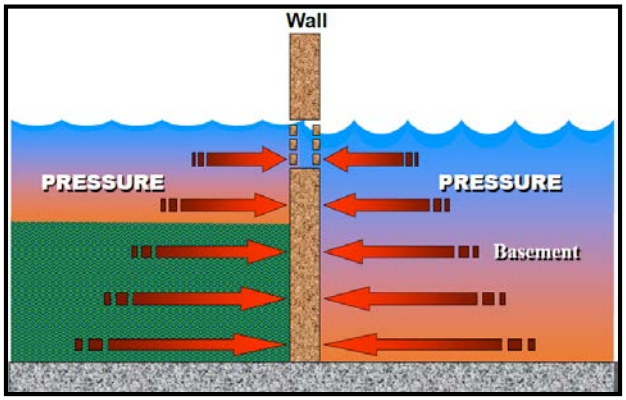
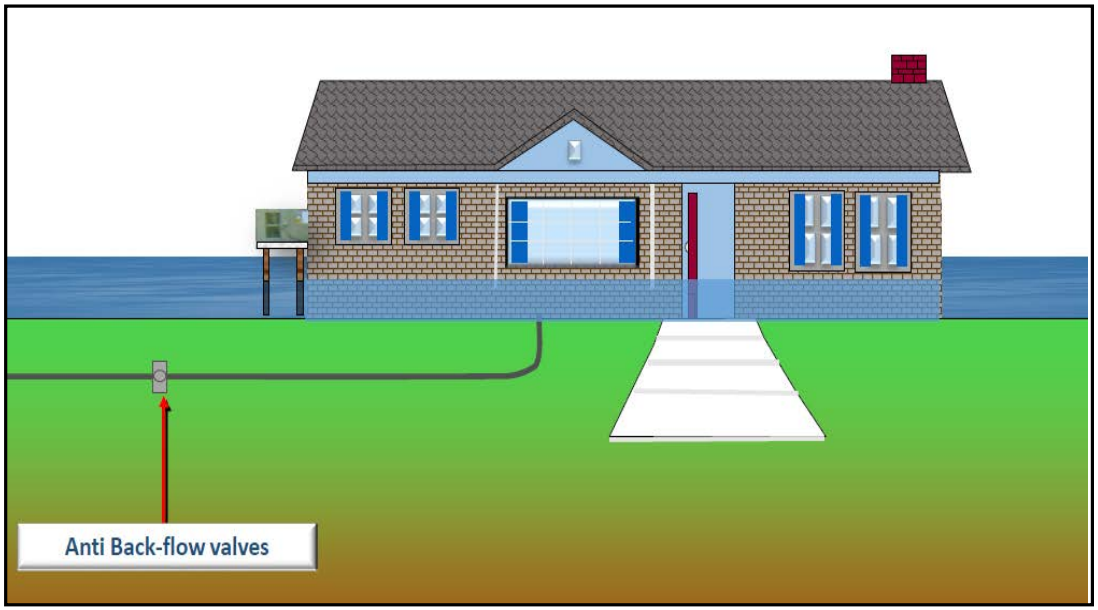
WET FLOOD PROOFING

- Allow water to pass through the structure
  - *Elevate valuables*





Flood Vent

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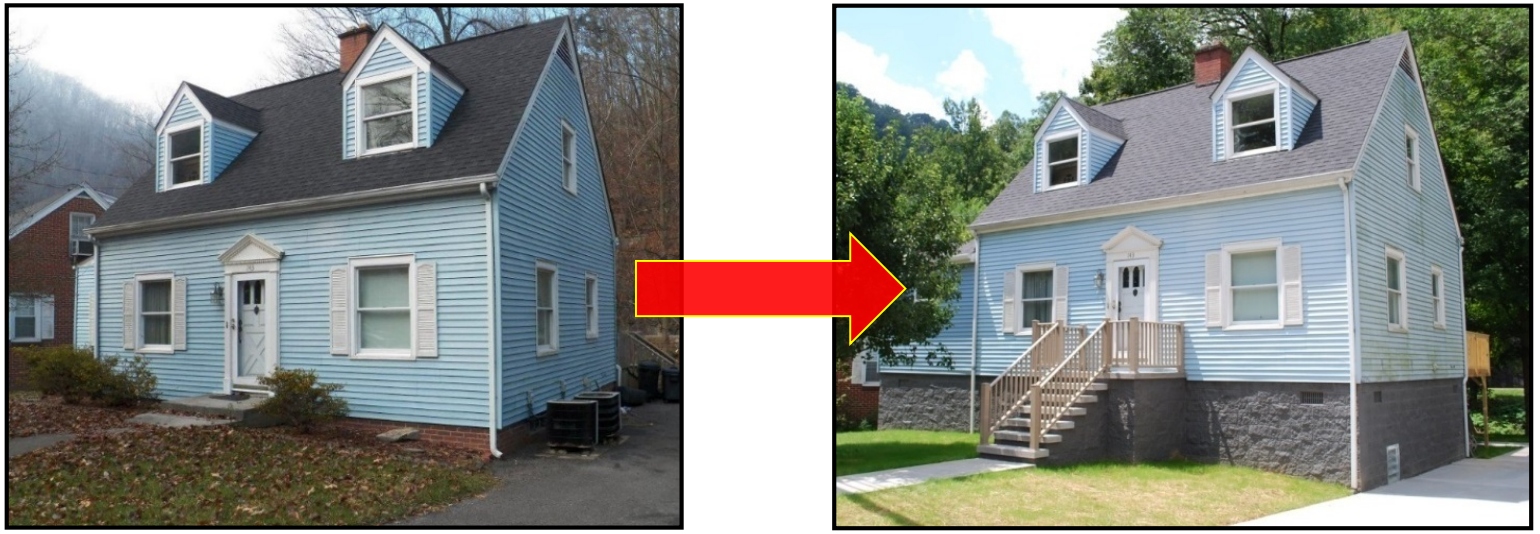
ELEVATION



Elevation on Extended Foundation Walls

Elevation on Fill

Elevation on Piles

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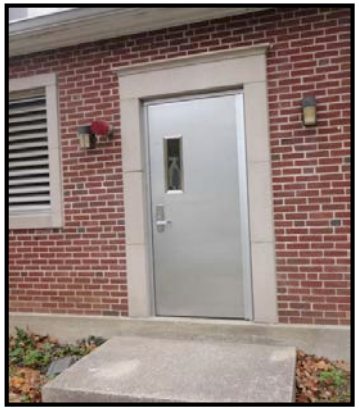
PASSIVE VS ACTIVE MEASURES

PASSIVE

Little warning time

- Flood proof doors
- Building elevations
- Wet flood proofing



Flood Door

Elevation on Foundation

ACTIVE

Require labor and warning time

- Panel door closures

Door Panels

Window Panels

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FACTSHEETS IN APPENDIX

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NONSTRUCTURAL FLOOD RISK MEASURES

FACTSHEETS

Prepared by: U.S. Army Corps of Engineers, Baltimore District
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Baltimore, Maryland 21203-1715

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NEED FOR NONSTRUCTURAL FLOOD PROOFING

- Reduce flood damages
- Typically less expensive than structural solutions
- Structures are protected individually
- Multiple solutions/customizable

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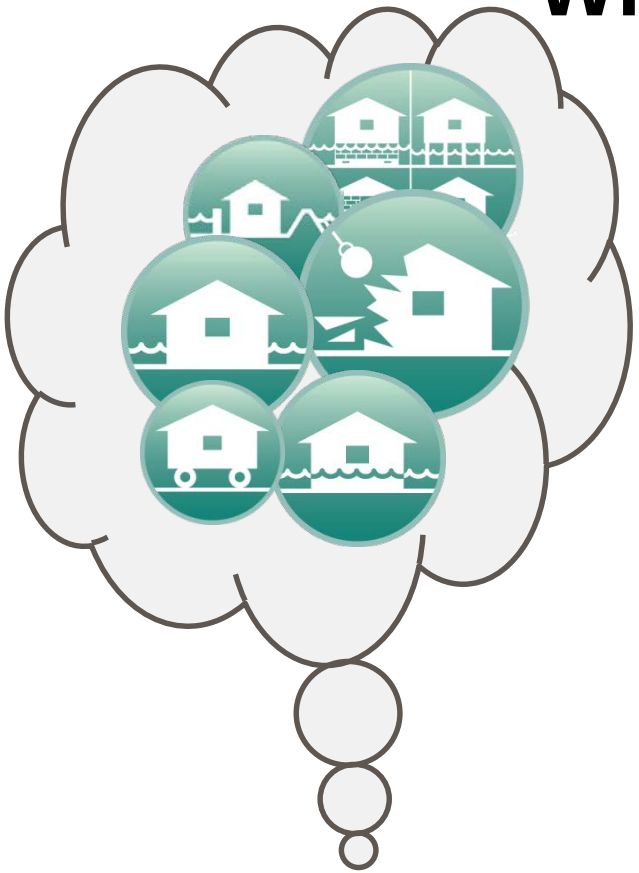
What is our process?



Flood Characteristics (Modeling)

- Depth/velocity
- Duration/rate of rise
- Debris/wave impacts
- Floodplain

Site Characteristics (GIS)

- Location/land use
- Topography/soil type

Structure Characteristics (Site Visit)

- Type of construction/materials
- Condition
- Elevation/locations of openings
- Historic value

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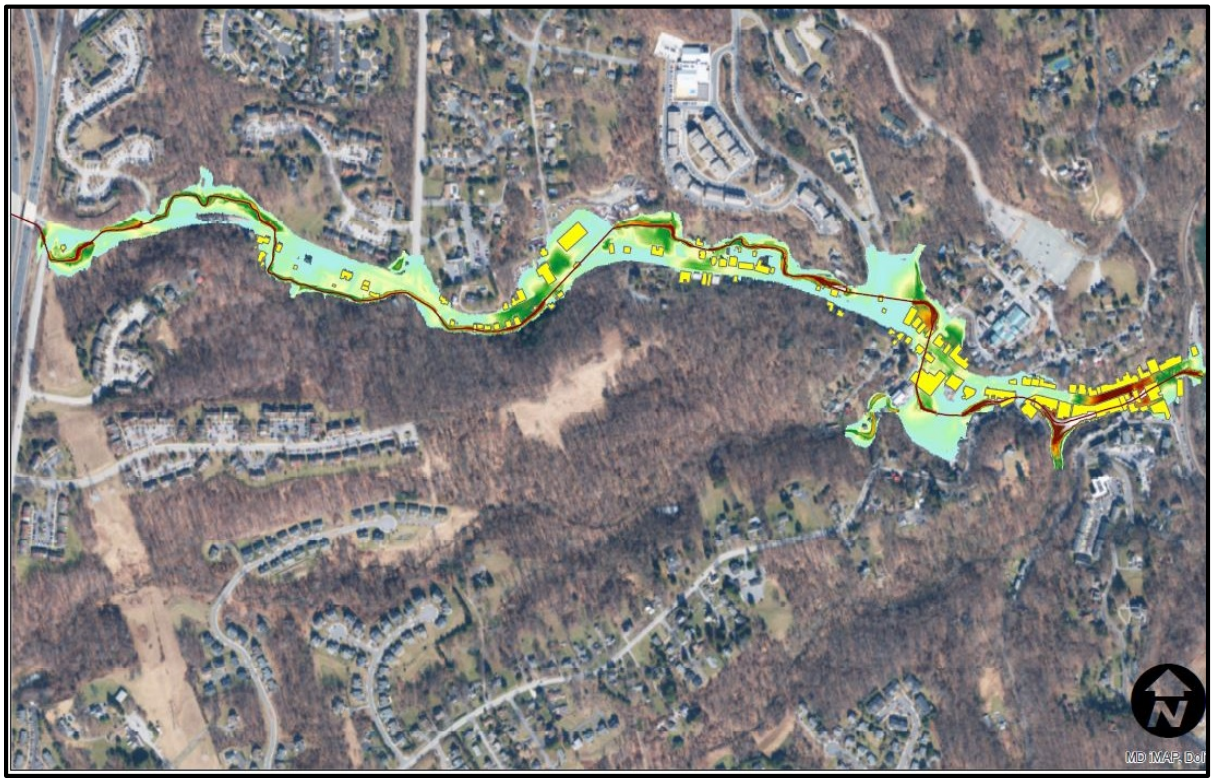
FLOOD CHARACTERISTICS

- *FEMA*: 1% annual chance (100-yr) and 0.2% annual chance (500-yr) flood maps
- *McCormick Taylor*: 2-D Modeling results



30 July 2016 Storm 2-D Model

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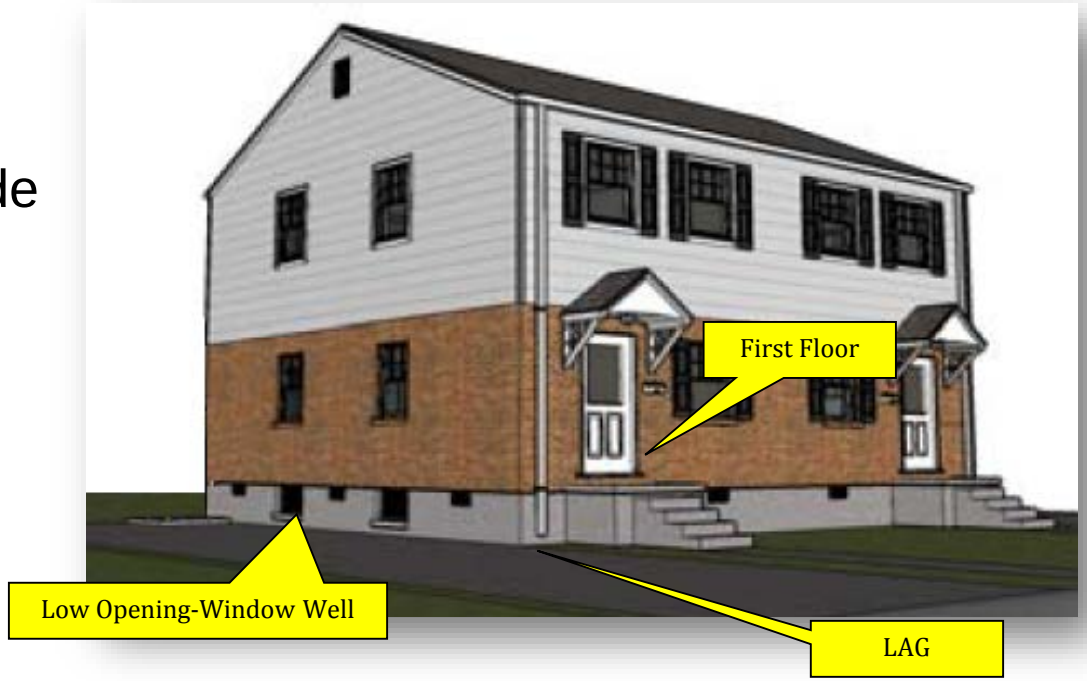
BUILDING ELEVATION FIELD SURVEY

- **Elevations**
  - Low Opening
  - First Floor
  - Lowest Adjacent Grade
  - (LAG)
- **Structure Data**
  - Photos
  - Condition
  - Value
  - Building Material



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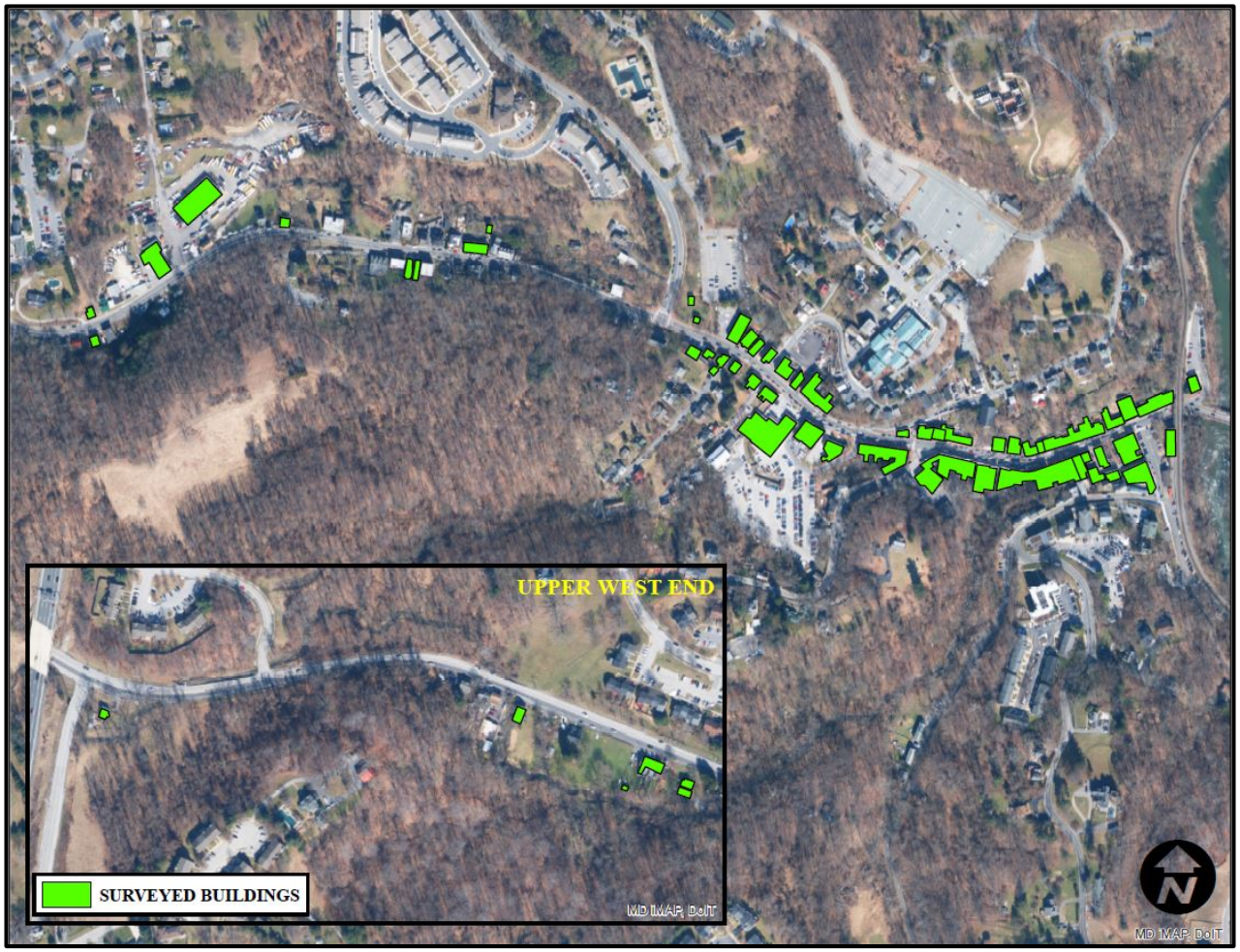
BUILDING ELEVATION FIELD SURVEY (FEB 2017)



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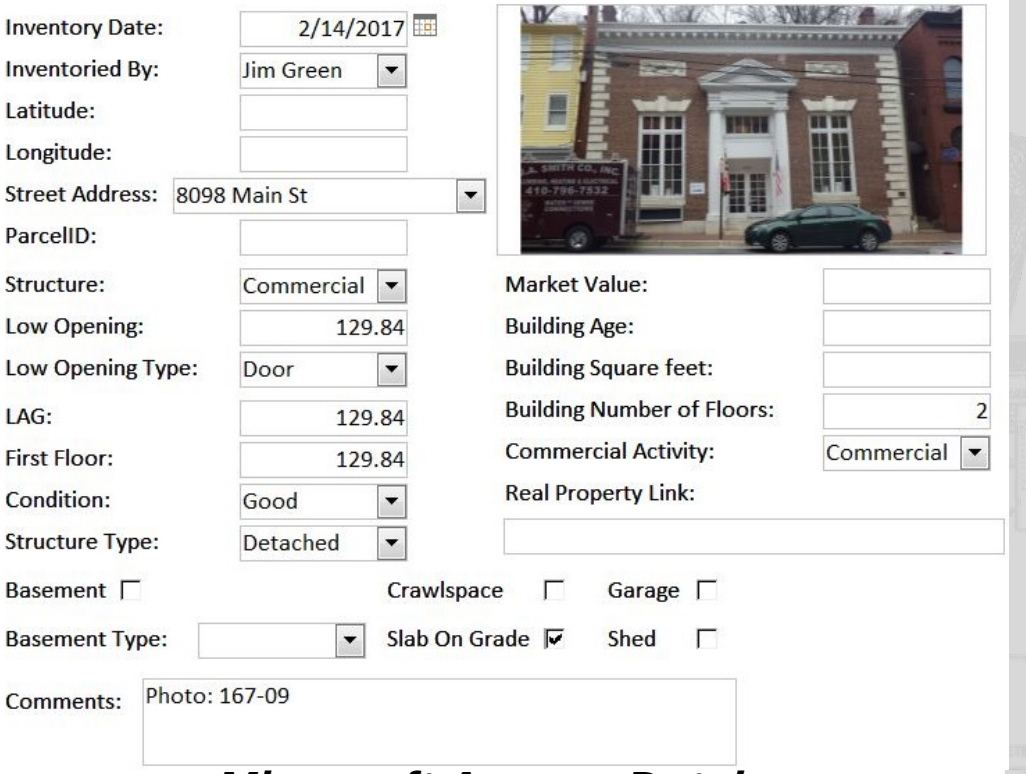
BUILDING ELEVATION FIELD SURVEY (FEB 2017)

- **80 buildings surveyed**
  - 66 commercial
  - 10 residential
  - 4 public



Microsoft Access Database

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NONSTRUCTURAL FLOOD PROOFING FIELD ASSESSMENT

- **16 Example Buildings**
- *Considerations:*
  - Volunteered Buildings
  - Historic Status
  - Usage
    - (Commercial v Residential)
  - Architectural Features

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SELECTED BUILDINGS

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HISTORIC PRESERVATION

- Property Owner Interaction
- Local Ordinances/ Building Codes (County)
- State and Local Preservation Officials

EARLY COORDINATION IS THE KEY !

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SELECTED BUILDINGS

8000 Main Street

8044 Main Street

8069 Main Street

8085 Main Street

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SELECTED BUILDINGS

8092 Main Street

8202 Main Street

8267 Main Street

8344 Main Street

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SELECTED BUILDINGS

8358 Main Street

8300 Main Street

8398 Main Street

8512 Main Street

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SELECTED BUILDINGS

8572 Main Street

8600 Frederick Road

8602 Frederick Road

8637&8639 Frederick Road

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CONCEPT SHEET EXAMPLES

- 8000 Main Street (Law Office)*
- 8069 Main Street (Glass Shop/ Antique Shop)
- 8202 Main Street (Howard House)
- 8267 Main Street (Visitors Center)
- 8300 Main Street (Log Cabin)
- 8637 & 8639 Frederick Road (Residential Duplex)

EXAMPLE CONCEPT SHEETS

8069 Main Street - Glass Shop and Antique Store

Key Building Features:

- Floor retrofitted with concrete slab
- Stone masonry/ wood frame construction
- Multiple commercial tenants
- Located directly over the stream

Considerations:

- Doors/exterior
- Storefront glass windows

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Dry + Wet Flood Proofing 8069 Main Street

Interior Flood Gate

Stoplog Panels

Louvers

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8267 Main Street- Visitors Center

Key Building Features:

- Stone masonry construction
- Finished and occupied basement
- Flooding from multiple directions
- Exterior utilities

Considerations:

- MHT Easement
- Doors/exterior
- Interior contents

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8267 Main Street- Visitors Center

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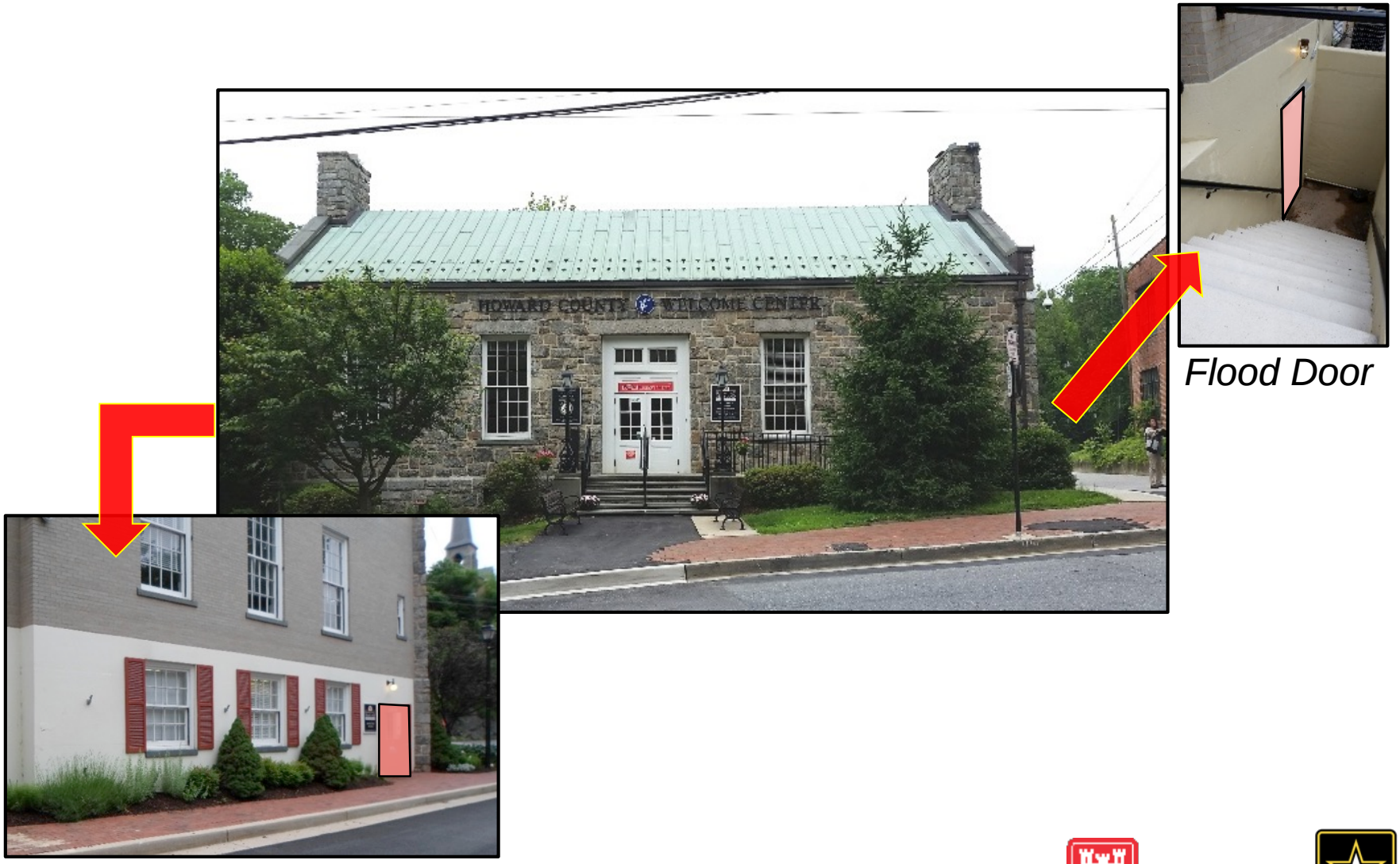
Dry Flood Proofing- 8267 Main Street



Flood Door

Flood Door

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Dry Flood Proofing- 8267 Main Street

Small Wall Around Grate
(Final design should match historic aesthetic)

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8367& 8369 Frederick Road- Residential Duplex (Elevation)

Key Building Features:

- BFE+2 >3 ft. above first floor elevation
- Building foundation on stream bank
- Detach duplex structure

Considerations:

- Foundation materials
- Adjacent building layout

Elevate on Foundation

Elevate Utilities

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8358 Main Street- Residential/Commercial (Elevation/ Wet Flood Proofing)

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8358 Main Street- Wet Flood Proofing

Key Building Features:

- Masonry construction below first floor
- Significant portion of structure is wood frame
- Unoccupied walkout basement

Considerations:

- Placement of flood vents

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8202 Main Street- Howard House

Bollards Hidden Behind Porch

Flood Door Behind Porch

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SUMMARY OF RESULTS

Building	Usage	DFE	BFE + 2 ft.	Primary Solution	*Costs
8000 Main St.	Commercial	128.24	128.8	Dry Flood Proof	$105,000
8044 Main St.	Commercial	130.6	134.3	Dry Flood Proof	$65,000
8069 Main St.	Commercial	130.1	137.6	Dry + Wet Flood Proof	$120,000
8085 Main St.	Commercial	129.3	139	Dry Flood Proof	$20,000
8092 Main St.	Commercial	135.5	140.9	Dry Flood Proof	$65,000
8202 Main St.	Commercial	154.9	154.2	Dry Flood Proof	$30,000
8267 Main St.	Public	170.12	169.5	Dry Flood Proof	$65,000
8300 Main St.	Public	199.0	198.5	Elevation	$115,000
8344 Main St.	Commercial	186.1	185.6	Elevation	$185,000
8358 Main St.	Commercial	187.7	187.2	Elevation	$195,000
8398 Main St.	Public	191.2	191.2	Elevation	$145,000
8512 Main St.	Residential	232.3	231.8	Elevation	$190,000
8572 Main St.	Residential	245.2	245.3	Dry Flood Proof	$50,000
8600 Frederick Rd.	Commercial	248.87	249.4	Dry + Wet Flood Proof	$145,000
8602 Frederick Rd.	Commercial	248.0	250.5	Wet Flood Proof	$20,000
8637&8639 Frederick Rd.	Residential Duplex	255.4	254.9	Elevation	$110,000

** Planning construction cost estimates. Costs are subject to change based on final designs.*

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ECONOMIC ANALYSIS

*PRELIMINARY ECONOMIC ANALYSIS BASED ON FUTURE **FLOOD DAMAGE REDUCTION ONLY!***

- Computed Benefit-to-Cost Ratios (BCRs) for sample bldgs. **BCR>1 is considered cost-effective.**

Based on Recommendations:

- *Passive Dry Flood Proofing:* 6/9 had BCR greater than 1
- *Active Dry Flood Proofing:* 10/11 had BCR greater than 1
- *Wet Flood Proofing:* 4/4 had BCR greater than 1
- *Elevation:* 0/6 had BCR greater than 1

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FLOOD ACTION PLAN

Recommend general pre-flood actions associated with flood proofing measures

- **LIMITED WARNING TIME!!!**
- **PASSIVE MEASURES MORE EFFECTIVE**
- **HAVE AN <u>EMERGENCY ACTION PLAN</u>**

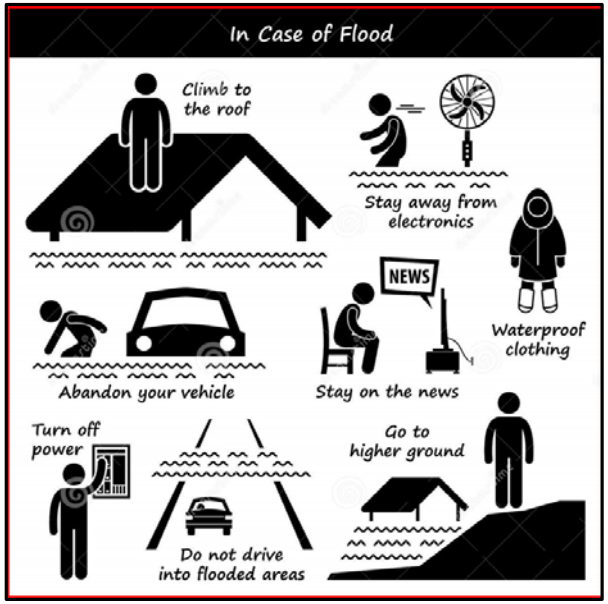

Image source: Dreamstime.com

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NEXT STEPS

- Final Ellicott City Nonstructural Flood Proofing Study Report posted on Howard County website by 2/28/2018

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QUESTIONS & DISCUSSION

Points of Contact

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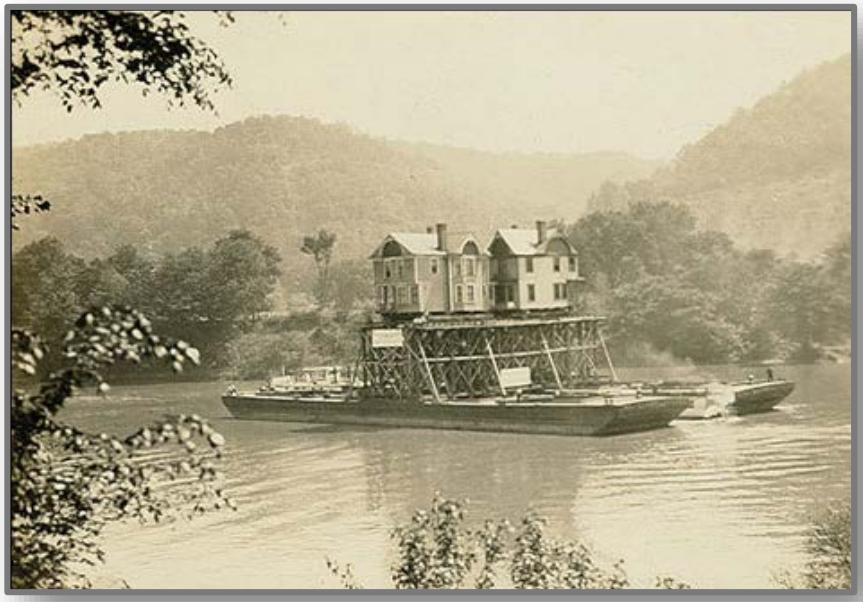

THANK YOU!

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