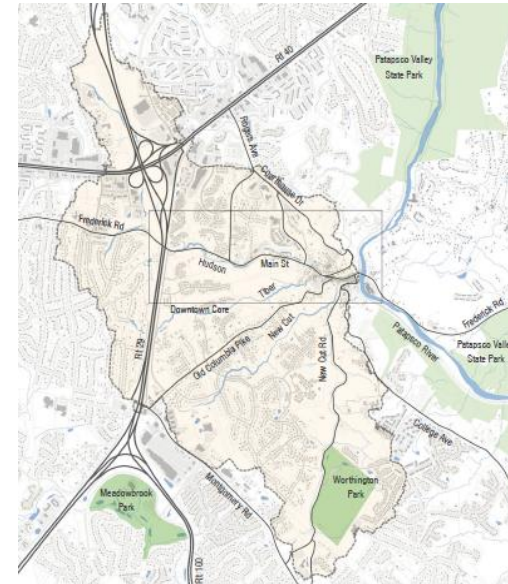




The Ellicott City Flood Mitigation Plan

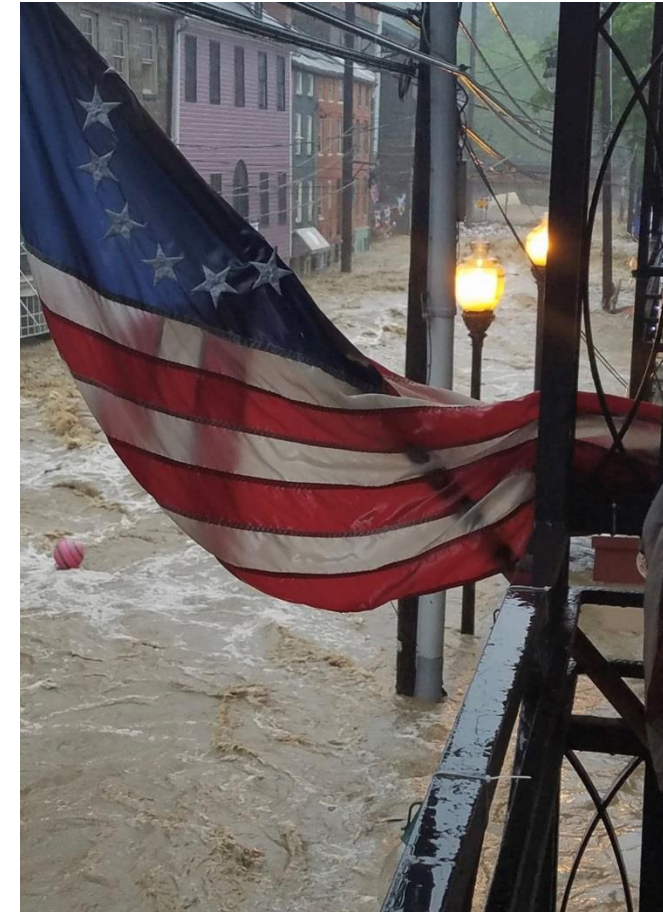
Allan H. Kittleman, County Executive
Jon Weinstein, Councilmember District 1

County Council Presentation
September 4, 2018



Protecting Lives

- **Four lives have been lost** as a result of two significant floods in Historic Ellicott City in the last two years.
- Each flood was considered a “1-in-a-1000 event.”
- National Weather Service says storms capable of producing devastating flash floods will be more frequent.
- **We must act now to protect lives!**



Flood Mitigation Plan Guiding Principles

Protect Lives

Too many lives have already been lost. Mitigating the life safety risk for residents, business and property owners, as well as visitors to the town, must be the top priority.

Continue to Engage the Community

The Ellicott City Master Plan and Hydrologic and Hydraulic Analysis included substantial community input. We will continue collaborative, open and transparent community engagement.

Make Economically Sound Investments

Investments made in Ellicott City must yield the largest impact per dollar.

Safeguard the Environment

The important visual and natural environment must be protected.

Preserve Historic Character

The town of Ellicott City and its character must be preserved for generations to come. Changes must be made now to learn from the past and adapt to the weather patterns and reality of our future.



Protecting Lives – Saving Our Town

Summary of the 5-Year Flood Mitigation Plan Improvements:

- Ellicott City and Valley Mede Property Acquisition/Removal
- Lower Main Open Space Construction
- Ellicott Mills Culvert Expansion
- Hudson 7 Retention Facility at US 29/Rt 40 Interchange
- Quaker Mill Retention Facility on Rogers Ave
- 8600 Main Street Culvert Expansion
- Two 10' Culverts from Maryland Ave to Patapsco River

A History of Floods

"The occupants were frequently warned of the dangerous appearance of the freshet, but, trusting to their former experience, they chose to remain yet a little longer, thinking there would be time to escape when the worst came." --- Harpers Weekly, August 8, 1868



1952



A History of Floods

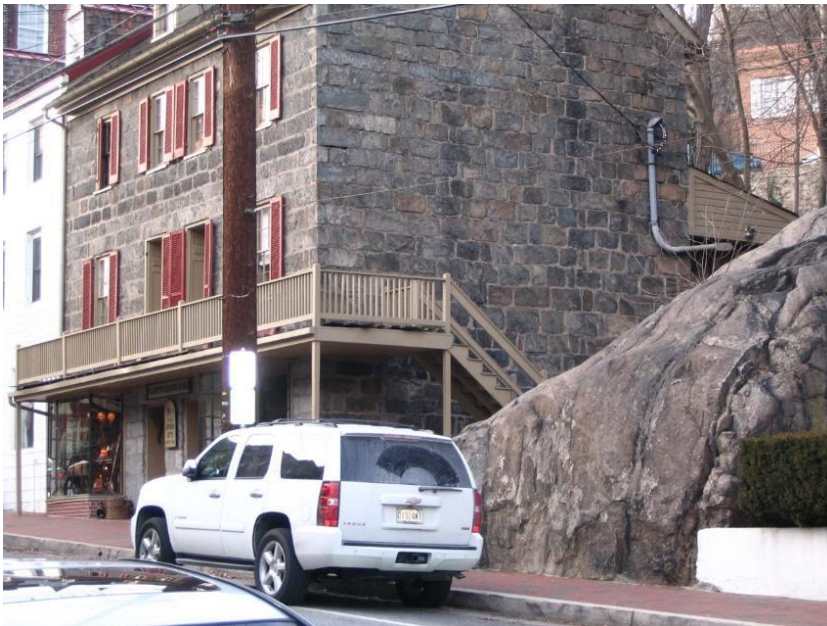
1700s	1800s	1900s	2000s
1768	1817	1901	2006
	1837	1917	2011 - tributary-based
	1855 – tributary-based	1923	2016 - tributary-based
	1858 - tributary-based	1933	2018 - tributary-based
	1868 - Great Flood of Maryland	1942	
	1894	1952 - tributary-based	
		1972 - Hurricane Agnes	
		1975	
		1989	
		1998	

Note the town was founded in 1772; Ellicott City will celebrate 250 years in 2022

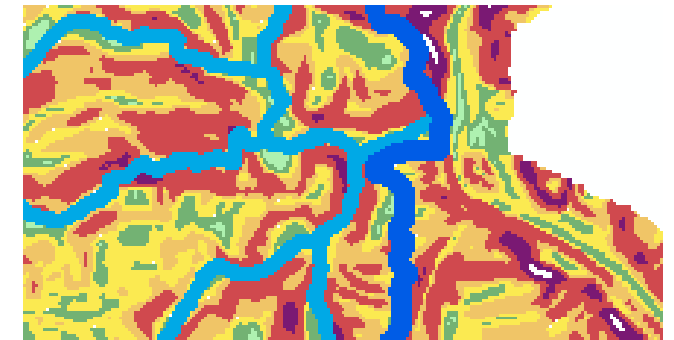
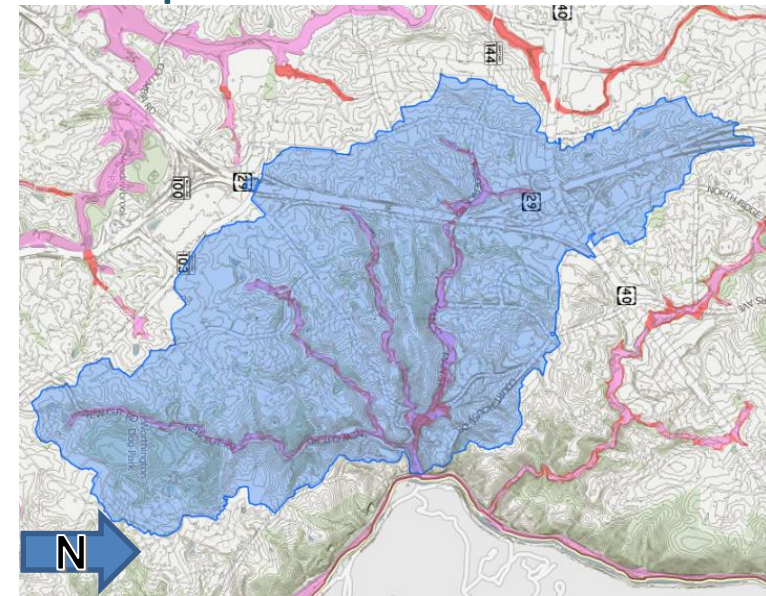
Tributary-based: flooding from the top down; Otherwise, flooding from the river rising, or unknown type.

Why is Ellicott City Vulnerable to Flooding?

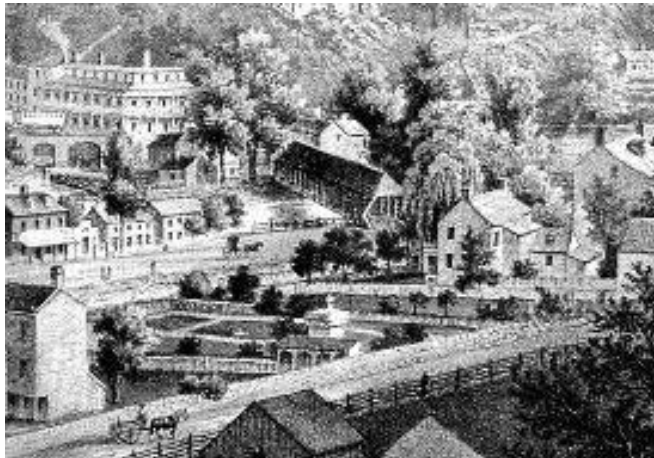
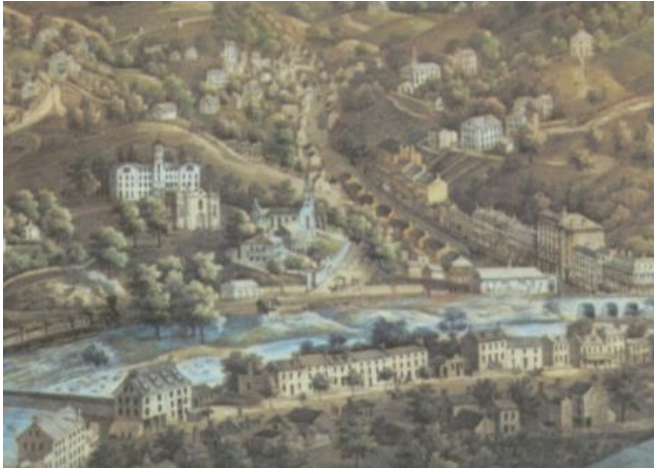
- Ellicott City sits at the bottom of a granite funnel in the steep Tiber-Hudson Watershed where four tributary streams empty into the Patapsco River.
- Shallow bedrock and steep slopes minimize the effect of land use on runoff, particularly during heavy storms.



Red = slopes 25-45%
Purple = slopes >45%



An Ideal Mill Town



PLAN OF ELLICOTT CITY
HOWARD & BALTIMORE COUNTIES.

Scale: 300 feet per inch.

Explanation:
 Mill: Khaki
 Warehouse: Stone building
 Brick " "
 Frame " "
 Brick or Stone Stable
 Frame Stable or shed

GENERAL MERCHANTS.
JOHN DAY. Y. W'ENDERS DAY
JOHN DAY & SON,
 Dealer in Dry Goods, Boots and Shoes,
 Hats and Caps, Queens and Hard Ware,
 Hosiery, Notions, &c.
 A full and complete assortment of Groceries,
 Tea, &c.
JAMES V. BIRBY. CHAS. V. FURLEY
BIRBY BROS.
 Manufacturers and Dealers in Boots, Shoes
 and Galles,
 29 Main street, nearly opposite the Howard
 House.

GRANITE WORKERS.
C. F. RAPPANIER,
 Outsetter of Granite Works and Masonry
 in general.
Granite Quarry, Elllicott City.
A. J. ISAAC & SON'S
 Granite Quarry,
 On the B. and O. R. R., Elllicott City.
 Places they furnish Granite Work, such
 as Curbing, Platforms, Sills, Base, Lin-
 ings, Ashlar for Bridges, Rubble Stone
 for Walls, &c.

CHARLES O. ISAAC,
 Granite Cutter.
CHARLES J. WERNER,
 Granite Cutter.

LIVERY STABLES.
R. F. KUHN,
 Livery Stable, Coal and Wood Yard.
 Box, 73.
JOSEPH T. DORSEY,
 Dealer in Coal and Fertilizers of all kinds.
 Horses and Vehicles of all kinds to hire,
 and Horses taken at Livery.

PHYSICIAN.
THOMAS B. OWING

POST MASTER.
ROBERT N. WHARF.

STATIONER.
J. S. STRAWBRIDGE

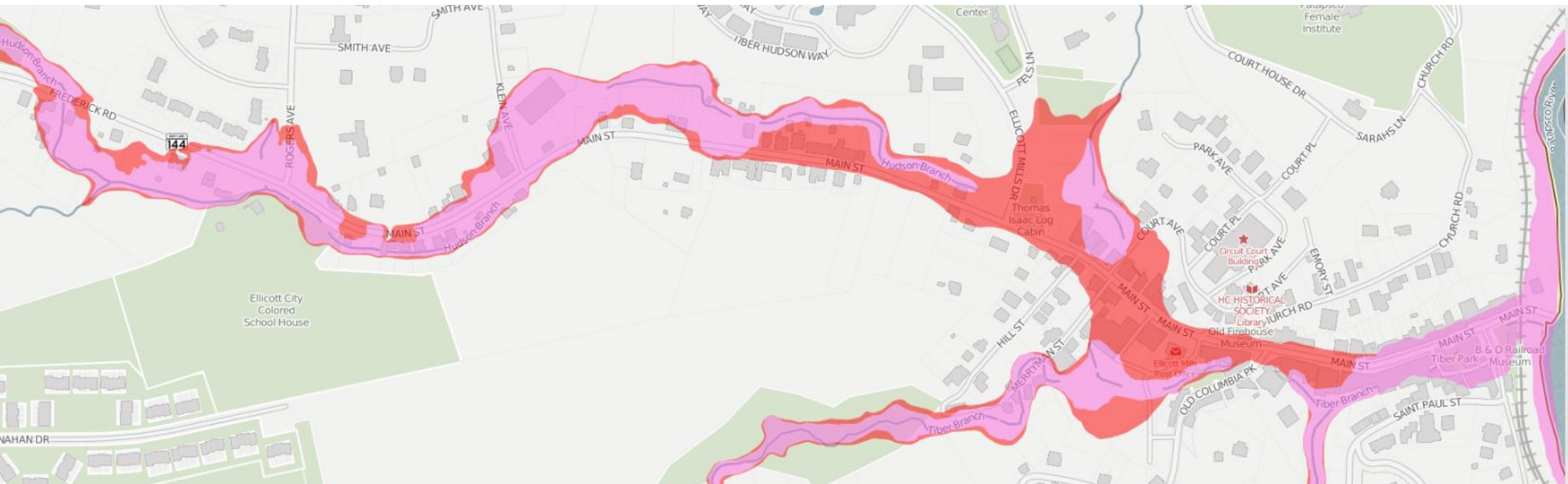
TAILOR.
C. P. CASSIDY.

ELLICOTT CITY BUSINESS NOTICES.
ATTORNEYS AT LAW.
R. T. MERRICK.
J. L. DUNKEL.
BAKERS.
EDWARD NORRIS,
 Practical Baker,
 and also supplied with Bread, Mince,
 Biscuits, Pies, Cakes, &c.
 Flour will be taken in exchange for
 bread, or baked to order.
**BLACKSMITHS AND WHEEL-
 WRIGHTS.**
ISAAC GEO. W.
GUSTAVUS RAY.
JOHN E. HELM.
BARBER.
DANIEL COOPER.
CIGAR MANUFACTURER.
T. D. HALL.
EDITORS AND PUBLISHERS.
AMERICAN PROGRESS,
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 Published every Friday, at Elllicott City.
 Terms, \$1.00 a year, in advance.
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Why is Ellicott City Vulnerable to Flooding?

- Much of Historic Ellicott City would not be allowed to be built today
- Howard County prohibits disturbances in the 100-year floodplain



Pink = 100-year floodplain; Red = 500-year floodplain

Why is Ellicott City Vulnerable to Flooding?

- Ellicott City lacks a natural floodplain, so streams were channelized
- Over time, buildings expanded over channels; stream sections were buried
- Channel turns 90 degrees in several places
- The existing stream channel network cannot handle a 1-in-a-1000 event; not a 1-in-a-100 event; not even a 1-in-a-10 event.
- Existing conditions and pinch points cause water to jump the channel and flow down Main Street during flash flood events.



8600 Main St. Culvert; 84 inch diameter

Why is Ellicott City Vulnerable to Flooding?

For Lower Main Street specifically:

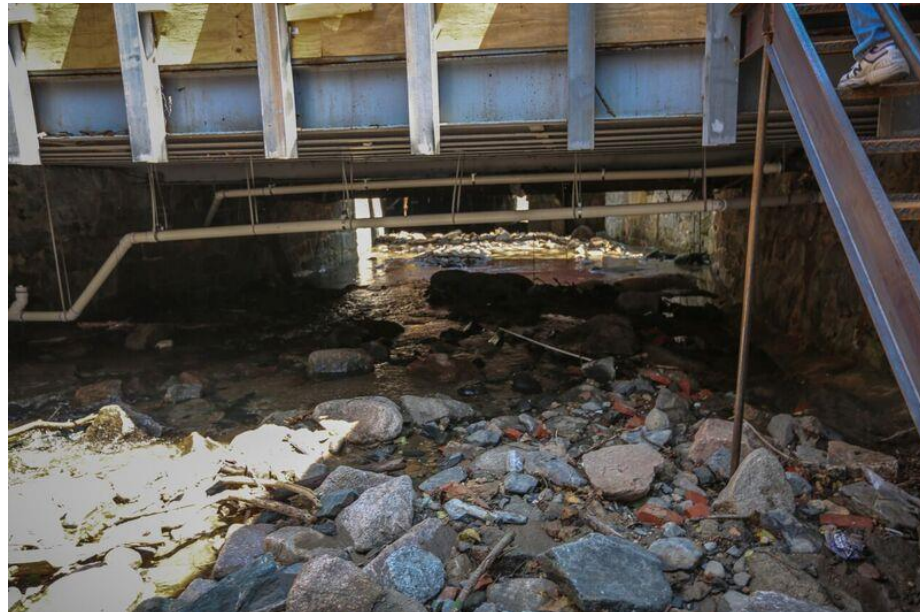
- Three tributary streams converge behind the Caplan's building.
- The damage from the stream flooding from underneath is extensive.



Why is Ellicott City Vulnerable to Flooding?

For Lower Main Street specifically:

- Converged streams then go under buildings.
- Flood water flows through a single point under the railroad bridge to reach the Patapsco River.



2011 Storm and Aftermath

- 8.11 inches of rain fell over a 24-hour period September 2011
- Engaged McCormick Taylor in 2012 to perform a Hydrologic and Hydraulic study of the Hudson Branch in the Tiber-Hudson Watershed
- Engaged Smith & Smith to perform Stream Corridor Assessment
- Charette held in 2012
- All studies available at ECfloodrecovery.org



2011 Storm and Aftermath

- In the Spring of 2015, we **created the Historic Ellicott City Flood Work Group** to engage the community.
- The **stream channel walls** were inspected and replacements were being designed.
- In addition, work was being done to better maintain the channels through **READY**.



“Acquiring buildings and removing them from the floodplain is not only the most effective flood protection measure available, it is also a method to convert a problem area into a community asset and obtain environmental benefits.”

-- 2010 Flood Mitigation Plan by Vision Planning and Consulting, LLC, and Eastern Shore Regional GIS Cooperative

July 30, 2016 Storm

6 inches of rain fell in 2 hours



After the 2016 Storm

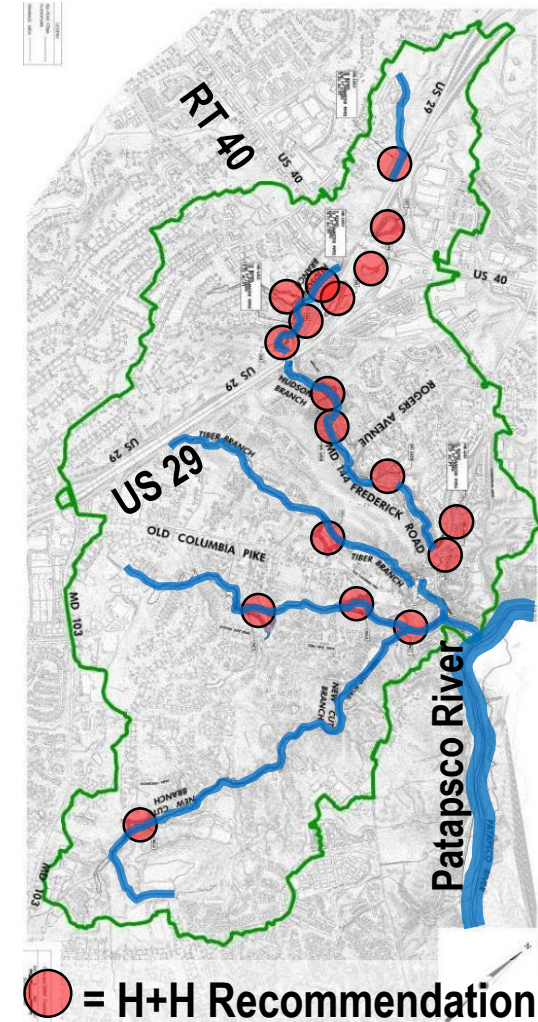
- Re-engaged McCormick Taylor for most comprehensive analysis ever conducted
- Mapped entire watershed
 - Identify how to slow the flow of water
 - 18 infrastructure improvements identified
- Established the **Community Advisory Group**
- Launched the **Ellicott City Master Plan Process**



Infrastructure Improvements in Process

Floodwater Retention/Conveyance Improvements in process after 2016 storm include:

- **Hudson 7 Retention Facility**
13 acre-ft of storage at US 29/40 Interchange
- **8600 Main Street Culvert Expansion**
Significantly increasing the capacity of culvert
- **Tiber 1 (T1) Stormwater Retention Facility**
70 acre-ft of storage in open space adjacent to Old Columbia Pike
- **Quaker Mill Retention Facility**
10 acre-ft of storage along Rogers Avenue



Engaging the Community

- The **Community Advisory Group** included representatives of local organizations, businesses, residents and the faith-based community.
- Held **19 meetings** between August 2016 and January 2017.
- **Community input** on thoughts for the future provided online and at four large public forums.
- Public submitted **315 project ideas** that were prioritized by the Community Advisory Group and also considered during the Master Plan process.



Completing the Ellicott City Master Plan

EC Flood Mitigation Plan - Incorporated into the Ellicott City Watershed Master Plan

Master Plan Will:

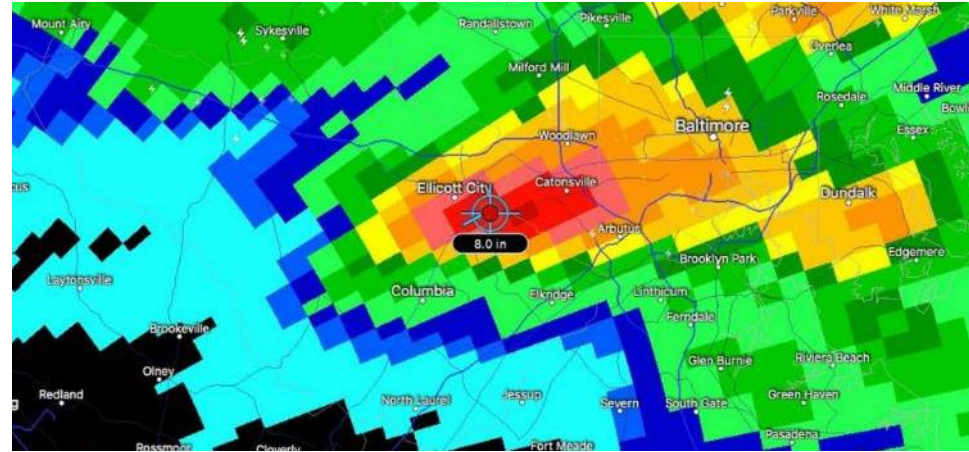
- Define a comprehensive community-driven vision for rebuilding a stronger and more resilient Ellicott City.
- Provide more holistic recommendations in the Tiber-Hudson Watershed to address transportation, community and economic development.
- Continue community engagement in improving the watershed and identifying stormwater improvements.

The Master Planning Process –
Continuing on **September 12, 2018.**

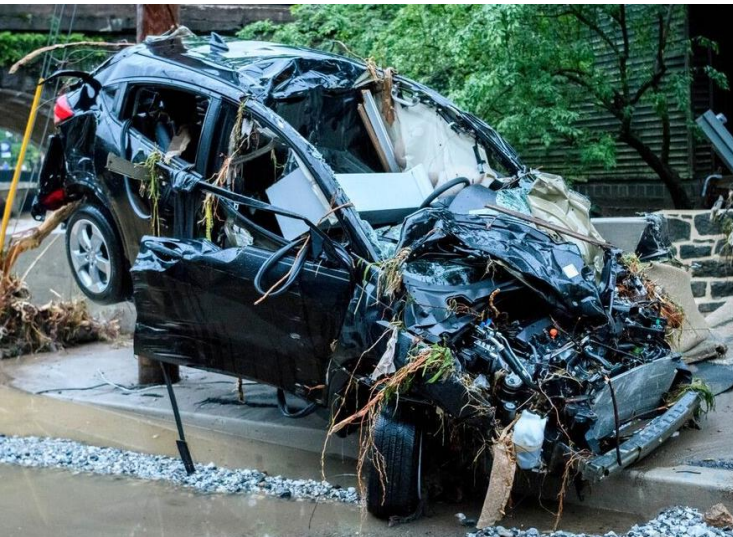
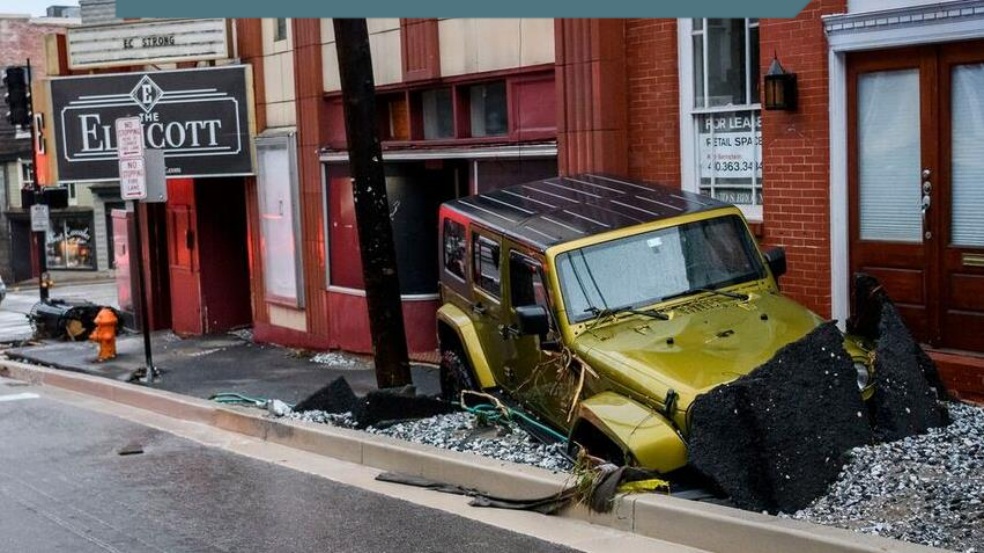


May 27, 2018 Storm

7.5 inches of rain in 5 hours
Majority fell in 3 hours



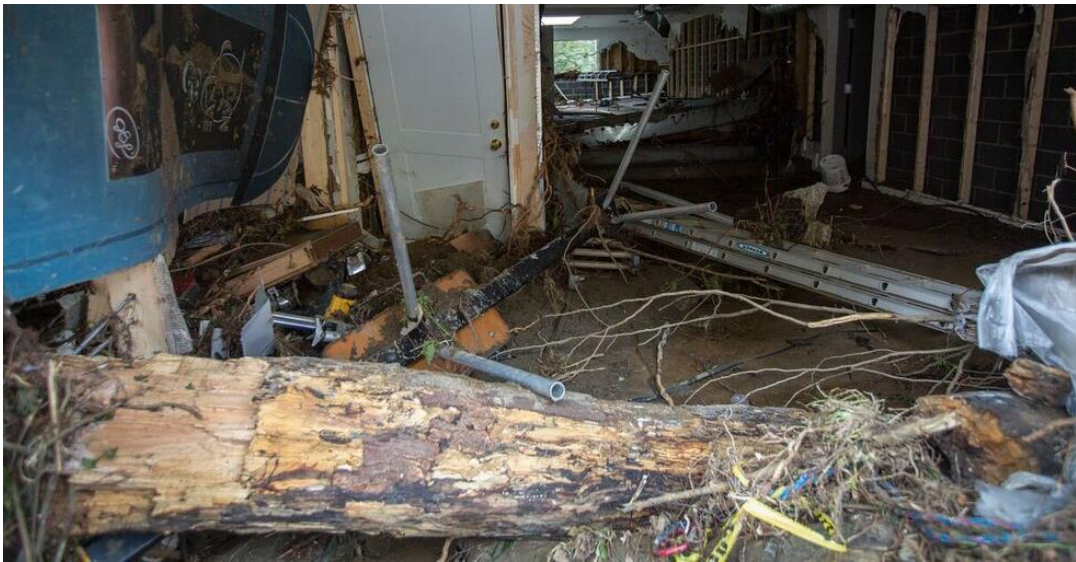
May 27, 2018



**Montage of video cameras located along
Main Street showing how the May 27, 2018
flood evolved throughout Ellicott City.**

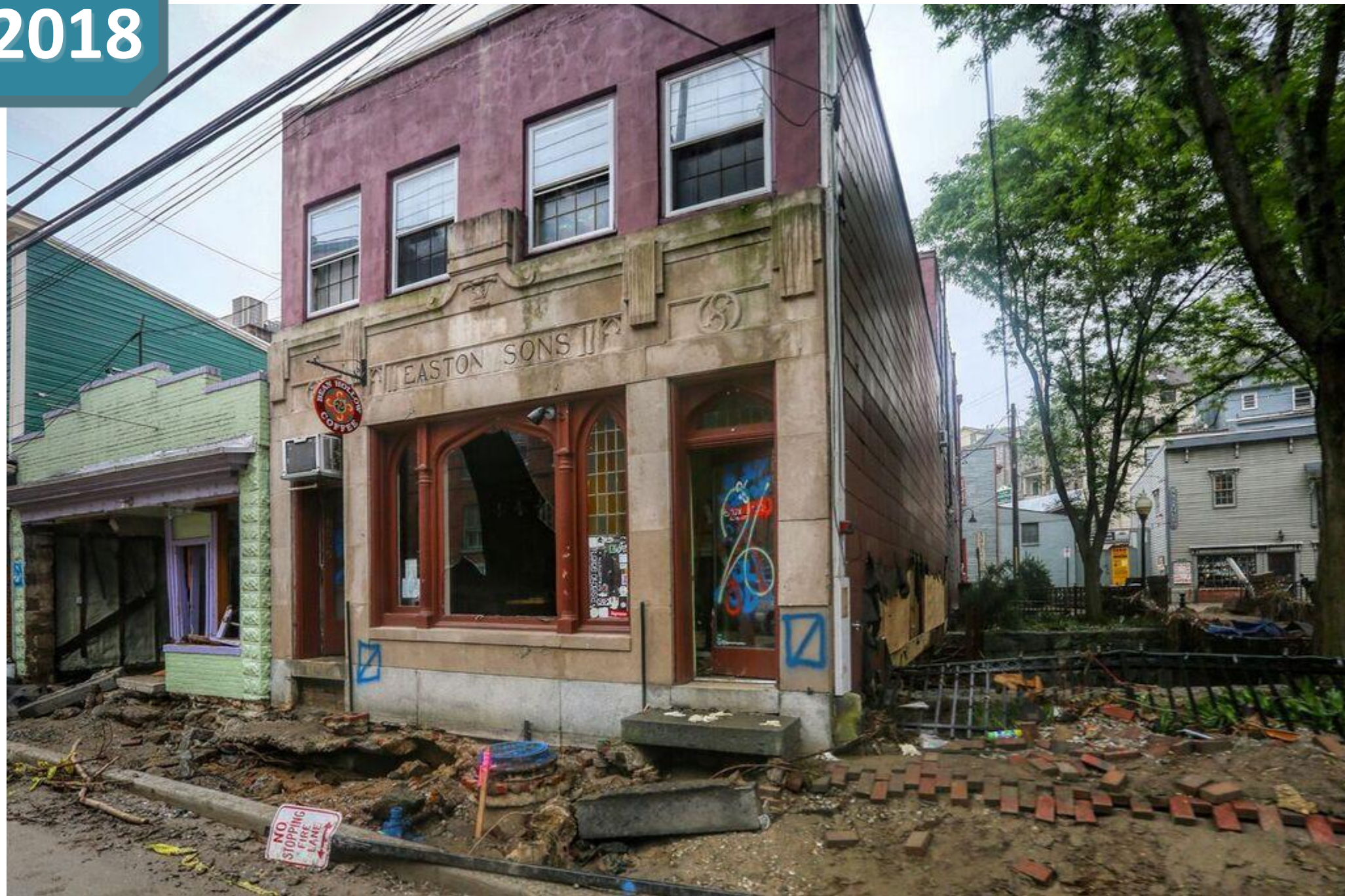
<https://youtu.be/GUqhTv3fQM0>

May 27, 2018



May 27, 2018

Bean Hollow



May 27, 2018

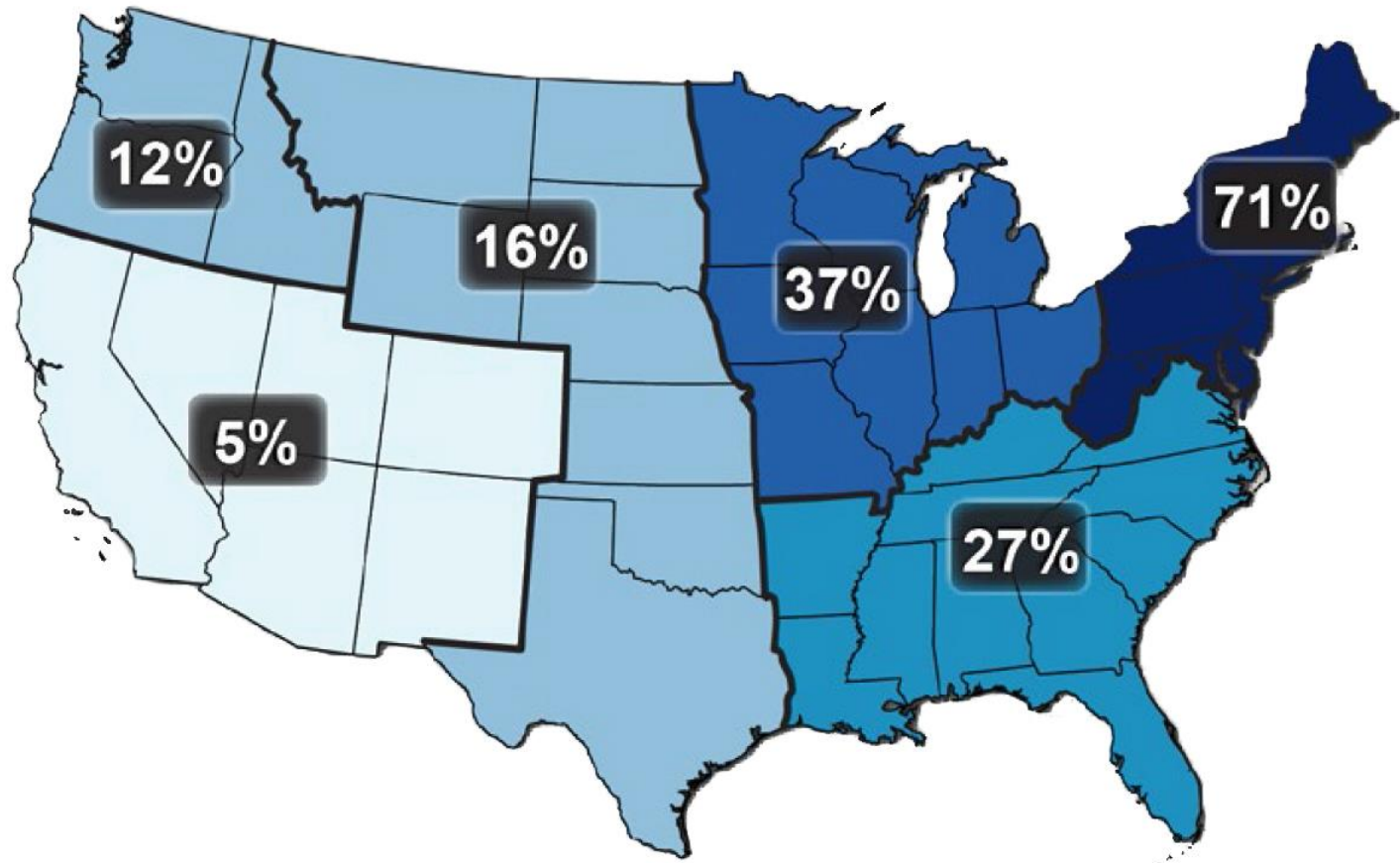


Caplan's Interior
MissFIT

Nationwide Trend

“The frequency and intensity of severe storms has increased...The amount of precipitation falling in the heaviest 1% of storms increased by 37% in the Midwest and 71% in the Northeast from 1958 to 2012.”

- NOAA



Ellicott City & Mid-Atlantic Flash Floods



Significant Flash Floods of 2018



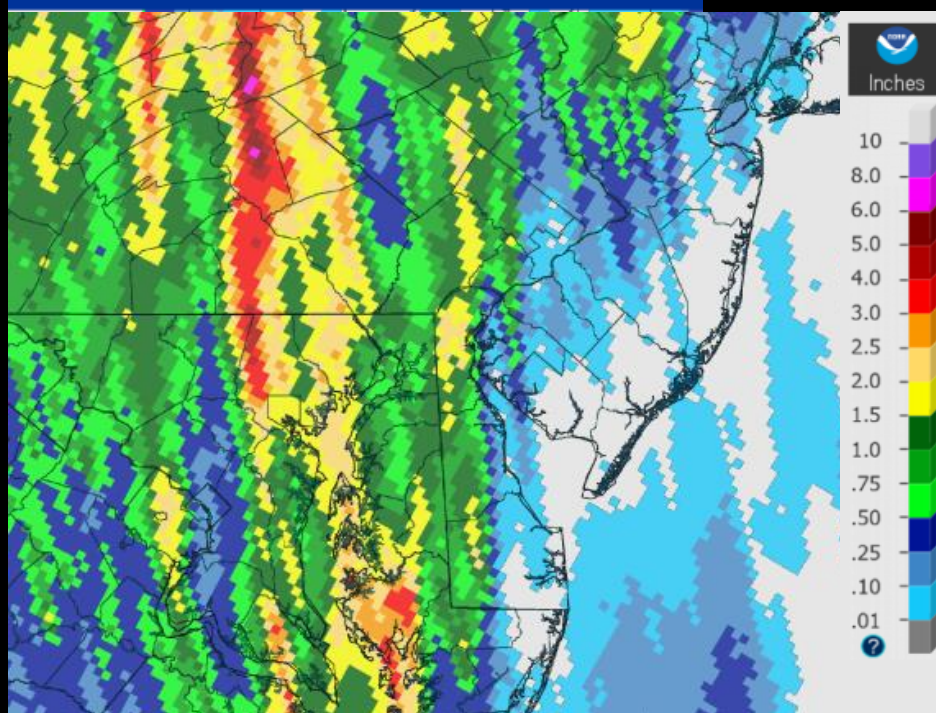
How Close to Another One in Ellicott City?

► July 24-25

July 24, 2018 1-Day Observed Precipitation

Created on: August 20, 2018 - 13:59 UTC

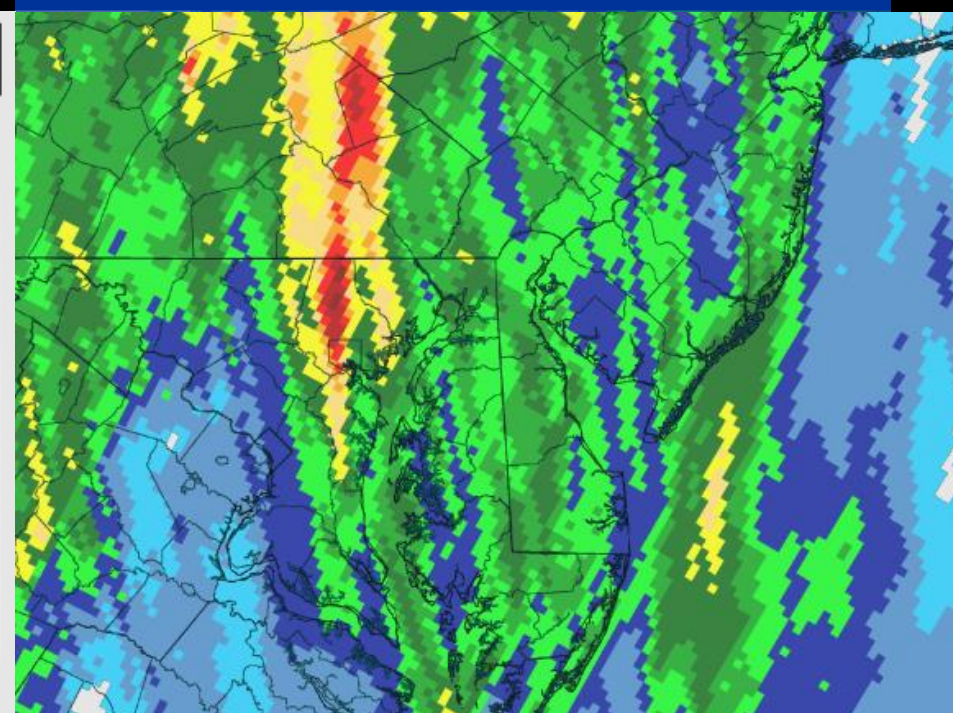
Valid on: July 24, 2018 12:00 UTC



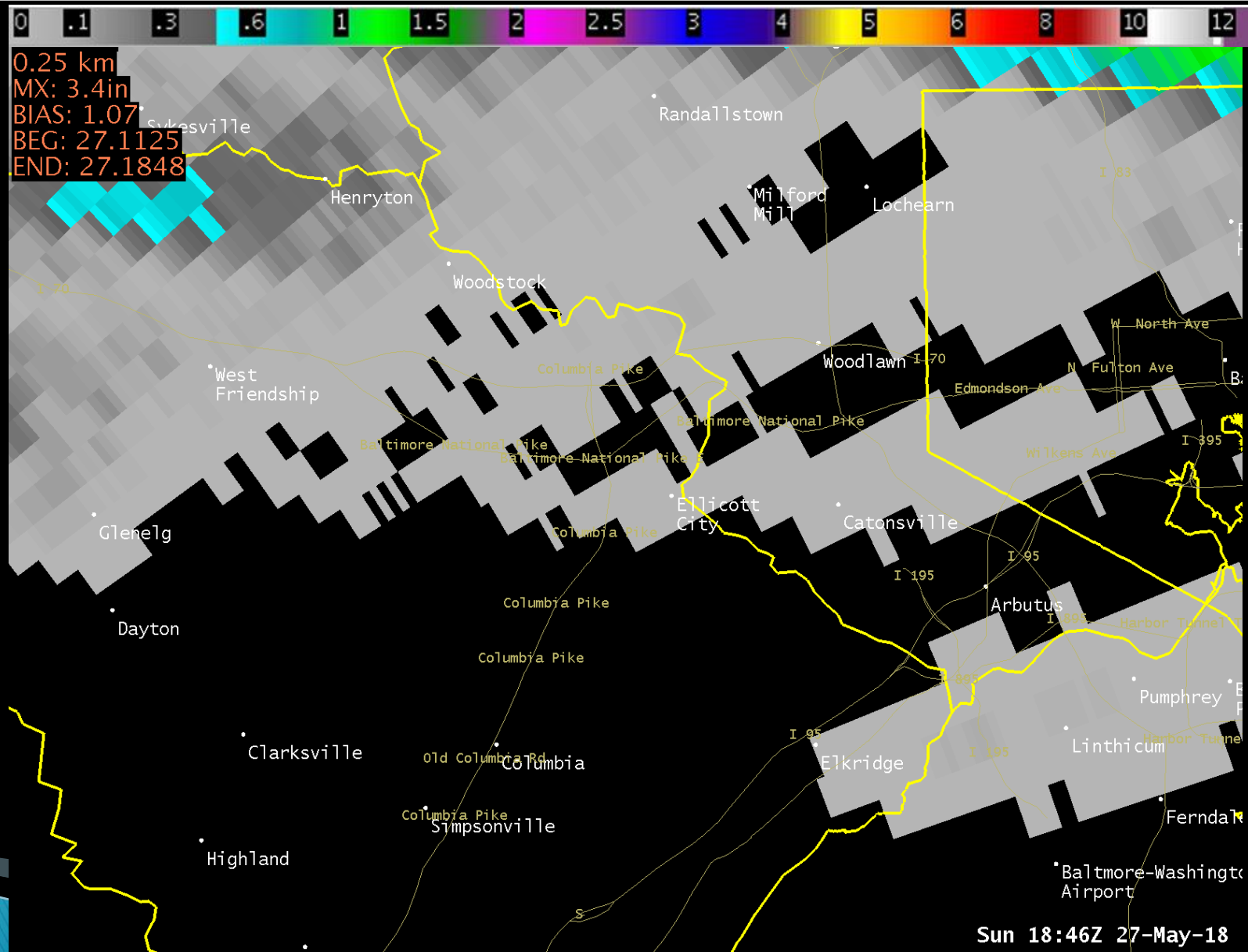
July 25, 2018 1-Day Observed Precipitation

Created on: August 20, 2018 - 14:06 UTC

Valid on: July 25, 2018 12:00 UTC



Even May 27th could have been worse...



“1000-Year Flood”?

- ▶ Short answer: No!
- ▶ Image from 4:35pm →
- ▶ Rainfall through 4:25pm:
 - 30 minute rain: 1.1” – 1.7”
 - 60 minute rain: 2.1” – 3.2”
(amounts from radar estimates & gauges)
- ▶ Rain of this intensity is not uncommon and occurred in all the places shown on the previous map *this year!*



Developing the Flood Mitigation Plan

McCormick Taylor continued to perform Hydrologic & Hydraulic Analyses

Multiple Options Studied:

- Open First Floor
- Culvert in Lower Main Street
- No Structures over the River
- Expanded Stream Channel

Protect the lives of residents, business and property owners, and visitors to Ellicott City.



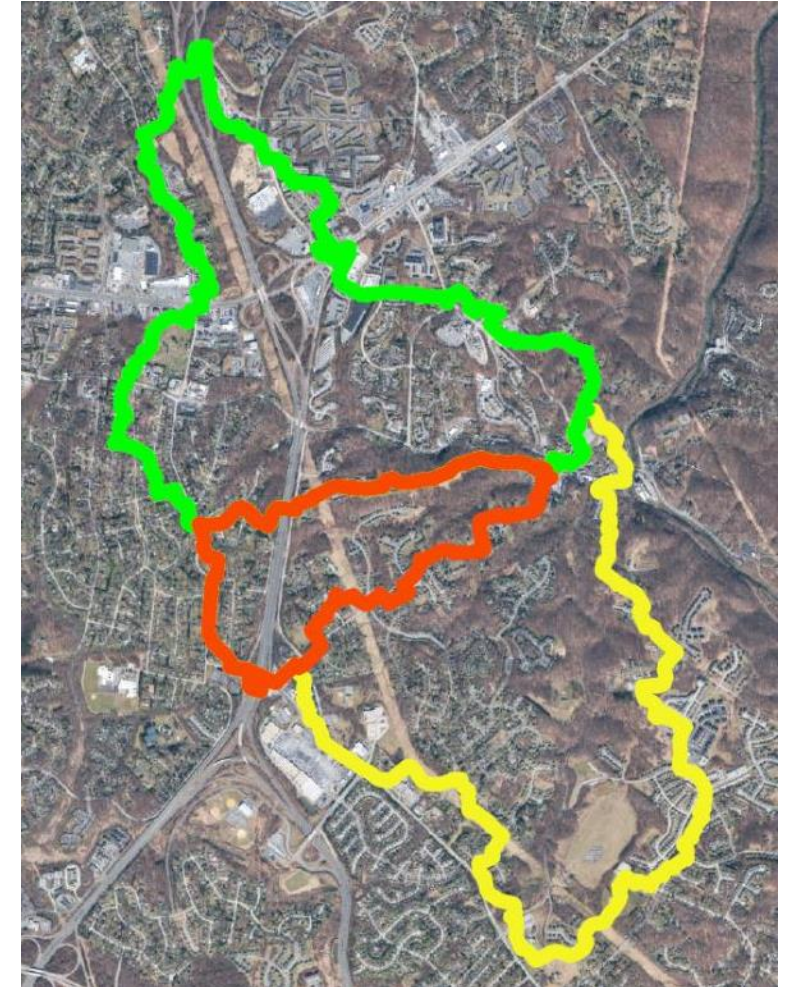
Hydrology & Hydraulic Analysis

McCormick Taylor Studied Entire Tiber-Hudson Watershed – 3.7 sq. mi.

- Hudson Branch – 1.55 sq. mi.
- Tiber Branch – 0.54 sq. mi.
- New Cut Branch (includes Autumn Hill) – 1.55 sq. mi.

Modeled Multiple Storm Scenarios

- 100-year (1%) 24-hour baseline
- 10-year
- Recreated July 30, 2016 event
(using NWS data, USGS channel measurements, storm reports and YouTube videos)

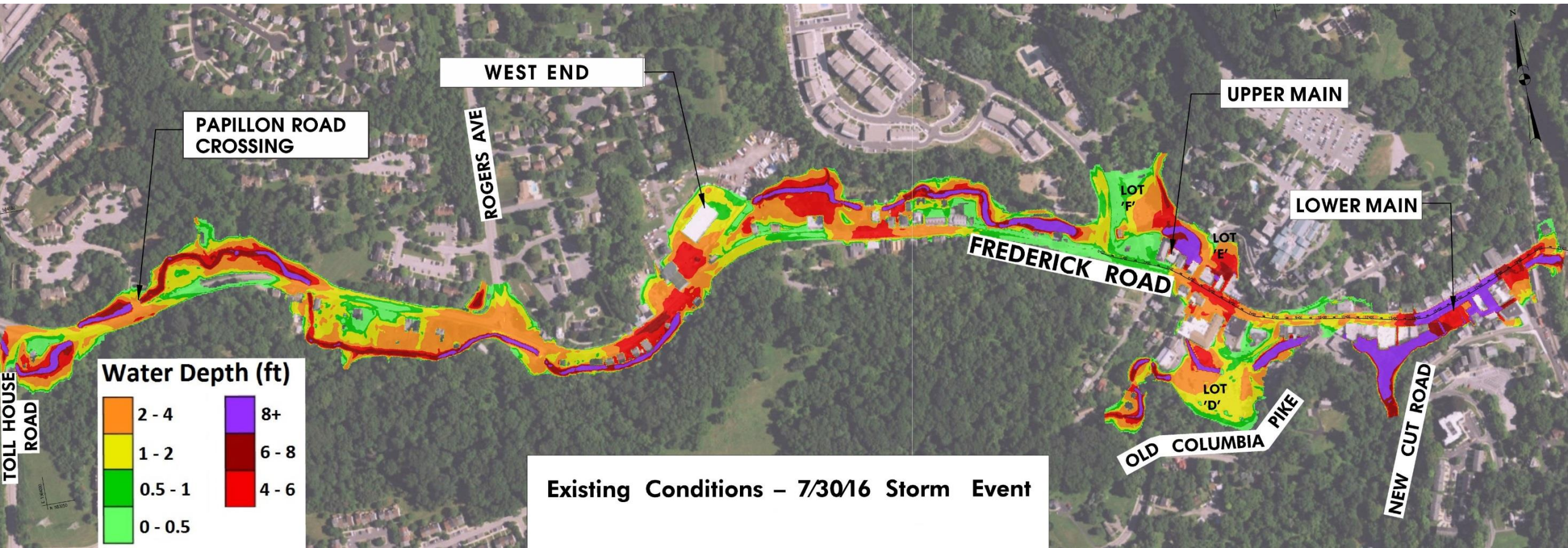


Watersheds Areas:

Green-Hudson; Red-Tiber; Yellow-New Cut

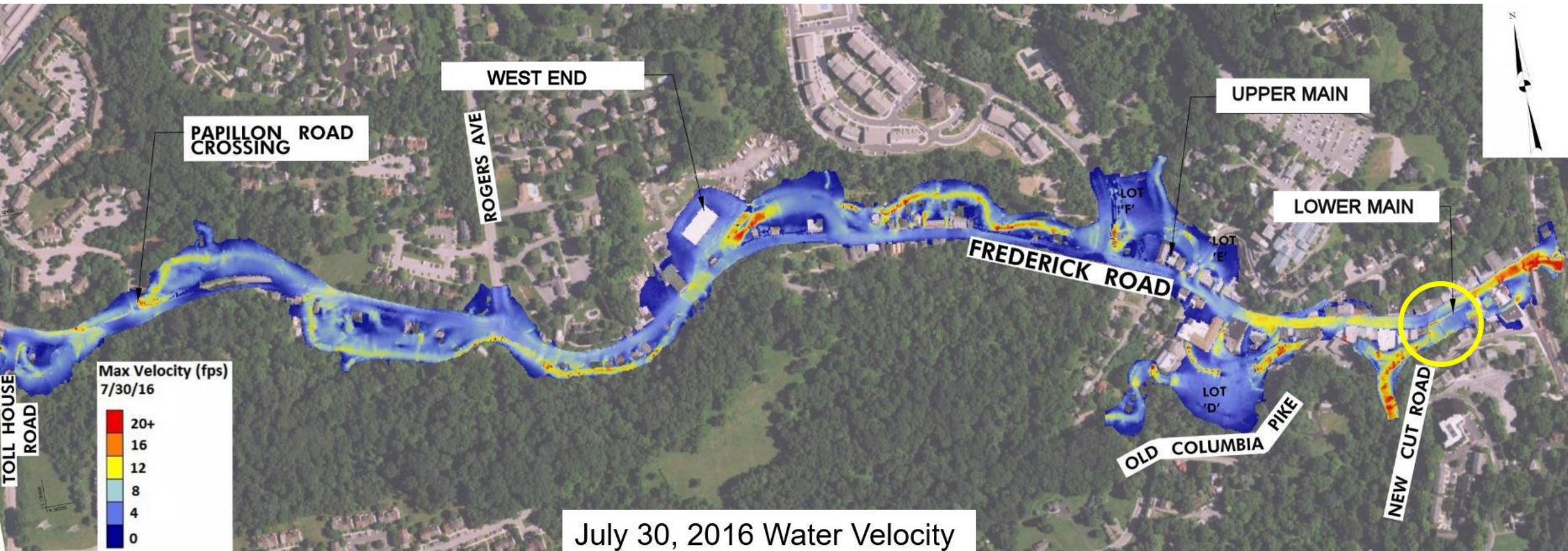
July 30, 2016 Water Depth Model

- Purple = 8+ feet (could be higher than 8')
- Yellow = 1-2'; 1' of rushing water can float a small car, 2' can carry away most vehicles
- Darker green = 0.5-1'; 6 inches of rushing water can knock over an adult



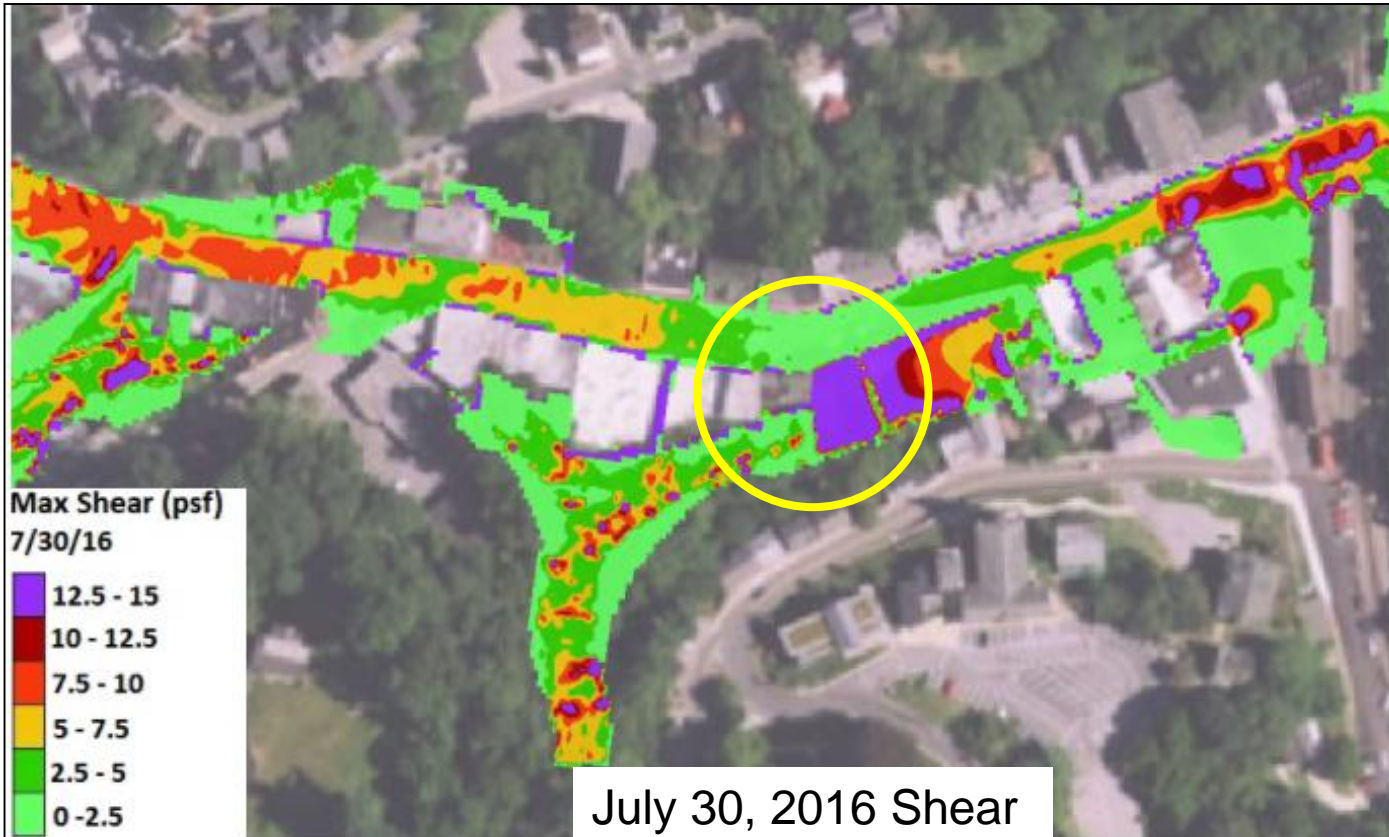
July 30, 2016 Velocity Model

- Maximum flow velocity: Red = 20+ feet per second
- Note: High Velocity on mid-Main St and lower Main St, and from New Cut Rd

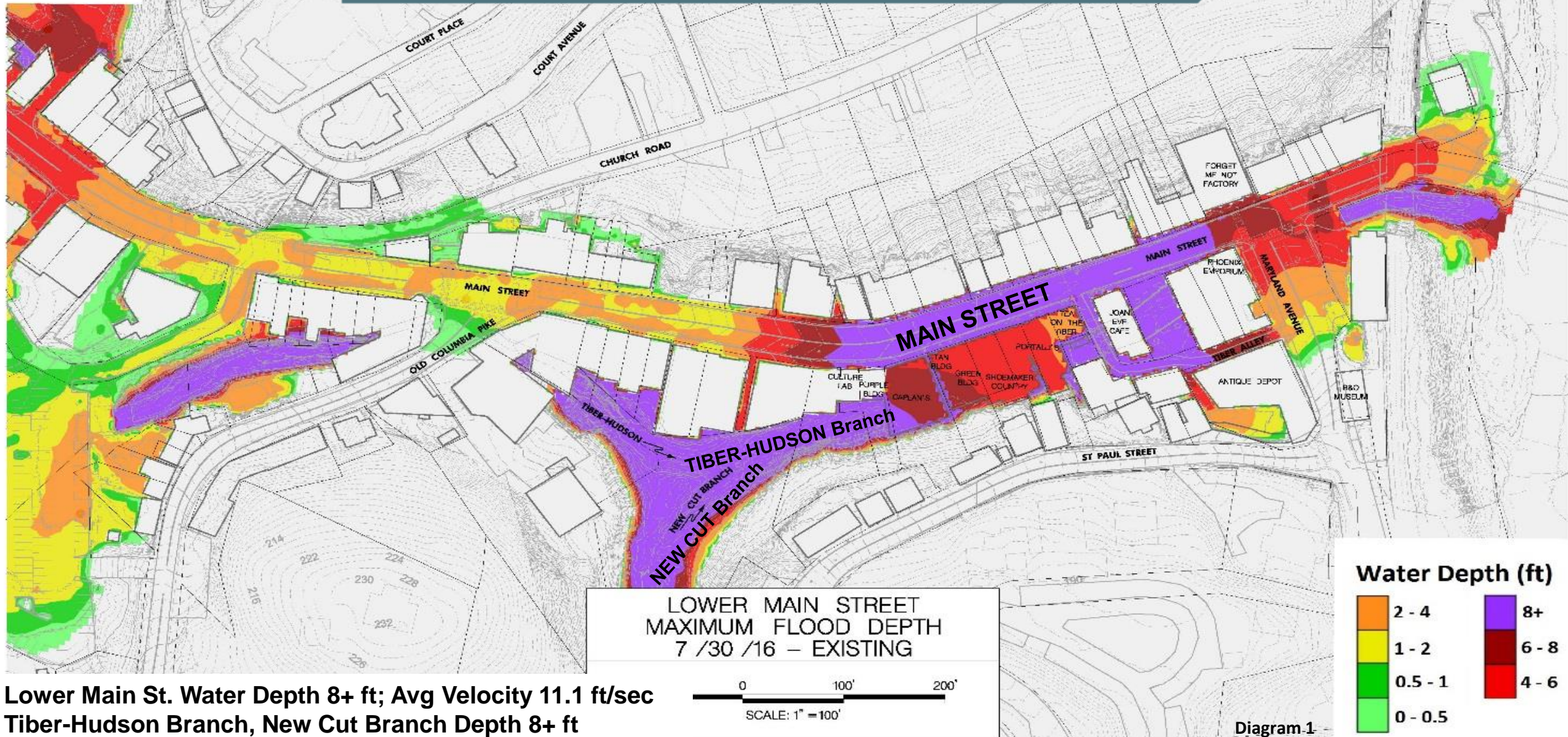


July 30, 2016 Shear Stress Model

- Shear: Purple = 12.5-15 pounds per square foot
- Simulation of shear stresses in Lower Main St matches locations of significant damage to buildings



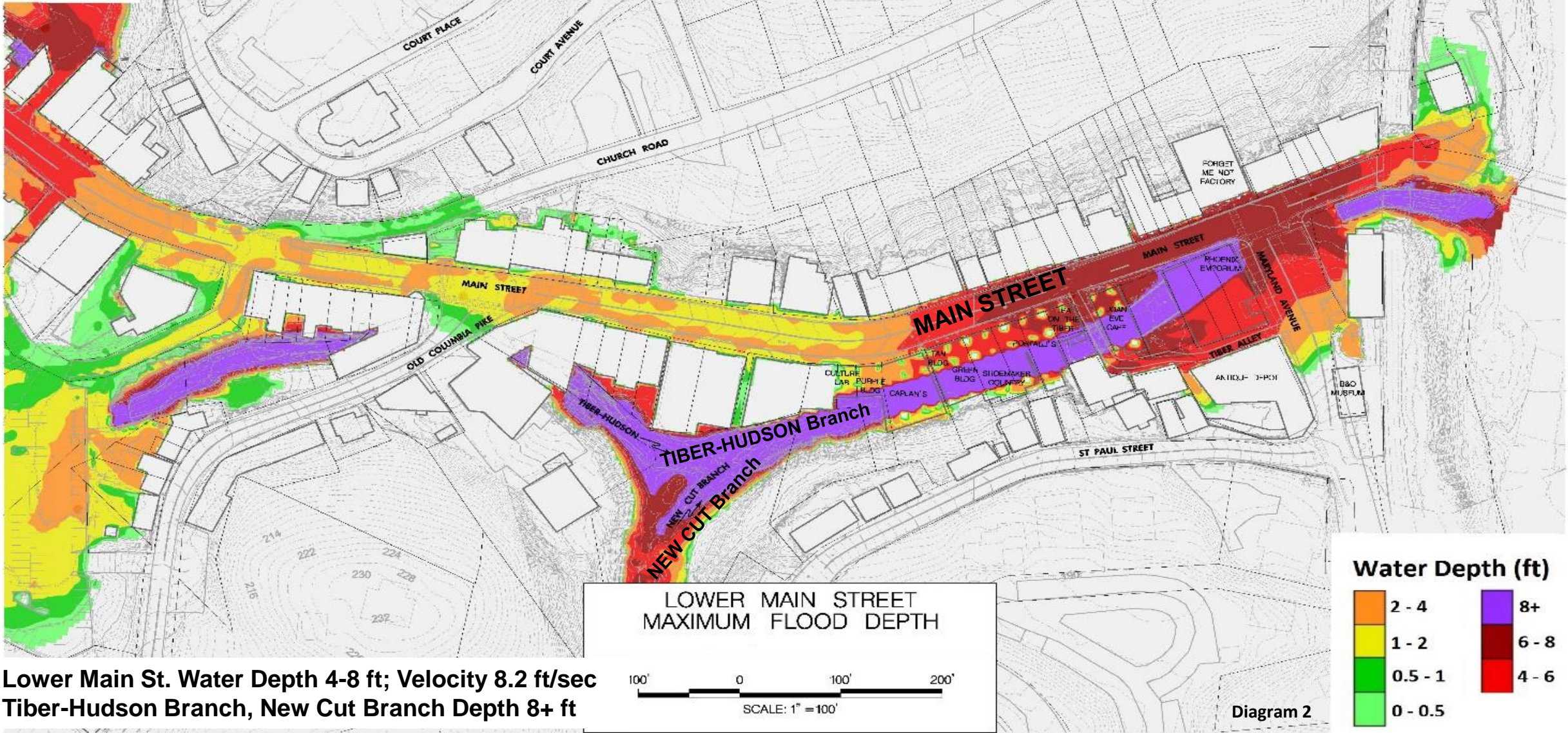
July 30, 2016 Flood Model



Lower Main St. Water Depth 8+ ft; Avg Velocity 11.1 ft/sec
Tiber-Hudson Branch, New Cut Branch Depth 8+ ft

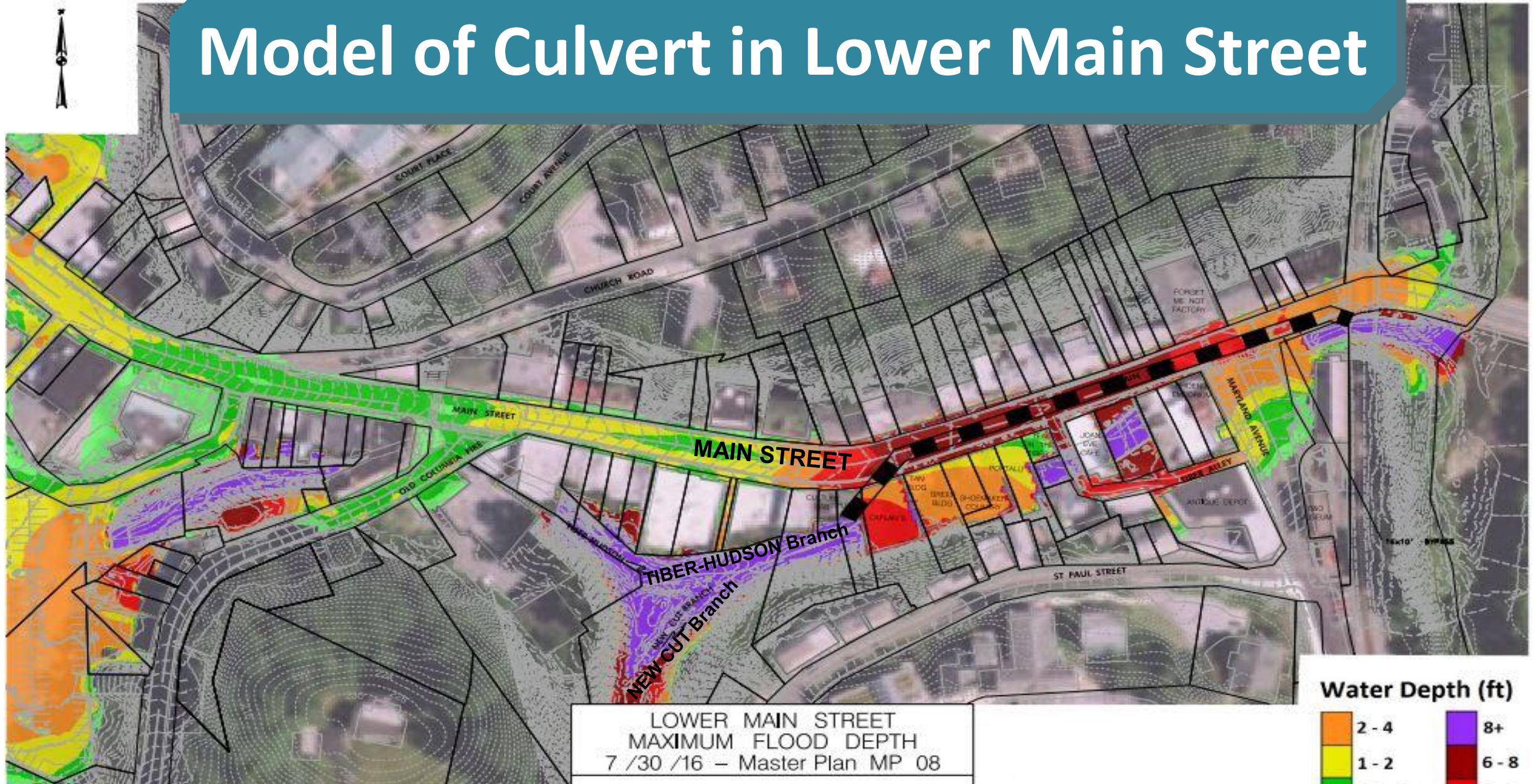
Open First Floor Model

12/20/2159 Court Ave Lot E

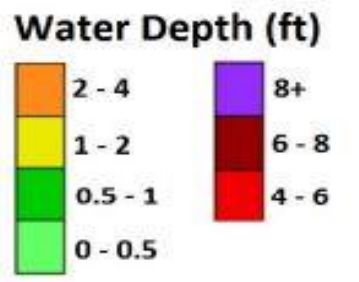


Lower Main St. Water Depth 4-8 ft; Velocity 8.2 ft/sec
Tiber-Hudson Branch, New Cut Branch Depth 8+ ft

Model of Culvert in Lower Main Street

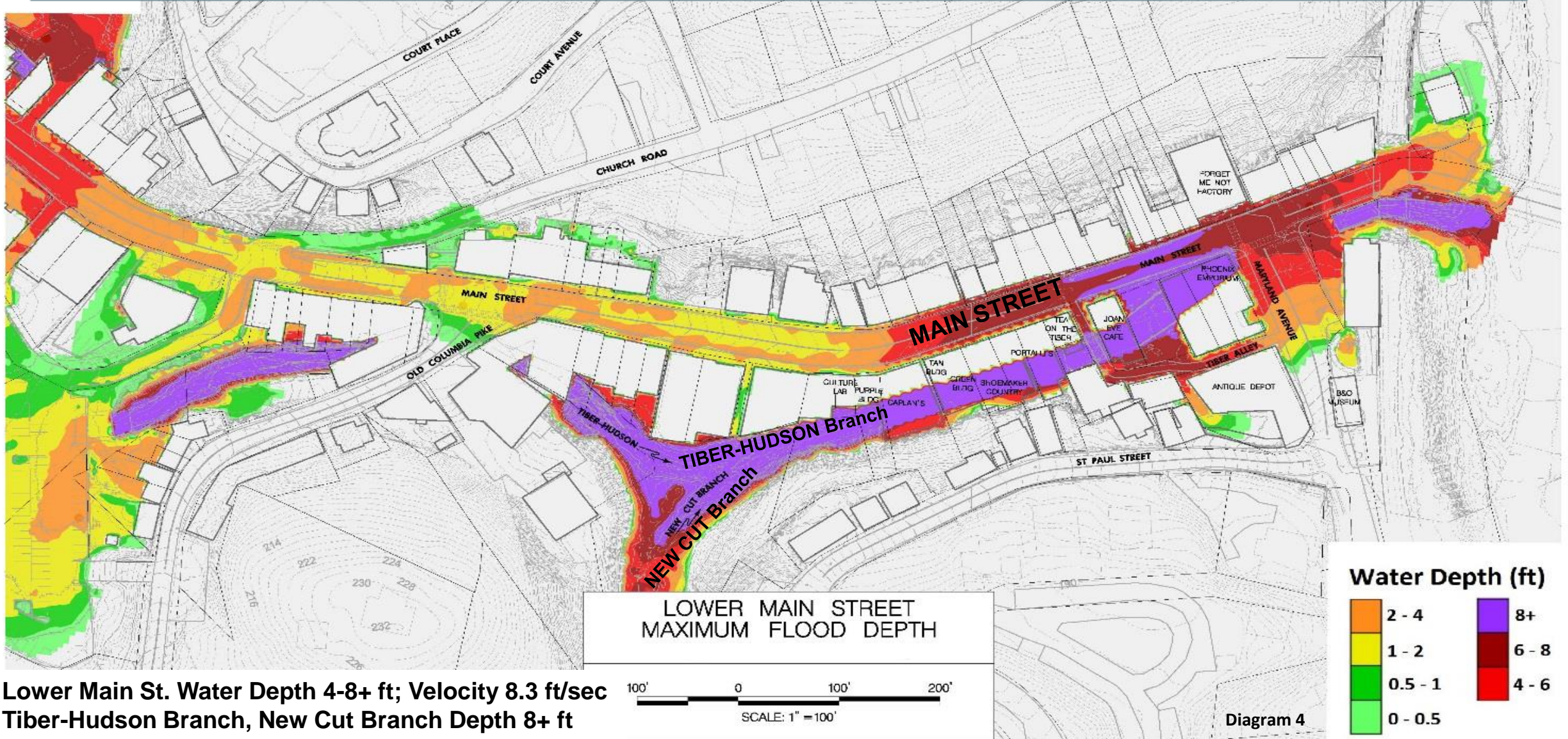


LOWER MAIN STREET
MAXIMUM FLOOD DEPTH
7 /30 /16 – Master Plan MP 08

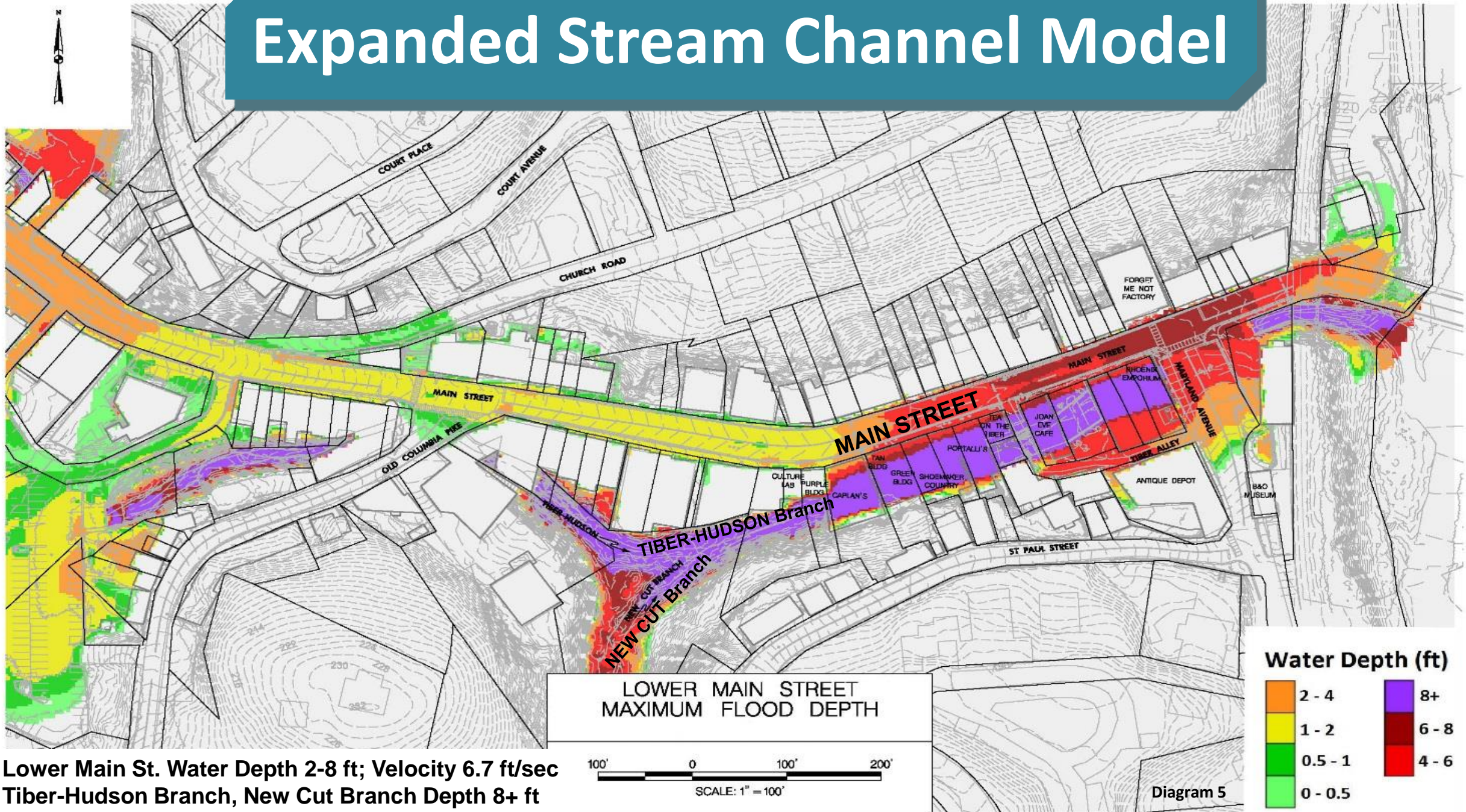


Lower Main St. Water Depth 6-8 ft; Velocity 7.75 ft/sec
Tiber-Hudson Branch, New Cut Branch Depth 8+ ft

Model with Facades – No Structures Over River



Expanded Stream Channel Model



Lower Main St. Water Depth 2-8 ft; Velocity 6.7 ft/sec
 Tiber-Hudson Branch, New Cut Branch Depth 8+ ft

LOWER MAIN STREET
 MAXIMUM FLOOD DEPTH

100' 0 100' 200'
 SCALE: 1" = 100'

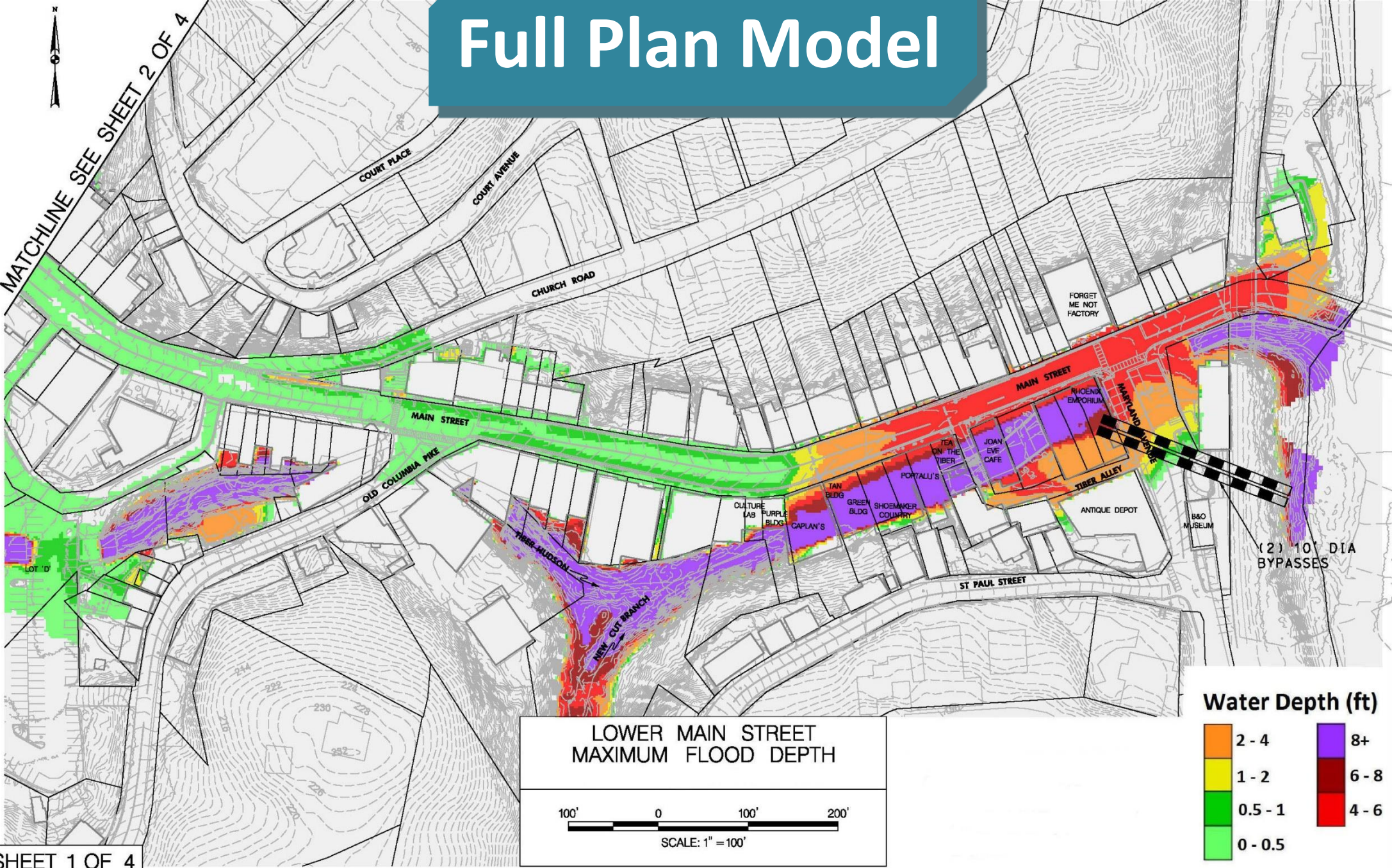
Water Depth (ft)

2 - 4	8+
1 - 2	6 - 8
0.5 - 1	4 - 6
0 - 0.5	

Diagram 5

Full Plan Model

MATCHLINE SEE SHEET 2 OF 4



LOWER MAIN STREET
MAXIMUM FLOOD DEPTH

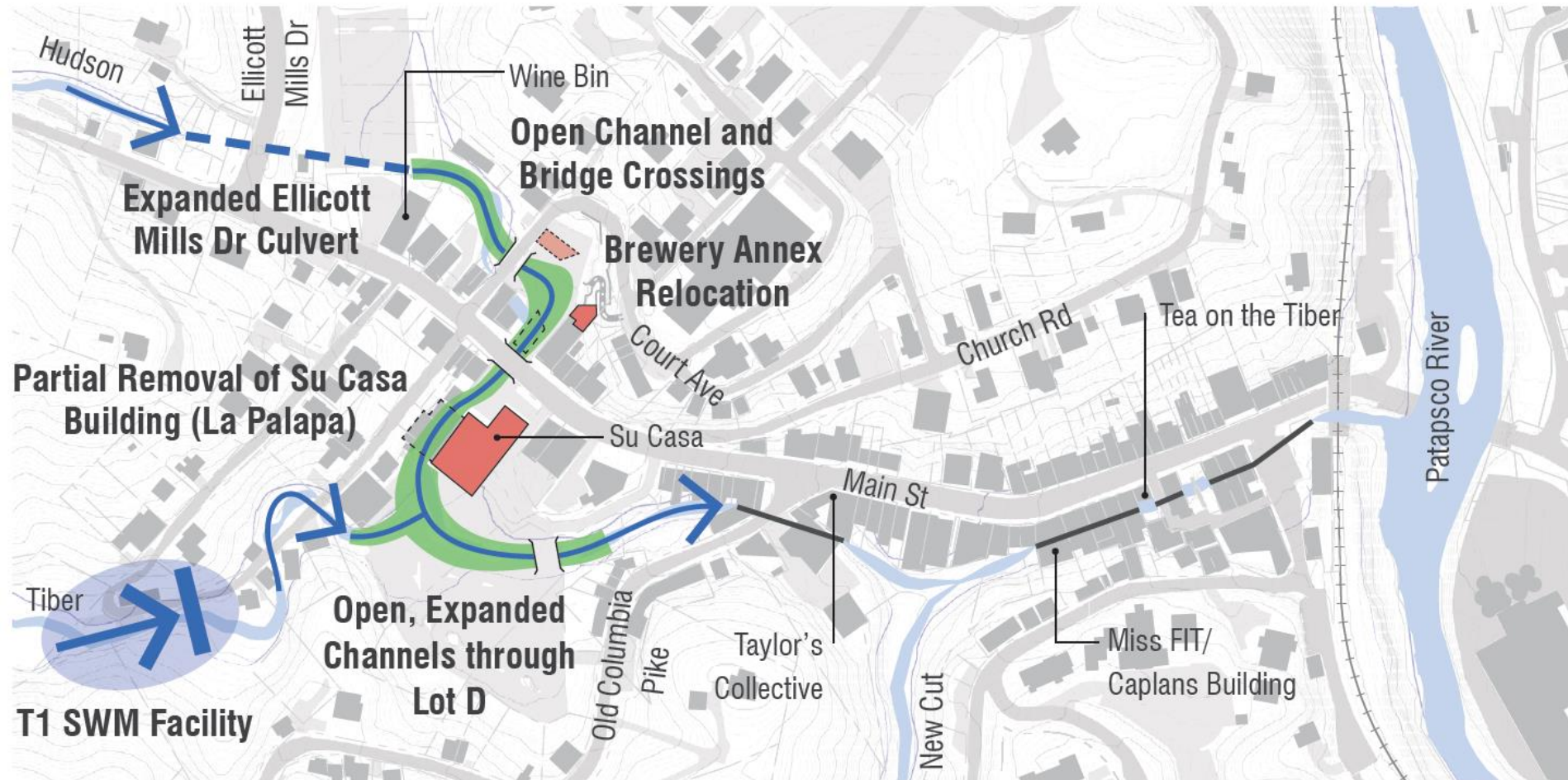
100' 0 100' 200'
SCALE: 1" = 100'

Water Depth (ft)

2 - 4	8+
1 - 2	6 - 8
0.5 - 1	4 - 6
0 - 0.5	

Upper Main Conveyance

The “Hudson Bend” and Open, Expanded Channels through Lot D



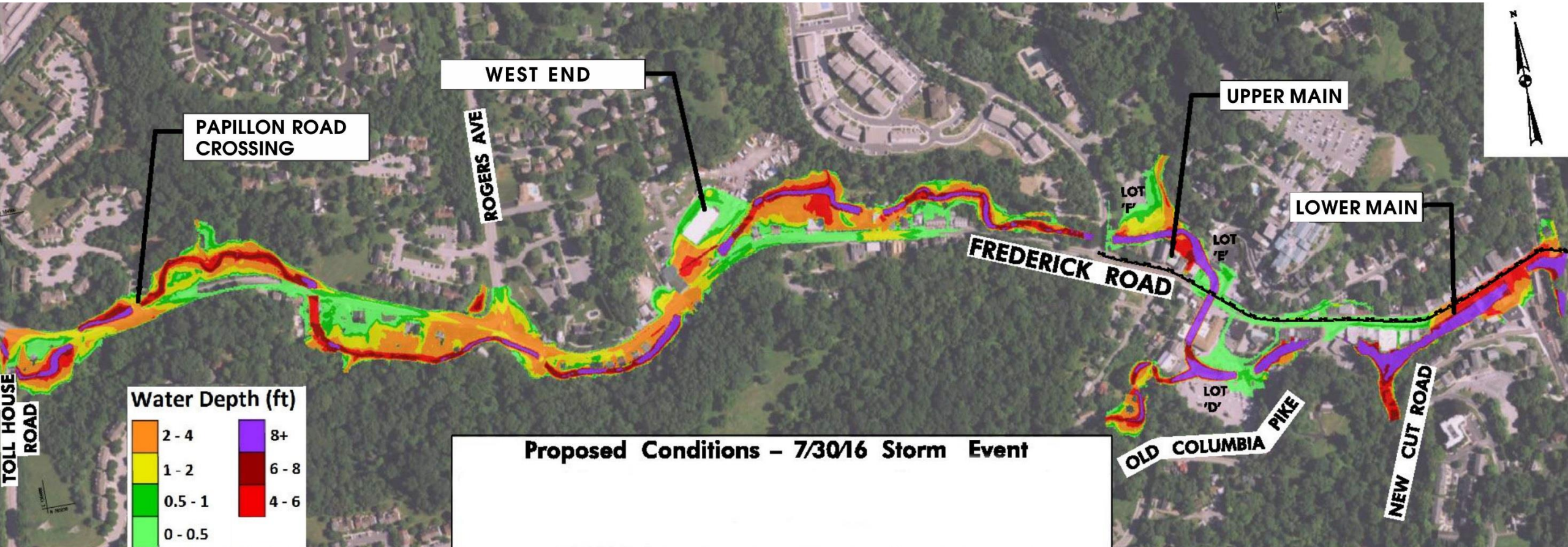
Infrastructure Improvements

Elements to Improve Conveyance of Water:

- **Expanding the channel** under Parking Lot E to Parking Lot D. Tie into the expansion of the Ellicott Mills Drive culvert.
- **Adding culverts** under Maryland Avenue. Connect the Tiber-Hudson with Patapsco River further downstream.
- Continue evaluation of **retention facilities** described as T1 and NC3.



Recommended Mitigation Improvements Model



Comprehensive Approach

- **Channel/floodplain expansion**
(acquisition and removal)
 - Public open space expansion
 - Pedestrian network enhancement
- **Stormwater retention facilities/improved wetlands**
- **New and expanded culverts**
- **Encourage floodproofing**
(as result Feb. 2018 of Army Corps of Engineers study)
- **Community partnerships**
 - Howard EcoWorks Soak it Up Campaign





Phoenix Emporium
8049 Main St.
Brick: c. 1851 Frame: c. 1870s

Discoveries
8055 Main St.
Block: c. 1920s-30s

Bean Hollow
8059 Main St.
Stone & Frame: c. 1930s

Great Panes
8069 Main St.
Brick & Stone: c. 1841

Tea on the Tiber
8081 Main St.
Stone: c. 1834



Portalli's
8085 Main St.
Brick: c. 1920s, c. 2000

Shoemaker's
8095 Main St.
Block: c. 2000

Johnson's Buildings
8109 Main St. 8113 Main St.
Frame: c. 1859 Frame: c. 1830s

Caplan's
8125 Main St.
Brick: 1926

Lower Main St.

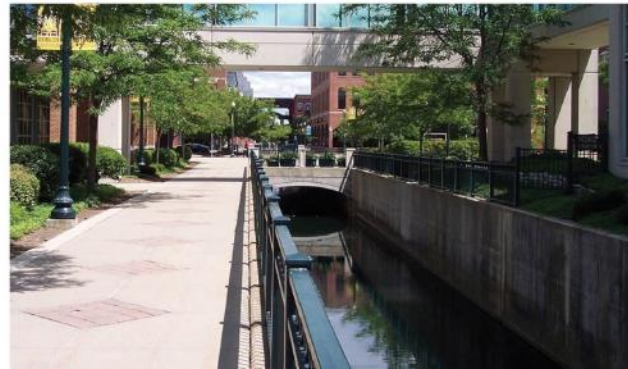
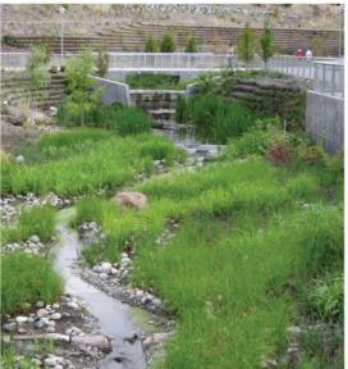
Gathering Space at Expanded Stream Channel



Gathering Space



Flood Conveyance



Gathering Space at Expanded Stream Channel

Hebden Bridge



Continuing Community Engagement

Master Plan Process – Continuing September 12, 2018

Ellicott City Historic Structures Review Committee

- Key historical elements to preserve and re-use

Historic Preservation Commission

- Certificate of Approval

Projects with federal or state permitting or funding must include a **Section 106 Review**

- Identify any impact or adverse effects of historic resources
- Work with state agencies, including Maryland Historic Trust

County Council Public Hearing – September 17, 2018



Protecting Lives – Saving Our Town

Summary of the 5-Year Flood Mitigation Plan Capital Improvements:

- Ellicott City and Valley Mede Property Acquisition/Removal
- Lower Main Open Space Construction
- Ellicott Mills Culvert Expansion
- Hudson 7 Retention Facility at US29/Rt40 Interchange
- Quaker Mill Retention Facility at Rogers Ave
- 8600 Main Street Culvert Expansion
- Two 10' Culverts from Maryland Ave to Patapsco River

Funding the Plan to Protect Lives

Legislation for FY 2019 Funding to begin implementation of the Ellicott City Flood Mitigation Plan

\$16,759,000 **TAO 1-2019**

\$ 2,000,000 **CB 61-2018**

\$18,759,000 **Total**

Funding the Plan to Protect Lives

TAO 1-2019 Implementation of Ellicott City Flood Mitigation Plan

<u>Amount</u>	<u>From</u>
\$ 984,000	Contingency Fund
\$ 1,100,000	Technology Infrastructure Upgrades
\$10,975,000	Route One Fire Station*
<u>\$ 3,700,000</u>	East Columbia Library Athletic Field & Site Improvement*
\$16,759,000	Total (*site acquisition pending)

<u>Amount</u>	<u>To</u>
\$15,759,000	Ellicott City Improvements and Enhancements
<u>\$ 1,000,000</u>	Valley Mede/Chatham Flood Mitigation
\$16,759,000	Total

Funding the Plan to Protect Lives

Council Bills 61-2018 and 62-2018 – Implementation of Ellicott City Flood Mitigation Plan

CB 61-2018

Emergency Appropriation

\$2,000,000 from General Fund Contingency

CB 62-2018

Authority to Borrow

Full Faith and Credit

Funding the Plan to Protect Lives

Projects		Est Costs (\$- Millions)
FY2019		\$18.8
Property Acquisition/Removal		
Lower Main Street Acquisition	C0337	9.5
Lower Main Street Removal	C0337	1.1
Valley Mede Acquisition	D1175	1.0
Lower Main Open Space	C0337	0.6
Ellicott Mills Drive Culvert	C0337	3.0
Hudson Bend (Lot D)	C0337	0.6
Rogers Ave Storm Drainage	C0337	0.2
Highways Projects	C0337	2.8

Protecting Lives – The Time is Now

- **Too many lives have been lost.**
- **Protecting lives must be our highest priority.**
- **We cannot wait to act. When will the next catastrophic storm hit?**

Video of Joan-Eve Shea Cohen, owner of Joan Eve Classics and Collectibles, and her employee and friend, Gary Weltner.

They recount their escape from the store during the May 27, 2018 flood.

<https://youtu.be/TYs5lizBpLE>

NOW is the Time - Protecting Lives

“The nightmares I had right after the flood and still do will haunt me forever. It makes me sick to my stomach to think of what could've happened.”

-- Shelley Sharkey, *MissFIT*

“It only took a matter of a few minutes for the water to get neck high...”

-- Paula Dwyer, *Georgia Grace Cafe*

“Several friends could have drowned in the basement of Portalli’s in 2016 if it wasn’t for miraculous circumstances...the kitchen guys were barely able to escape the giant hole blown through the wall. I have no interest in returning to that building, ever.”

-- Steve Miller, worked at *Portalli’s*

NOW is the Time - Protecting Lives

“No matter what option we choose for Ellicott City, the absolute #1 priority must be personal safety.”

-- Amy Lynne

“Acquisition of property in floodprone areas is a mitigation strategy that should be on the table...the upstream strategies alone will not be enough...”

-- Lori Lilly, *Howard EcoWorks*

“If it happened twice it’s going to happen again. The last few weeks of flash floods have caused much anxiety and fear. Something has to be done in OEC not over 10 years, but immediately! My kids who feel so emotional about Caplan’s, each will tell you it’s not worth the risk of people’s lives.”

-- Tammy Beideman, *Sweet Elizabeth Jane*

NOW is the Time - Protecting Lives

“The buildings have to come down to not only open the channel but to remove citizens from the area that floods the heaviest.”

-- Ron Peters, Main Street property owner

“I will never forget the feeling of evacuating that night. I will never forget the look on my child’s face when I screamed ‘get your shoes and get in the car, we have to leave right this minute.’ And I won’t forget my child seeing our home and our neighborhood for the first time afterwards. These are terrible memories and anyone with similar ones likely understands why it’s time for immediate action.”

-- Beth Woodruff, *West End resident*

NOW is the Time - Protecting Lives

“My family owned one of those buildings and I have a ton of history and memories, but it all pales when I think of the people I know who’ve had to suffer through this, and who face future suffering or worse if we don’t get this right.”

-- Monica Fabbri

“It’s really frustrates me that they value buildings over lives. And I know those buildings are important to people, but at this point they’re dangerous...”

-- Christina Allen Page

“The studies have been done and we know what needs to happen. History will always be there. It cannot be erased, even with the removal of buildings. Not everyone is in agreeance to this, however it’s the right choice for Main Street.”

-- Stephanie Hopkins, *Ellicott City resident*

NOW is the Time - Protecting Lives

“I think most anyone who knows me knows how much I love EC and what a big part of my life it’s been. I’m torn up over the buildings but when I really stop to think about EC, it’s the people. Without the people what is the building? Brick or stone do not come alive without the people and if we can’t keep the people safe, what are we as a community?”

Each business owner and resident is the true foundation of the town and they deserve to be in a safer place without fear at the crack of thunder or flash of lightning. Ellicott City will be changed once more as it has been before. And it will be stronger not for its buildings or lack thereof, but because of its people.

We will grieve for the buildings and the memories but I’d rather do that than grieve for the people.”

-- Rachel MacNeill Rawlings, *Salon Marielle*

NOW is the Time - Protecting Lives

Today, Ellicott City is not a safe place and I don't want the town and the businesses within it to die as we wait endlessly.

EC is out of time and I have zero confidence that EC will survive as a vibrant town if another flood hit before some major steps are taken.

This administration has the unfortunate task of fixing this mess and is forced to remedy problems that were decades in the making...

-- Sally Fox Tennant, *Discoveries*

More Information:
ECfloodrecovery.org
