TA01-FY19

Sayers, Margery

From: Lasser, Caryn
Sent: Saturday, September 29, 2018 8:08 AM
To: Feldmark, Jessica
Cc: Sigaty, Mary Kay; Sager, Jennifer; CouncilMail
Subject: EC Flood Mitigation Plan - Council Requests and Responses
Attachments: Response to Question 17 - All Tiber Watershed Projects Funded w Status.pdf; Response to Question 33 - Site Plan_South Bore_ECity_20180921.pdf; Response to Question 33 - Profile_South Bore_ECity_20180921.pdf; Response to Question 33 - Curves.pdf; Response to Question 35 - Ellicott_City_Timeline.pdf; Response to Question (b) - Modified McT Modeling w Timing and Costs.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Jess,

Please find below, and attached as referenced below, responses to Council questions regarding the Ellicott City Flood Mitigation Plan. A wealth of information is available at: www.ECfloodrecovery.org.

Council Requests for Additional Information:

17. *Please provide a complete list of every Tiber-Hudson watershed flood mitigation project that has been funded and its current status.*

    Please see the attached file for a list of the Tiber-Hudson watershed flood mitigation projects and their current status.

33. *Please provide copies of any engineering report, feasibility study, cost estimate, or other documentation related to the tunnel bore improvements included in the 2016 McCormick Taylor study.*

    Please see the three attached files responsive to the request for tunnel bore information included in the 2016 McCormick Taylor study, along with the information below.
    For the 20-ft diameter pipe:
    - Tailwater condition is based roughly on the 7/30/16 storm event (extrapolating from the upstream gage data using a similar delta decrease as the FEMA model from the gage to the outfall location).
    - Slope is relatively flat, to keep the invert sufficiently depressed as to utilize the full diameter/height of pipe at an 8' +/- channel depth. Iterative analysis did not yield significant increases in capacity using steeper slopes, so this slope is not concerning.
    - The conceptual entrance utilizes a long weir that maintains up to 2' of baseflow in the channel that bypasses the flume before beginning to utilize the tunnel by allowing lateral flow from New Cut (and roughly head on flow from Tiber) to spill over into the bore tunnel via the 'bypass flume' (roughly designed for the purpose of this concept).

- The entrance is set fairly deep into the existing hillside to reduce length of bore and, more importantly, create space for a tunneling pit that can be sufficiently large and walled off from the adjacent river during construction.
- The profile shows relative depth to the roadways and buildings above.

Feasibility Analysis:

1. At storm high tail water, pipe efficiency drops dramatically. Large hydraulic head in the Tiber/New Cut needed to push water through pipe. High head will cause additional flooding on Main Street or through buildings straddling stream.
2. Pipe opening susceptible to debris blockage, reducing pipe efficiency and contributing to additional flooding.
3. Problematic maintenance and operating costs such as type of equipment needed, access issues, safety equipment.
4. Top of pipe elevation at outfall is only approximately 8 feet below the train tracks. Depending on subgrade material, pipe may not be low enough to adequately carry train surcharge loading.
5. Construction will require extended permit process.
6. Construction will require extended negotiations with property owners and CSX for easements.
7. Complexity and feasibility of construction unknown will most like result in much higher costs.
8. Estimated construction costs are approximately $32,000 per linear foot of pipe. With pipe length at 600 to 700 feet, project costs estimated at $19M to $22.4M. These costs do not include design, easement acquisitions, and contingencies.
9. Public safety concern with trespassing inside the pipe.
10. Cost of project compared against efficiency reliability, time of property acquisition, time of construction, possibility of large cost over runs, complexity of construction, and other projects that could produce the same result at a higher degree of certainty at lower costs resulted in the conclusion that the tunnel bores were not the preferred project to advance at this time.

35. *Please provide a single timeline from 2010 to present which includes all Ellicott City flooding events, studies, workgroups, SWM/flood mitigation improvements funded, and SWM/flood mitigation improvements constructed.*

Please see the attached file for a timeline of flooding events, studies, workgroups and flood mitigation improvements.

36. *If TAO1-FY2019 were to pass but CB61-2018 did not, what would be the impact on which projects could be completed in the current fiscal year?*

If funding is not received from the transfer proposed in CB 61, one or more of the design and/or construction projects planned for FY 19 will be delayed. The projects which could be impacted are listed below:

Completion of the Ellicott Mills Culvert Construction
Hudson Bend Design
Frederick Road Culvert Expansions Design and Construction
Church and Emory Streets Storm Drain Rehabilitation Final Design and Construction
Quaker Mill Flood Control Facility
H7 Flood Control Facility Continued Design
New Cut Road Stream Wall Restoration Construction

From Work Session:

(a) Provide the modeling maps for options 1 through 16D (in pdf format so we can zoom in as needed)

The file responsive to this request is too large to attach in an email. Please use the following URL and your Howard County Government username/password to access the MOVEIT file and view this package over a secure connection. The file attachment is titled *Depth_Maps_73016_CombinedGraphics_only.pdf* and available here:

https://hcmoveit.howardcountymd.gov/human.aspx?OrgID=9144&Arg12=message&Arg06=516030985&Arg08=tg4d7nxujgs4uac5

MAPS are posted separately

(b) Provide an updated version of the McCormick Taylor Modeling Post May 27 chart to add columns for timing and cost

Please see the attached file for an updated chart reflecting the McCormick Taylor Modeling Post May 27 with timing and cost information included.

(c) Provide the map showing modeling of the amount flood water would be lowered (in pdf format so we can zoom in as needed)

Please see the modeling maps for options 1 through 16D in the response to Question (a) which are in a MOVEIT file because of the large file size. Then look for Option 16C page 22 of 34 of the modeling maps.

(d) In order to do the Hudson Bend part of the project, would there need to be any road closures? If so, what portion of road(s) would be closed and for how long?

There would need to be road closures as described below:

1. Court Avenue would be closed during the construction of a new expanded culvert.
2. Parking Lot E would be closed during the construction of the expanded stream channel.
3. Main Street would be closed during the construction of the new expanded culvert under the road.

These projects would be phased and temporary opening may be possible depending on contractor maintenance of traffic plans and method and means.

(e) We have heard that with 4-6 feet of water, swift water rescues would still be required, and it only takes 1-2 feet of water to sweep a car away. If this plan would leave 4-6 feet of water of parts of Main Street, what are the plans to prevent the necessity for swift water rescues? How does this plan improve life safety?

The plan lowers flood waters to 4 to 6 feet and reduces velocities to as low as 4.5 fps. This is a much safer condition than over 8 feet of water at as much as 22 fps. The necessity for swift water rescues is unknown, however, by these planned reductions and not having people concentrated in locations at the lower end of Main street, the risk during any rescue is reduced.

Thanks.

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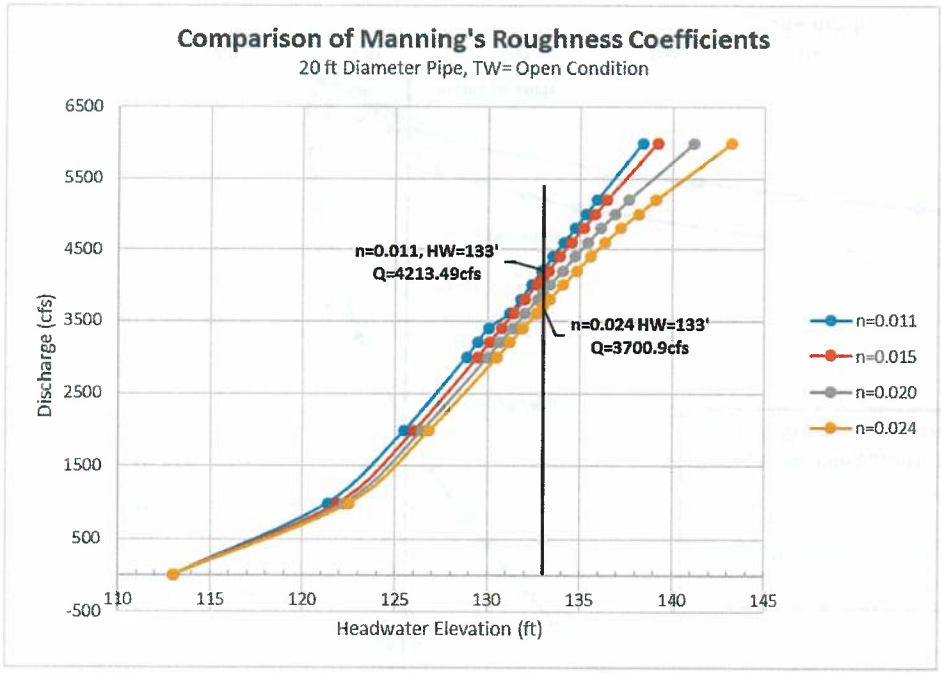
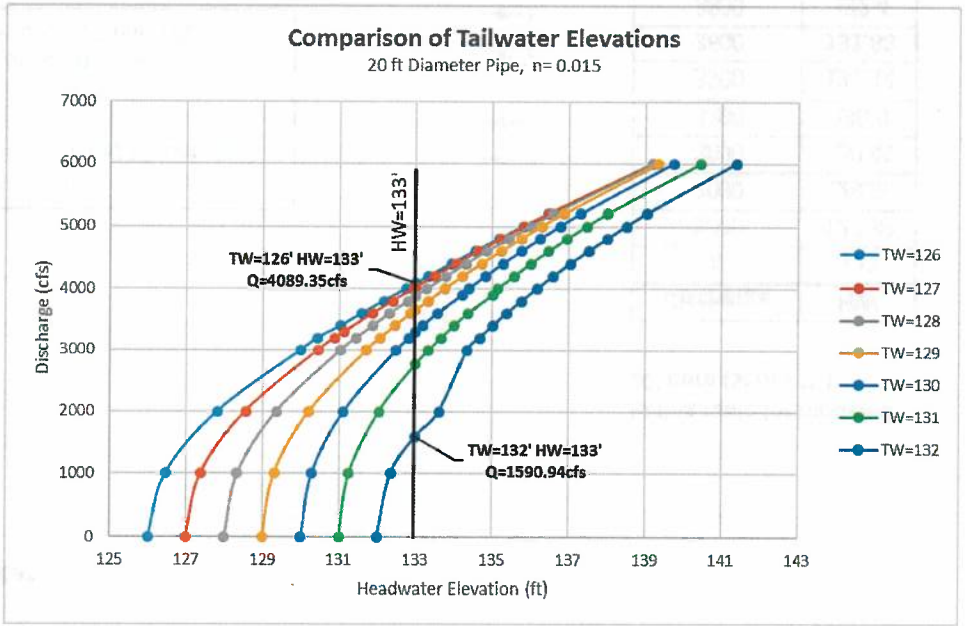
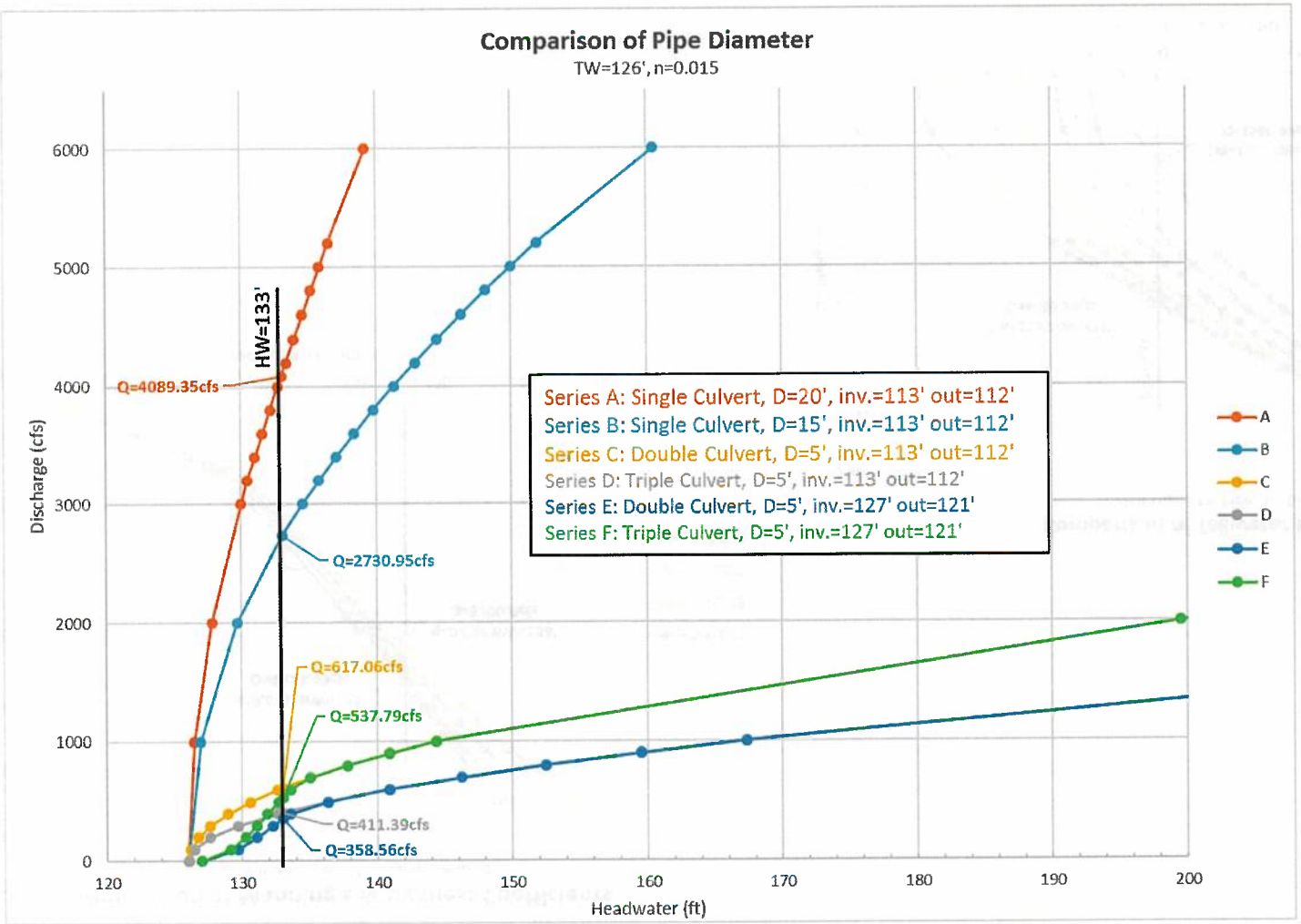
Tiber Hudson Flood Mitigation Projects
(Since July 2016 Flood Event)
Updated September 27, 2018

Project Description	Cap Proj	Status
Brew Pub Stream Wall Reconstruction	D-1165	Complete
Comprehensive Hydrology and Hydraulic Study	D-1165	Complete
Repair Stream Channel Wall behind Hi Ho Silver	D-1165	Complete
Repair Stream Channel Wall at 8659 Main St	D-1165	Complete
Stream Clearing on the north side of West Main St	D-1165	Complete
Reconstruct Stream Walls between Parking Lots E and F	D-1165	Complete
Rebuild Stream Channel Wall behind Old Theatre	D-1165	Complete
Comprehensive Floodproofing Study by US Army Corps of Engineers	D-1165	Complete
Stream Wall at 84-inch Culvert in 8600 Block of Main St	D-1165	Complete
84-inch Culvert Enlargement at 8600 Block and Secondary Pipe along West End of Main St	D-1165	In Design
Hudson 7 Dry Flood Mitigation Facility (Funding for Design Only)	D-1165	In Design
Tiber 1 Dry Flood Mitigation Facility (Funding for Design Only)	D-1165	In Design
New Cut 3 Stormwater Retention Facility (Funding for Design Only)	D-1165	In Planning
Court House Drive Slope Stabilization	C-0337	In Design
Headwall Repair and Stream Channel Stabilization between Court House Drive and Fels Lane that leads to Parking Lot F (Funding for Design Only)	D-1165	In Design
George Howard Building Drainage Project (Funding for Design Only)	D-1165	At Concept Design
Court House Parking Lot Drainage Project (Funding for Design Only)	D-1165	At Concept Design
Upgrade of Storm Drains on Emory and Church Streets (Funding for Preliminary Design Only)	D-1165	Preliminary Design Underway
Upgrade of Storm Drains on Old Columbia Pike and Maryland Avenue (Funding for Preliminary Design Only)	D-1165	Preliminary Design Underway
Quaker Mill Dry Flood Mitigation Facility (Funding for Design Only)	D-1160	In Design
Fels Lane Storm Drain Improvements	C-0337	Complete
Ellicott Mills Drive Culvert/Roadway Replacement (Funding for Design Only)	D-1165	In Design
New Cut Road Slope Failure Repair (Funding for Design Only)	D-1165	In Design
Historic Colored School Slope Failure Repair (Funding for Design Only)	D-1165	In Design
Parking Lot F to Maryland Avenue Preliminary Open Channel Design (Funding Through 30% Design Only)	D-1165	In Design
Support for Undermined Wall 17B (Below Hi Ho Silver)	D-1165	In Design
Woody Debris Clearing at Multiple Locations – Post July 2016 and May 2018 Storm Events	D-1165	Mostly Complete
Rogers Avenue Storm Drain Improvements	D-1165	In Design

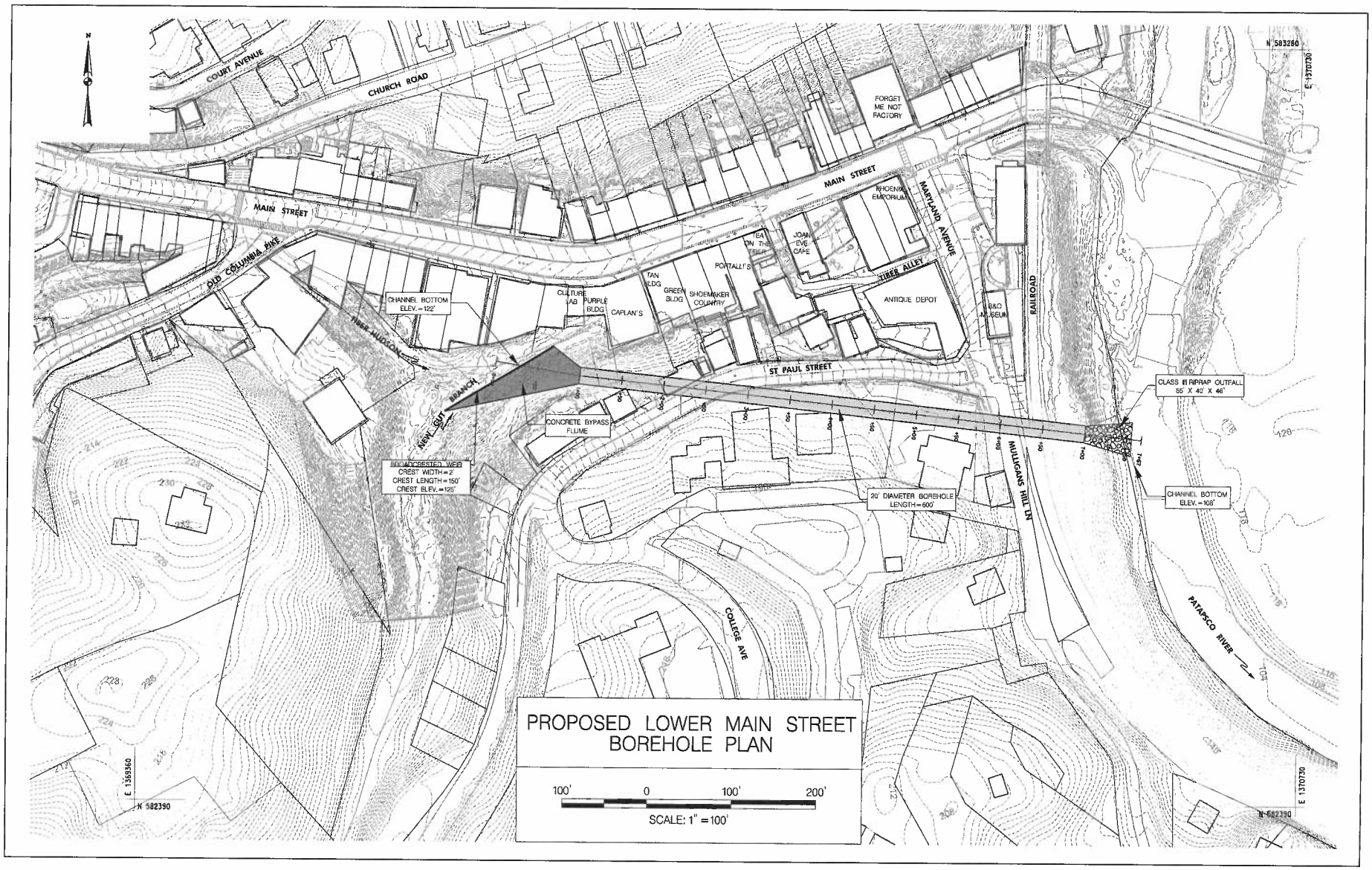

Comparison of Manning's Roughness Coefficients
20 ft Diameter Pipe, TW= Open Condition
Discharge (cfs)
6500
5500
4500
3500
2500
1500
500
-500
110
115
120
125
130
135
140
145
Headwater Elevation (ft)
n=0.011, HW=133'
Q=4213.49cfs
n=0.024 HW=133'
Q=3700.9cfs
n=0.011
n=0.015
n=0.020
n=0.024


Comparison of Tailwater Elevations
20 ft Diameter Pipe, n= 0.015
Discharge (cfs)
7000
6000
5000
4000
3000
2000
1000
0
125
127
129
131
133
135
137
139
141
143
Headwater Elevation (ft)
HW=133'
TW=126' HW=133'
Q=4089.35cfs
TW=132' HW=133'
Q=1590.94cfs
TW=126
TW=127
TW=128
TW=129
TW=130
TW=131
TW=132



Rating table for modeled 20' bore (Series 'A')

Discharge	HW
0	127
1000	127.39
2000	128.56
3000	130.45
3200	130.9
3300	131.14
3600	131.88
3800	132.4
4000	132.93
4024.09	133
4200	133.49
4400	134.05
4600	134.64
4800	135.24
5000	135.85
5200	136.48
6000	139.19


COURT AVENUE
CHURCH ROAD
MAIN STREET
MAIN STREET
OLD COLUMBIA PIKE
FORGET ME NOT FACTORY
PHOENIX EMPORIUM
MARYLAND AVENUE
TIBER ALLEY
JOAN EVE CAKE
TAN BLDG
GREEN BLDG
SHOEMAKER COUNTRY
PORTALI'S
CULTURE LAB
PURPLE BLDG
CAPLAN'S
ANTIQUE DEPOT
B&O MUSEUM
RAILROAD
CHANNEL BOTTOM ELEV. = 122'
TIBER-HUDSON BRANCH
NEW CUT
ST PAUL STREET
CONCRETE BYPASS FLUME
UNCONTROLLED WEIR
CREST WIDTH = 2'
CREST LENGTH = 150'
CREST ELEV. = 125'
20' DIAMETER BOREHOLE LENGTH = 600'
CLASS III RIPRAP OUTFALL
55' X 40' X 46'
CHANNEL BOTTOM ELEV. = 108'
MULLIGANS TRILL LN
COLLEGE AVE
PATAPSCO RIVER
N 583280
E 1370730
E 1369360
N 582390
E 1370730
N 582390
PROPOSED LOWER MAIN STREET
BOREHOLE PLAN
100' 0 100' 200'
SCALE: 1" = 100'

Ellicott City Timeline Overview

September 7, 2011- Tropical Storm Lee hits Ellicott City

June 28, 2012- Valley Mede-Ellicott City Tropical Storm Lee Case Study Completed

December 12, 2012- Tiber-Hudson and Plumtree Branch Stream Corridor Assessment Completed

April 3, 2014- Ellicott City Flood Study and Concept Mitigation Report Completed

October 14, 2014- Howard County Government purchases West End residence

May 29, 2015- Executive Kittleman and Councilmember Weinstein establish Flood Work Group

December 1, 2015- Flood Work Group submits their report. It is important to note the Flood Work Group continues to meet to and more information on their efforts can be found here: https://www.howardcountymd.gov/Departments/Ellicott-City-2016-Flood-Recovery/Flood-Work-Group

July 1, 2016- Funds allocated as part of the FY2016 Budget to support the Flood Work Group's recommendations

July 30, 2016- Flash flood occurs in Ellicott City

**Please see below for a list of projects conducted after the 2016 flood*

August 25, 2016- Executive Kittleman establishes Community Advisory Group

October 18, 2016- Community forum for those impacted

November 10, 2016- Rebuilding and the Environment Community Forum

November, 2016- Economic Impact Study completed

December 1, 2016- Rebuilding and Economic Development Community Forum

December 10, 2016- Community forum on Rebuilding and Historic Preservation

February, 2017- 2016 Storm Stream Corridor Assessment competed

February, 2017- Community Advisory Group completes Final Report

March, 2017- 2016 Storm Case Study completed

May, 2017- Master Plan Advisory Team created to support the Master Plan Process

May 31, 2017- Master Plan Kick-off Meeting

June, 2017- Comprehensive Hydrologic and Hydraulic Analysis completed

July 11, 2017- Master Plan Community Forum

September, 2017- Master Plan Consultant attended several community meetings to garner more input

November 14 and 15, 2017- Master Plan Community Forums

February, 2018- U.S. Army Corps of Engineers Non-structural Floodproofing Study completed

March 22, 2018- Master Plan Community Forum

May 27, 2018- Flash Flood occurs in Ellicott City

June 28, 2018- Ellicott City Town Hall

September 12, 2018- Master Plan Public Information Meeting

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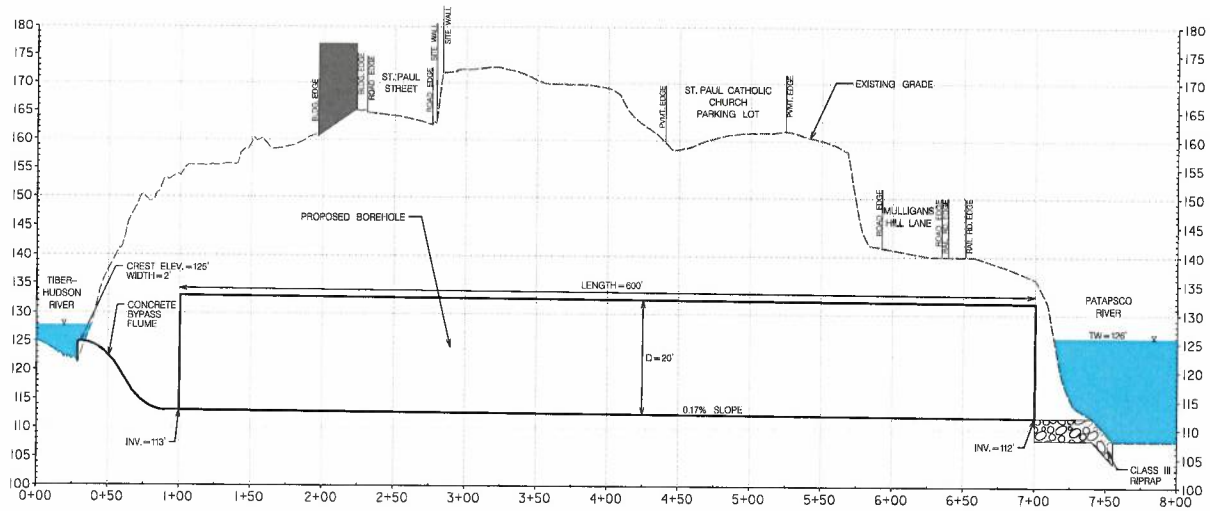

PROPOSED LOWER MAIN STREET BOREHOLE PROFILE
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'

Question (b) from Work Session:

Provide an updated version of the McCormick Taylor Modeling Post May 27 chart to add columns for timing and cost.

Modified McCormick Taylor Modeling Post May 27th, 2018

(considers removing Lower Main properties and West End properties)

Option	Terraced Floodplain	Modified Floodplain	Quaker Mill	Lot D Expand	T-1	H-7	NC-3	MD Ave Culverts	Tailwater	West End Improve	Notes	Timing (years)	Cost
1	*										Only removes 5 bldgs in floodplain	2	$10.9M
2	*										FP grading w/piers	5	$20.5M
3	*										FP Facades only	5	$25.5M
4	*										Includes Ellicott Mills Improve	3	$15.4M
5	*		*			*						5	$22.9M
5A	*	*(tot, gp in)	*			*						5	$22.9M
5B	*	*(C.Lab, Purple)	*			*						5	$22.9M
6	*		*	*		*						5	$42.9M
7	*		*	*		*	*					8 to 10	$50.9M
8	*		*	*	*	*						8 to 10	$62.9M
9	*		*	*	*	*	*					10 to 15	$70.9M
10	*			*				*(1-8-ft)			Conveyance option	5	$37.5M
10A	*			*				*(2-8-ft)				5	$37.5M
10-TW	*			*				*(2-8-ft)	*			5	$37.5M
10TW2	*			*				*(2-10-ft)	*			5	$37.5M
10TW3	*		*	*		*		*(2-10-ft)	*		minor adjustments	5	$45.0M
MP08a											Single 16'x10' bypass in main street	5	$ 5.0M
15	*	*(tot, gp in)	*	*		*		*(2-10-ft)	*	*		5	$47.5M
16	*	*(C Lab)	*	*		*		*(2-10-ft)	*	*		5	$47.5M
16B	*	*(C Lab)	*	*		*		*(2-10-ft)	*	*	Adjusted Terracing	5	$47.5M
16C	*	*(C Lab Purp)	*	*		*		*(2-10-ft)	*	*	**Current 5-year plan**	5	$47.5M
16D	*	*(C Lab Purp)	*	*	*	*		*(2-10-ft)	*	*		8 to 10	$67.5M

Terraced floodplain includes the removal of the buildings from 8133 Main down to Maryland Avenue (for option 4 and subsequent runs)

Modified Floodplain includes keeping noted buildings

Sayers, Margery

From: Lasser, Caryn
Sent: Saturday, September 29, 2018 8:10 AM
To: Feldmark, Jessica
Cc: Sigaty, Mary Kay; Sager, Jennifer; CouncilMail
Subject: EC Flood Mitigation Plan - Council Requests and Responses
Attachments: Response to Question 34 - Tiber Branch Watershed Impervious Surface - updated.pdf; Response to Question 34 - Tiber Branch Watershed-Residential Issued Building Permits 1991 thru June 30 2016.pdf; Response to Question 34 - EC2018Flood.InProcessPlansPermitsIssuesSinceJuly1 2016.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Jess,

Please find below, and attached as referenced below, responses to Council questions regarding the Ellicott City Flood Mitigation Plan. A wealth of information is available at: www.ECfloodrecovery.org.

Council Requests for Additional Information:

34. *Please provide a timeline of development in the Tiber Branch Watershed including number of permits issued and amount of impervious surface built. Although earlier years may be aggregated as you see fit, please provide this data by year for at least the last 10 years.*

Please see the four attached files responsive to describing a timeline of development in the Tiber Branch Watershed, including permits issued and impervious surfaces. Note that there are two impervious surface maps – based on planimetrics created from 2014 and 2016 aerial photography. Planimetrics are not available every year for the last 10 years, and the quality is not consistent. The two impervious surface maps provided, however, do show the most recent impervious cover in the watershed and show the slight change between 2014 and 2016. The other two maps show building permits issued over time in the Tiber Branch Watershed.

Please note – these four files together are too large to send in a single email. Two emails are being sent for this response, one with three files, and another with a single file.

Thanks.

Caryn D. Lasser
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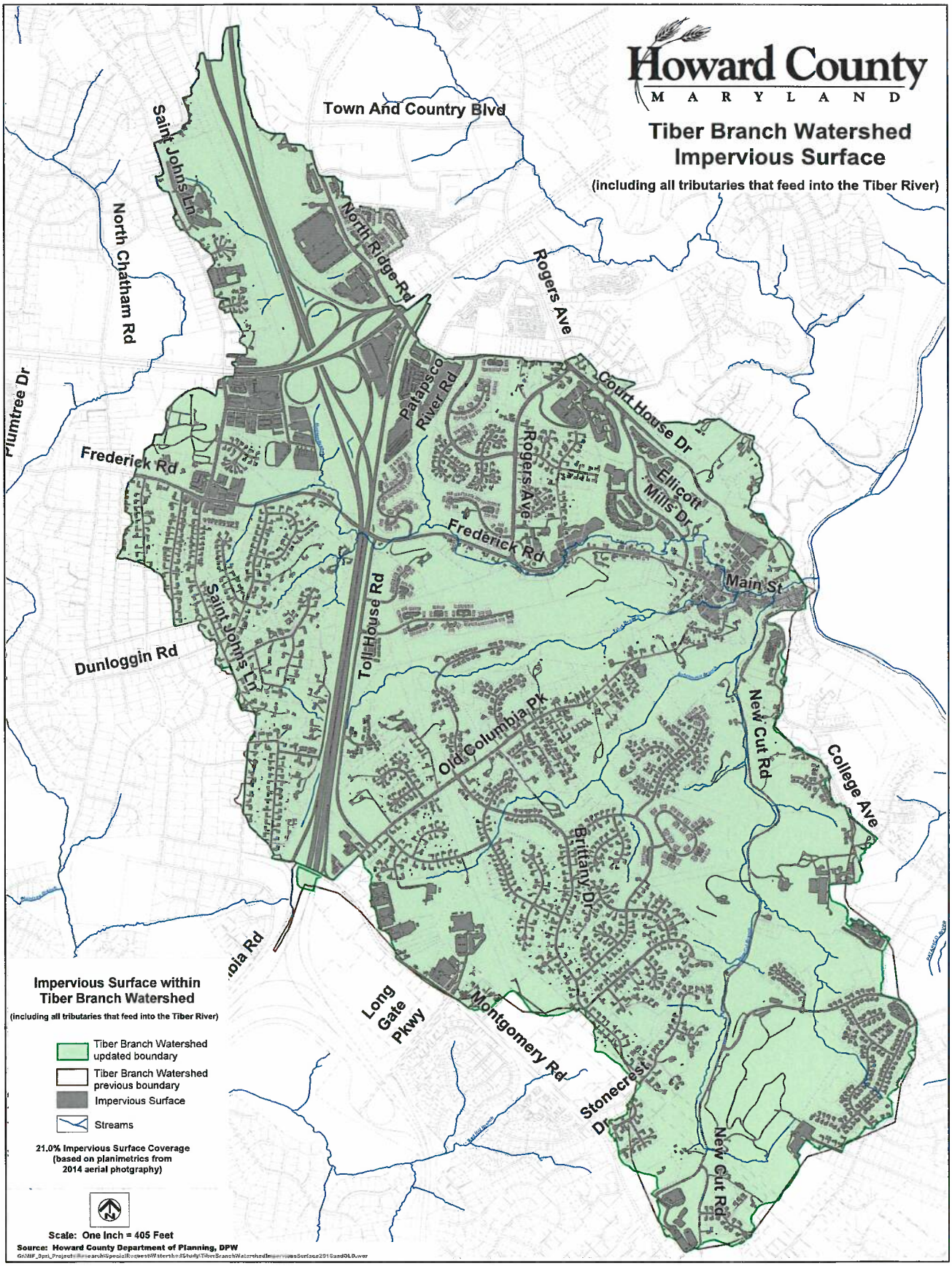
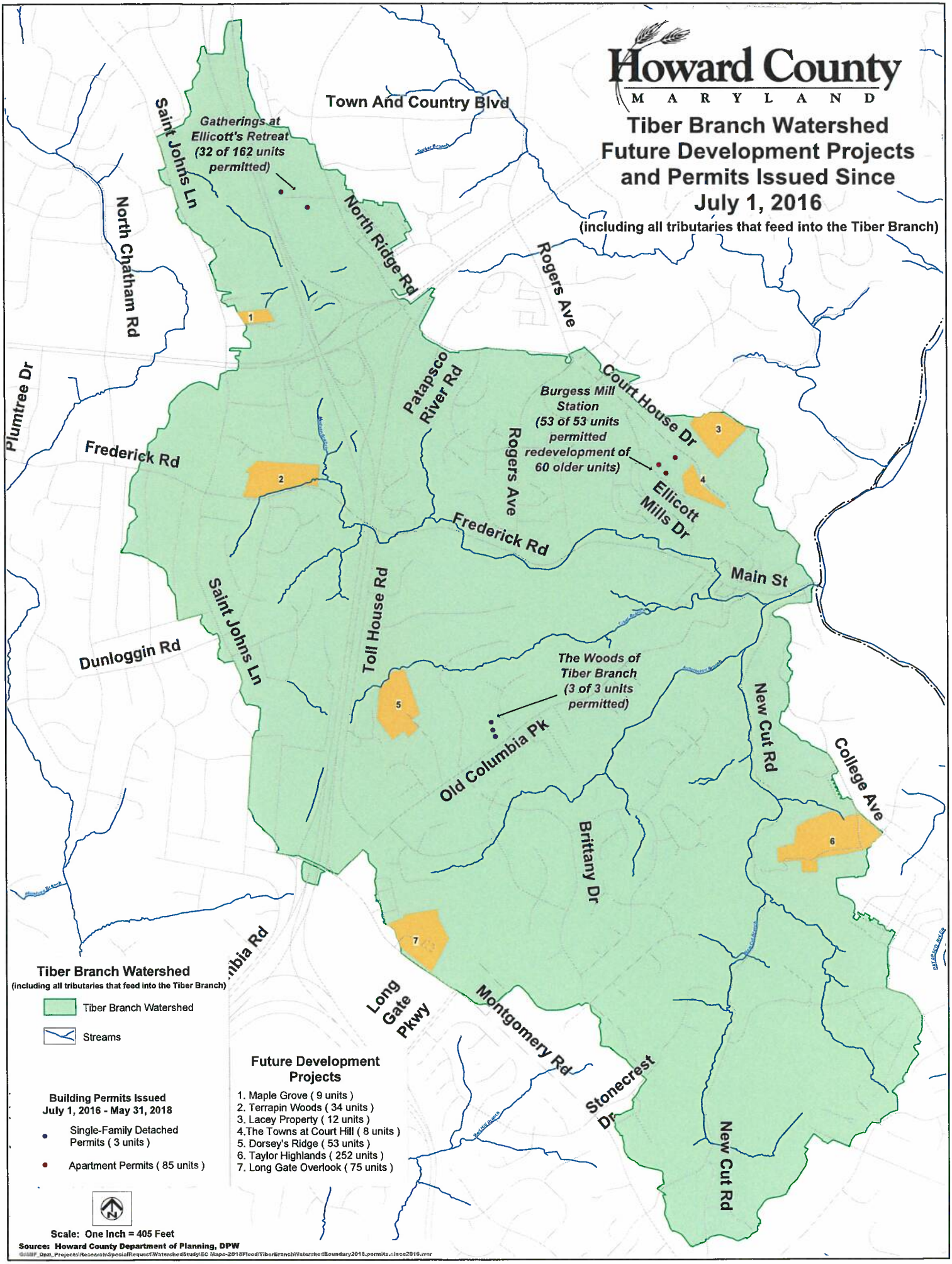
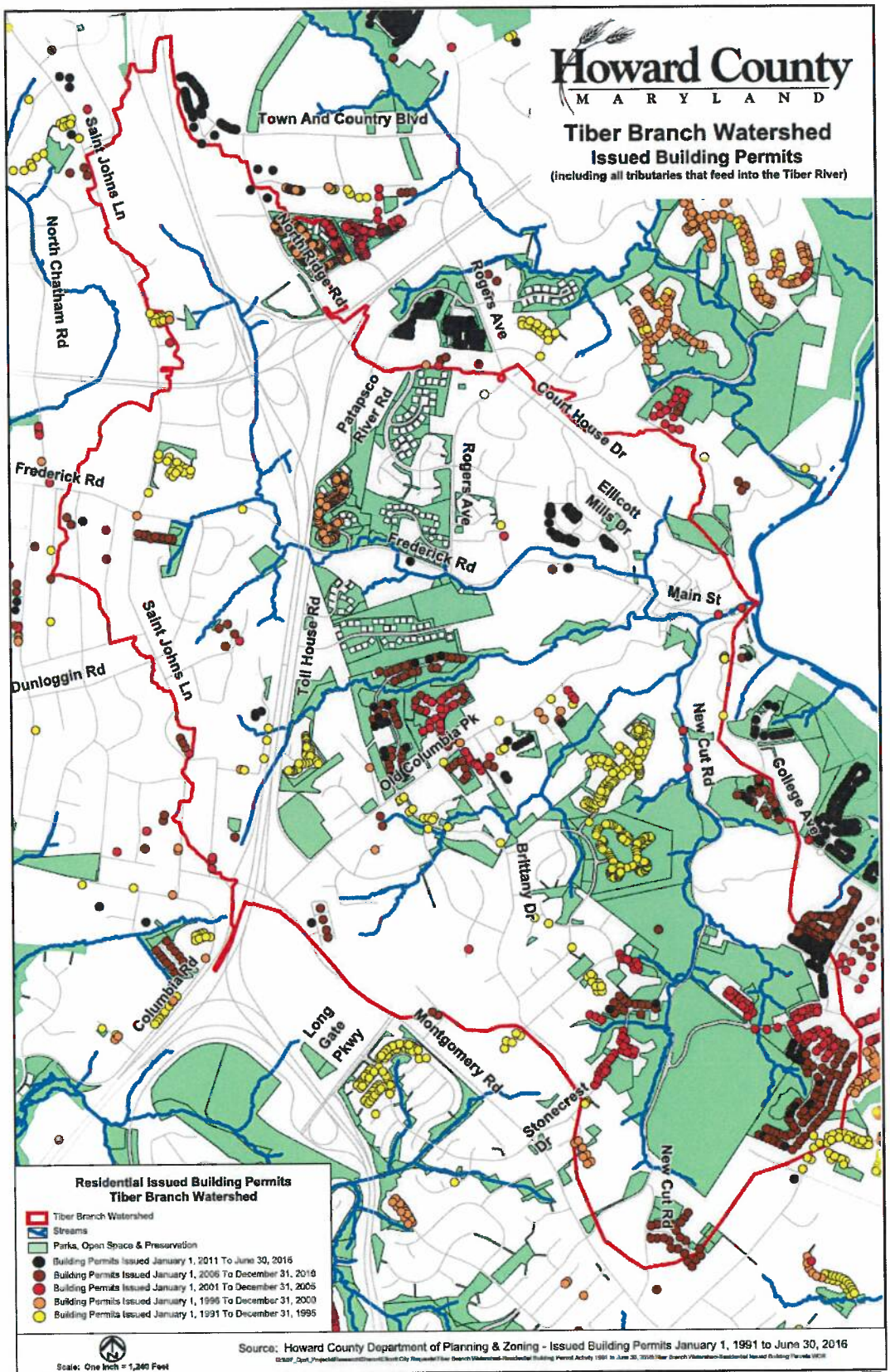
Ellicott City, Maryland 21043
410-313-4308 Direct Office
410-313-2013 Main Office

443-537-3501 Cell


Howard County
MARYLAND
Tiber Branch Watershed
Impervious Surface
(including all tributaries that feed into the Tiber River)
Town And Country Blvd
Saint Johns Ln
North Chatham Rd
North Ridge Rd
Rogers Ave
Patapsco River Rd
Court House Dr
Ellicott Mills Dr
Plumtree Dr
Frederick Rd
Rogers Ave
Frederick Rd
Main St
Saint Johns Ln
Dunloggin Rd
Toll House Rd
Old Columbia Pk
New Cut Rd
College Ave
Brittany Dr
Long Gate Pkwy
Montgomery Rd
Stonecrest Dr
New Cut Rd
Impervious Surface within Tiber Branch Watershed
(including all tributaries that feed into the Tiber River)
Tiber Branch Watershed updated boundary
Tiber Branch Watershed previous boundary
Impervious Surface
Streams
21.0% Impervious Surface Coverage (based on planimetrics from 2014 aerial photgraphy)
N
Scale: One Inch = 405 Feet
Source: Howard County Department of Planning, DPW


Howard County
MARYLAND
Tiber Branch Watershed
Future Development Projects
and Permits Issued Since
July 1, 2016
(including all tributaries that feed into the Tiber Branch)
Town And Country Blvd
Saint Johns Ln
Gatherings at Ellicott's Retreat (32 of 162 units permitted)
North Ridge Rd
North Chatham Rd
Rogers Ave
Plumtree Dr
Patapsco River Rd
Court House Dr
Burgess Mill Station (53 of 53 units permitted redevelopment of 60 older units)
Frederick Rd
Rogers Ave
Ellicott Mills Dr
Frederick Rd
Main St
Saint Johns Ln
Toll House Rd
Dunloggin Rd
The Woods of Tiber Branch (3 of 3 units permitted)
Old Columbia Pk
New Cut Rd
College Ave
Brittany Dr
Long Gate Pkwy
Montgomery Rd
Stonecrest Dr
New Cut Rd
1
2
3
4
5
6
7
Tiber Branch Watershed
(including all tributaries that feed into the Tiber Branch)
Tiber Branch Watershed
Streams
Building Permits Issued
July 1, 2016 - May 31, 2018
Single-Family Detached Permits (3 units)
Apartment Permits (85 units)
Future Development Projects
1. Maple Grove (9 units)
2. Terrapin Woods (34 units)
3. Lacey Property (12 units)
4.The Towns at Court Hill (8 units)
5. Dorsey's Ridge (53 units)
6. Taylor Highlands (252 units)
7. Long Gate Overlook (75 units)
Scale: One Inch = 405 Feet
Source: Howard County Department of Planning, DPW



Tiber Branch Watershed - Issued Building Permits
1991 to June 30, 2016

Year	SFD	SFA	APT	Total	Percent
January 1, 2011 to June 30, 2016	50	26	225	301	8.8%
January 1, 2006 to December 31, 2010	189	17	108	314	9.1%
January 1, 2001 to December 31, 2005	139	53	2	194	5.6%
January 1, 1996 to December 31, 2000	18	238	0	256	7.5%
January 1, 1991 to December 31, 1995	162	178	0	340	9.9%
Units Prior To 1991	1,295	493	243	2,031	59.1%
Total	**1,853**	**1,005**	**578**	**3,436**	**100.0%**

Notes:
Year 2016 includes issued building permits thru June 30, 2016.
Unit tabulations reflect results from net new units of issued permits.

Sayers, Margery

From: Lasser, Caryn
Sent: Saturday, September 29, 2018 2:47 PM
To: Feldmark, Jessica
Cc: Sigaty, Mary Kay; Sager, Jennifer; CouncilMail
Subject: EC Flood Mitigation Plan - Council Requests and Responses
Attachments: Response to Question 34 - EC2018Flood.ImperviousSurface.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Jess,

Please find below, and attached as referenced below, responses to Council questions regarding the Ellicott City Flood Mitigation Plan. A wealth of information is available at: www.ECfloodrecovery.org.

Council Requests for Additional Information:

34. *Please provide a timeline of development in the Tiber Branch Watershed including number of permits issued and amount of impervious surface built. Although earlier years may be aggregated as you see fit, please provide this data by year for at least the last 10 years.*

Please see the four attached files responsive to describing a timeline of development in the Tiber Branch Watershed, including permits issued and impervious surfaces. Note that there are two impervious surface maps – based on planimetrics created from 2014 and 2016 aerial photography. Planimetrics are not available every year for the last 10 years, and the quality is not consistent. The two impervious surface maps provided, however, do show the most recent impervious cover in the watershed and show the slight change between 2014 and 2016. The other two maps show building permits issued over time in the Tiber Branch Watershed.

Please note – these four files together are too large to send in a single email. Two emails are being sent for this response, one with three files, and another with a single file.

Thanks.

Caryn D. Lasser
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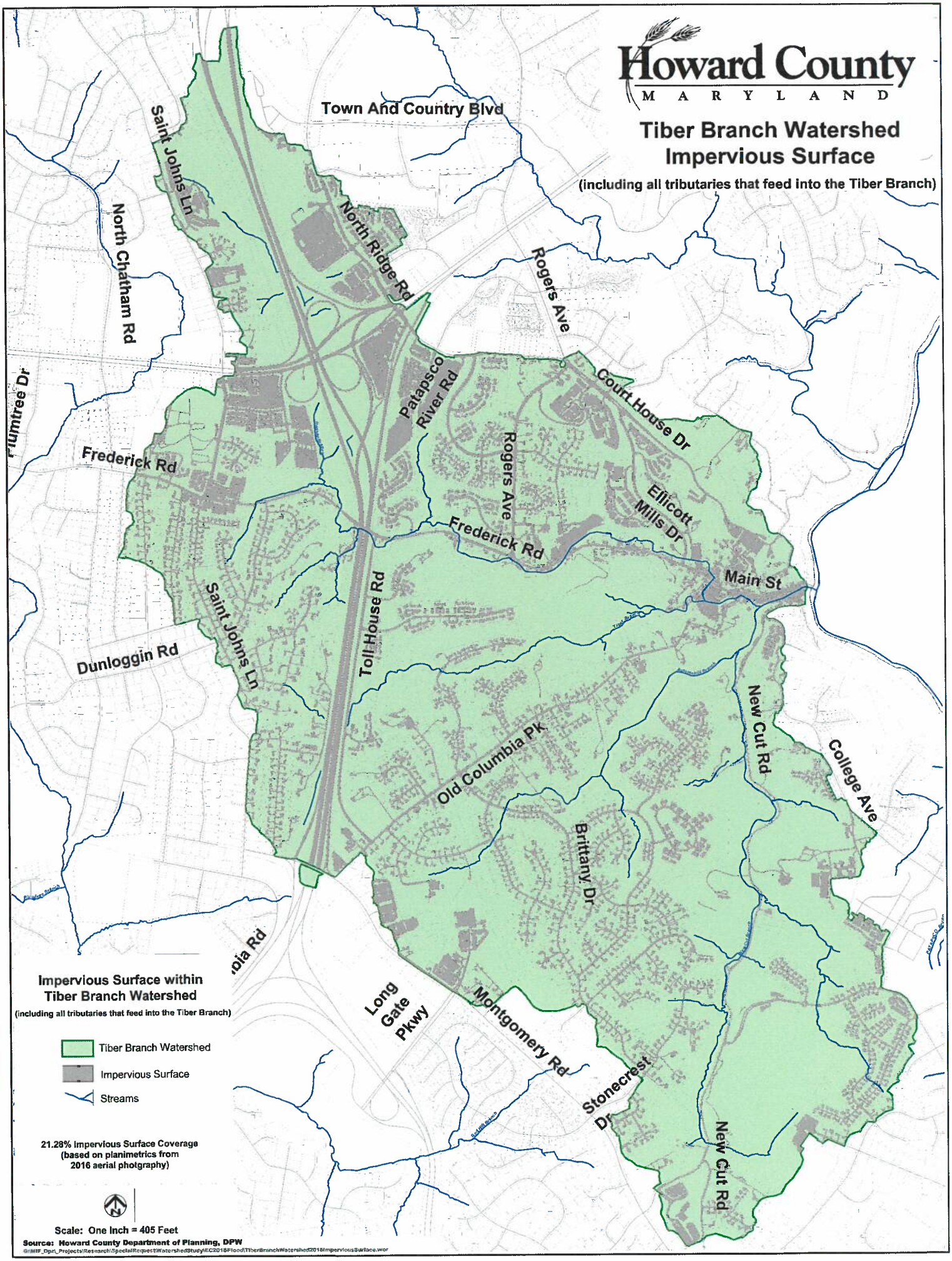
Howard County
MARYLAND
Tiber Branch Watershed
Impervious Surface
(including all tributaries that feed into the Tiber Branch)
Town And Country Blvd
Saint Johns Ln
North Chatham Rd
North Ridge Rd
Rogers Ave
Patapsco River Rd
Court House Dr
Plumtree Dr
Frederick Rd
Rogers Ave
Ellicott Mills Dr
Frederick Rd
Main St
Saint Johns Ln
Toll House Rd
Dunloggin Rd
New Cut Rd
College Ave
Old Columbia Pk
Brittany Dr
Long Gate Pkwy
Montgomery Rd
Stonecrest Dr
New Cut Rd
Impervious Surface within Tiber Branch Watershed
(including all tributaries that feed into the Tiber Branch)
Tiber Branch Watershed
Impervious Surface
Streams
21.28% Impervious Surface Coverage
(based on planimetrics from 2016 aerial photgraphy)
N
Scale: One Inch = 405 Feet
Source: Howard County Department of Planning, DPW

Sayers, Margery

From: Lasser, Caryn
Sent: Sunday, September 30, 2018 11:47 AM
To: Feldmark, Jessica
Cc: Sigaty, Mary Kay; Sager, Jennifer; CouncilMail
Subject: EC Flood Mitigation Plan - Council Requests and Responses

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Jess,

Please find below a response to Council questions as noted regarding the Ellicott City Flood Mitigation Plan. A wealth of information is available at: www.ECfloodrecovery.org.

Council Requests for Additional Information:

24. *Please provide plans and evaluations for any early warning systems including sirens, flashing lights on Main Street poles, river gauges, etc.*

Note: The information below was presented during the work session by Ryan Miller.

Howard County Government has had underway since before the 2018 flood a project with the Department of Homeland Security and the National Weather Service to increase the number of stream sensors in the Ellicott City watershed as well assist with the interpretation of that data to improve alert and warning products. According to DPW SWM, the first round of 16 stream sensors were just installed.

As well, the Ellicott City Watershed Master Plan process will include a discussion on the best possible way to integrate visual and auditory alert and warning indicators. In the interim Howard County Government has deployed variable message sign boards to three strategic locations around downtown Ellicott City. These sign boards are illuminated when Main Street Ellicott City is placed under a Flash Flood Watch or Warning by the NWS.

In the event of a Flash Flood Warning, the Howard County Police Department has a plan to use public address and sirens to alert, warn, and instruct the public. To date in 2018 (September 24), Ellicott City has been under a Flash Flood Watch 13 times, and a Flash Flood Warning 2 times – one of those being the May 27 flood disaster.

We know that the biggest alert and warning challenge is not what kind of visual and auditory system we use – it's developing a system that is timely, sensitive, and specific to actual and escalating flood risk.

Regarding Ellicott City flash flood alert and warning, we know we have four challenges:

- Extreme weather that is difficult to forecast until it is actually happening

- The need for more and faster sensors that can aggregate data and feed it to the NWS
- Steep slopes with limited egress – most of which actually cross streams
- Difficulty in understanding / predicting / and influencing human behavior under different and dynamic scenarios

Since prior to the 2018 flood, we have been working closely as a team to ensure we leverage the best available information from the NWS and the current technology that is deployed in the field. That internal team includes: OEM, DFRS, HCPD, DPW and the PIO.

Our current approach:

- NWS notifies Howard County 911 Center when Howard County is placed under a Flash Flood Watch or Warning
    - Public is notified via NWS over IPAWS which includes WEA for "flash flood warning" conditions.
- PIO messages online social media time permitting – HCPD and DPW illuminate message boards at three strategic locations.
- HCPD activates their Main Street plan, DFRS notified, and SWM begins monitoring existing gauges.
- OEM provides overall coordination of the Howard County team and NWS to include escalation of alert level if need be and / or activation of EOC.

During recovery to the 2016 and 2018 floods, OEM and/or DFRS has had the opportunity to provide direct consultation to individual property owners who were offered or who asked for flood pre-planning assistance.

One book end to our public information campaign was just three months prior to the 2016 Flood when in the Banneker Room, on March 15 2016, we hosted a NWS "Skywarn" course focused on raising awareness flooding with special guest Dr. Louis Uccellini – the Director of the NWS and nearly 150 people from the public. Jim Lee was present during the Council meeting on September 4, 2018 and during the work session on September 24. Mr. Lee is the Meteorologist in Charge of the NWS forecast office in Sterling, Virginia who has been exceedingly supportive of Howard County and presented Howard County with its first StormReady Community Credential in 2011.

As new stream and rain sensors come on line and we better understand how the watershed responds to different rainfall scenarios, and Howard County's and the NWS's ability to predict flash flooding improves – our ability alert and warn the public will also continue to improve.

Thanks.

Caryn D. Lasser
Deputy Chief of Staff
Howard County Executive Office