



# BALTIMORE CITY INLAND FLOOD MITIGATION

CCB #21-0002R - Investigative Hearing

February 24, 2021



City of Baltimore

# OFFICE OF SUSTAINABILITY



City of Baltimore

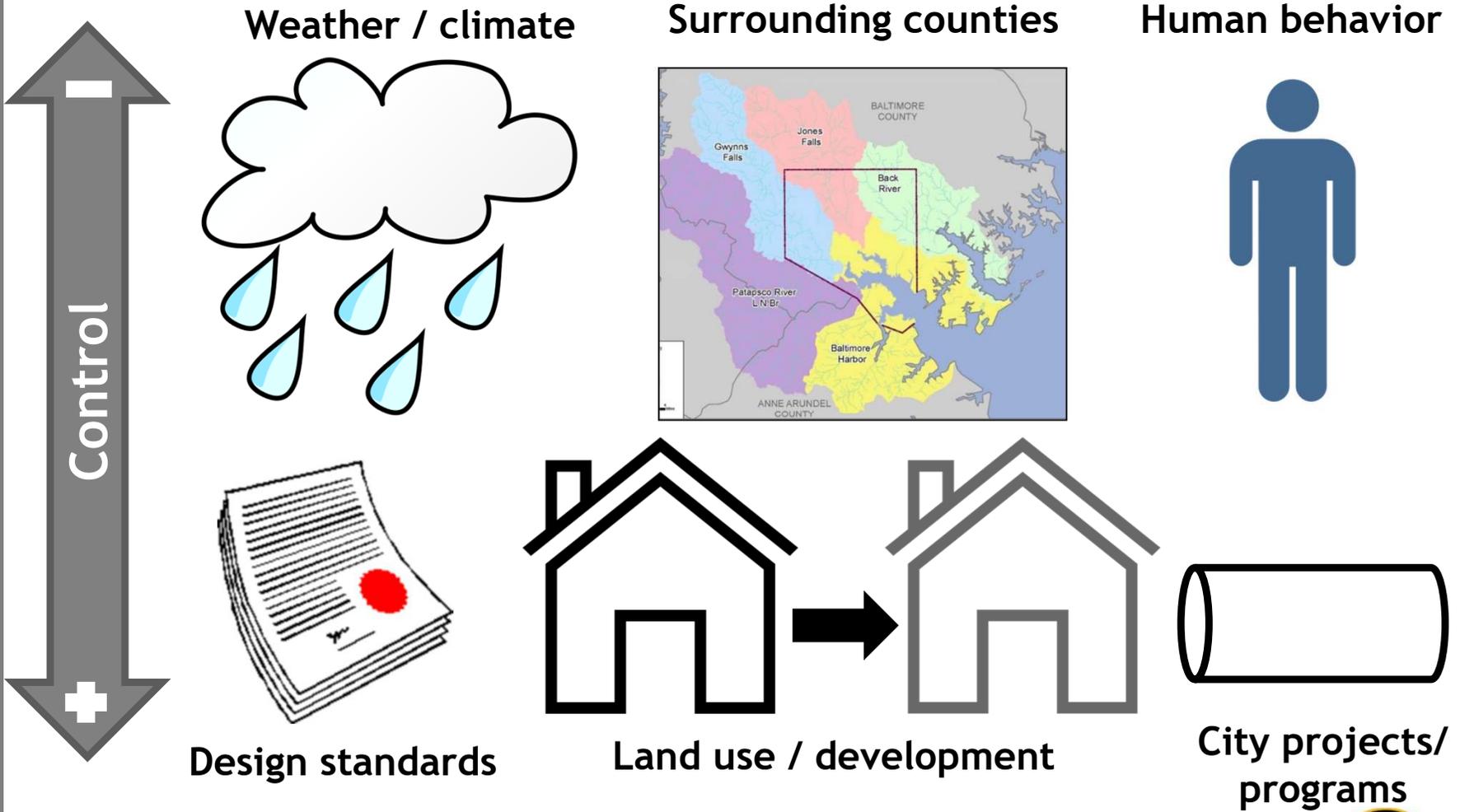


## Baltimore Office of Sustainability

- Acts as a resource, catalyst, and an advocate to create an equitable and resilient Baltimore. We integrate environmental integrity, social equity, and economic prosperity and provide innovative solutions to important challenges that benefit all Baltimoreans.
- Created by City Code (Article 1, Subtitle 34) and charged with maintaining a Sustainability Plan and annual reporting on progress
- Provides staff for the Commission on Sustainability.



# Planning Factors



## 2018 Disaster Preparedness Plan (DP3)

The Disaster Preparedness and Planning Project (DP3) combines:

- the FEMA-required planning for existing natural hazards (All Hazards Mitigation Plan)
- the need to address future climate change impacts.

Its goals are to:

- Protect the health, safety, and welfare of residents and visitors
- Prevent damage to structures, infrastructure, and critical facilities
- Build resilience and disaster prevention and planning into all programs, policies, and infrastructure (public and private)

Will be updated in 2023 to include human-made hazards, address equity, and add information on food resilience and hazard mitigation for historic resources.



## DP3 Recommendations for Flooding (Examples)

- Improve stormwater management, operations and maintenance for stream flooding
- Increase stormwater recharge areas and quantity management to prevent flooding from overflows
- Ensure adequate funding is in place to support stream maintenance
  
- Prioritize infrastructure upgrades for roads identified at risk of flooding
- Prioritize storm drain upgrades and replacement in areas with reoccurring flooding
- Alter transportation systems in flood-prone areas in order to effectively manage stormwater
- Educate the public on the dangers of driving through flooded roads
  
- Support and increase coordination and information sharing across jurisdictions to better enable mitigation of cross-border impacts on the region's watersheds
- Strengthen City zoning, floodplain and construction codes to integrate anticipated changes in climate
- Encourage owners of properties to purchase flood insurance and improve policyholder awareness at time of sale or renewal

## Baltimore Nuisance Flood Plan

- Nuisance flooding, known as “sunny day flooding,” is high tide flooding that causes disruptions to daily activities. It can occur with or without precipitation and is expected to increase in the coming years due to anticipated sea level rise.
- The Plan assesses the waterfront to identify areas that are prone to nuisance flooding, with the intention to map, track, and catalog nuisance flooding that happens from 2020 until 2025.
- Mandated by the State of Maryland, HB-1427 (2019)



## Baltimore Nuisance Flood Plan

### Event Tracking and Cataloging

- Baltimore must track and catalog nuisance flood events that happen from 2020 to 2025.
- No specific reporting structure yet.

### Event Identification

- 3-1-1 Service
- MyCoast Application

### Event Cataloging

- Quarterly reports from 3-1-1 Service
- Quarterly reports from the MyCoast Application
- Event validation (weather conditions, location and type)
- Excel will be used to consolidate the data and share with the State.



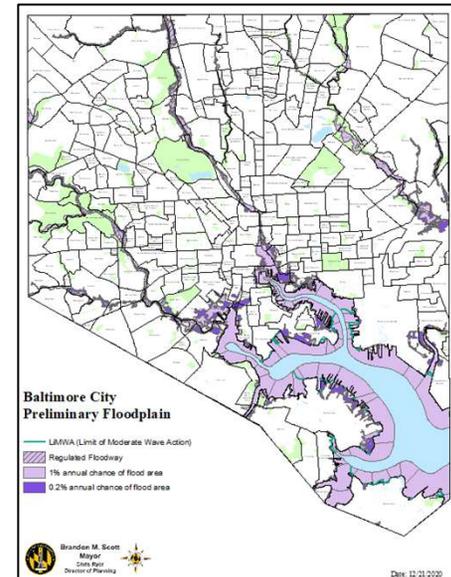
## Floodplain Management

**Floodplain Management:** The Office also enforces floodplain regulations as part of participating in the National Flood Insurance Program (NFIP) throughout the City.

- We review permits and development projects and perform other required activities (like public outreach to increase flood awareness) to all residents to ensure compliance with the NFIP.
- We maintain the Digital Flood Insurance Rate Maps and are currently seeking approval for the newest version by June 16, 2021. As part of that approval process, we also plan to submit proposed updates to the floodplain policy (Article 7, Division 1 of the City Code) based on FEMA requirements.

**Community Rating System:** We were recently recertified at a Class 5 status in this voluntary program, the highest rating achieved by a Maryland jurisdiction.

- Because of this rating, residents within the regulated floodplain are eligible for up to a 25% discount on flood insurance policies - a savings of around \$800,000 each year.



# OFFICE OF EMERGENCY MANAGEMENT



## OEM Mitigation Activities

### OEM works with DPW and DOP to:

- Identify, apply for, and secure funding for mitigation projects
- Provide community outreach
- Support City agencies' critical needs

### There are currently several areas in the City of Baltimore that we are focused on for these tasks:

- Frederick Avenue
- Cherry Hill
- Hillen Road and 35<sup>th</sup>



## Funding

OEM, along with its local, state, and federal partners, has applied for several grants in order to fund mitigation efforts in the Frederick Avenue flood zone:

- Flood Mitigation Assistance (FMA) program: \$600,000 matching grant
- FMA/Advanced Assistance program: \$200,000 matching grant
- Hazard Mitigation Grant Program (HMGP): \$54,000 matching grant
- Comprehensive Flood Management Grant Program through MDE: \$53,000 matching grant
- Army Corps of Engineers (ACE) Silver Jackets: \$384,000

**FEMA funding, studies, and construction projects will not be available until the 2022 cycle, which begins in late 2021:**

- FEMA BRIC Program
  - OEM and its local, state, and federal partners are working on gathering information needed for the Notice of Interest Letter that will be required to start to application process in late 2021



## Community Outreach

- **Frederick Avenue Corridor**
  - BMORE Alert: custom flyers included with water bills; notification list for the area created
  - Door to Door Campaign: handouts and information sheets on flooding preparedness and prevention; general preparedness information provided; 300 outreach bags left with Resiliency Hub at Stillmeadow Church
  - Online Outreach: meetings on June 15, 2020; September 22, 2020, and October 22, 2020
  - General preparedness outreach video filmed on September 23, 2020
- **Cherry Hill and Hillen Road**
  - Model outreach plans after the successful Frederick Avenue Corridor outreach efforts
  - Planning meetings held and plans developed



## Support for Critical Needs

### Provides assistance with obtaining resources City agencies may need

- Staffing
- Supplies
- Equipment
- Mutual Aid
- MEMAC/EMAC

### Participates in planning meetings

- DP3
- Outreach planning
- Mitigation planning
- MEMA and FEMA funding meetings

### Identifies and applies for funding

- State
- Federal



## Other Plans, Projects, and Protocols

- Flood Annex- establishes responsibilities for OEM, City agencies, and organizations within the City to prepare for, respond to, and recover from flood incidents, as well as mitigate the effects of such incidents within the City of Baltimore
- Flood Monitoring through Flood ALERT system
- Outreach to Mills of the Jones Falls during flood events
- National Weather Service 24/7 assistance



# DEPARTMENT OF PUBLIC WORKS

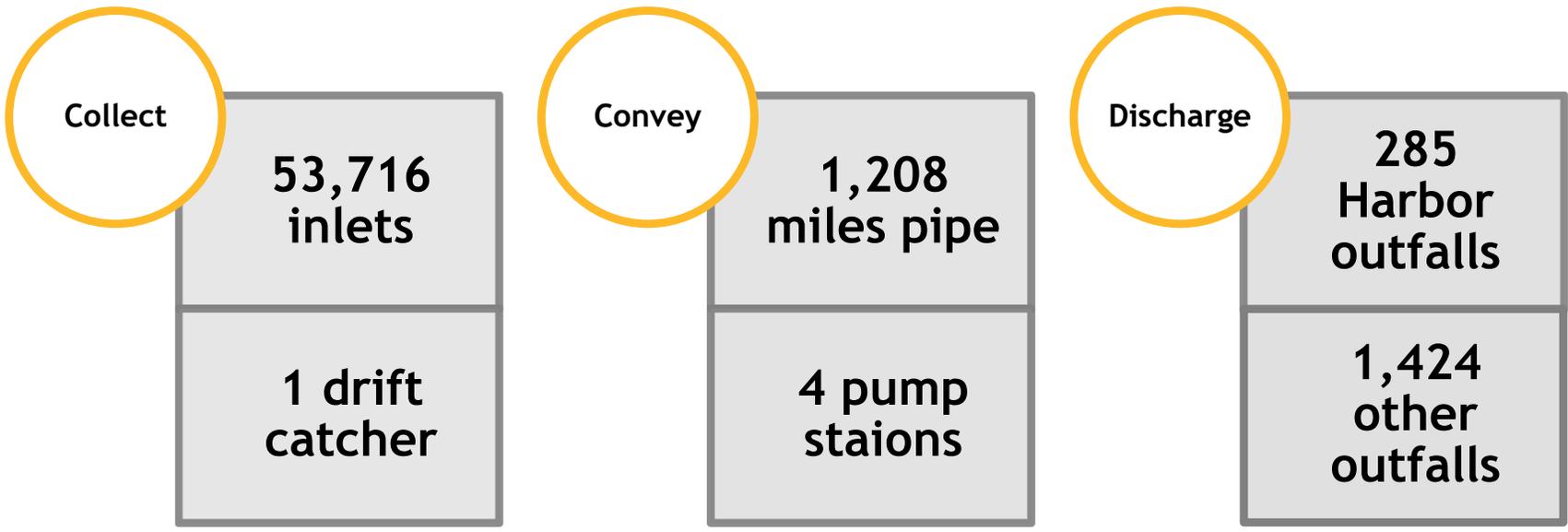


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# DPW Stormwater Assets



## DPW Roles and Responsibilities

### Utility Maintenance Division

- Response to 3-1-1 Requests
- Pro-active inlet cleaning in sump areas
- Repair of minor storm drain failures

### Office of Engineering and Construction

- CIP project delivery
- Repair of major storm drain failures
- Flood investigation technical resource
- H & H model development

### Office of Asset Management

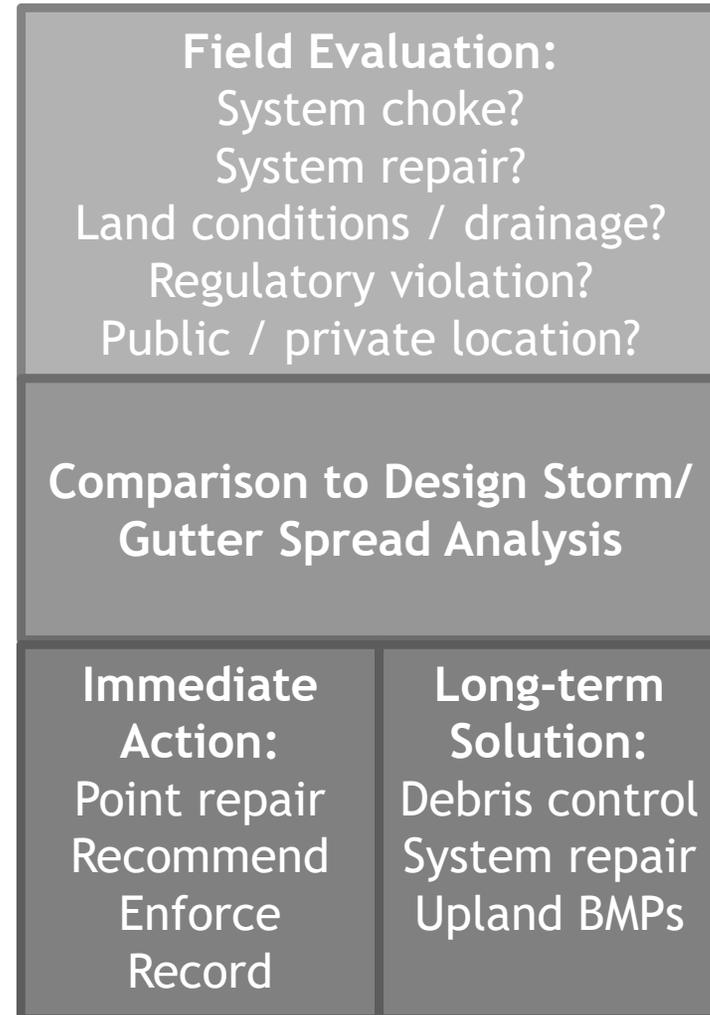
- GIS data management
- Conditional assessment of assets
- Contracted debris removal

### Office of Compliance and Research

- Watershed assessments and planning
- Plans reviews SWM/ESC and wet utilities
- Flood ALERT maintenance
- Water quality monitoring

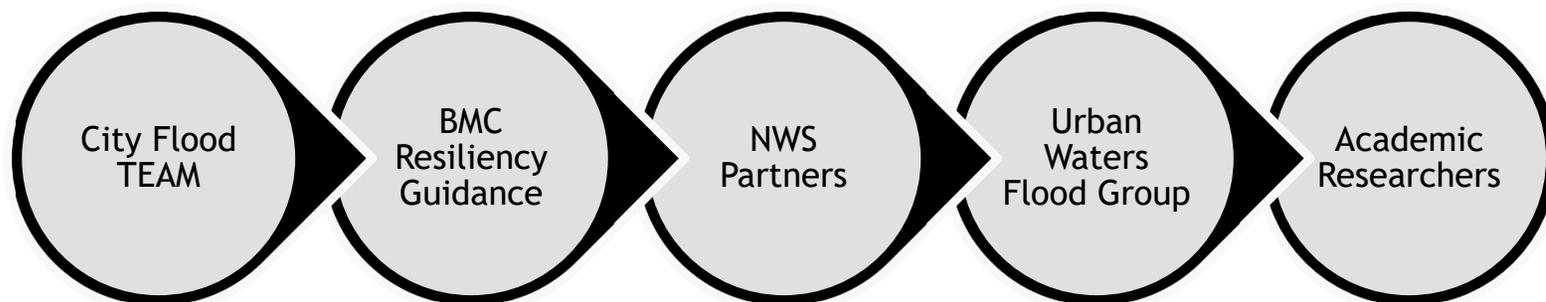
### Office of Emergency Response and Planning

- Coordination for City-wide emergencies

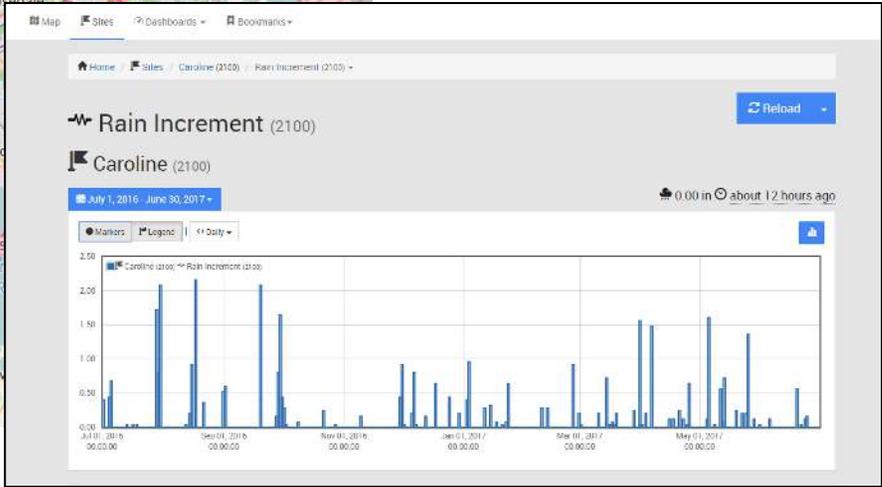
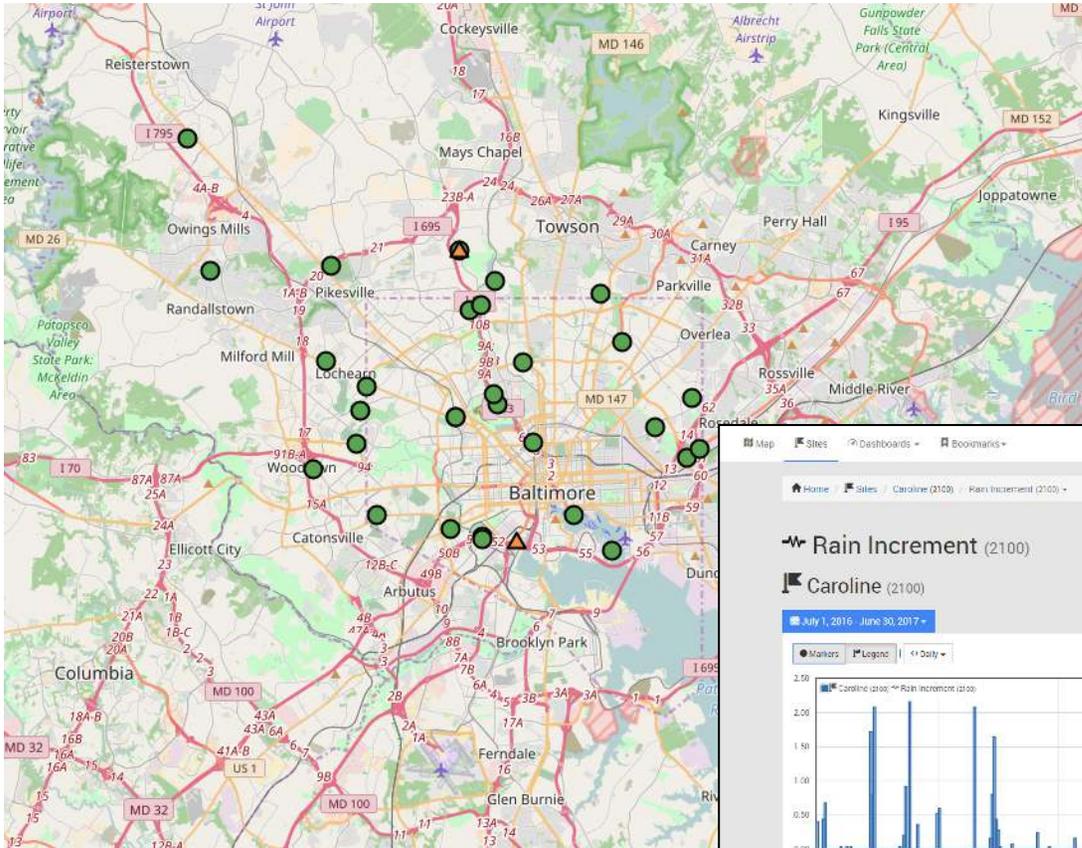


## Current Flood Response and Mitigation Efforts

- Flood ALERT system upgrade to Flood ALERT 2
- CIP for storm drain improvements and flood mitigation (Program 520)
- Increasing in-house crews for pro-active inlet cleaning by FY 2023
- Hydraulic and hydrologic model of entire storm drain system
- Partner collaboration

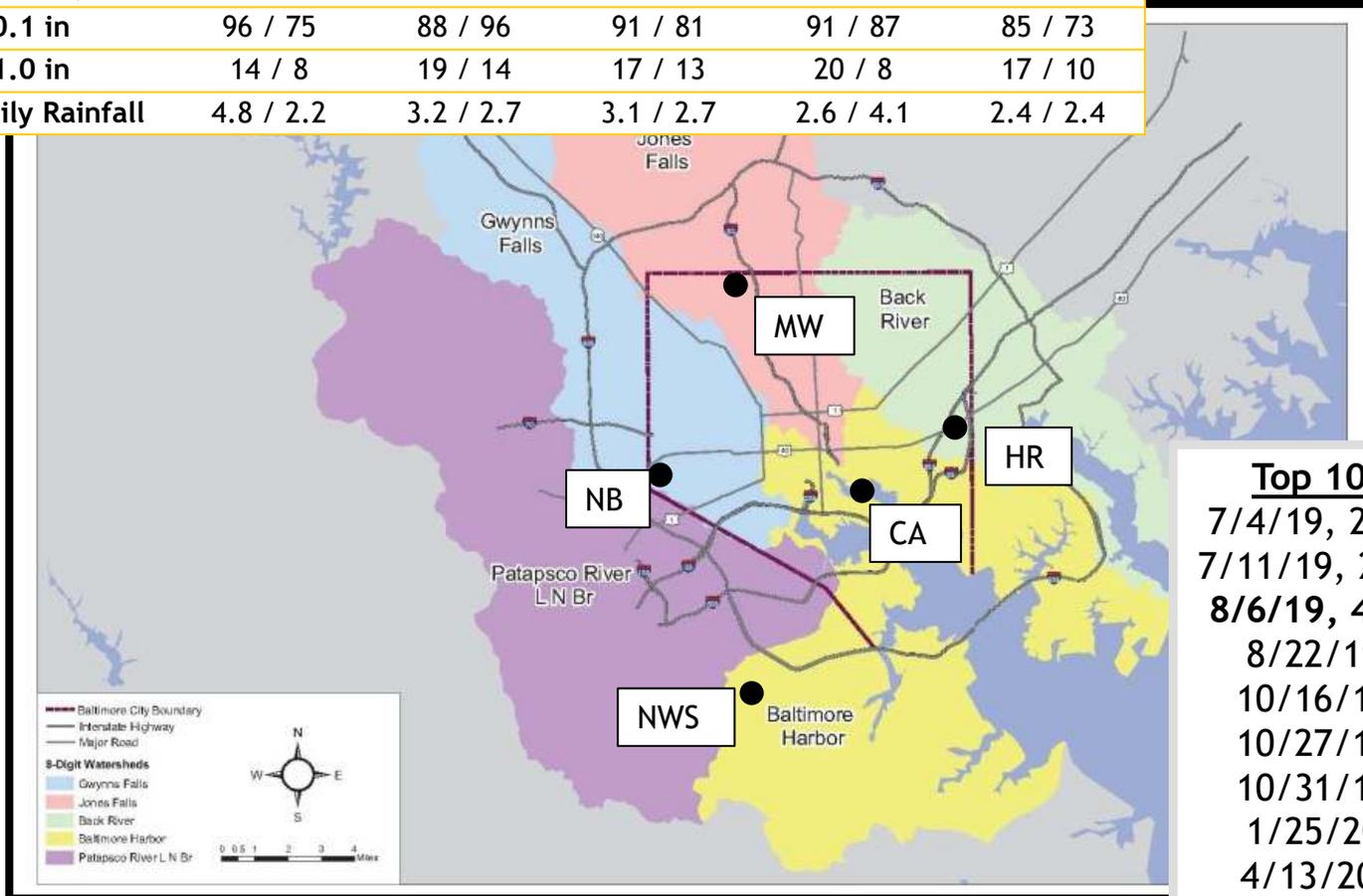


# Flood ALERT System



## Rainfall Variation (FY 19 and 20)

Location	NWS	DPW, MW	DPW, NB	DPW, CA	DPW, HR
Total Rainfall, in	68.0 / 39.0	68.3 / 49.0	62.2 / 38.2	64.9 / 41.0	57.7 / 40.8
Days > 0.1 in	96 / 75	88 / 96	91 / 81	91 / 87	85 / 73
Days > 1.0 in	14 / 8	19 / 14	17 / 13	20 / 8	17 / 10
Max. Daily Rainfall	4.8 / 2.2	3.2 / 2.7	3.1 / 2.7	2.6 / 4.1	2.4 / 2.4

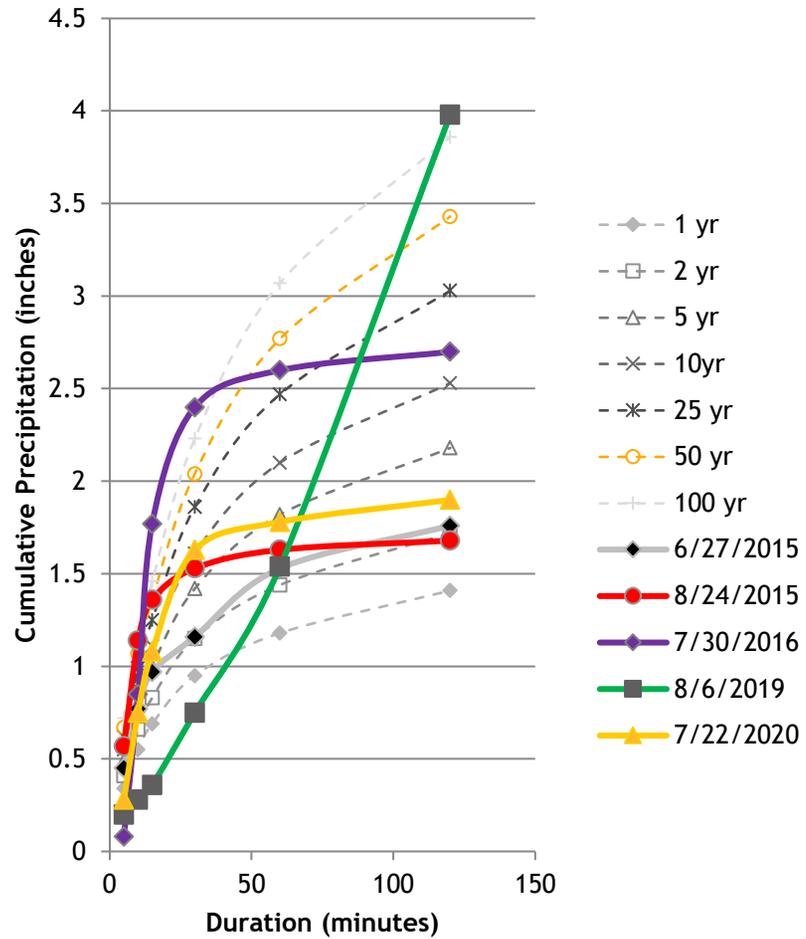
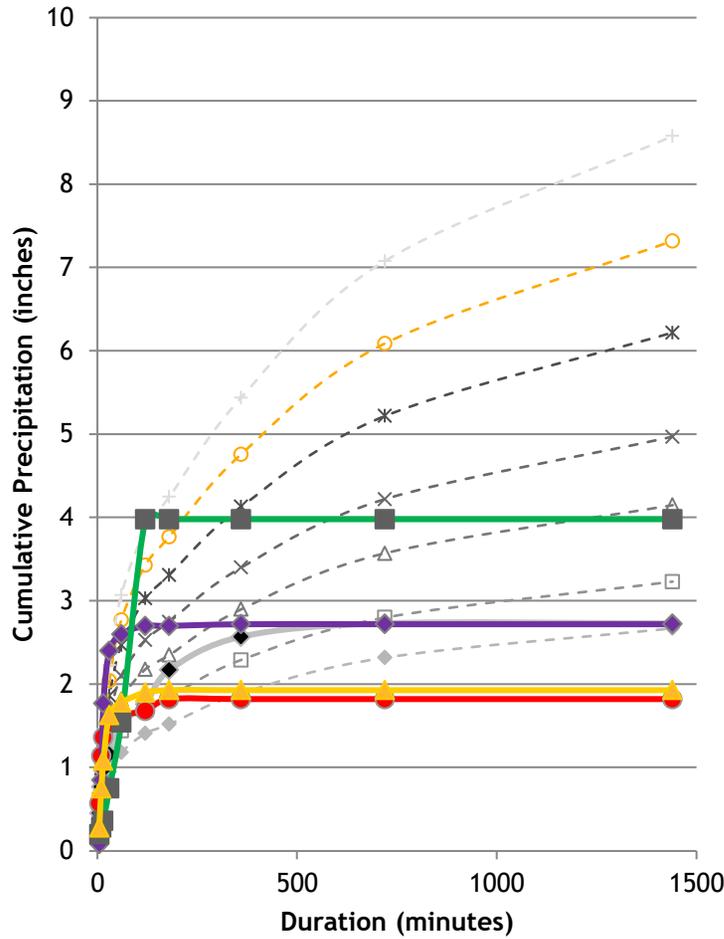


**Top 10 Events**

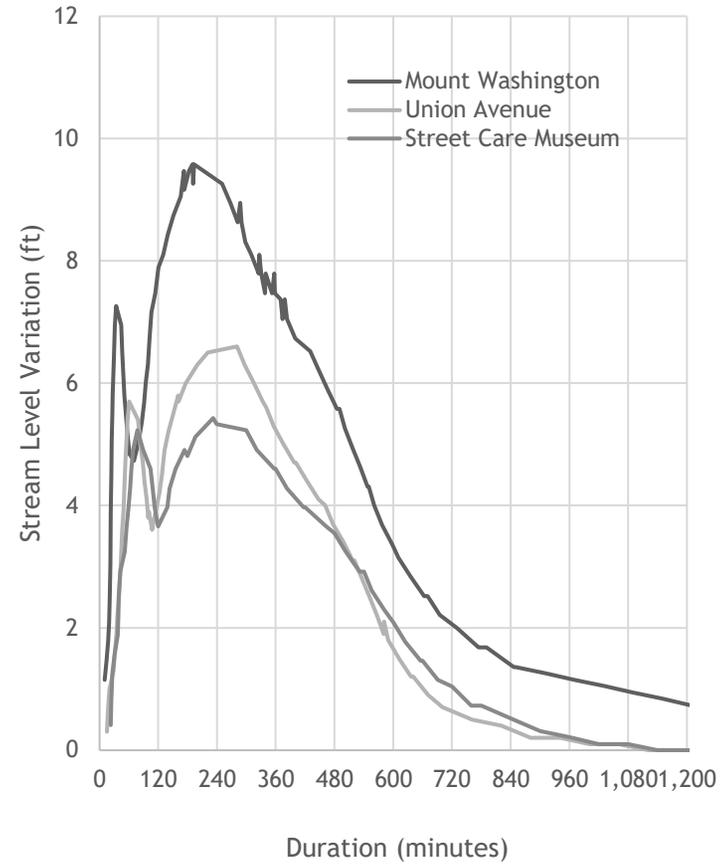
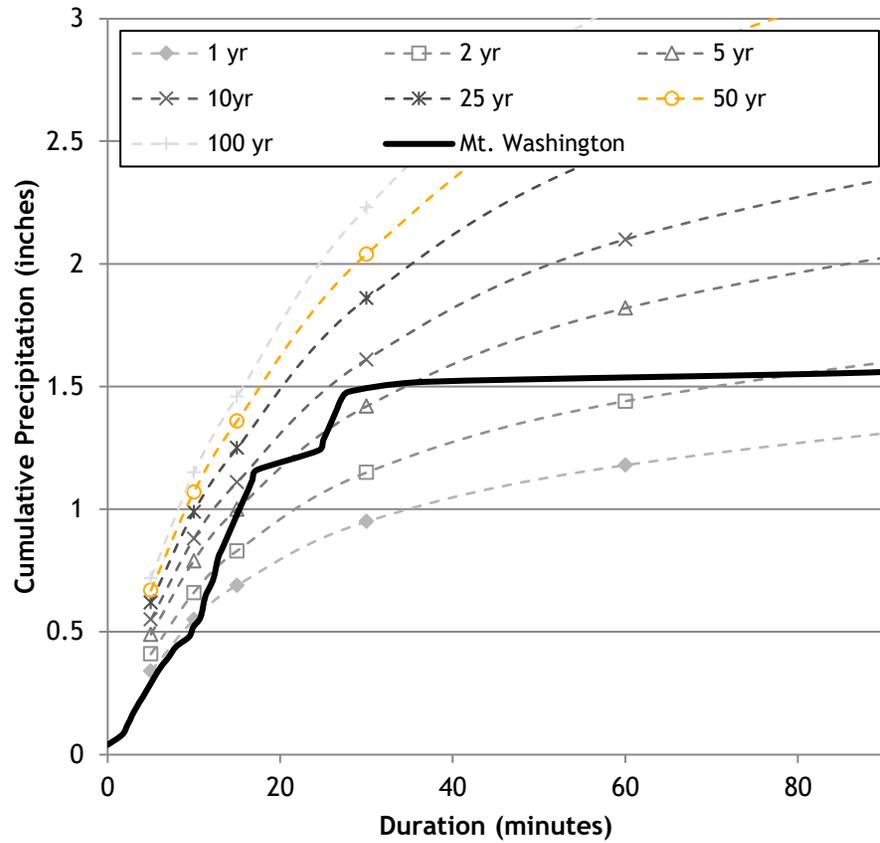
- 7/4/19, 2.68" (MW)
- 7/11/19, 2.36" (MW)
- 8/6/19, 4.08" (CA)**
- 8/22/19, 1.64"
- 10/16/19, 1.72"
- 10/27/19, 1.88"
- 10/31/19, 2.28"
- 1/25/20, 1.84"
- 4/13/20, 2.44"
- 4/30/20, 1.68"



# Comparison to Design Storms



# Micro-burst Event (7/11/19)

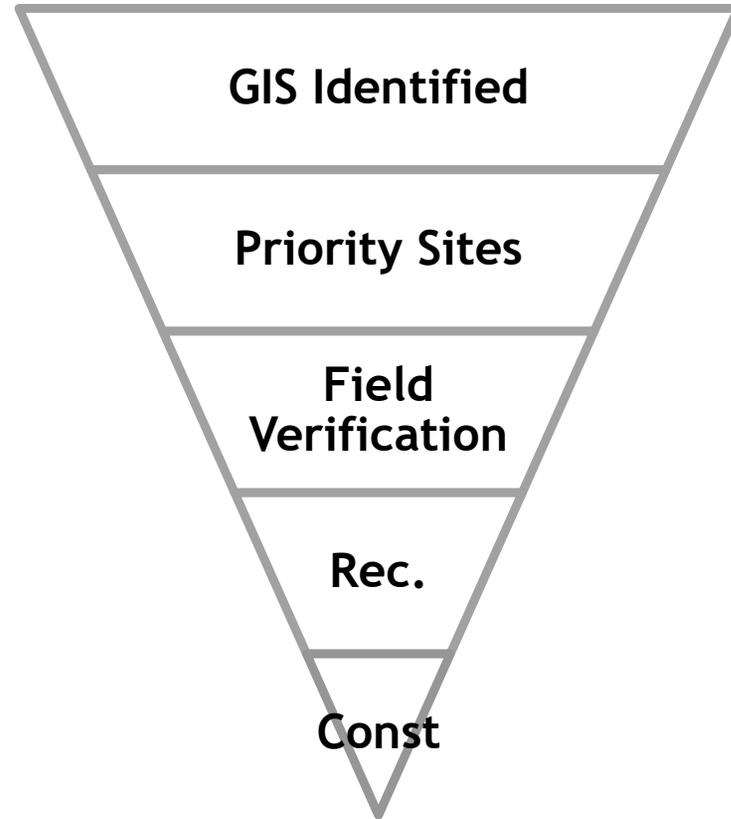
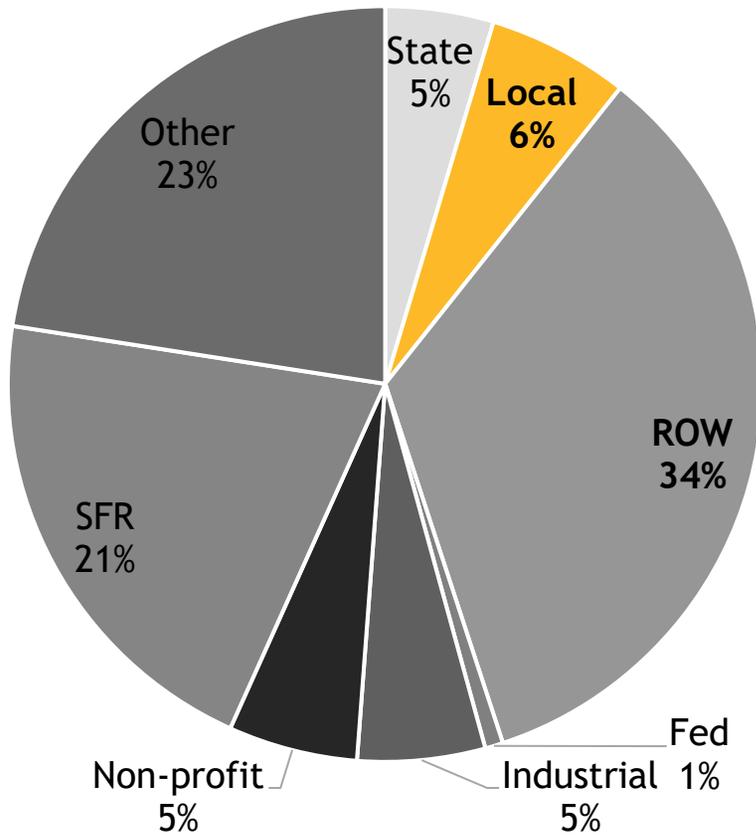


## MS4: Water Quality Improvements vs. Flood Mitigation

Practice	Nutrients	Sediment	Bacteria	Trash	Reduced Flooding
Stream Restoration	Y	Y			Improve conveyance in stream Reconnect to floodplain
Tree Planting/ IA Rem.	Y	Y	PC		Reduce runoff
Bioretention	Y	Y	PC		Reduce peak flow rate for some storms
Rainwater Harvest	Y	Y			Mitigate peak flow rate Retain runoff
Outfall Stabilization	Y	Y			Improve conveyance in stream
Street Sweeping	Y	Y	Y	Y	Maximize system capacity
Inlet Cleaning	Y	Y	Y	Y	Maximize system capacity
IDDE	Y	Y	Y		Maximize system capacity

# Solutions Limited By Access to Land

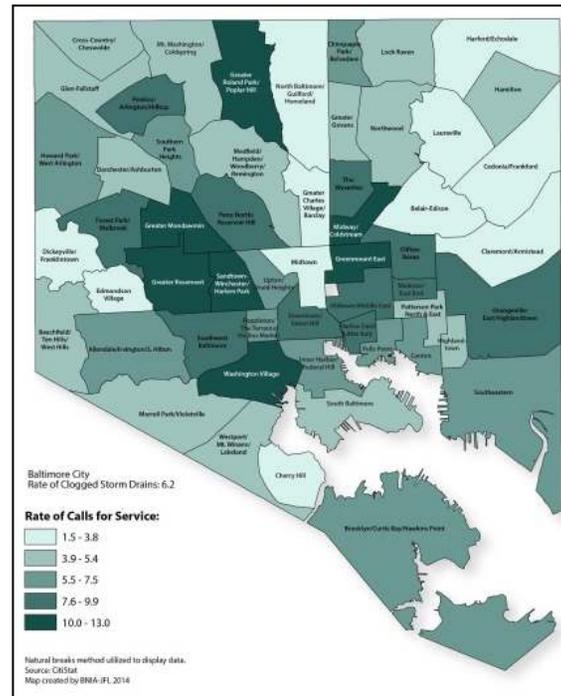
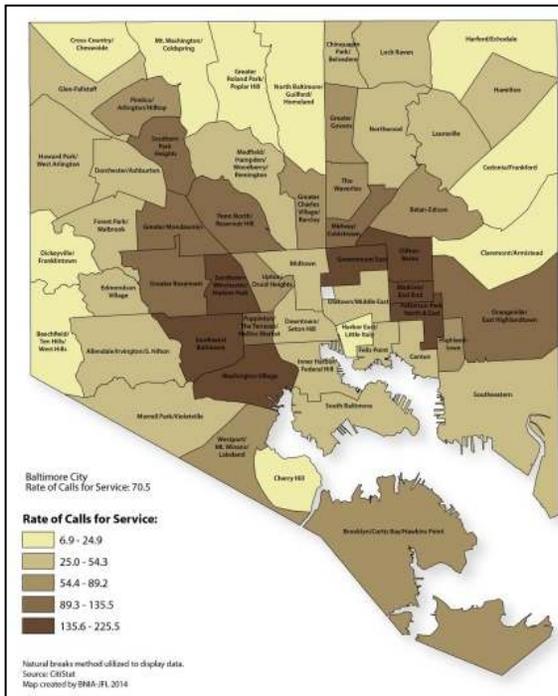
## Impervious Area Ownership



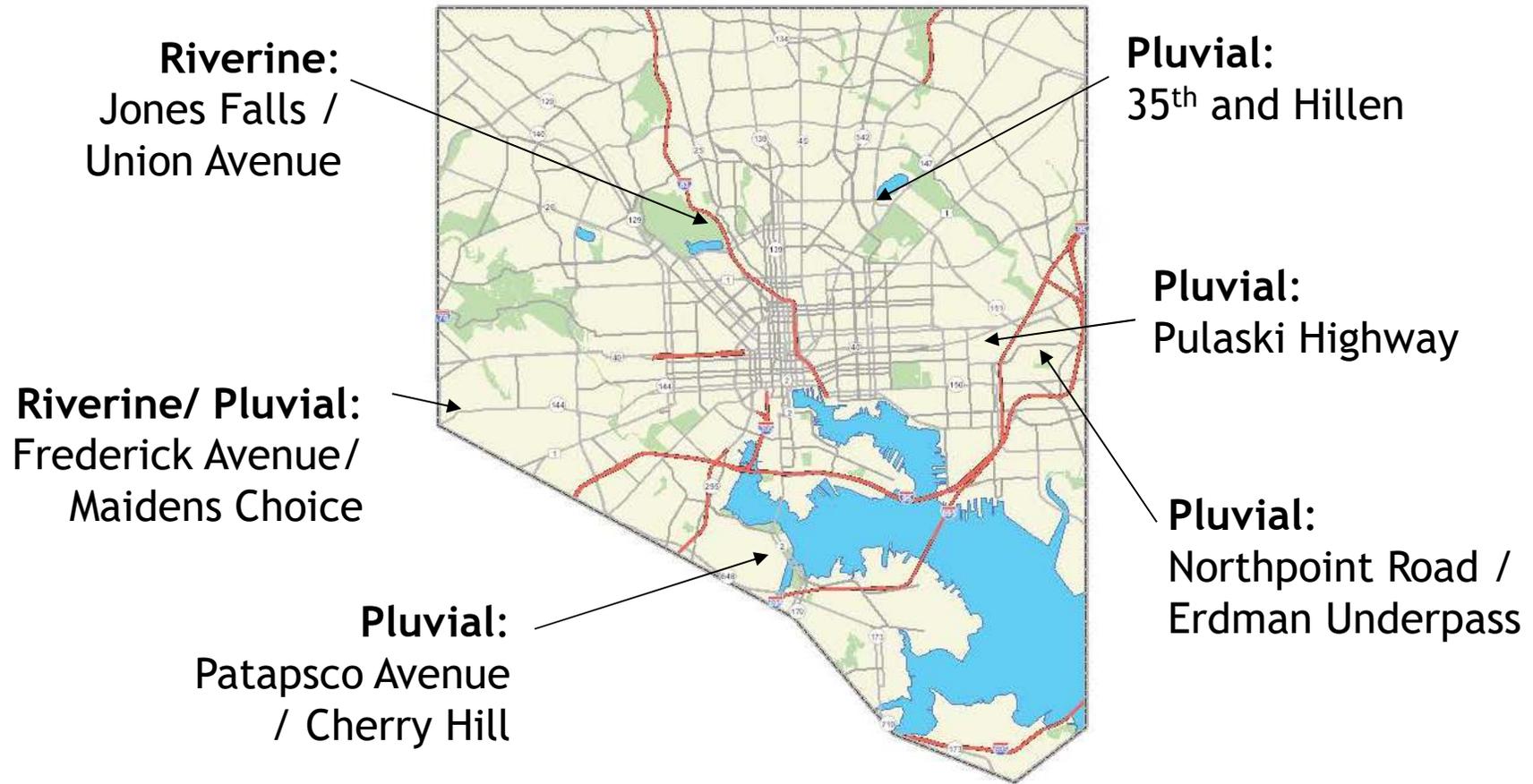
# Litter and Flooding

## Dirty Streets

## Clogged Storm Drains



# Current Focus Areas



## Riverine: Lower Jones Falls

- Multiple evacuations in business community at Mt. Washington and Meadow Mills
- Update to FEMA Floodplain
- Slope failures → water main breaks
- **Action Plan:**
  - Additional monitoring
  - Notification system for micro-bursts
  - Drift catcher structural assessment and efficiency evaluation
  - Riparian buffer enhancements
  - Stream channel assessment and stabilization
  - Upstream BMPs for flood mitigation and erosion reduction
  - Dam safety at Lake Roland
  - County coordination on Upper JF

Pro-active Cleaning at  
Drift Catcher

Fixing the Falls



## Pluvial: 35<sup>th</sup> & Hillen

- Residential area connected to 9-foot brick tunnel (diversion of Tiffany Run), last repair 1960
- 11 inlets at intersection, last repair 2018
- Bus trapped on 7/22/2020
- **Action Plan:**
  - Data gathering:
    - Interviews
    - 3-1-1 and 9-1-1 data
    - Rainfall data
  - Hydraulic modeling
  - Report of findings:
    - Anti-litter campaign
    - Debris collection systems
    - Automated signage
    - Upland BMPs
    - Storm drain upgrades



QUESTIONS?

