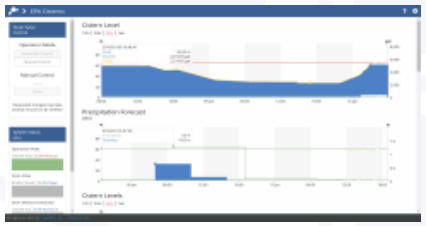
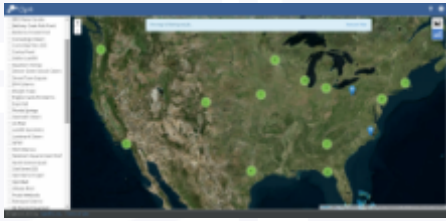
How the Internet of Things Helps Communities Better Manage Urban Stormwater Impacts

NEWEA & NYWEA Joint Spring Meeting
June 6, 2016







Jamie Lefkowitz, P.E.

Opti
active intelligence | clean water

Outline

- Overview of forecast-based stormwater control
- Case Studies
  - Rainwater harvesting + CSO mitigation (Washington, D.C.)
  - Flood protection (Minneapolis, MN)
  - Peak streamflow reduction + water quality (Anacostia River Watershed, MD)
  - Flow-Duration control (Portland, OR)
  - Watershed management (Fairfax, VA)

Stormwater Control

Passive → Adaptive → Active + Adaptive

BMP is designed and set for modeled conditions

BMP can be adapted over time

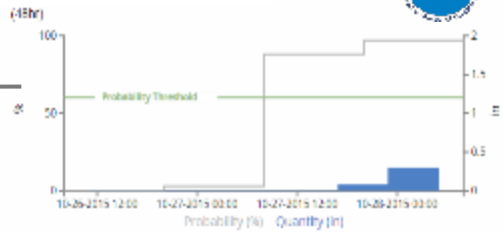
BMP can react to current conditions

Continuous Monitoring & Adaptive Control (CMAC)

web-based dashboard

cloud software

NWS forecast



control panel

runoff

irrigation

water level sensor

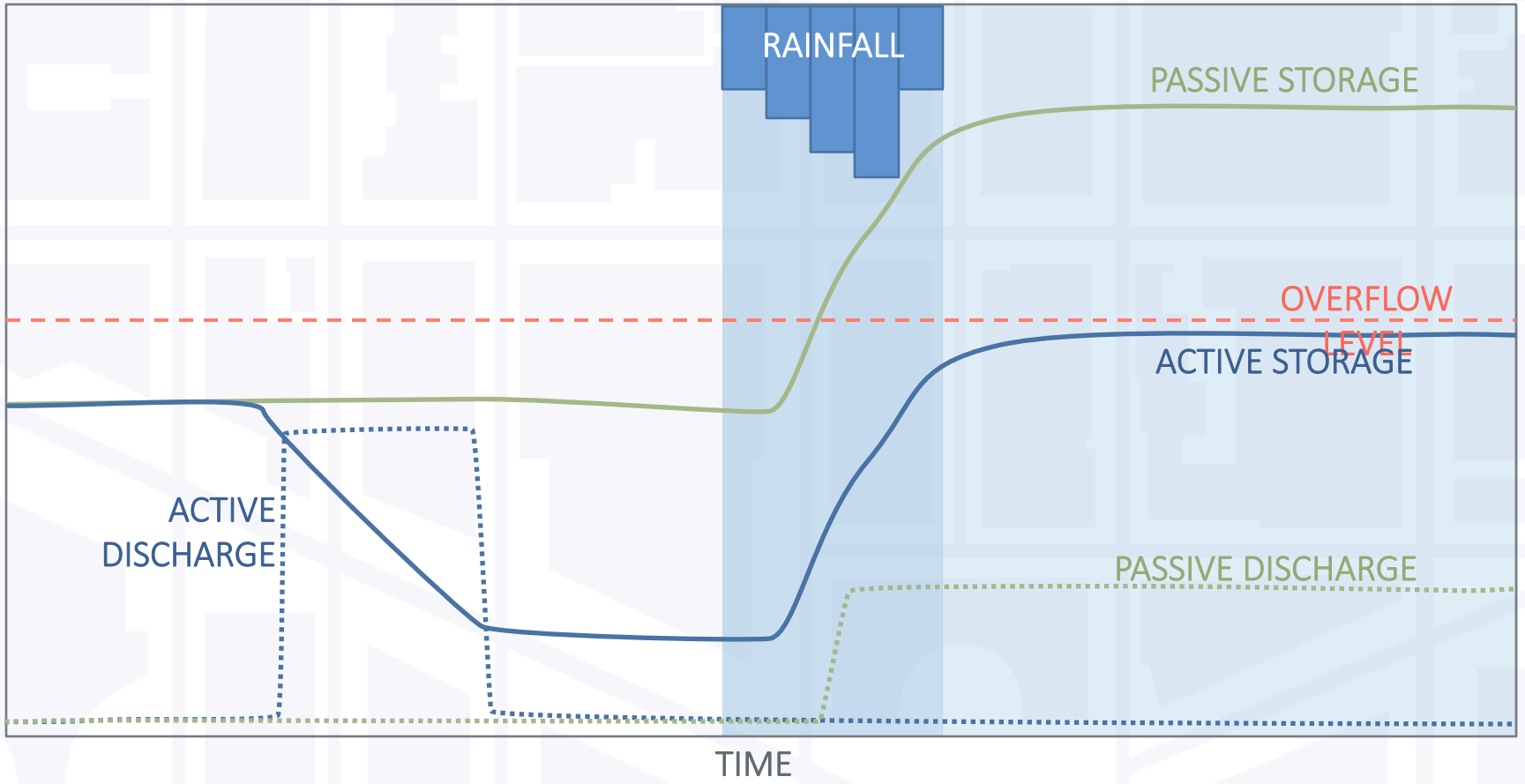
actuated valve outlet

stormwater infrastructure

infiltration

Forecast-Based Control

Adjust storage by releasing water in advance of a storm event



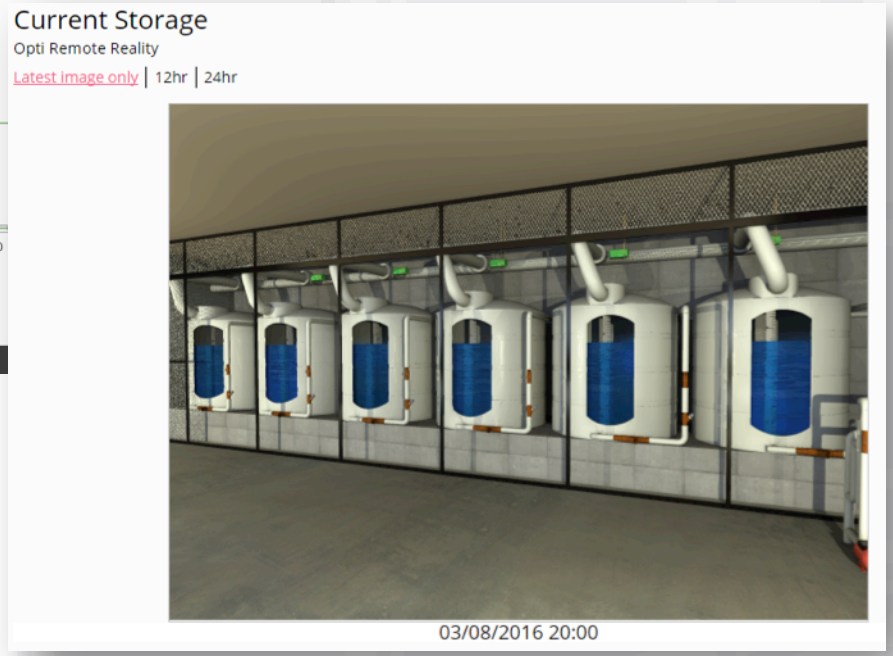
Case Study 1: EPA Headquarters
rainwater harvesting + cso mitigation

Intelligent Stormwater Detention to Mitigate CSOs

EPA Headquarters, D.C.

- 6,000 gallons of storage for roof drainage
- Prevents discharge to combined sewer during rain events

Intelligent Stormwater Detention to Mitigate CSOs



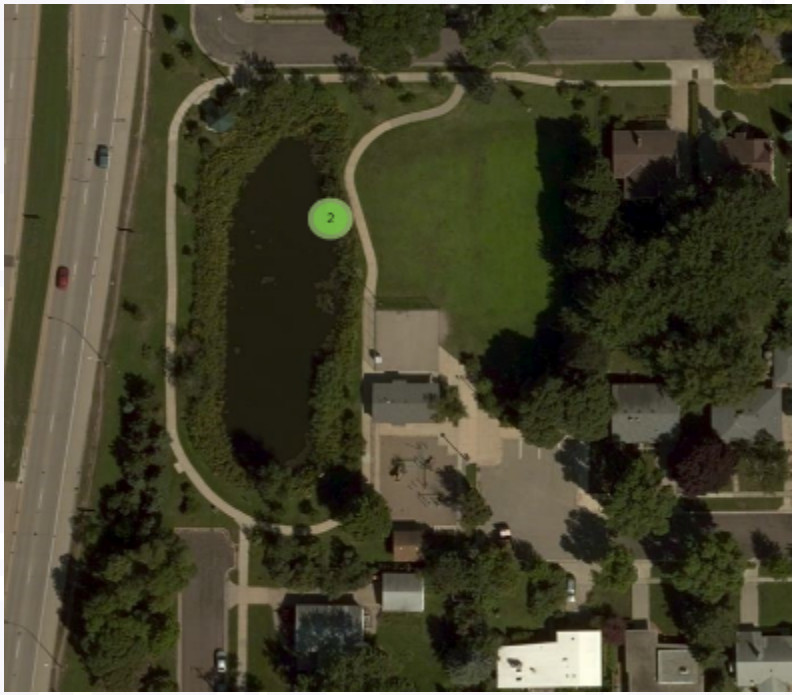
- 2 years in operation
- No significant irrigation demand
- **175,850 gallons** runoff captured
- **67% of rainfall captured**
- 68% of captured runoff NOT discharged during wet weather window

Case Study 2: Capitol Region Watershed District
flood protection

Minneapolis, MN - Adaptive Design for Flood Control

Capitol Region Watershed District, MN

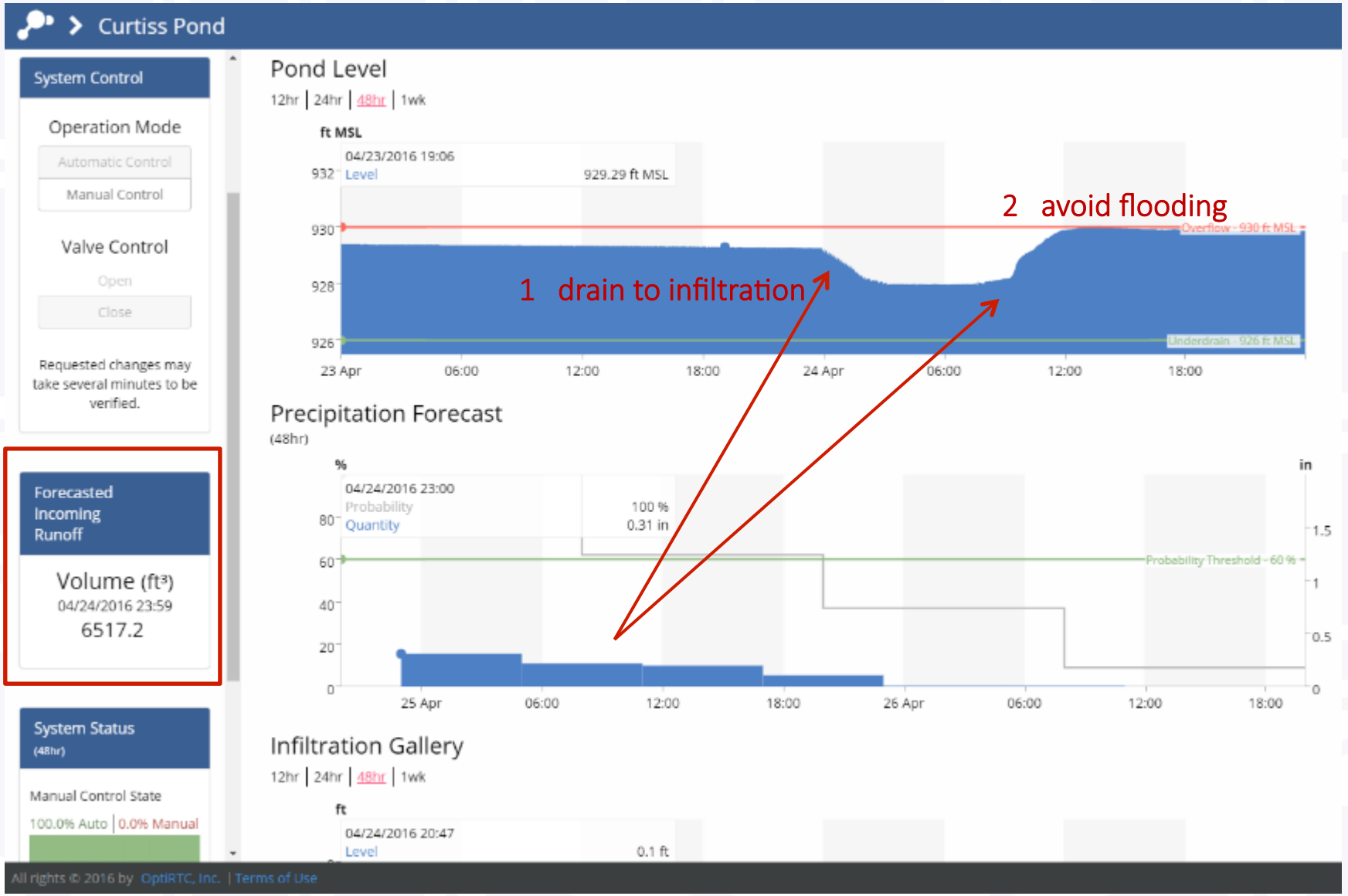
- 38 acre watershed
- 132,000 gallon pond
- Local flooding multiple times per year
- Space for ½ required capacity for infiltration chamber



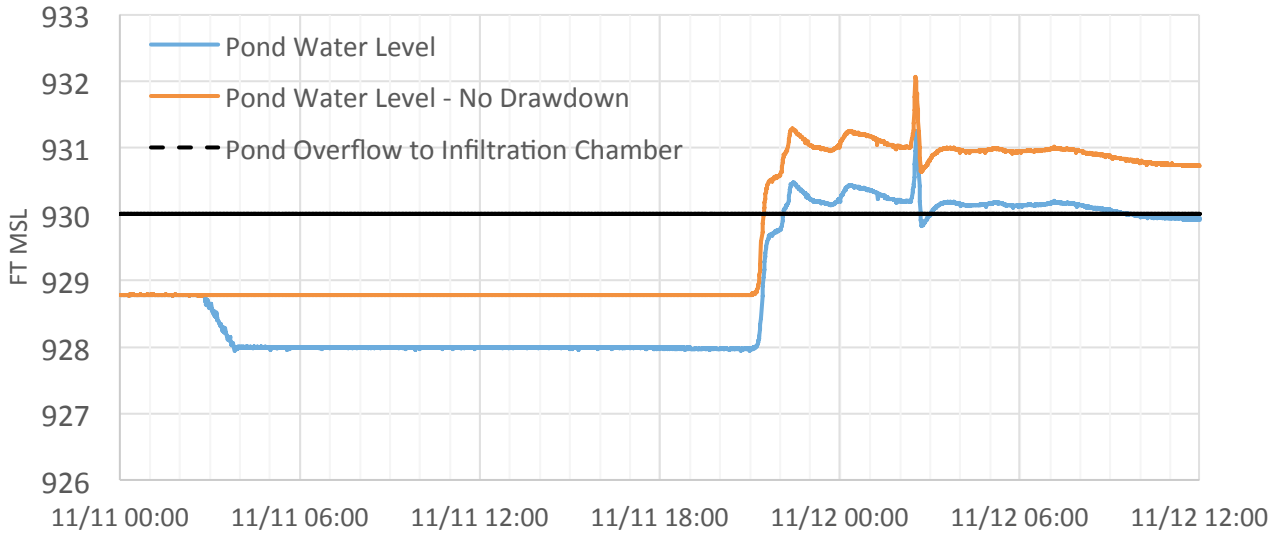
Adaptive Design for Flood Control

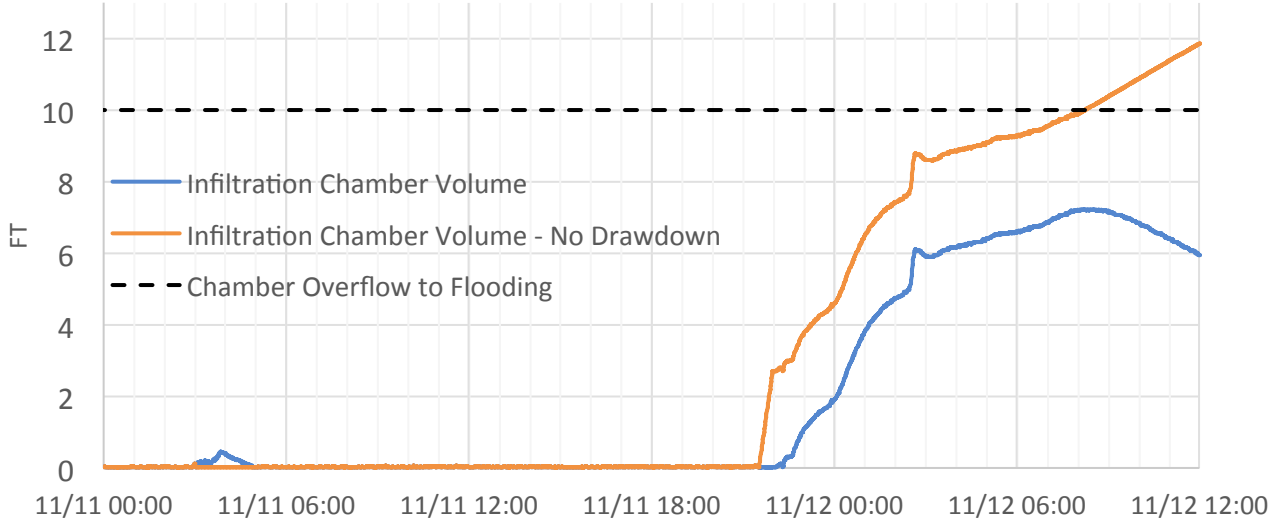
- Pond drains to infiltration chamber based on forecast
- Pond captures runoff and overflows to infiltration chamber
- Required chamber size reduced by 50%

Optimizing Stormwater Assets



Comparison Without Pre-Event Drawdown





November 11-12, 2015

2.33 inches rain

Pre-Event Drawdown Volume
52,600 gallons

System Overflow Volume without Pre-Event Infiltration
12,000 gallons

Case Study 3: Anacostia Watershed, MD

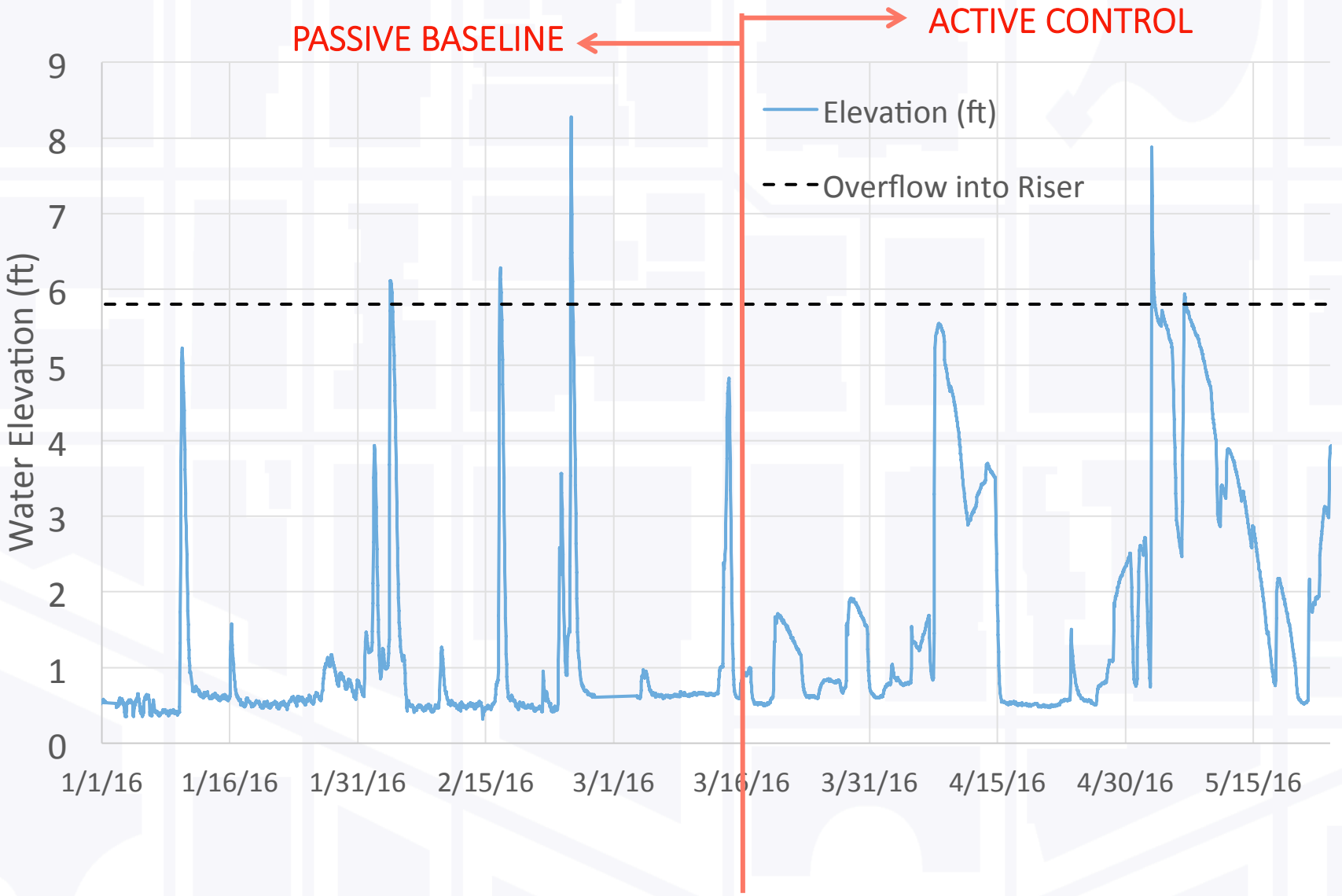
peak flow reduction + water quality

Anacostia River Watershed (Chesapeake Bay)

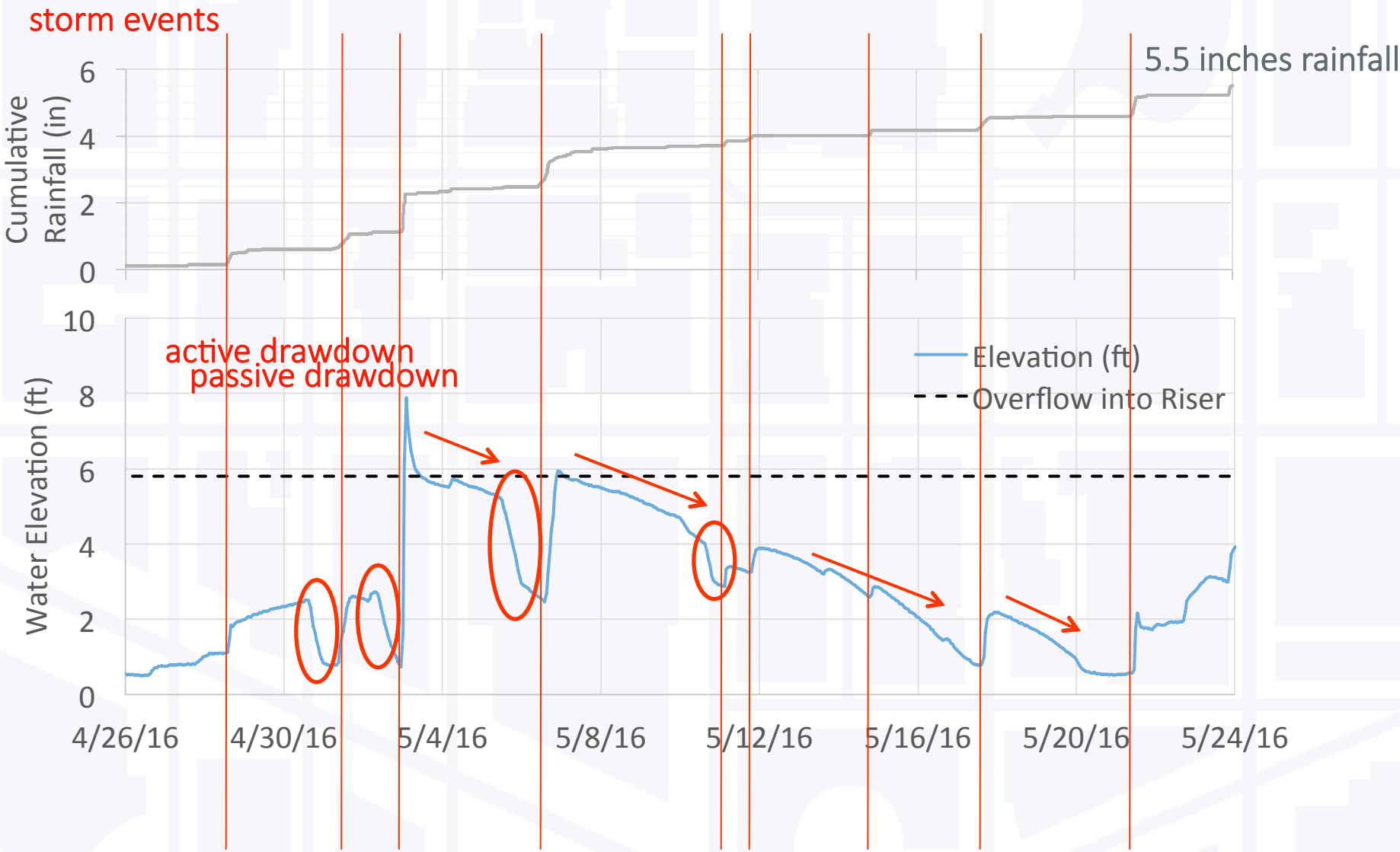
NFWF

METROPOLITAN WASHINGTON
Council of Governments

Pond Elevation Time Series

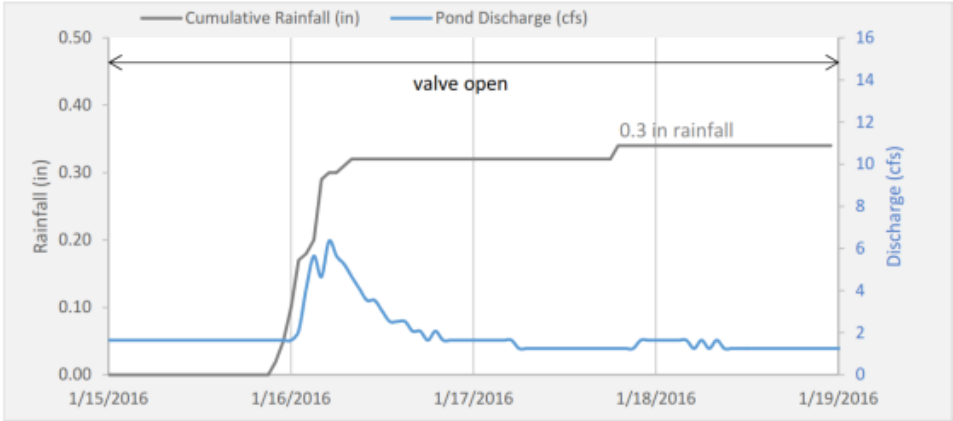


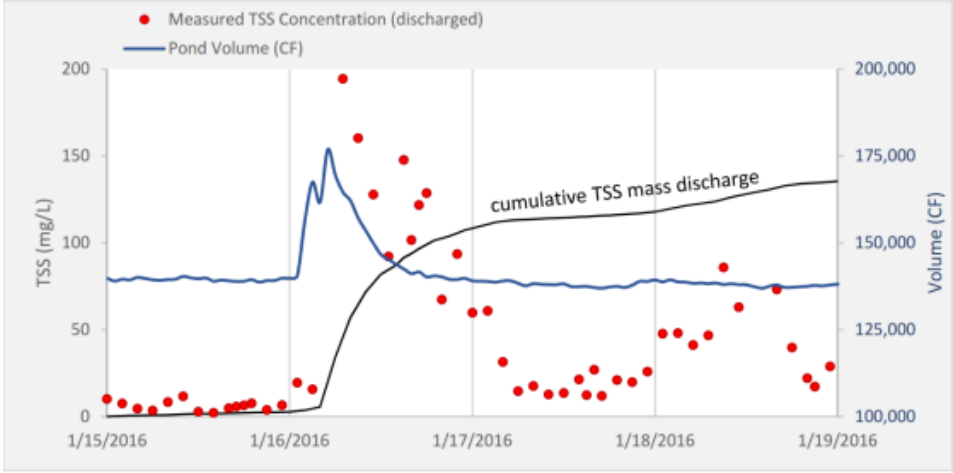
May was rainy…



Real-Time TSS Monitoring and Active Control

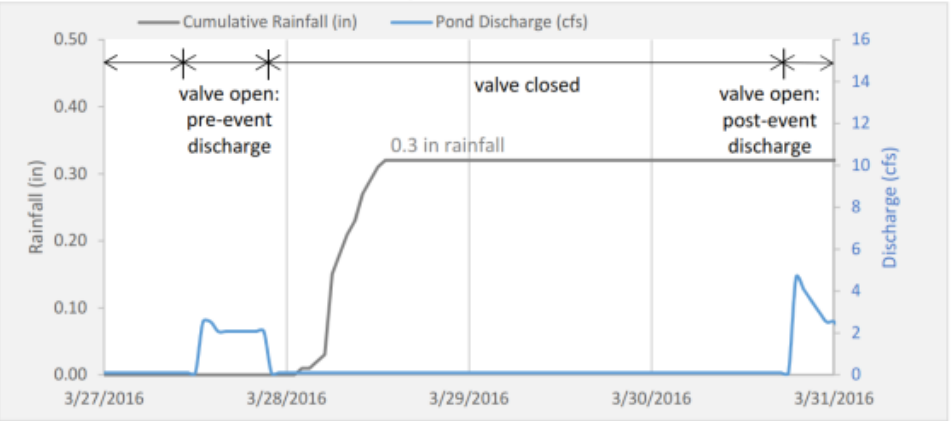
Passive Wet Pond

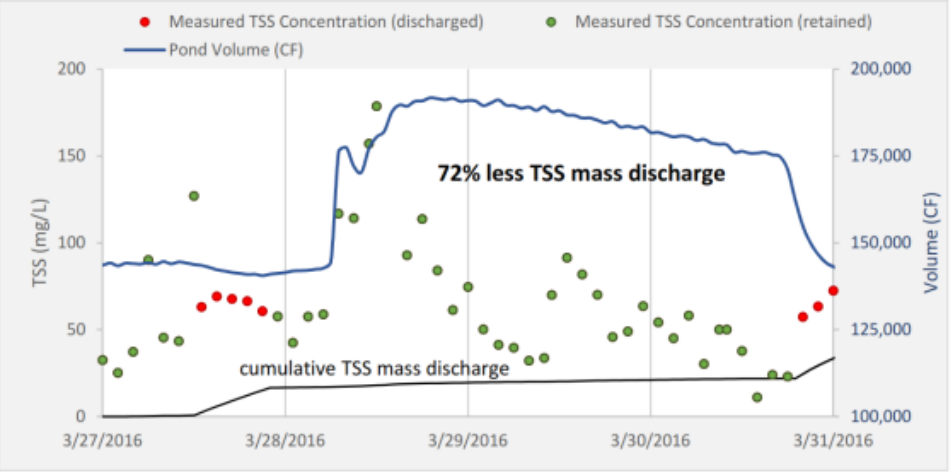




Jan 2016 - Before Active Control

Active Wet Pond



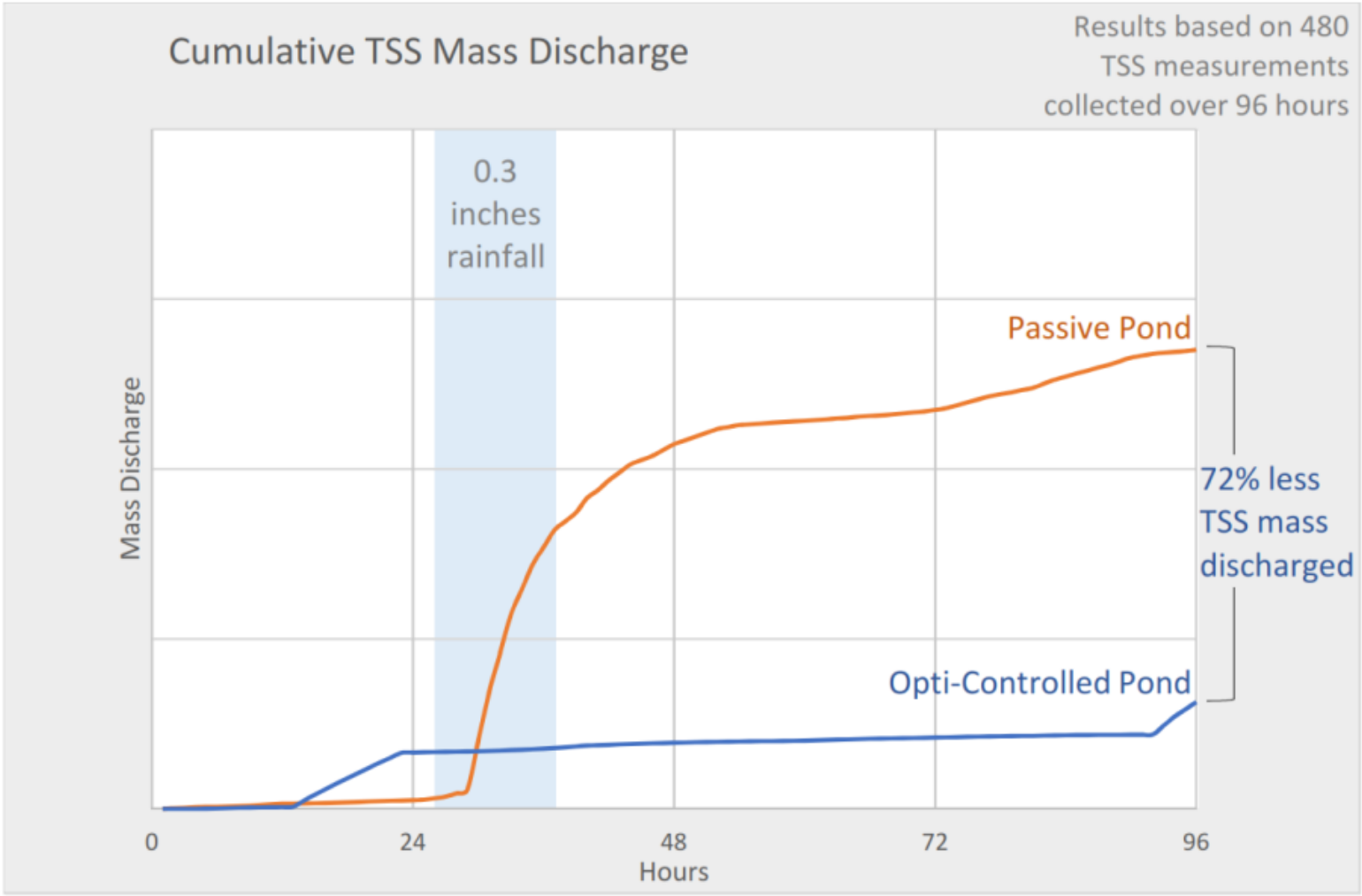


March 2016 - Active Control

In two different storms under different operating conditions.

*Preliminary data collected as part of a NFWF funded study in partnership with MWCOG

Real-Time TSS Monitoring and Active Control



TSS can be measured in real-time to show facility performance

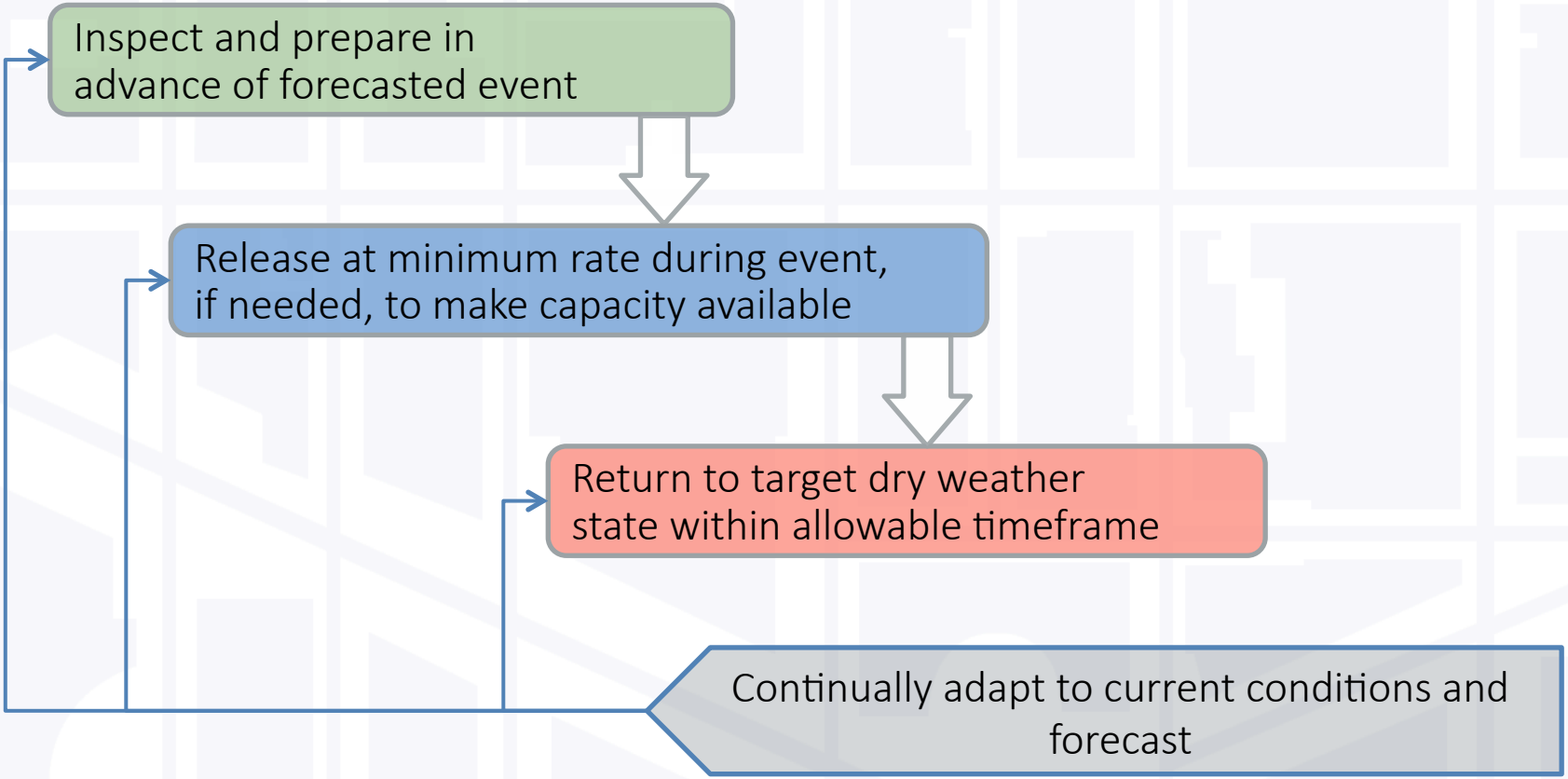
Active operation appears to discharge less TSS by enabling more settling

*Preliminary data collected as part of a NFWF funded study in partnership with MWCOG

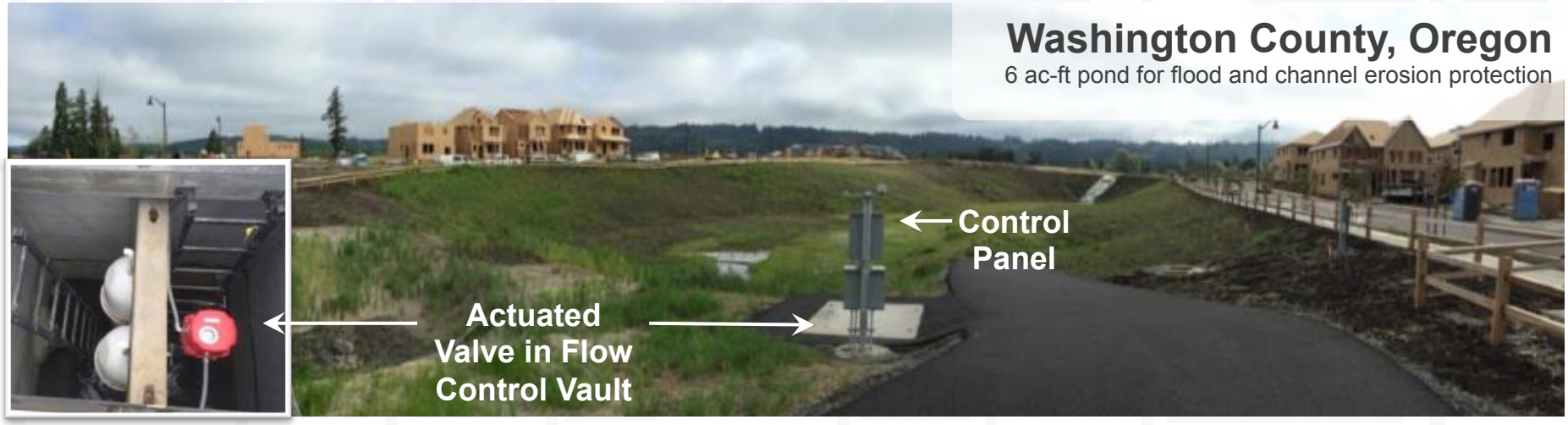
Case Study 4: Clean Water Services, OR
flow-duration control

Flow Control to Meet Instream Flow

- Traditional: use storage & gravity draining
- Active Control: use forecast, storage, & modulated outflow valve

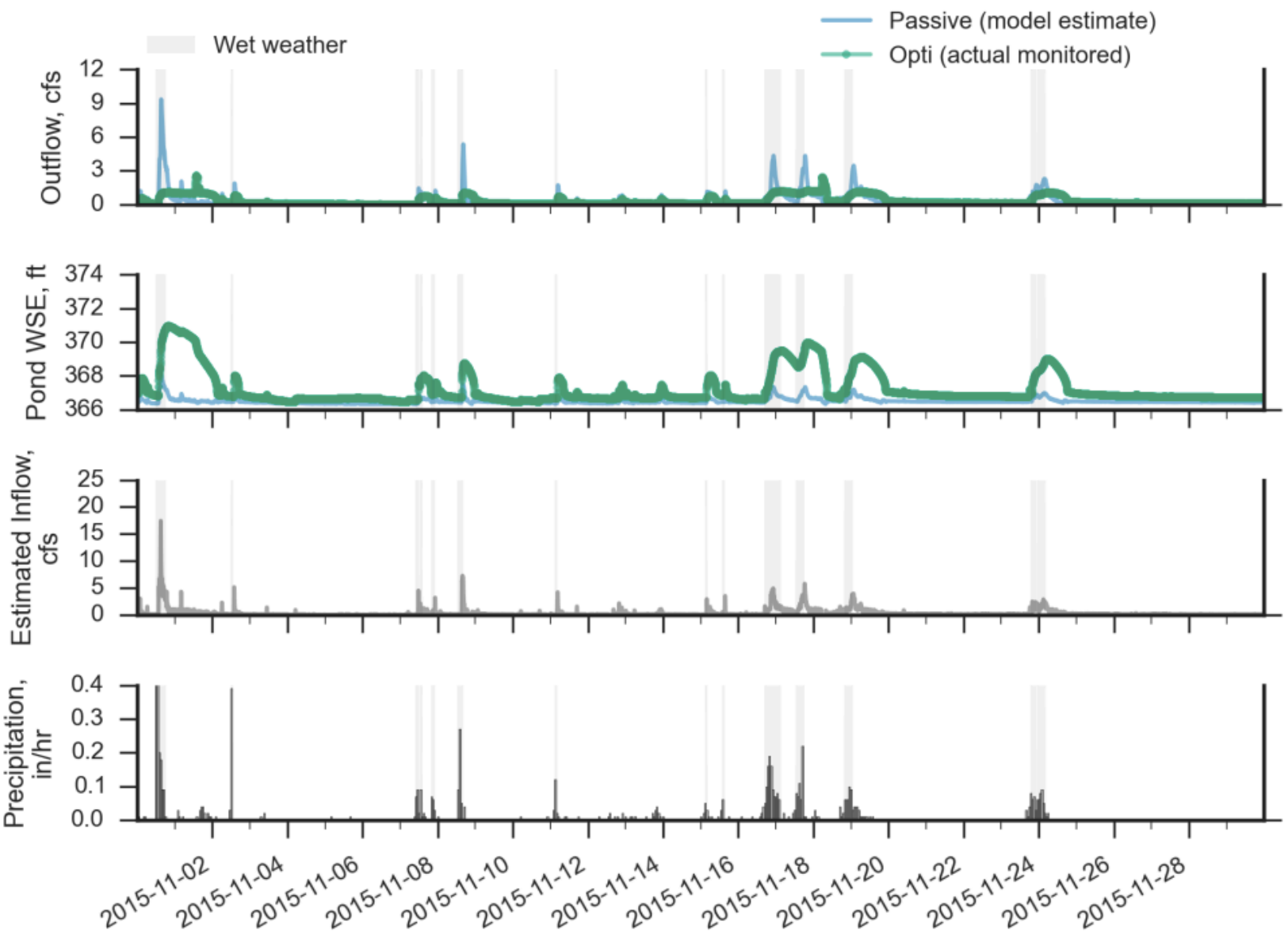


Portland, OR - Flow Control & Hydrograph Matching

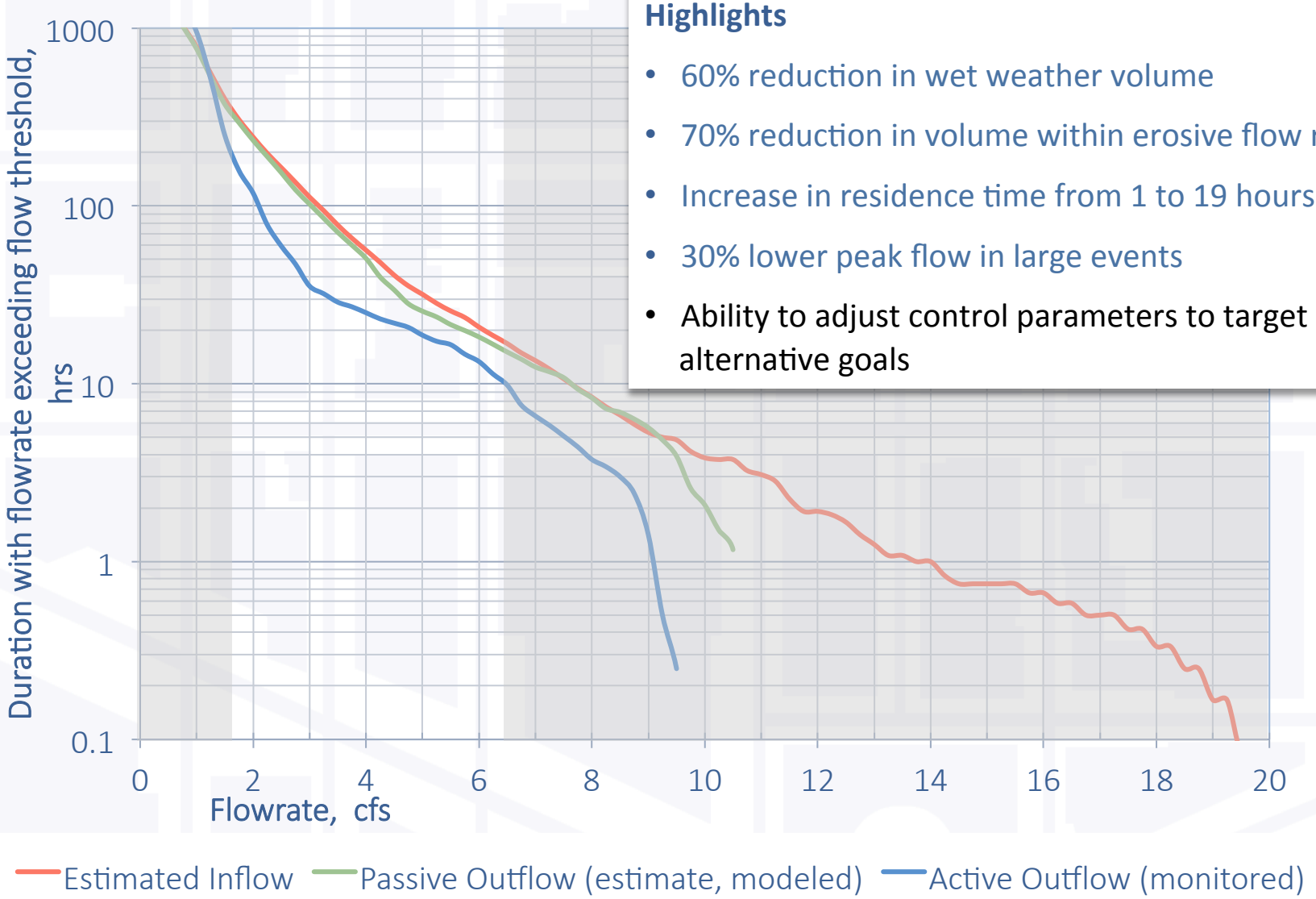


Based on continually updated precipitation forecasts, automated valve controls discharge to achieve **hydromodification goals**

Flow Control & Hydrograph Matching



Flow-Duration Control



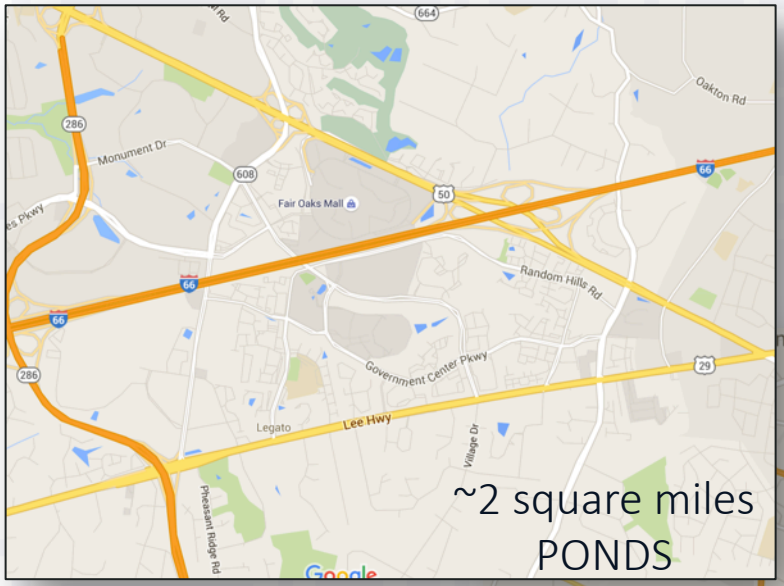
Highlights

- 60% reduction in wet weather volume
- 70% reduction in volume within erosive flow range
- Increase in residence time from 1 to 19 hours
- 30% lower peak flow in large events
- Ability to adjust control parameters to target alternative goals

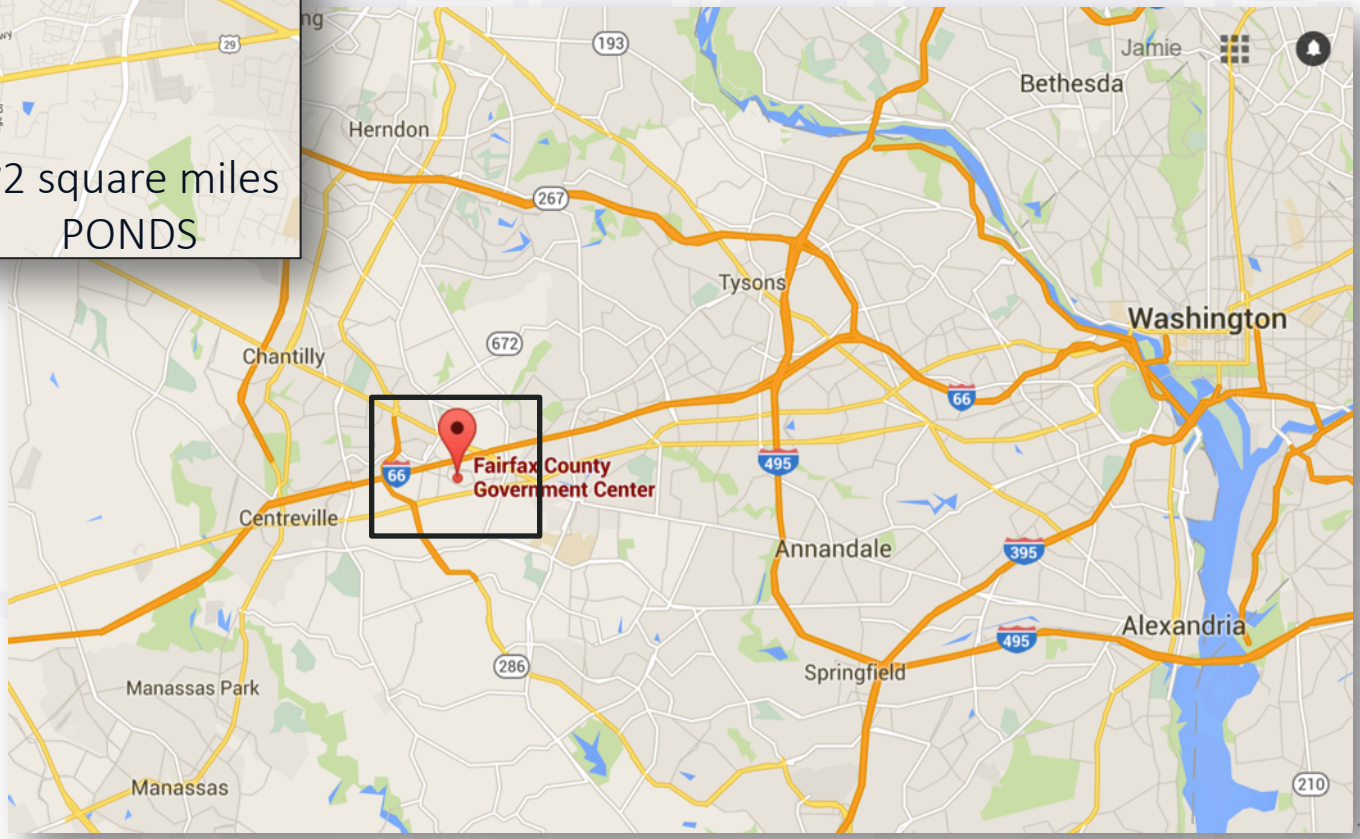
Case Study 5: Difficult Run Watershed, Fairfax, VA

watershed management

Next Steps: Watershed Scale Control



Difficult Run River (Potomac tributary)
58.3 square mile watershed
Retrofit 3 ponds with active controls
Chesapeake Bay TMDL compliance
Track cost, feasibility, performance



Questions & Contact

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