Addressing the City of Albany's CSO and Flooding Challenges with CMAC Technology

NEWEA - Annual Conference

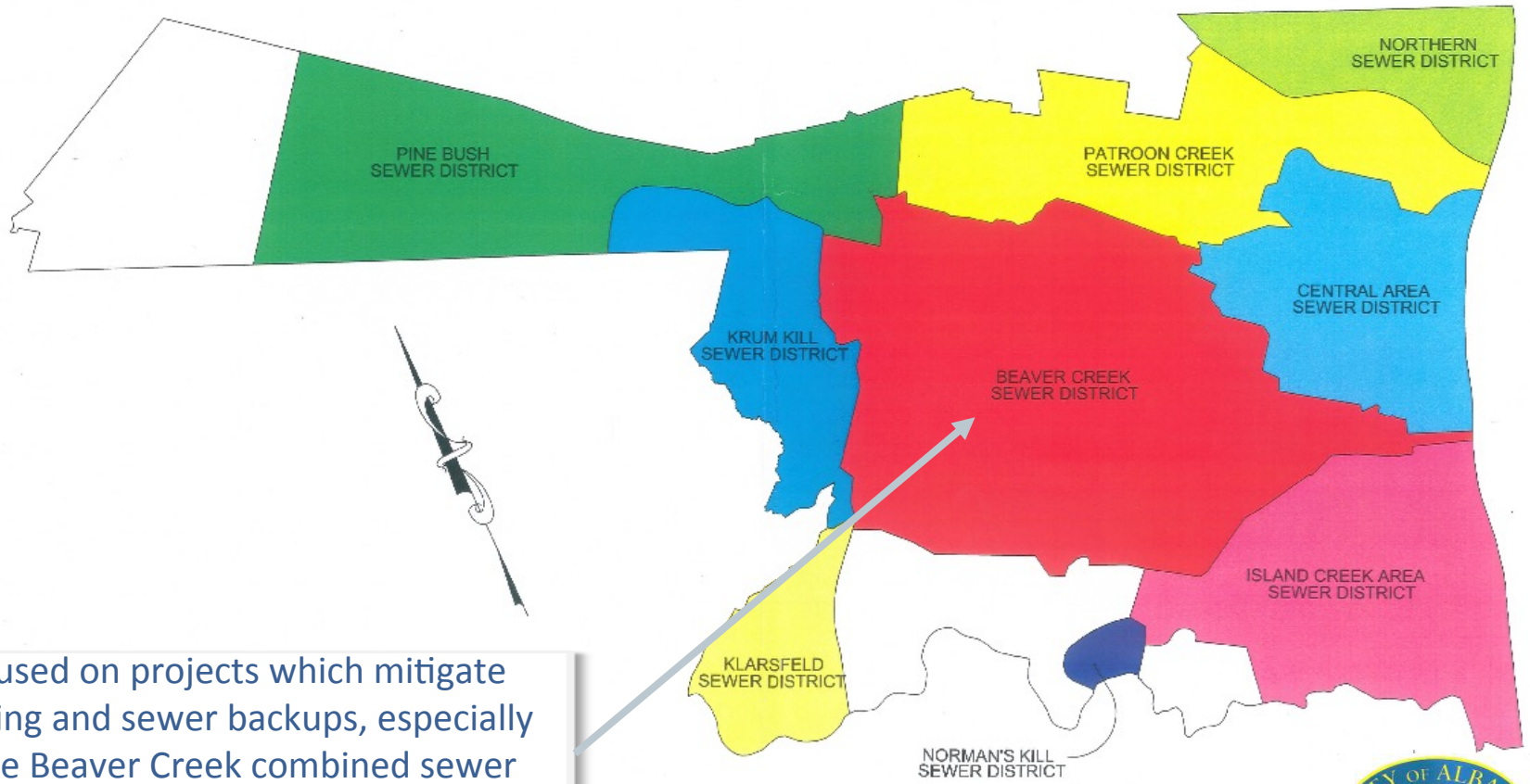
January 23, 2018

William Simcoe, P.E. - City of Albany

Michael Miller, P.E. - CHA Consulting, Inc.

Albany Water Board Overview

The Albany Water Board, established in 1987, owns the water and combined and sanitary sewer infrastructure of the City of Albany.

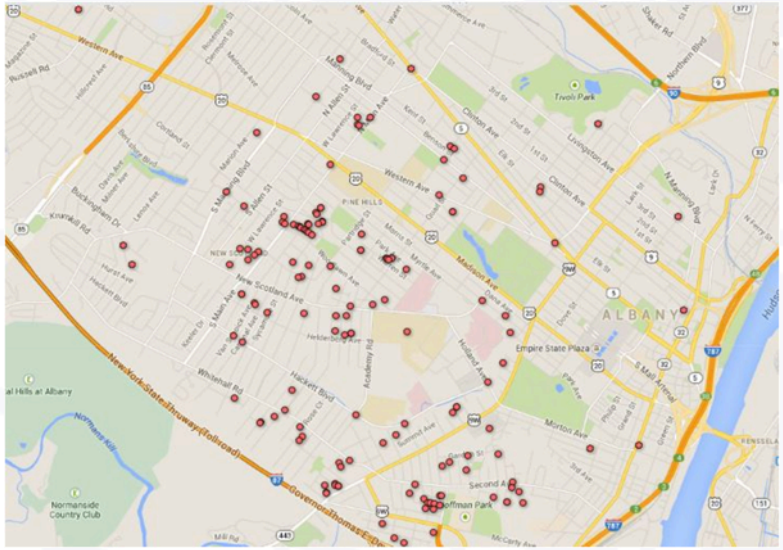


Focused on projects which mitigate flooding and sewer backups, especially in the Beaver Creek combined sewer district

Challenges

- Mitigating surface flooding and combined sewage surface discharges during storms
- Reporting wet weather CSOs to comply with Sewage Pollution Right To Know
- Complying with requirements for new development in combined sewer areas
- Tracking dry weather flows and available dry weather capacity
- Planning sewer separation projects
- Planning flood mitigation projects
- Developing flood mitigation measures for a higher level of service
- Finding the funds to do the projects

Beaver Creek – August 2014 Historical Flooding

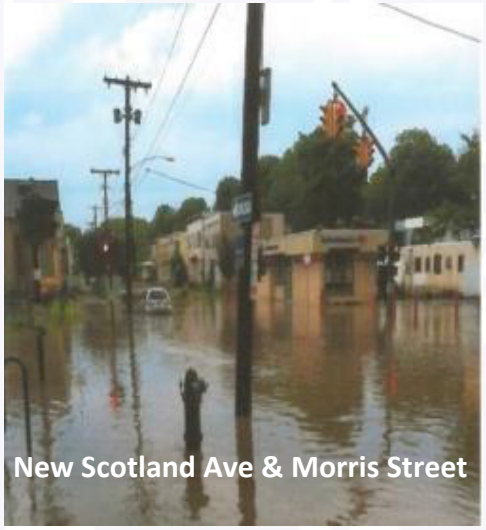


8-5-2014 Flash Flood Problem Areas

Elberon Place

Elberon Place

Rear of Western Ave & Quail Street

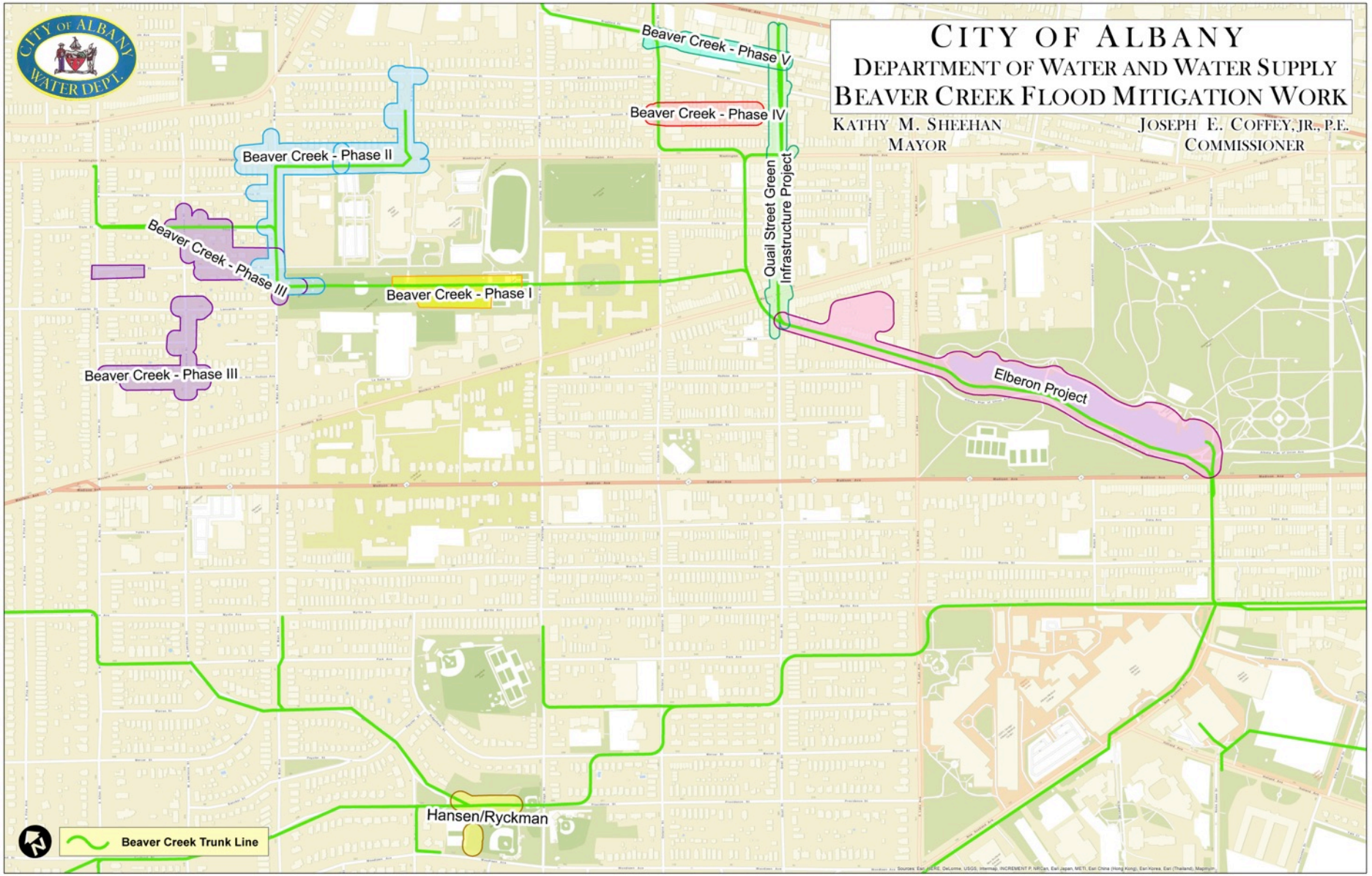


New Scotland Ave & Morris Street

Addressing the Challenges

- Green infrastructure practices for flood mitigation and combined sewage discharges
- Adaptive controls to optimize system storage and minimize flooding and CSOs
- Continuous level monitoring at CSO regulators
- Continuous flow monitoring at trunks sewers, interceptor and WWTP
- Stringent requirements in City Code for storm water management
- New York State low interest loans and grants

Beaver Creek Flood Mitigation Work



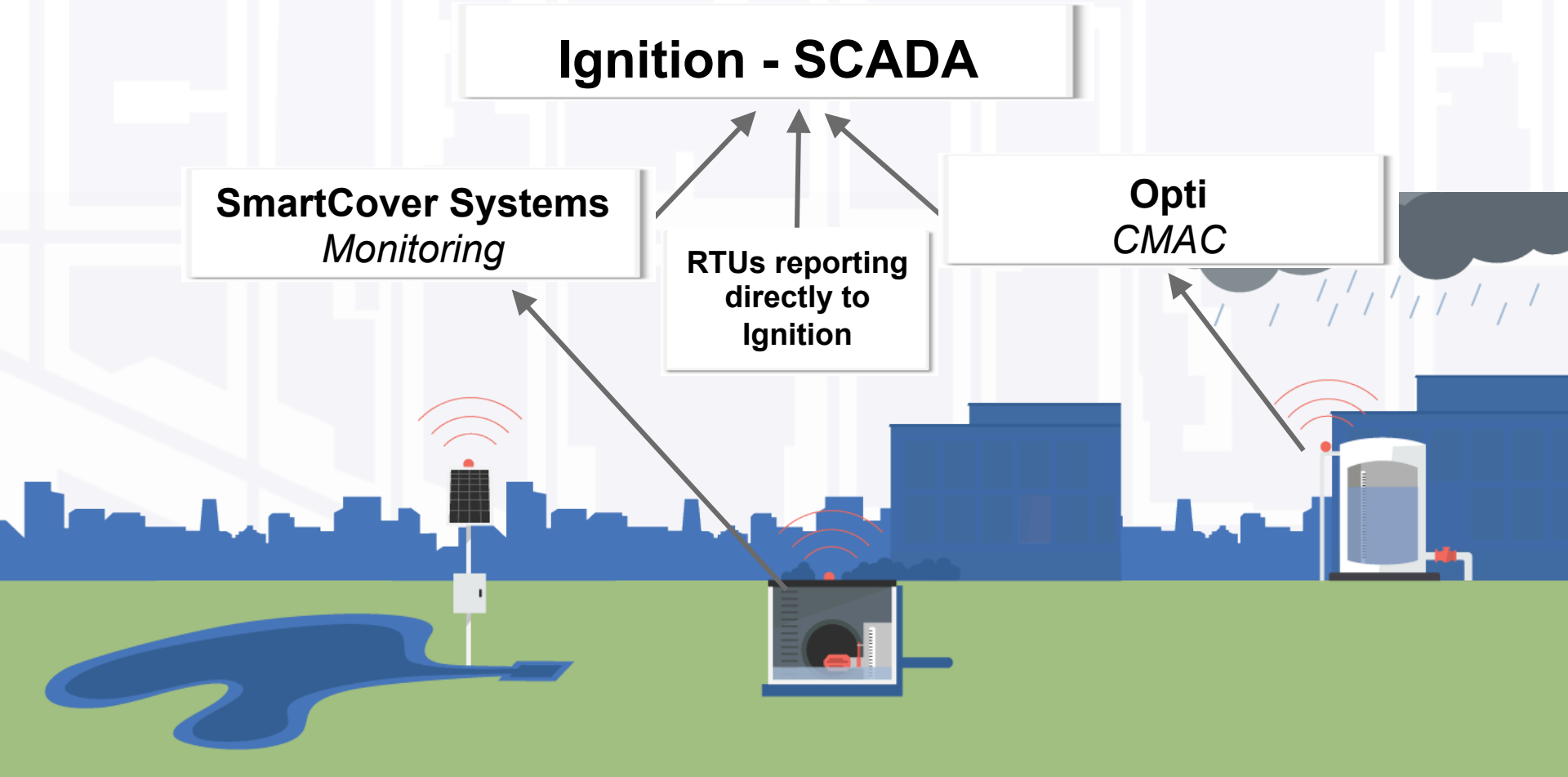
Building a Smart City around Stormwater Management

Building partnerships for smart stormwater management

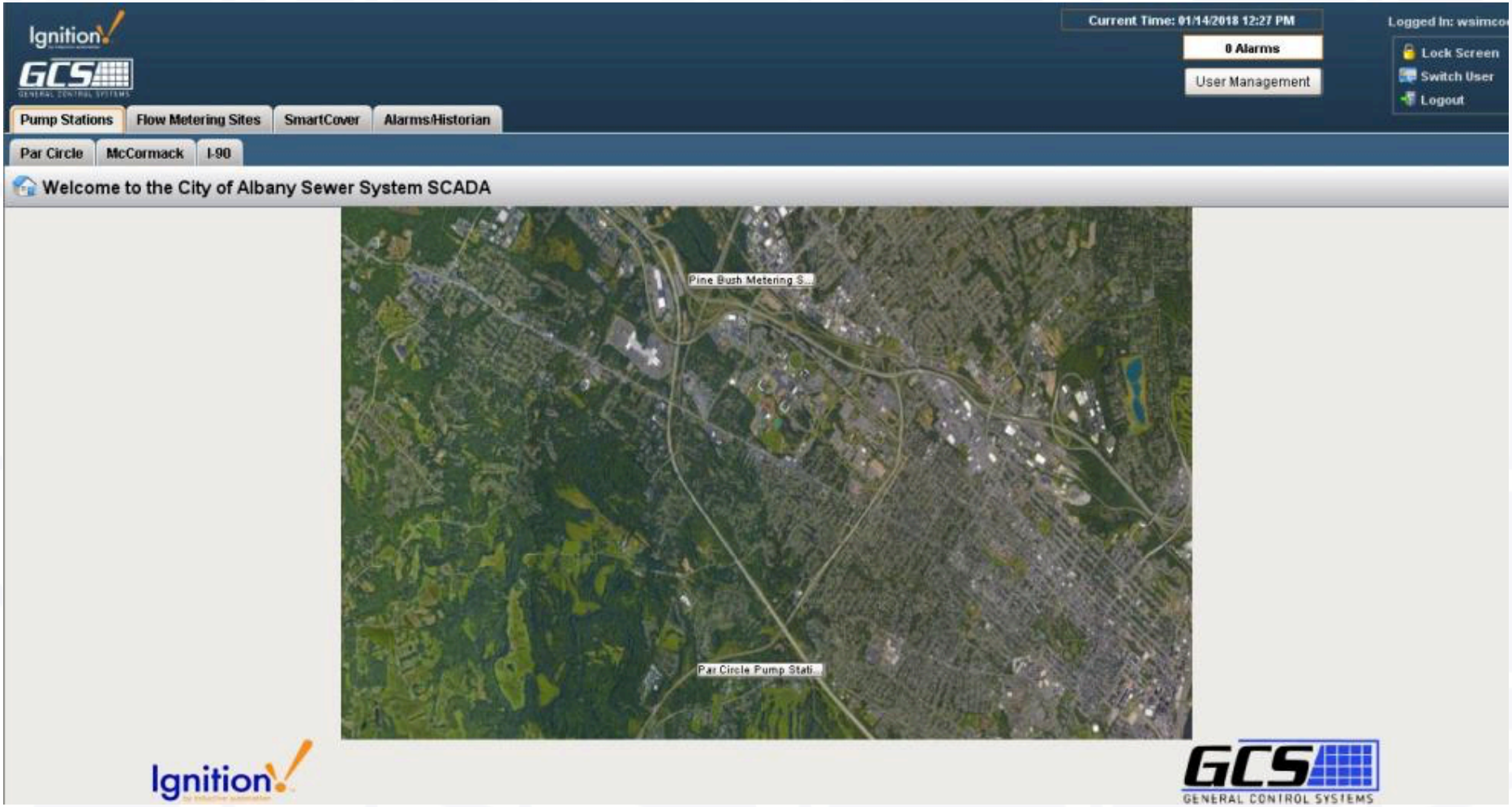
CHA design/construction solutions

City of Albany Water Dept.

Opti

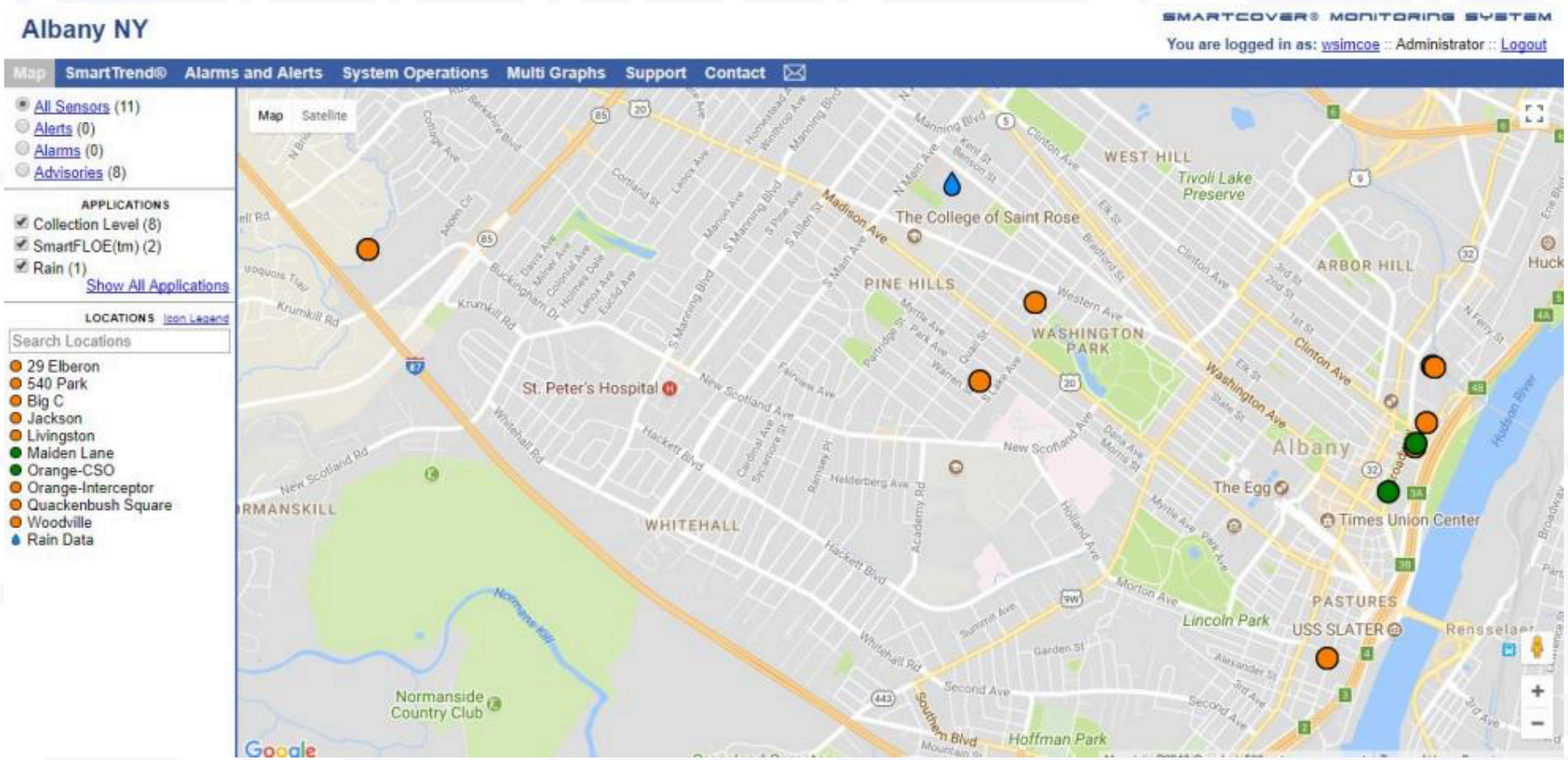


Sewer SCADA



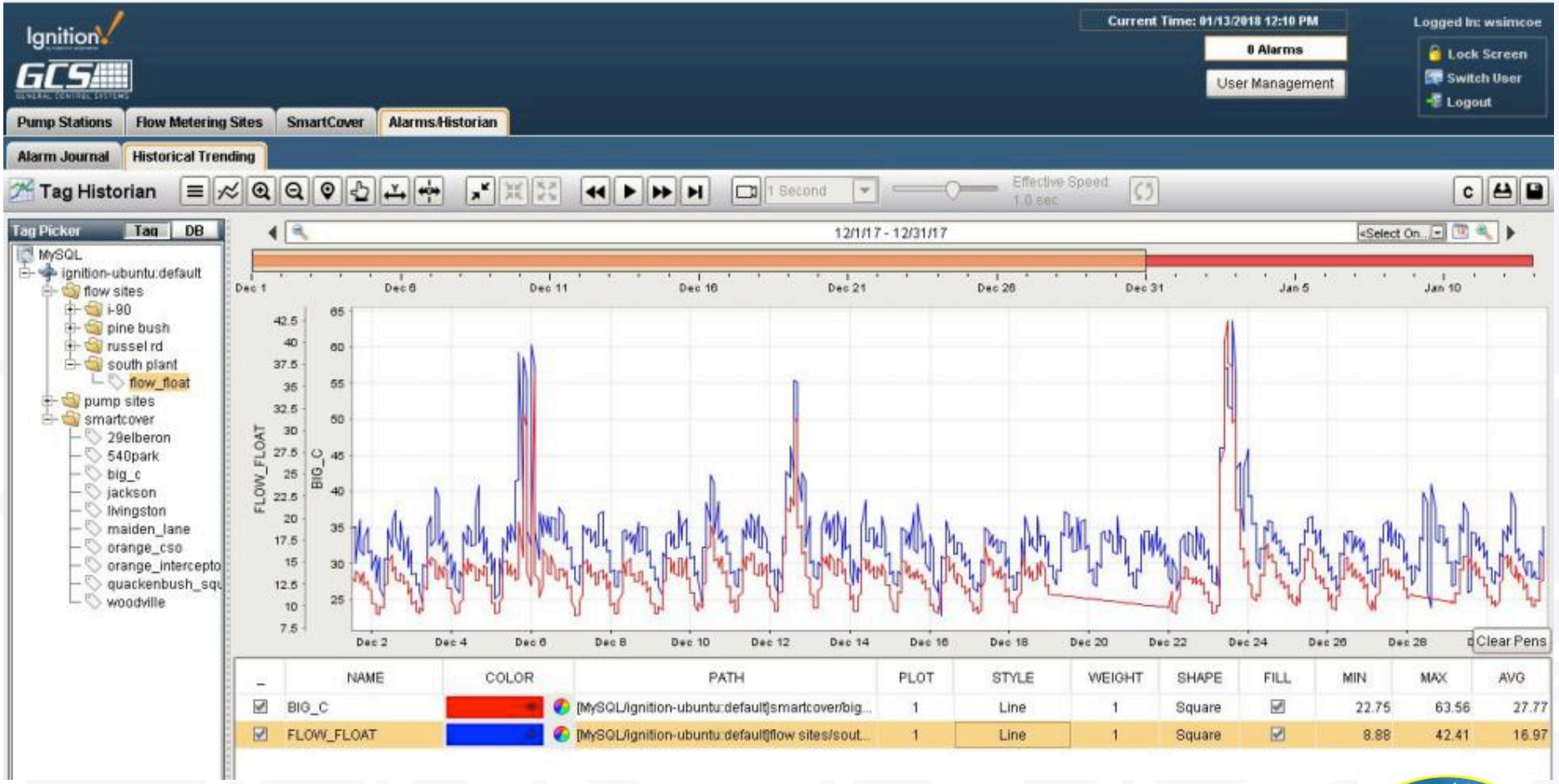
CITY OF ALBANY WATER DEPT.

SmartCovers

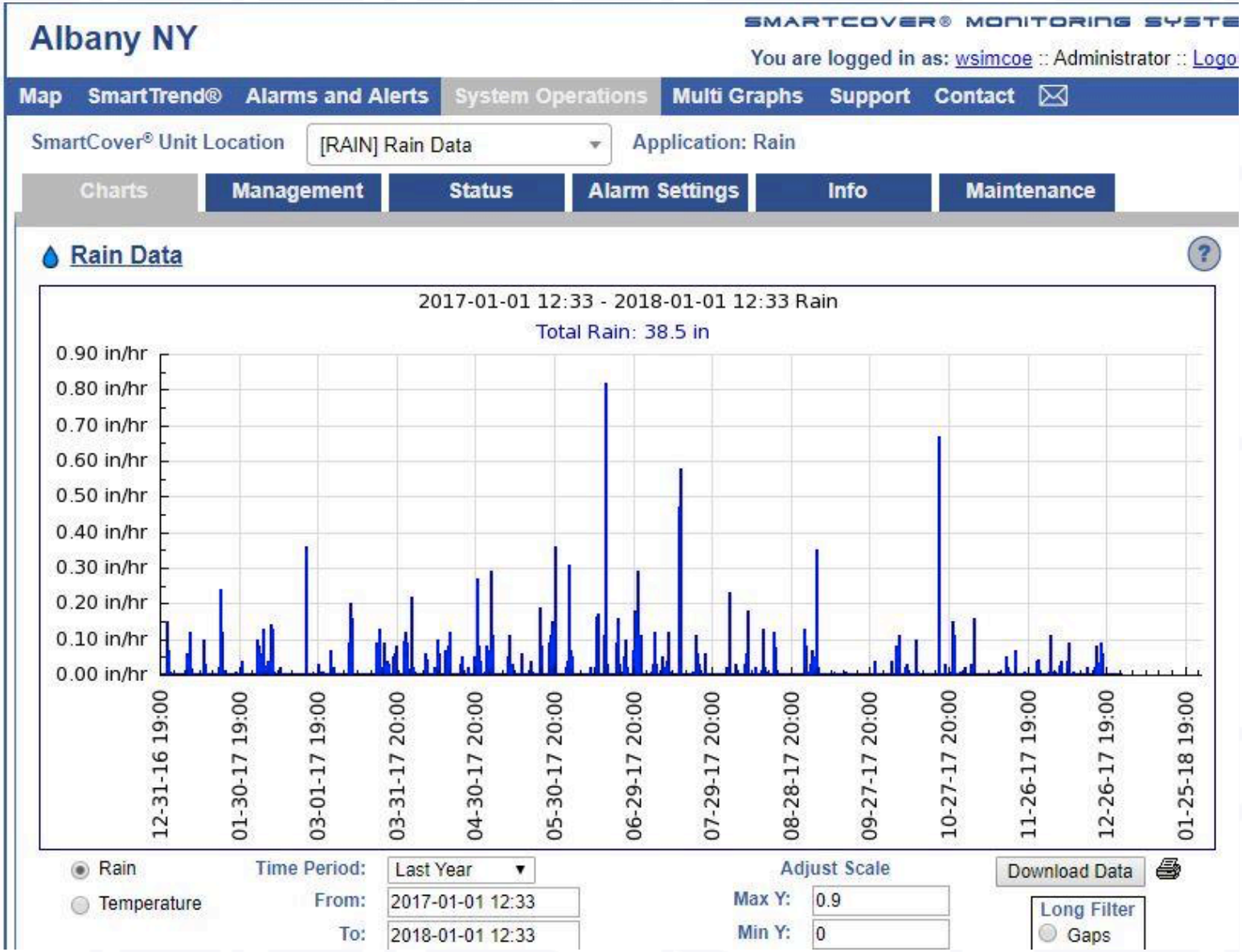


CITY OF ALBANY WATER DEPT.

CSO Monitoring



Rainfall Data 2017



Rainfall Data June 19-20

CSO Overflow and WWTP Flow June 19-20

Building Operational Intelligence within the Beaver Creek Sewershed

Building Operational Intelligence

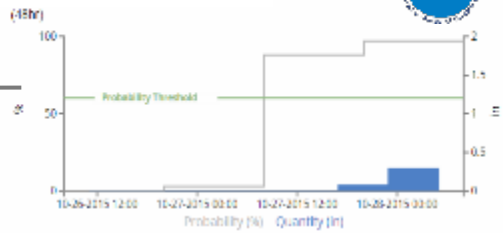
- **Incorporation of operational controls to optimize the performance of the wastewater system**
  - Insights into maintenance activities
  - Early detection and warnings of impending flooding
    - Notification for properties within known flood hazard areas
    - Other emergency actions (e.g., evacuations, barricade of streets)
  - Continuous Monitoring and Adaptive Control (CMAC)
    - Optimize the use of available system storage to reduce surcharging and flooding within the collection system
    - Maximize conveyance of flows to the wastewater treatment plant
    - Reduce combined sewer overflows to the Hudson River

Continuous Monitoring and Adaptive Control (CMAC)

web-based dashboard

Opti
cloud software

NWS forecast



control panel

runoff

Enables Dynamic and Adaptive
Water Storage Management

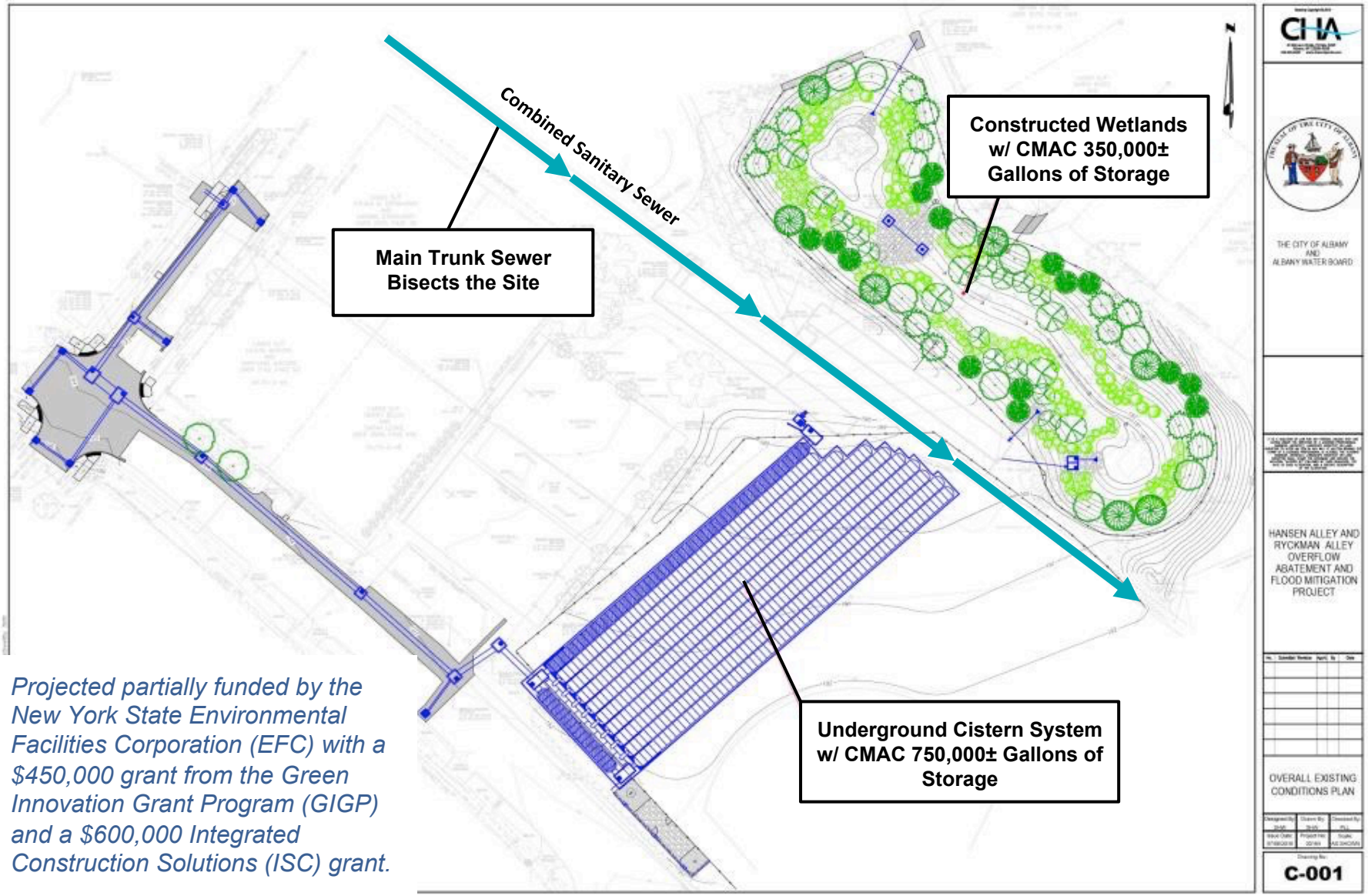
water level sensor

actuated valve
outlet or pump

stormwater infrastructure

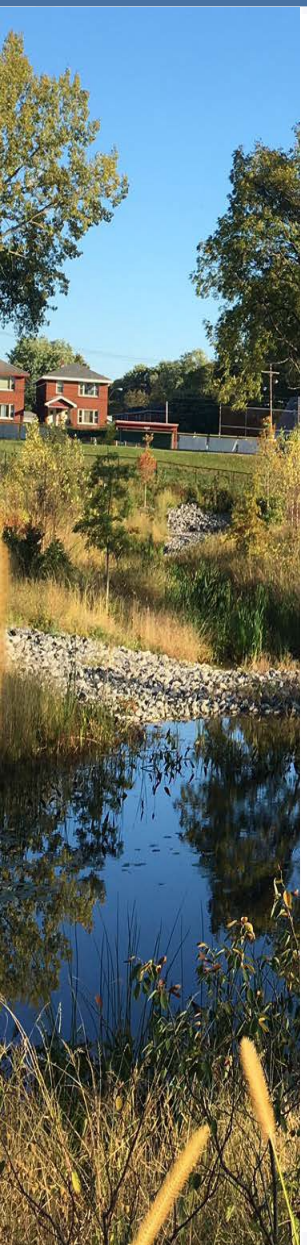
infiltration

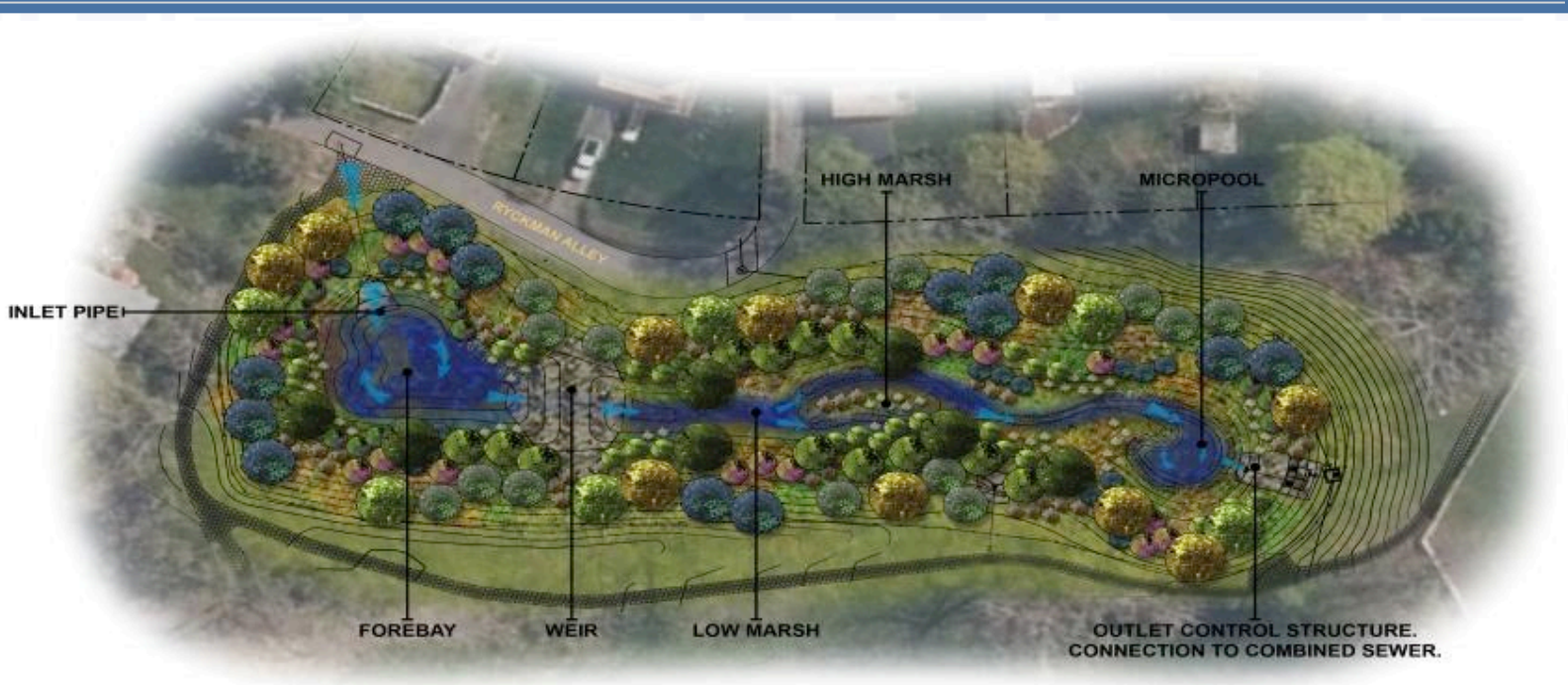
Hansen & Ryckman CSO Abatement and Flood Mitigation

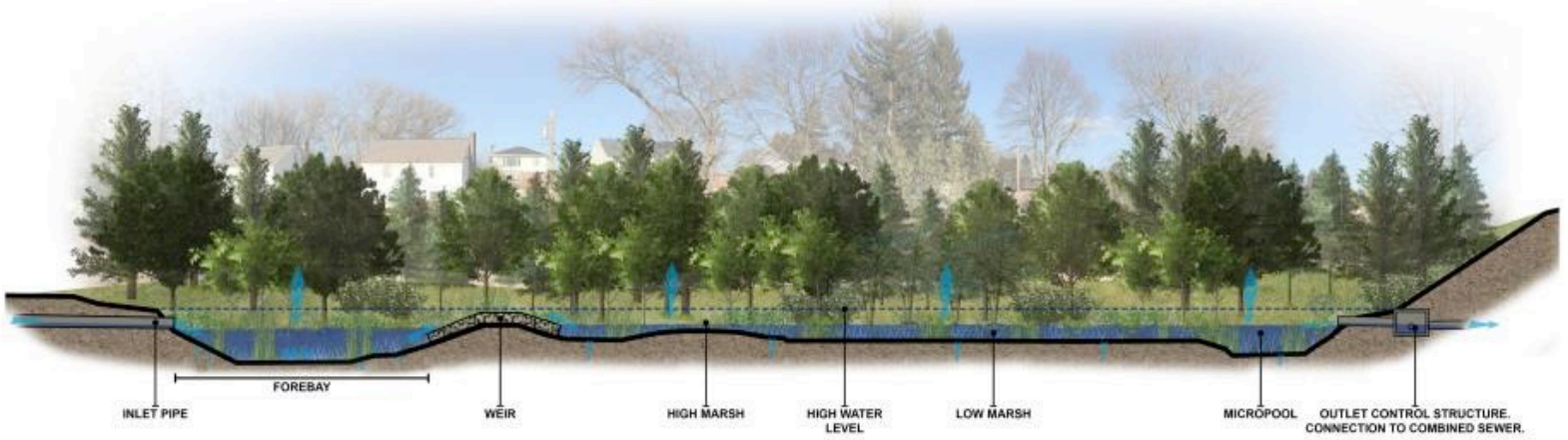


Projected partially funded by the New York State Environmental Facilities Corporation (EFC) with a $450,000 grant from the Green Innovation Grant Program (GIGP) and a $600,000 Integrated Construction Solutions (ISC) grant.

Ryckman Alley Constructed Wetlands

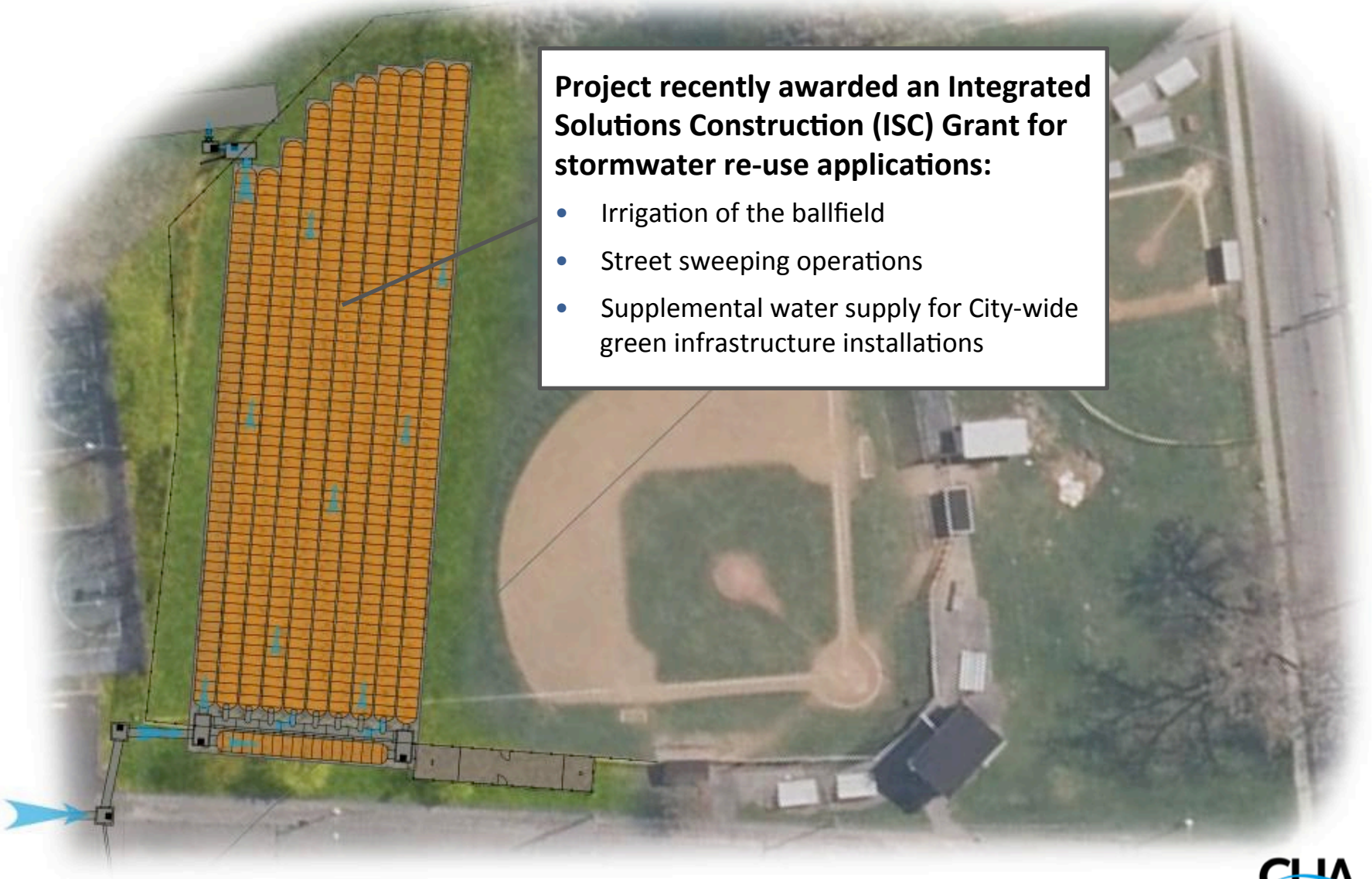






Ryckman Alley Constructed Wetlands

Hansen Alley Regional Underground Cistern System



Project recently awarded an Integrated Solutions Construction (ISC) Grant for stormwater re-use applications:

- Irrigation of the ballfield
- Street sweeping operations
- Supplemental water supply for City-wide green infrastructure installations

Hansen Alley Regional Underground Cistern System

Hansen & Ryckman Logic Control

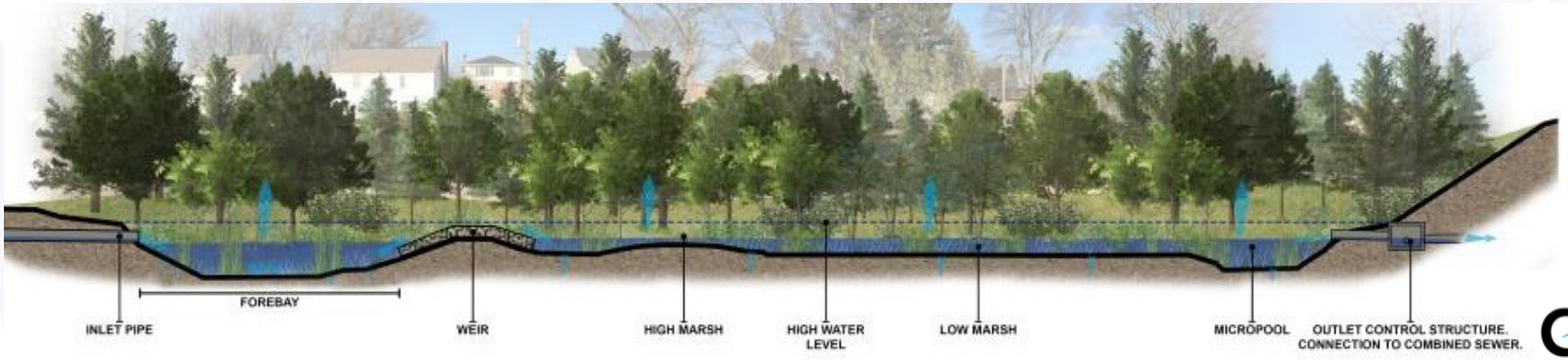
Pre-Event Planning based on NWS forecast	During Wet-Weather Event	Post-Event

Does the available storage exceed the forecasted runoff?

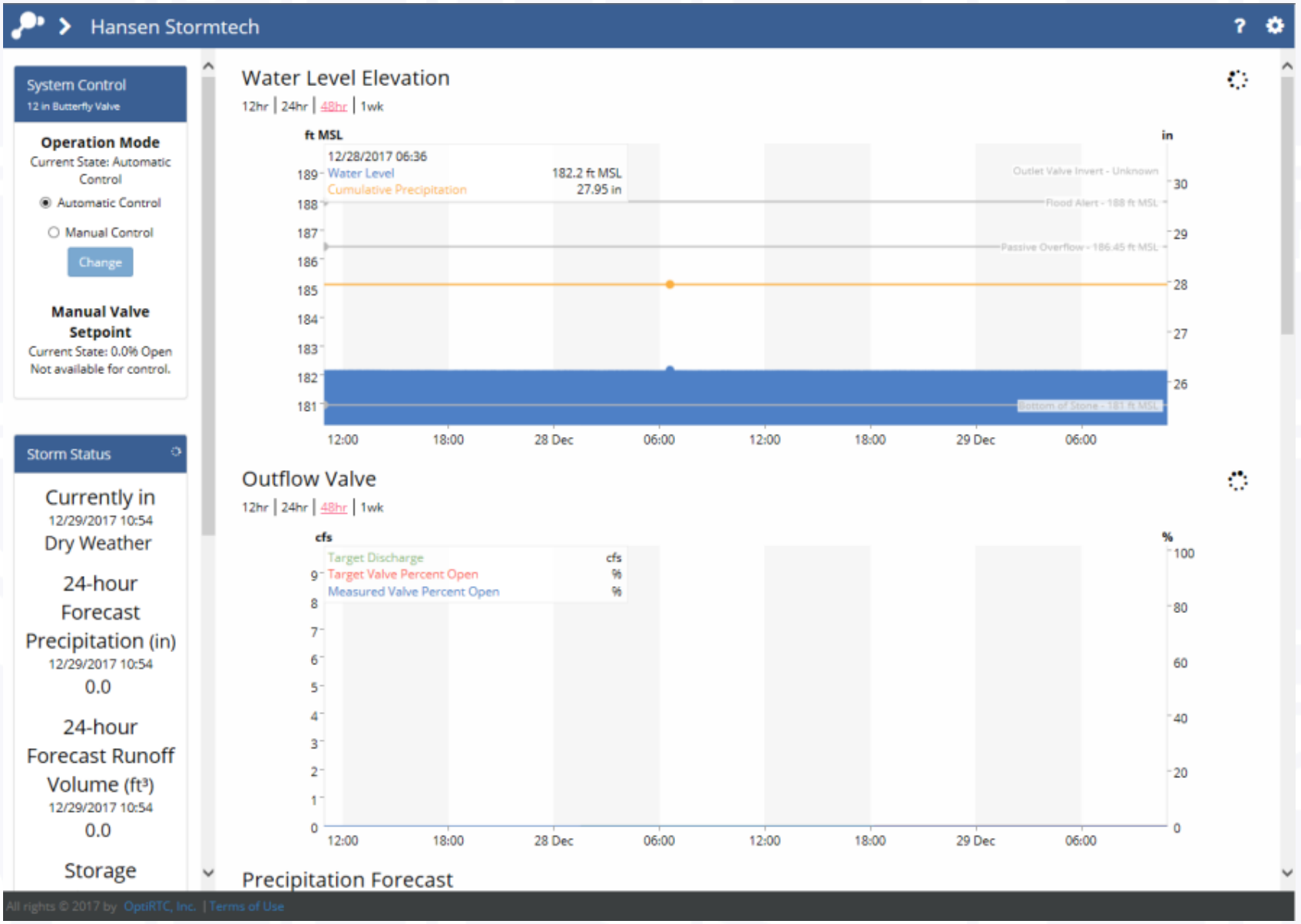
Yes → **No discharge during wet-weather event**

No → **Controlled release through actuated valve with passive high level overflow**

→ **Extended 24-Hour Programmed Discharge**



Web-Based CMAC Dashboard



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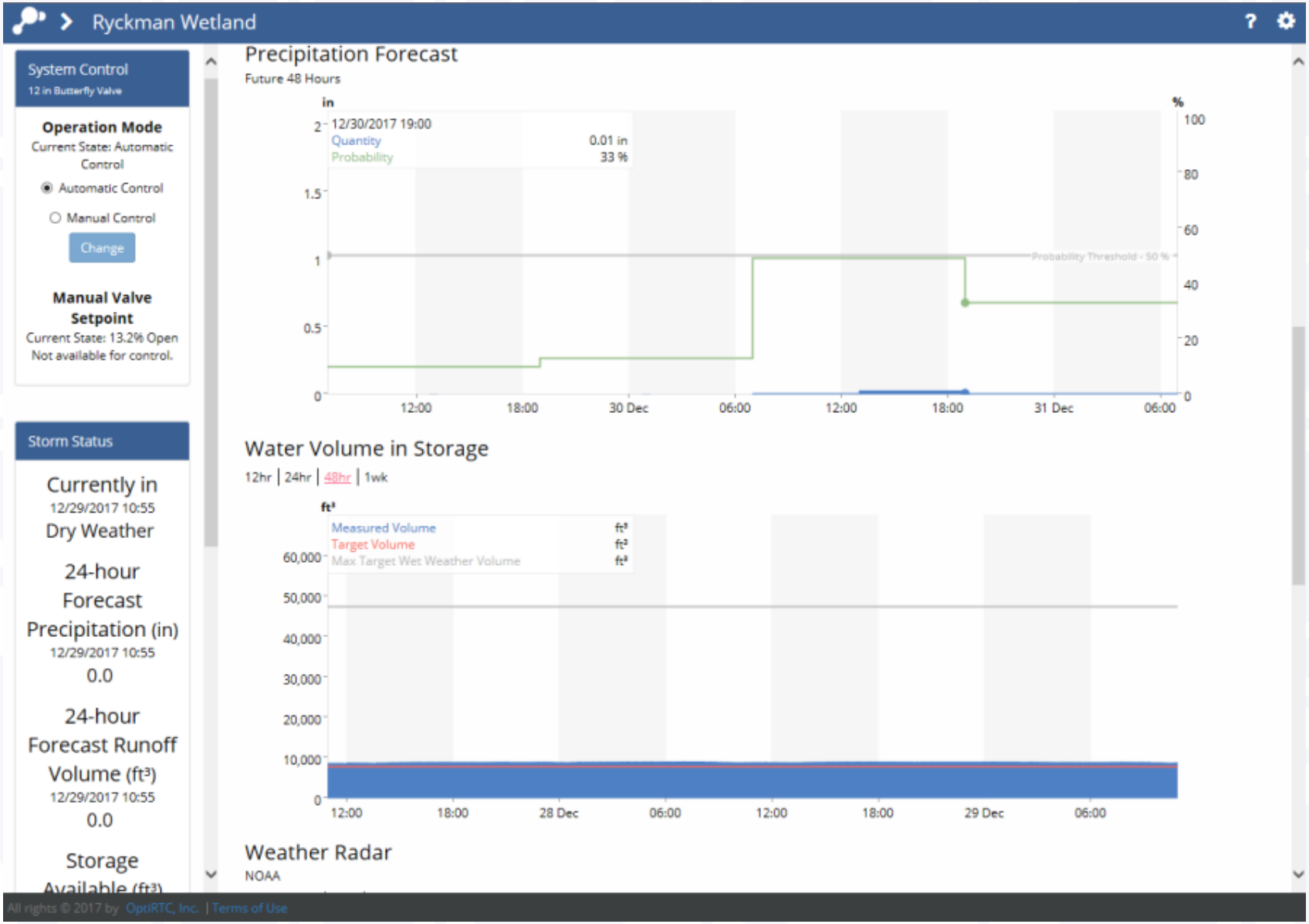
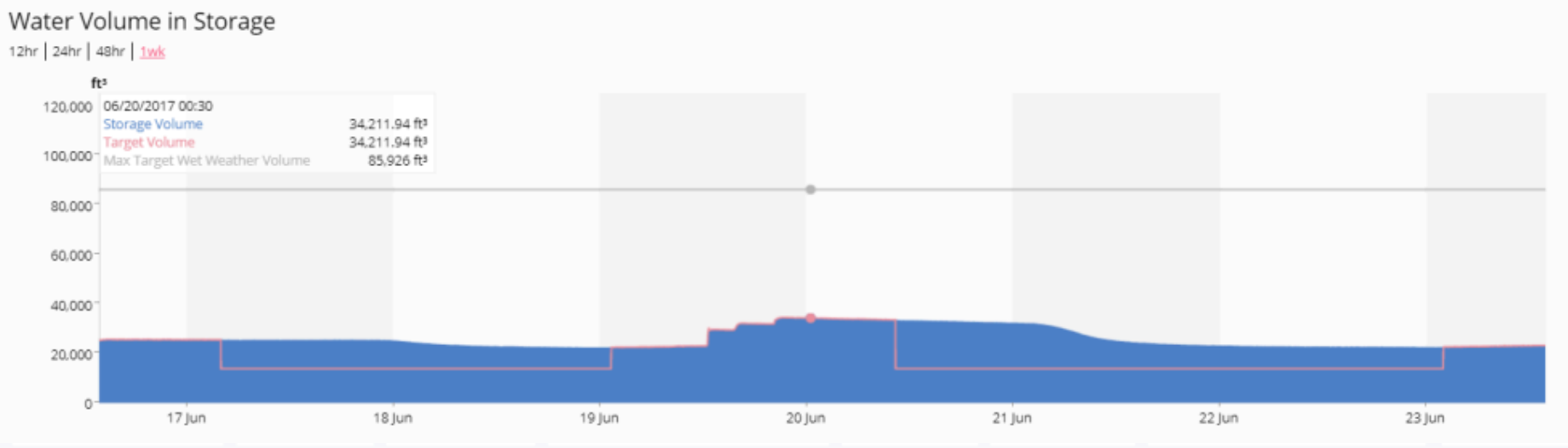
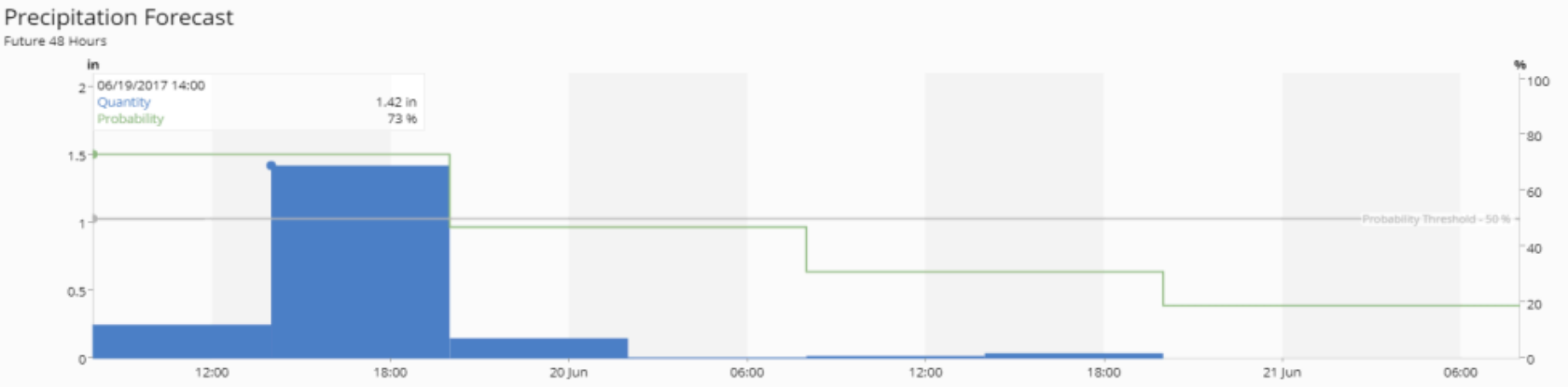
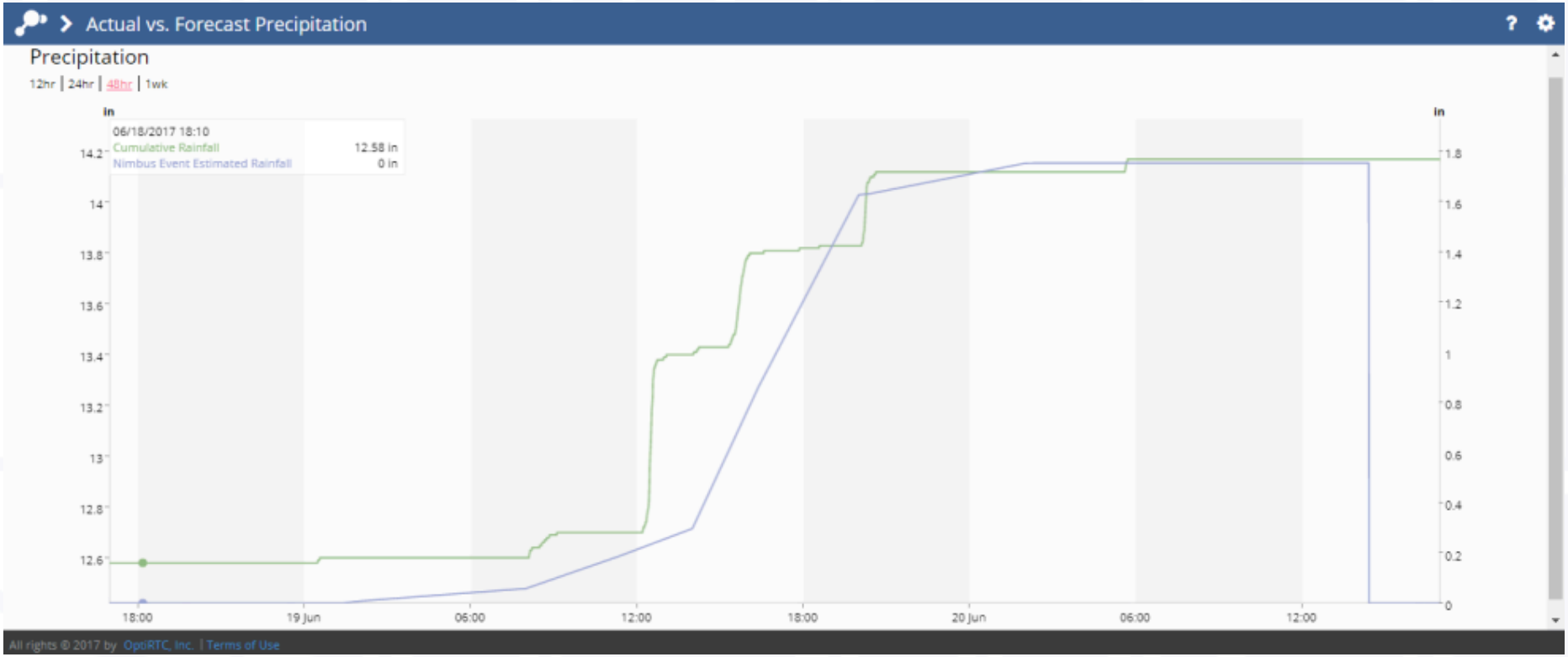


Performance Analysis - Hansen Alley





Forecast Accuracy



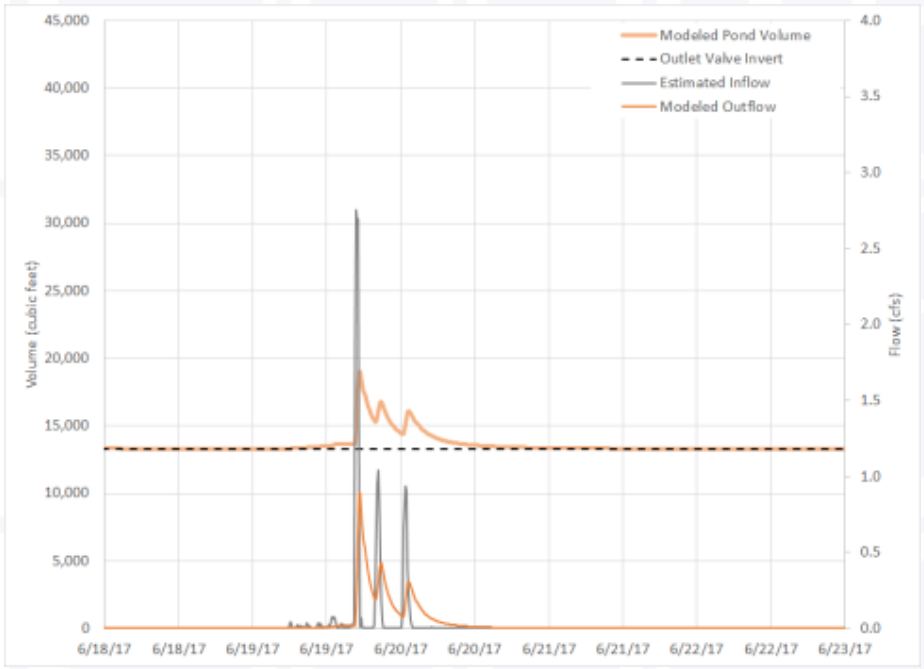
Forecast: 1.75in

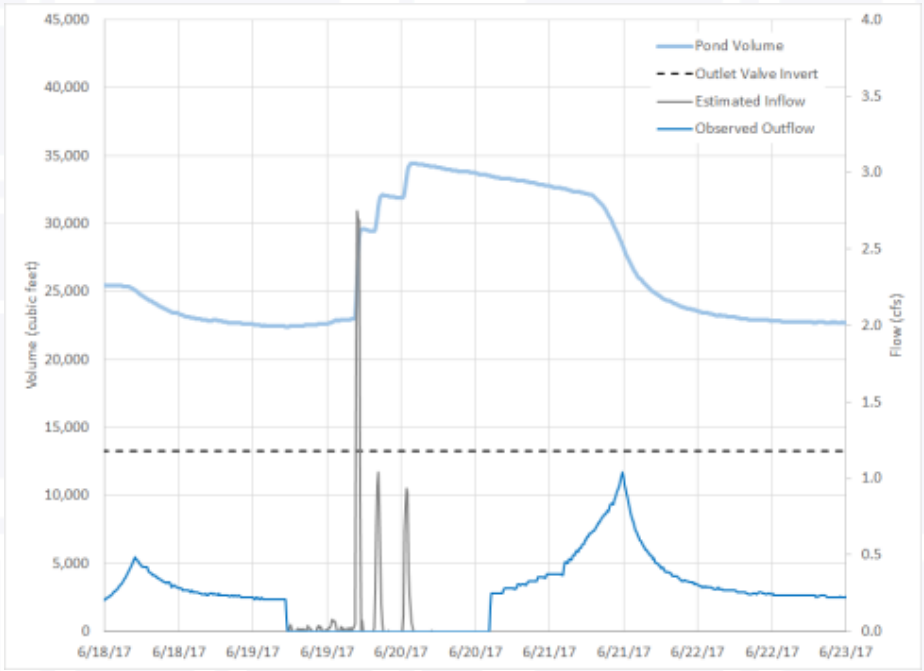
Actual: 1.59in

Opti

CHA

Performance Analysis - Hansen Alley





Summary Metrics

- Event Precipitation: 1.59 in
- Opti Wet Weather Flow: 0 ft^3 and 0 cfs max discharge
- Passive Wet Weather Flow: 11,800 ft^3 (90,000 gallons) and 0.89 cfs max discharge

Opti

CHA

Performance Analysis - Hansen Alley

Summary Results for Hansen Underground Cistern System
(4/1/2017 to 9/1/2017)

Total Precipitation: 22.6 in (NOAA)
Opti Rain Gauge: 21.84 in
Total Inflow: 120,000 ft^3*

	Opti - CMAC	Passive	Pre-construction
Wet Weather Flow	0 ft^3	87,000 ft^3 with 4" orifice** 111,000 ft^3 with 12" orifice	120,000 ft^3
Percent Wet Weather Flow Reduction	100%	27% with 4" orifice 7% with 12" orifice**	0%
Maximum Discharge Rate	**0 cfs in wet weather**	**0.43 cfs with 4" orifice** **2.46 cfs with 12" orifice**	**4.46 cfs**

* Total inflow based on mass balance and to does not include estimated exfiltration occurring above the liner

** 12" orifice is installed with Opti CMAC for the Hansen site

Opti

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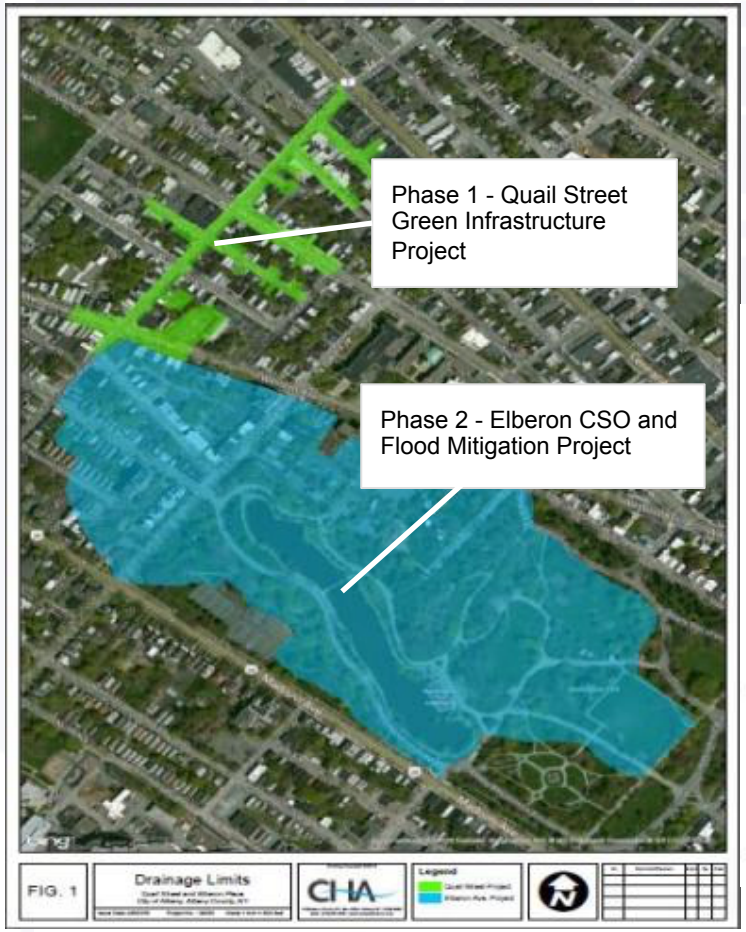
Washington Park Lake CSO Abatement and Flood Mitigation



Project particially funded by $1MM Water Quality Improvement Project (WQIP) grant from the NYS Department of Environmental Conservation (DEC) and $1.8MM grant through the NYS Environmental Facilities Corporation (EFC) Green Innovation Grant Program (GIGP)

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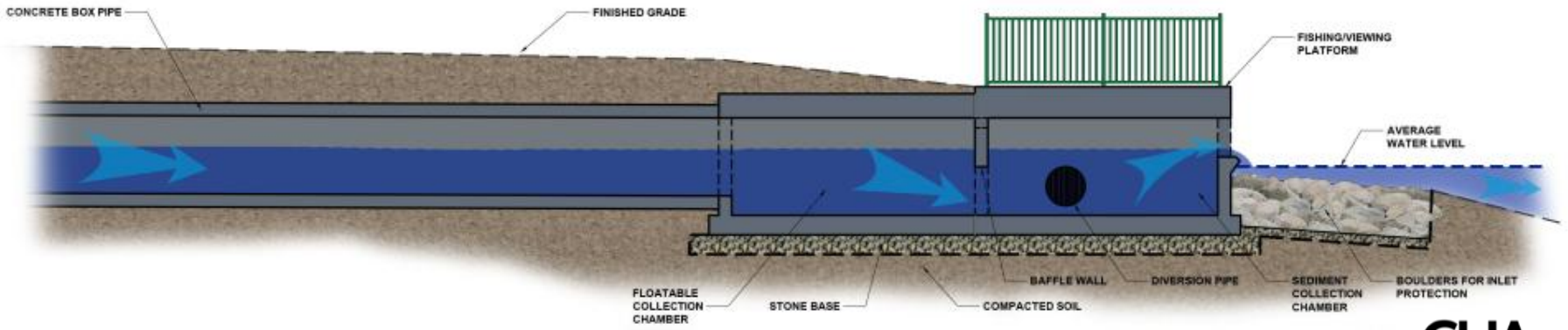
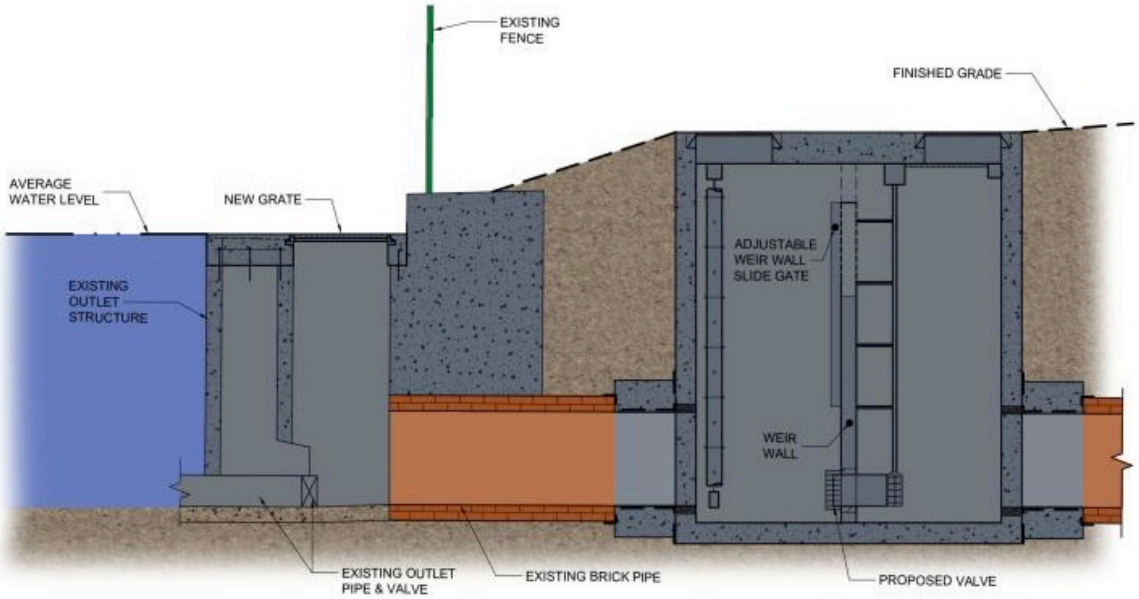
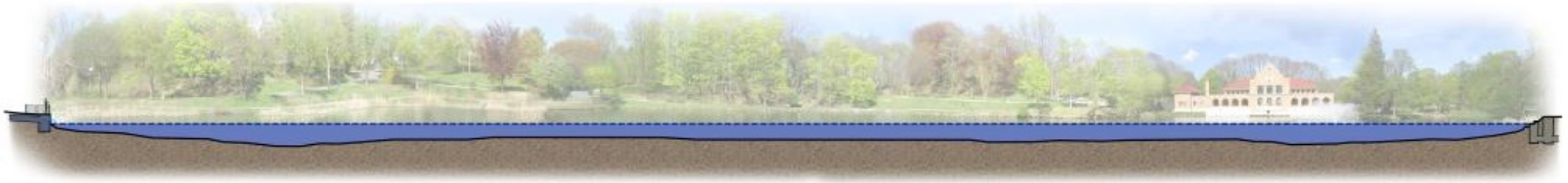
Washington Park Lake Inlet Configuration



Washington Park Lake CMAC Outlet Configuration

Re-establishes 7 million gallons of Beaver Creek floodplain storage





Washington Park Lake Logic Control

Pre-Event Planning based on NWS forecast	During Wet-Weather Event	Post-Event

Pre-Event 50% Volume Drawdown

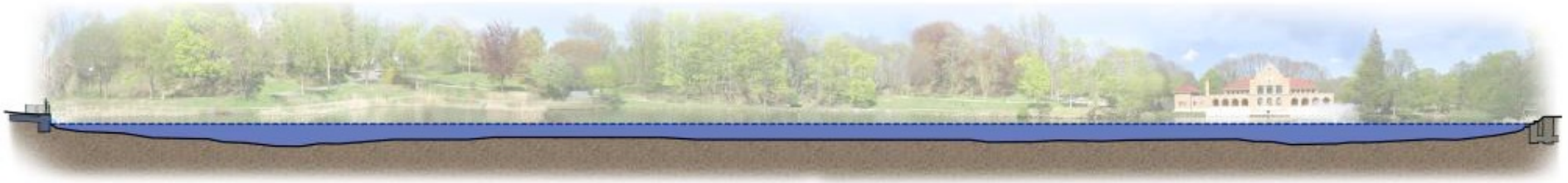
↓

Does the available storage exceed the forecasted runoff?

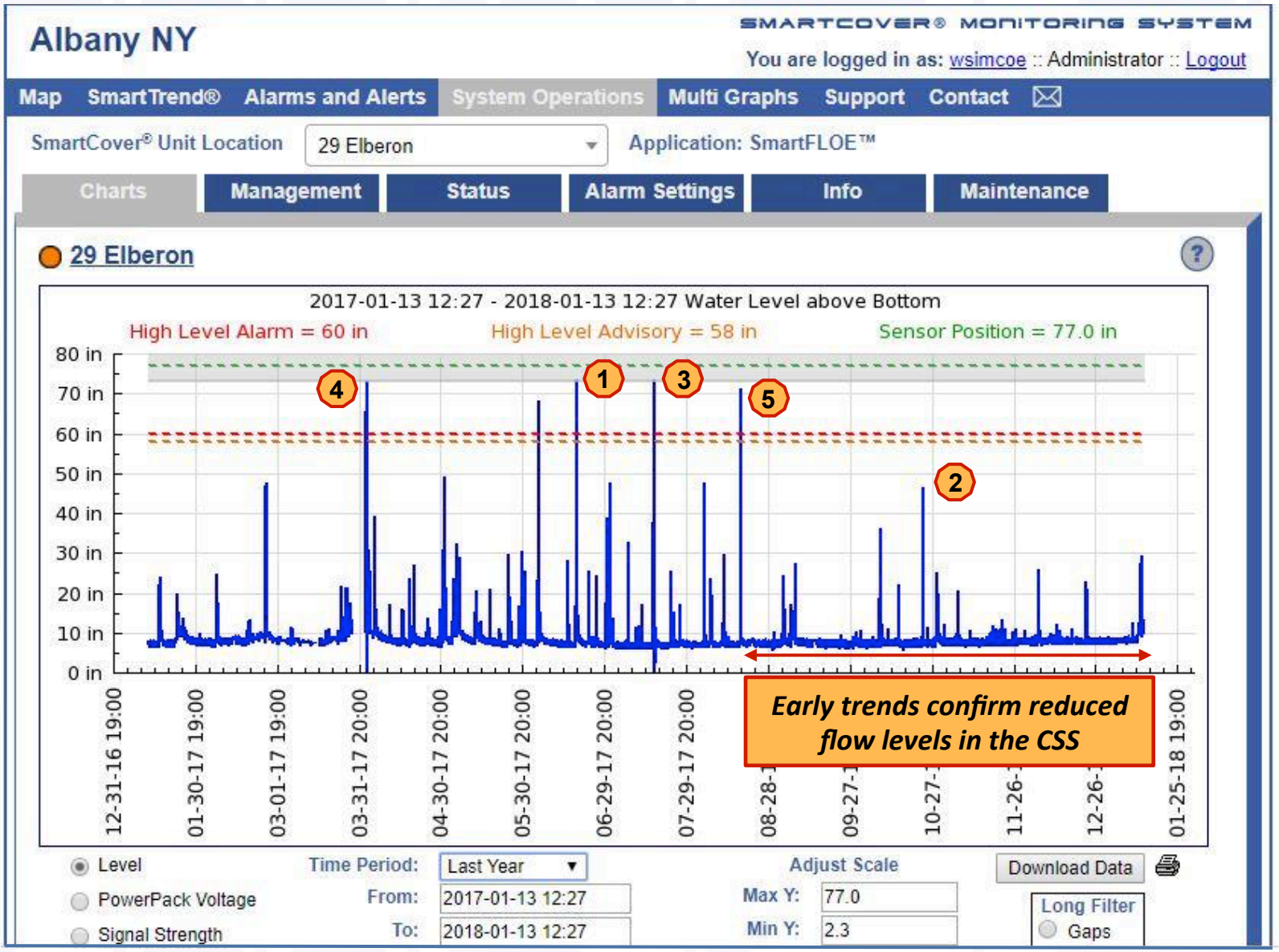
Yes → **No discharge during wet-weather event**

No → **Controlled release through actuated valve with passive high level overflow**

→ **Extended 24-Hour Programmed Discharge**



Elberon Place Water Level Data 2017



Next Steps

- Begin CMAC control of Washington Park Lake
- Integration of Opti controls with CSO monitoring equipment to inform discharge logic during dry-weather periods
- Incorporation of additional metering equipment for calibration of measures; and CSO recording and reporting purposes
- Retrofitting the Hansen regional cistern system to allow for stormwater re-use applications
- Evaluation of existing “traditional” passive storage systems
- Expansion of additional green infrastructure and/or CMAC elements to further enhance the performance of the system

Lessons Learned

- Building greater “performance and operation intelligence” can assist with prioritizing future capital investments, as well as providing improved LOS and means to measure results
- May wish to consider further calibration of the system control logic based on actual observed system response
- Use of CMACs further optimizes the operational performance of green infrastructure and storage elements
- CMACs can present cost-effective measures to enhance the performance of both existing facilities and new projects

Thanks to our Project Sponsors

The Beaver Creek CSO Abatement and Flood Mitigation Projects received the following grants:

- $2,250,000 in grants from the NYS Environmental Facilities Corporation (EFC) Green Innovation Grant Program (GIGP)
- $600,000 grant from the NYS EFC Integrated Solutions Construction (ISC) Program
- $1,000,000 grant from the NYS Depart. of Environmental Conservation (DEC) Water Quality Improvement Project (WQIP)
- $50,000 grant from the NYS DEC Sewerage Pollution Right to Know (SPRTK) Program

Questions & Contact

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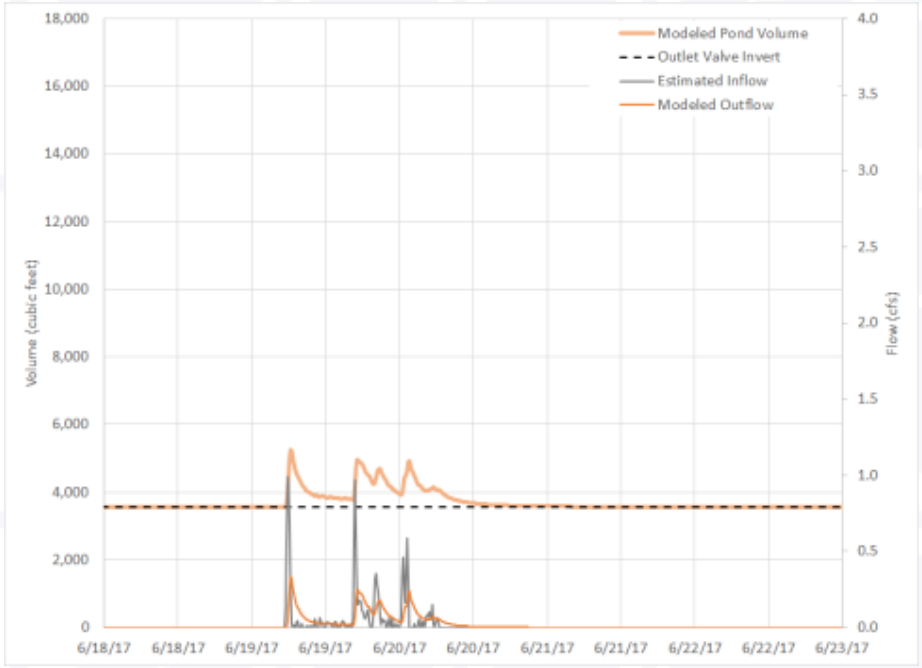
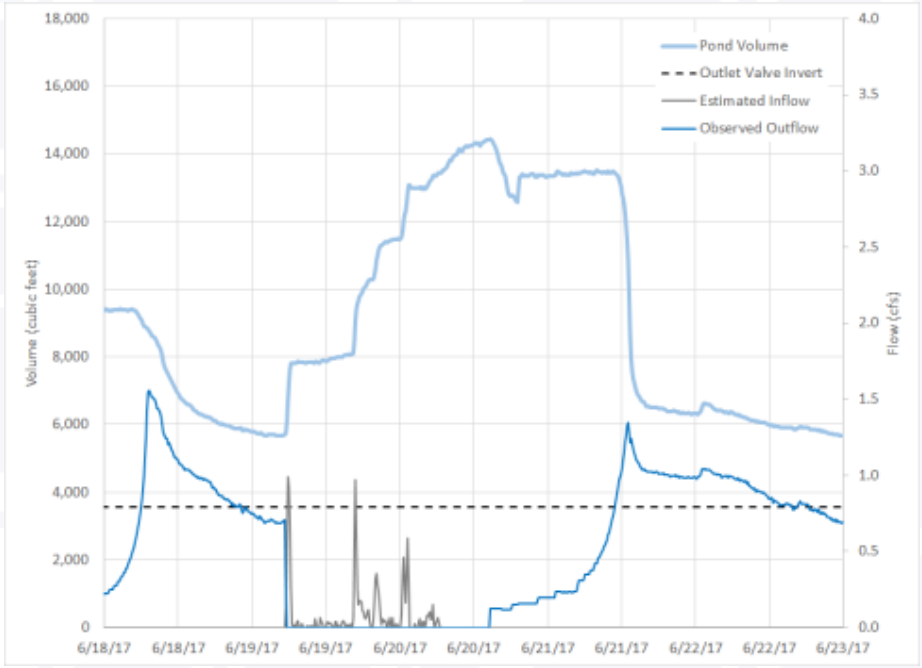
Bullpen Slides

Outline - Delete after completing deck

1. Introduction (Bill)
    a. Overview of Albany's watersheds and sewer districts
    b. Stormwater management challenges in Albany - water quality and flooding
2. Intelligence network - smart cities - optimize storage assets?
    a. Monitoring Data (i.e. Scada, Smart Cover, Meters)
    b. Adaptive Control (i.e. Opti)
3. Utilizing forecast-based controls (Mike)
    a. CMAC overview
    b. Beaver Creek CSO Abatement and Flood Mitigation Projects
        i. Storage elements and operational control logic
        ii. Performance analysis and dashboard screenshots
        iii. Calibrations
        iv. Value Proposition (cost, time)
4. Next steps
    a. Long-term vision in Albany (upcoming projects)
    b. Lessons for other municipalities

Ryckman Performance Analysis





Summary Metrics

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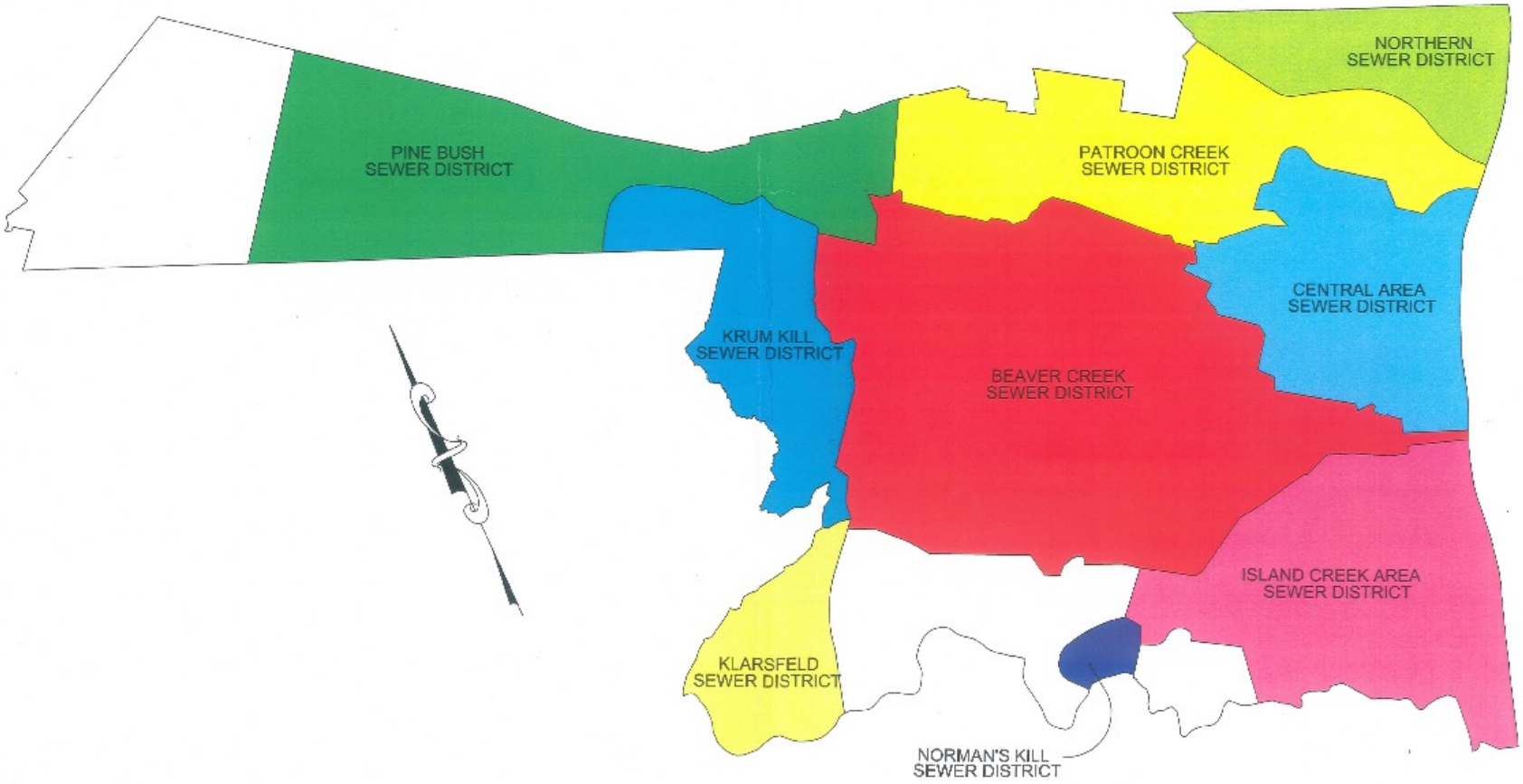
Opti Wet Weather Flow: 0 ft^3 and 0 cfs max discharge

Passive Wet Weather Flow: 7,800 ft^3 and 0.31 cfs max discharge

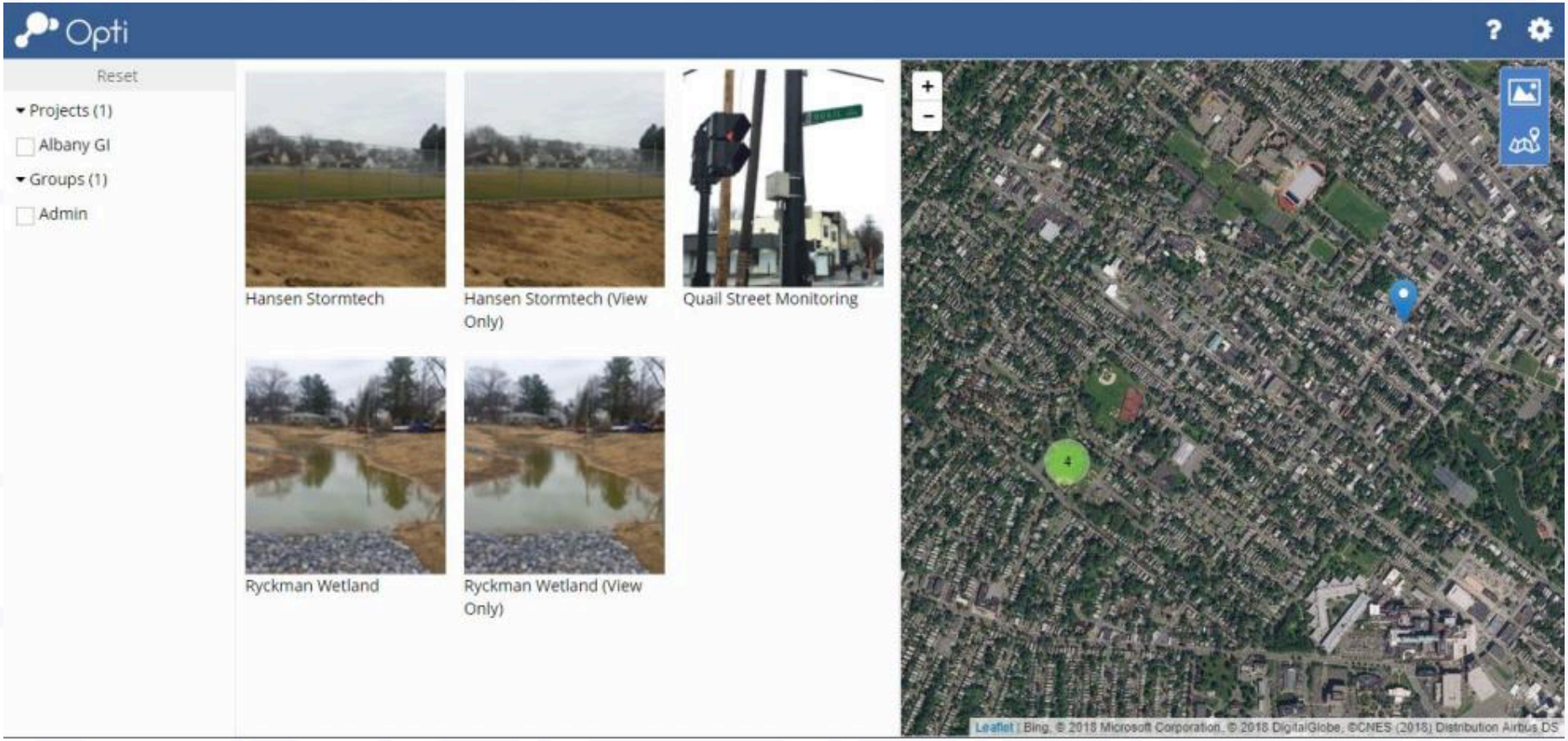
City of Albany Sewer Districts



Building Performance Intelligence

- Utilizing smart-infrastructure principals to better understand system performance and wet-weather response
  - Consolidation and management of traditional SCADA system data
  - Deployment of in-system monitors (i.e., Smartcovers, pressure sensors, soil moisture probes) within critical reaches or elements of the system
  - Installation of metering equipment to record flows and for reporting requirements for CSO discharges under the Sewage Pollution Right to Know (SPRTK) Act
  - Utilize “performance intelligence” to identify problems or operational issues, evaluate the effectiveness of constructed practices and for the design of future mitigation projects

Web-Based CMAC Dashboard



Next Steps

- Begin CMAC control of Washington Park Lake
- Integrate Opti controls with information from CSO monitoring equipment to release based upon the water level at the combined sewer overflow dams
- Install additional SmartCovers at CSO regulators and Opti controls at key locations, such as the Big C CSO regulator
-
- Implement additional flood control projects in the City, the next areas of priority being Hackett Blvd and Sheridan Avenue
- Retrofit existing storage system(s) with Opti Controls, such as Beaver Creek I (165,000 CF)