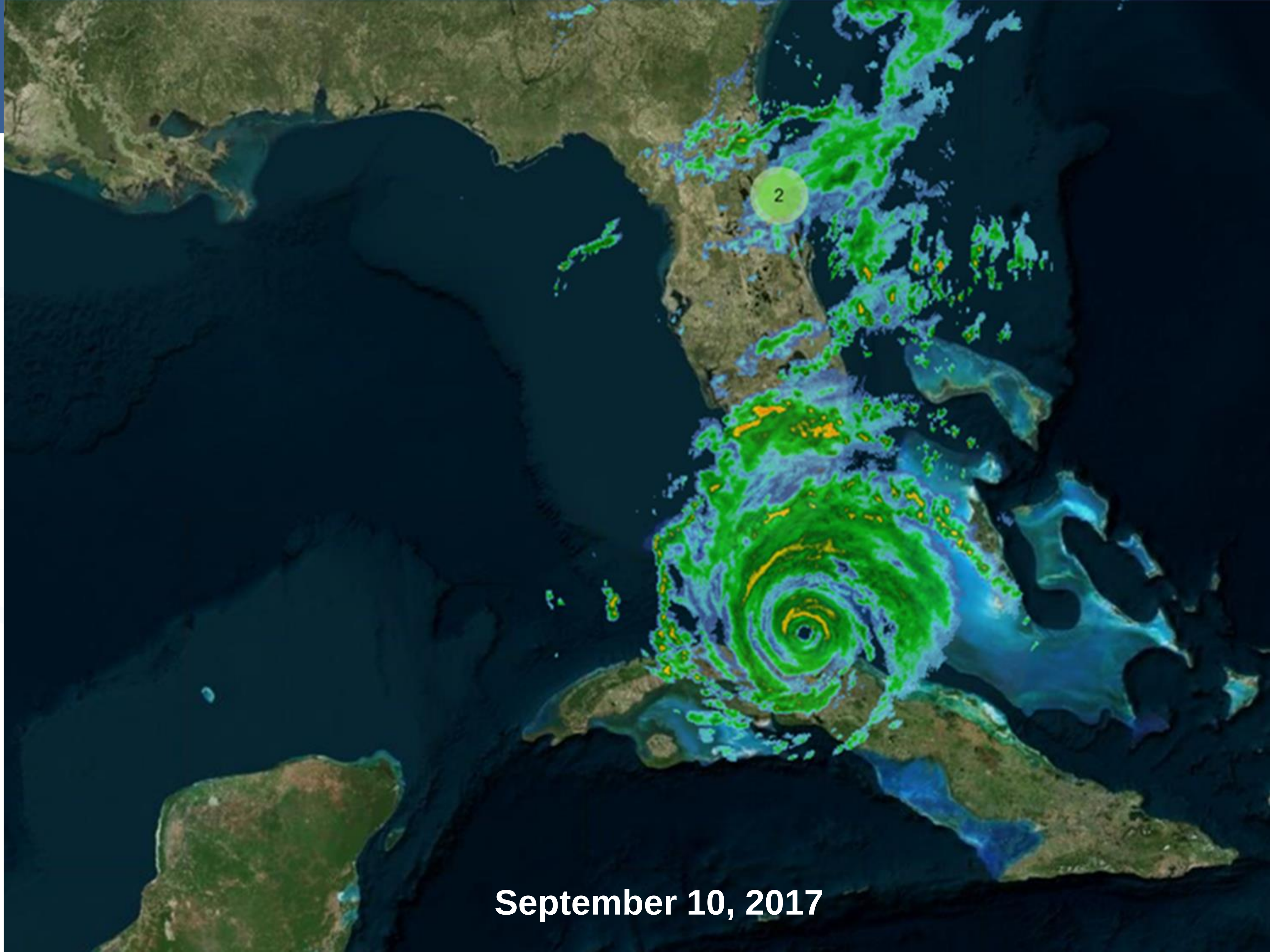
Opti

Reducing Flooding and Combined Sewer Overflows, Improving Water Quality, and Restoring Ecological Flows with Continuous Monitoring and Adaptive Control

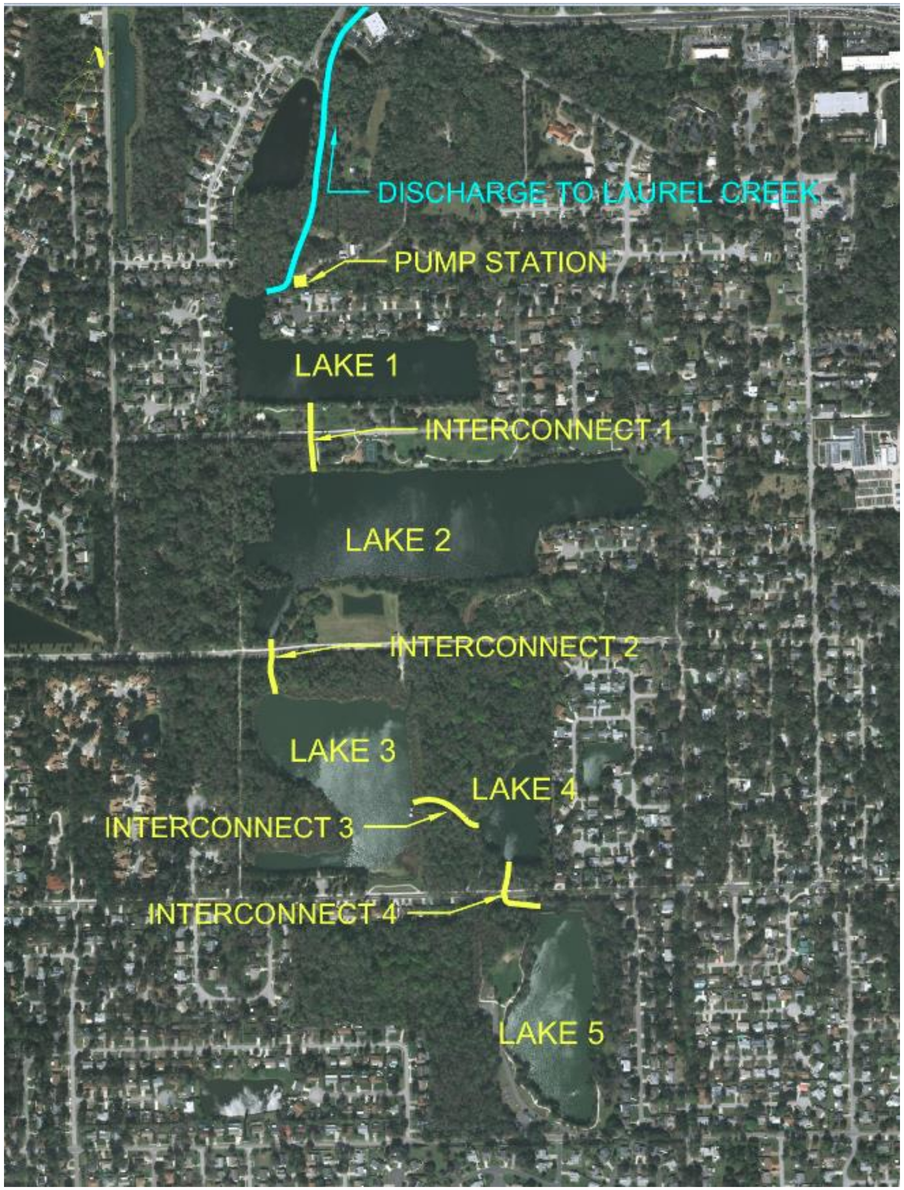


September 10, 2017

2009 flood, a historic storm event in Ormond Beach

Central Lakes, City of Ormond Beach

- 550-acre drainage basin
- 5 interconnected lakes
- Single family developments
- Pumps at Lake 1

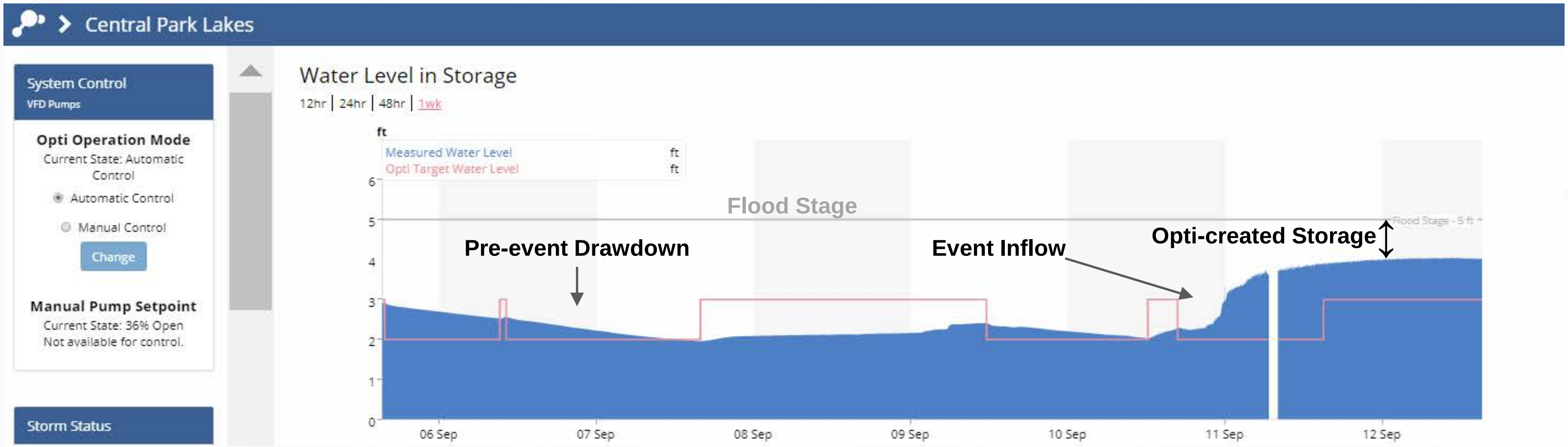


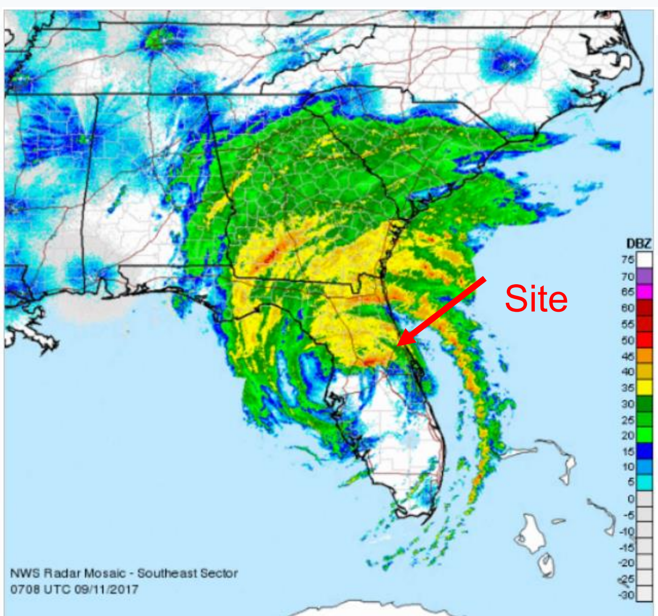
What is the status of my stormwater infrastructure?

What needs to be done in preparation of the event?

What resources do we need for emergency operations?

Ormond Beach Florida
Opti Prevented Flooding During Hurricane Irma





Based on forecasts, Ormond Beach used Opti to discharge ~70 ac-ft of storage from their lakes prior to the hurricane hitting.

The hurricane's torrential rains added 190 ac-ft of new water, which would have otherwise overwhelmed the water storage system.

Opti saved the City from projected flooded roads, and if the original forecast had hit, millions of dollars of averted flood damage

Background

Opti is a technology company focused on

Improving Water Quality

Reducing Flooding and Combined Sewer Overflows

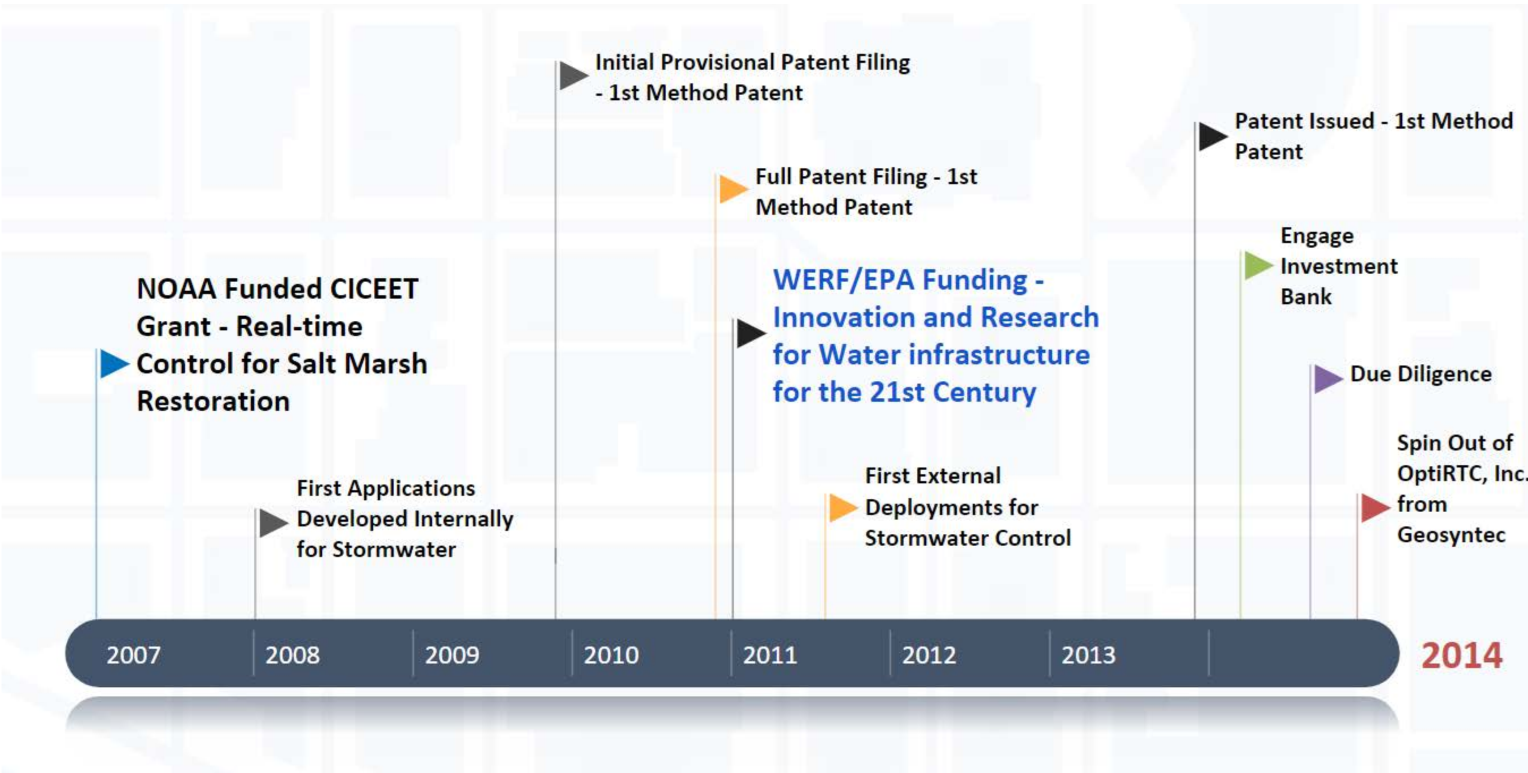
and Restoring Ecological Flows

through

Continuous Monitoring and Adaptive Control (CMAC)

of stormwater infrastructure

Brief History of Technology Development and Commercialization Timeline

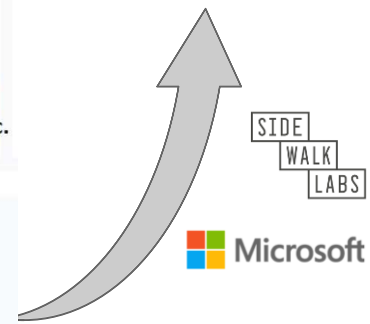


>130 projects across 21 states

>90 MG under management

>1B gal of wet weather flow being prevented per year

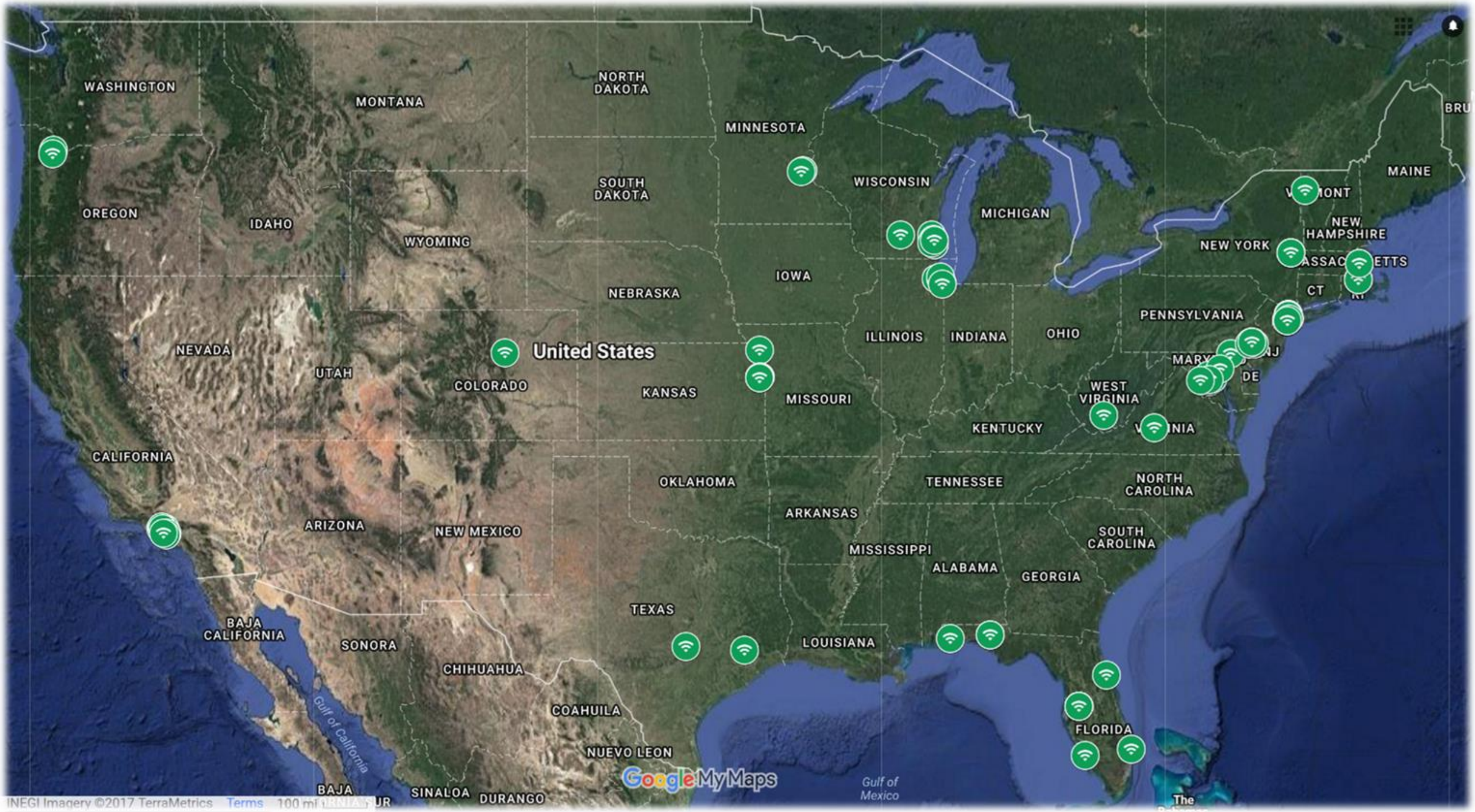
2018



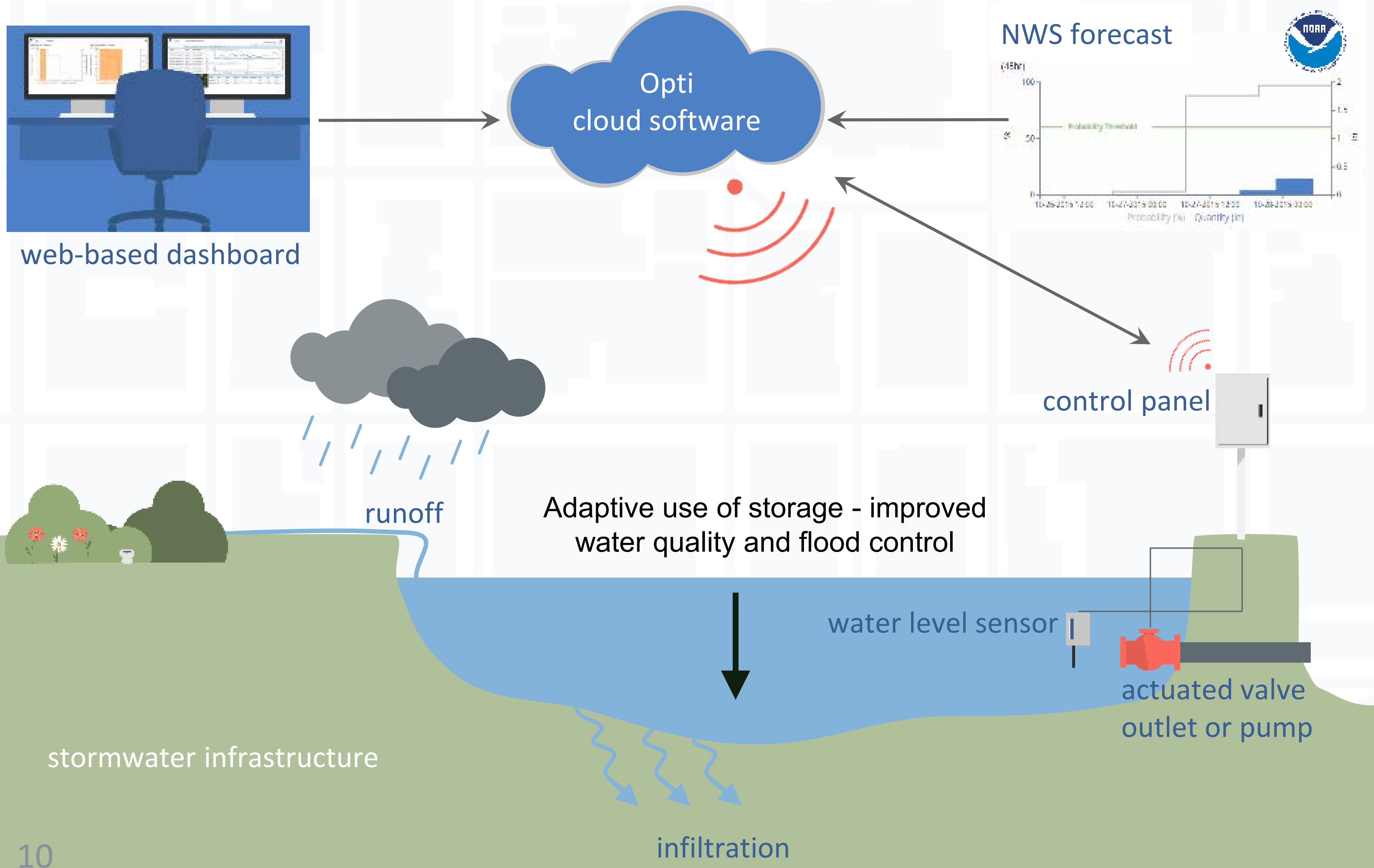
Between 2014 and 2018 over $14MM invested in the development of Opti

Directly Benefiting Communities, Creating Local Jobs

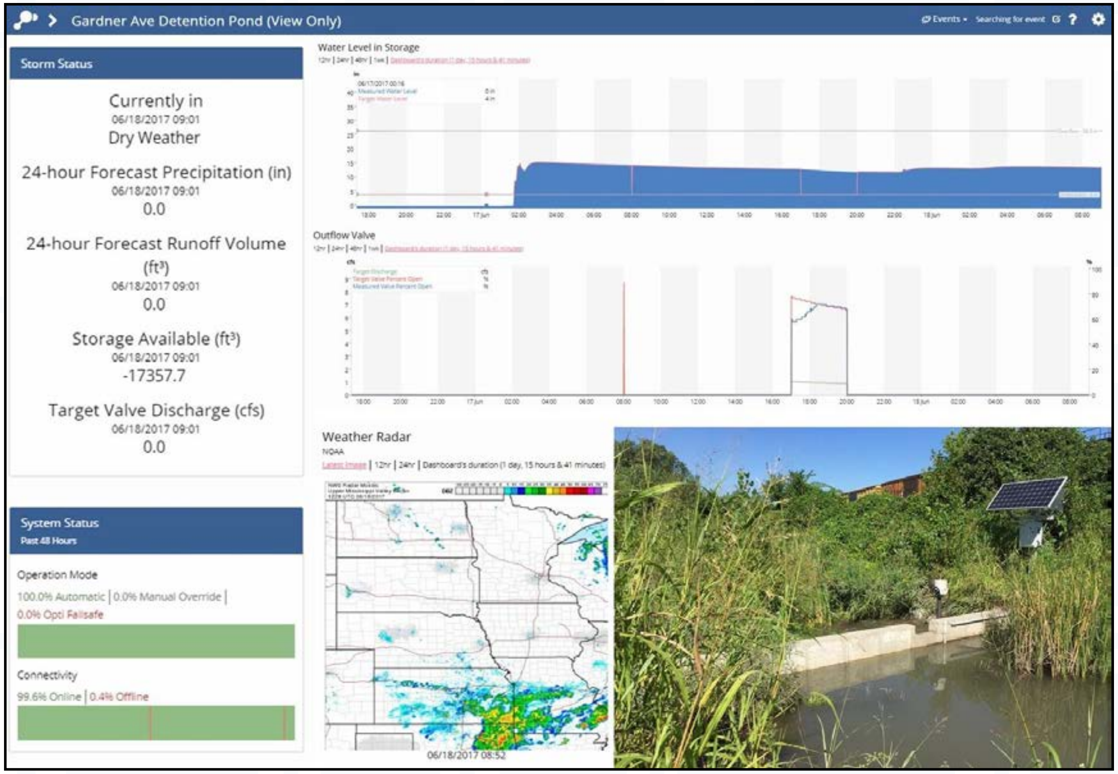
The Opti Community



How Continuous Monitoring and Adaptive Control works



Cloud-Hosted Software

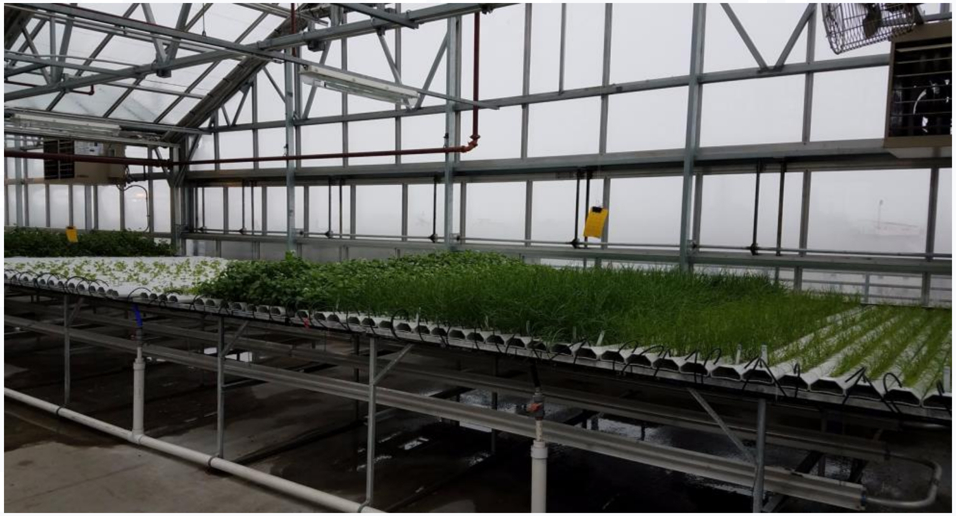


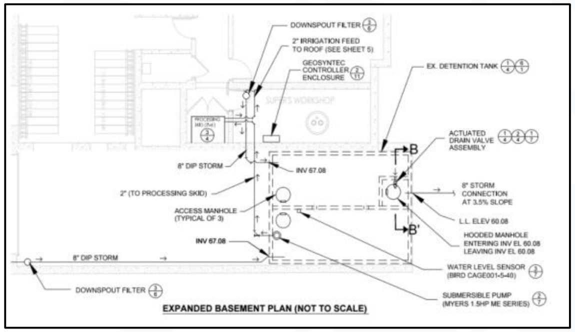
Integrated Hardware

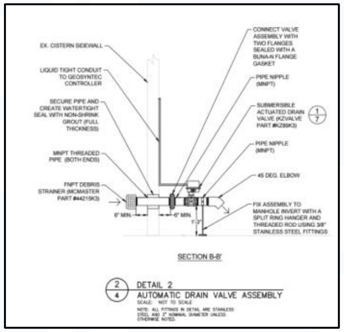
Example of CMAC Hardware in Suburban Setting
Pond Retrofit

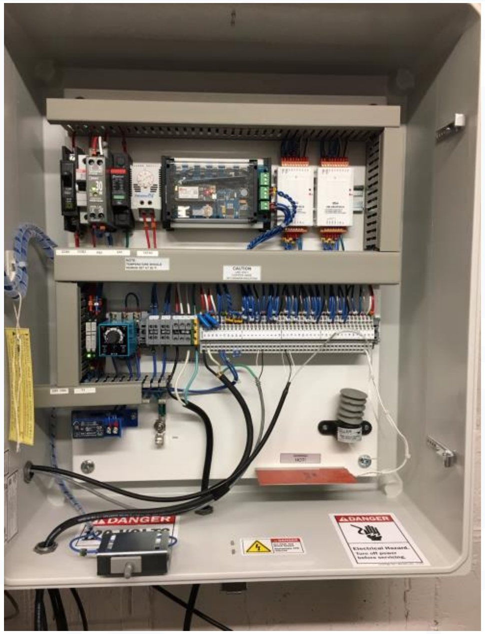
Example of CMAC in an Ultra Urban Setting
Forest House - The Bronx, NYC

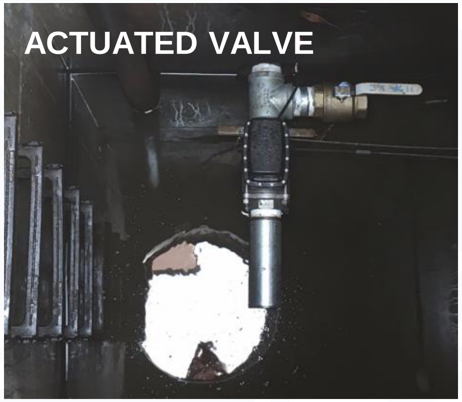
Utilize Underground Detention Basin for CSO Mitigation and Rainwater Harvesting



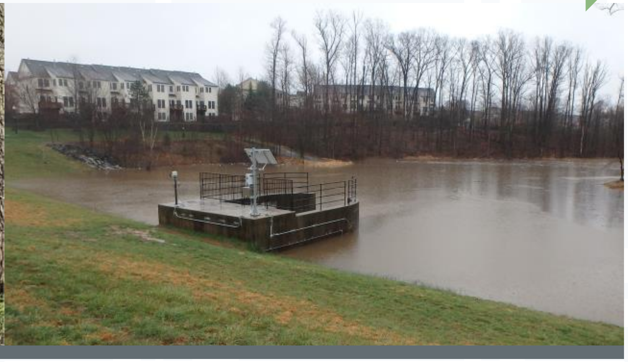




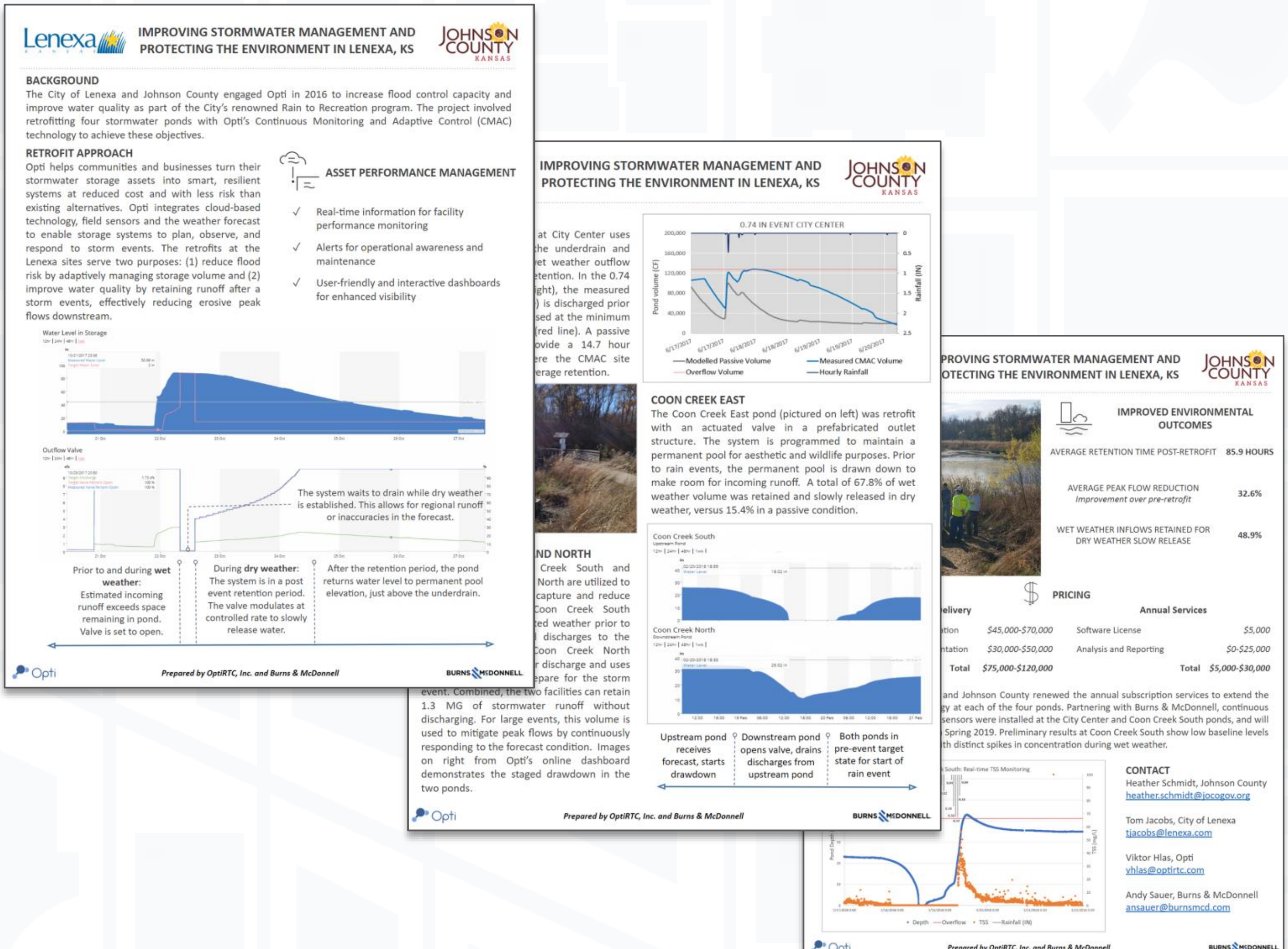




Range of CMAC Applications and Scales

Small	Medium	Large
		
Application Water Reuse and Water Quality **Scale** Residential (gallons)	**Application** Water Quality and CSO **Scale** Development (cubic feet)	**Application** Flood Control and CSO **Scale** Regional (acre feet)

Automated Reporting – Example from Lenexa, KS



Lenexa KANSAS

IMPROVING STORMWATER MANAGEMENT AND PROTECTING THE ENVIRONMENT IN LENEXA, KS

JOHNSON COUNTY KANSAS

BACKGROUND

The City of Lenexa and Johnson County engaged Opti in 2016 to increase flood control capacity and improve water quality as part of the City's renowned Rain to Recreation program. The project involved retrofitting four stormwater ponds with Opti's Continuous Monitoring and Adaptive Control (CMAC) technology to achieve these objectives.

RETROFIT APPROACH

Opti helps communities and businesses turn their stormwater storage assets into smart, resilient systems at reduced cost and with less risk than existing alternatives. Opti integrates cloud-based technology, field sensors and the weather forecast to enable storage systems to plan, observe, and respond to storm events. The retrofits at the Lenexa sites serve two purposes: (1) reduce flood risk by adaptively managing storage volume and (2) improve water quality by retaining runoff after a storm events, effectively reducing erosive peak flows downstream.

ASSET PERFORMANCE MANAGEMENT

- ✓ Real-time information for facility performance monitoring
- ✓ Alerts for operational awareness and maintenance
- ✓ User-friendly and interactive dashboards for enhanced visibility

Opti — *Prepared by OptiRTC, Inc. and Burns & McDonnell* — BURNS & McDONNELL

IMPROVING STORMWATER MANAGEMENT AND PROTECTING THE ENVIRONMENT IN LENEXA, KS

JOHNSON COUNTY KANSAS

...at City Center uses the underdrain and ...et weather outflow ...tention. In the 0.74 ...ght), the measured ...) is discharged prior ...sed at the minimum ...red line). A passive ...ovide a 14.7 hour ...re the CMAC site ...erage retention.

COON CREEK EAST

The Coon Creek East pond (pictured on left) was retrofit with an actuated valve in a prefabricated outlet structure. The system is programmed to maintain a permanent pool for aesthetic and wildlife purposes. Prior to rain events, the permanent pool is drawn down to make room for incoming runoff. A total of 67.8% of wet weather volume was retained and slowly released in dry weather, versus 15.4% in a passive condition.

...ND NORTH

...Creek South and ...North are utilized to ...capture and reduce ...Coon Creek South ...ted weather prior to ...discharges to the ...Coon Creek North ...r discharge and uses ...pare for the storm event. Combined, the two facilities can retain 1.3 MG of stormwater runoff without discharging. For large events, this volume is used to mitigate peak flows by continuously responding to the forecast condition. Images on right from Opti's online dashboard demonstrates the staged drawdown in the two ponds.

Opti — *Prepared by OptiRTC, Inc. and Burns & McDonnell* — BURNS & McDONNELL

...PROVING STORMWATER MANAGEMENT AND ...OTECTING THE ENVIRONMENT IN LENEXA, KS

JOHNSON COUNTY KANSAS

IMPROVED ENVIRONMENTAL OUTCOMES

AVERAGE RETENTION TIME POST-RETROFIT	85.9 HOURS
AVERAGE PEAK FLOW REDUCTION *Improvement over pre-retrofit*	32.6%
WET WEATHER INFLOWS RETAINED FOR DRY WEATHER SLOW RELEASE	48.9%

PRICING

...elivery		Annual Services	
...tion	$45,000-$70,000	Software License	$5,000
...ntation	$30,000-$50,000	Analysis and Reporting	$0-$25,000
Total	$75,000-$120,000	Total	$5,000-$30,000

...and Johnson County renewed the annual subscription services to extend the ...gy at each of the four ponds. Partnering with Burns & McDonnell, continuous ...sensors were installed at the City Center and Coon Creek South ponds, and will ...Spring 2019. Preliminary results at Coon Creek South show low baseline levels ...th distinct spikes in concentration during wet weather.

CONTACT

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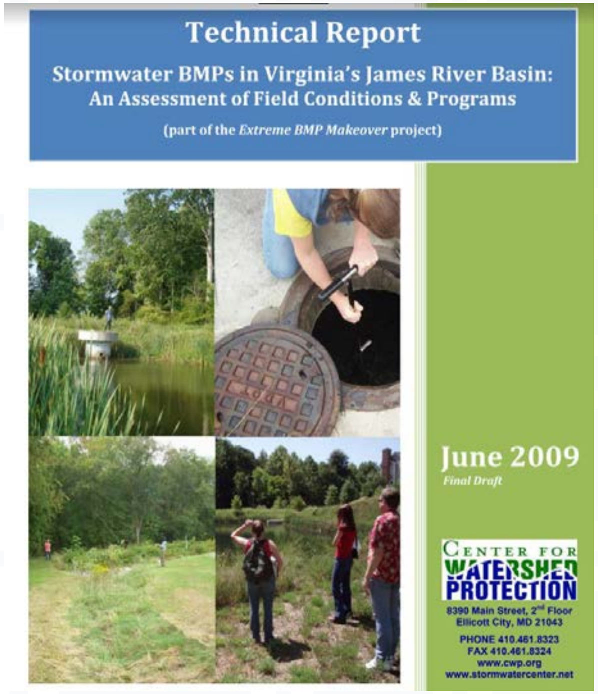
BMPs can't function if they don't work: Increased uptime and decreased risk with continuous monitoring



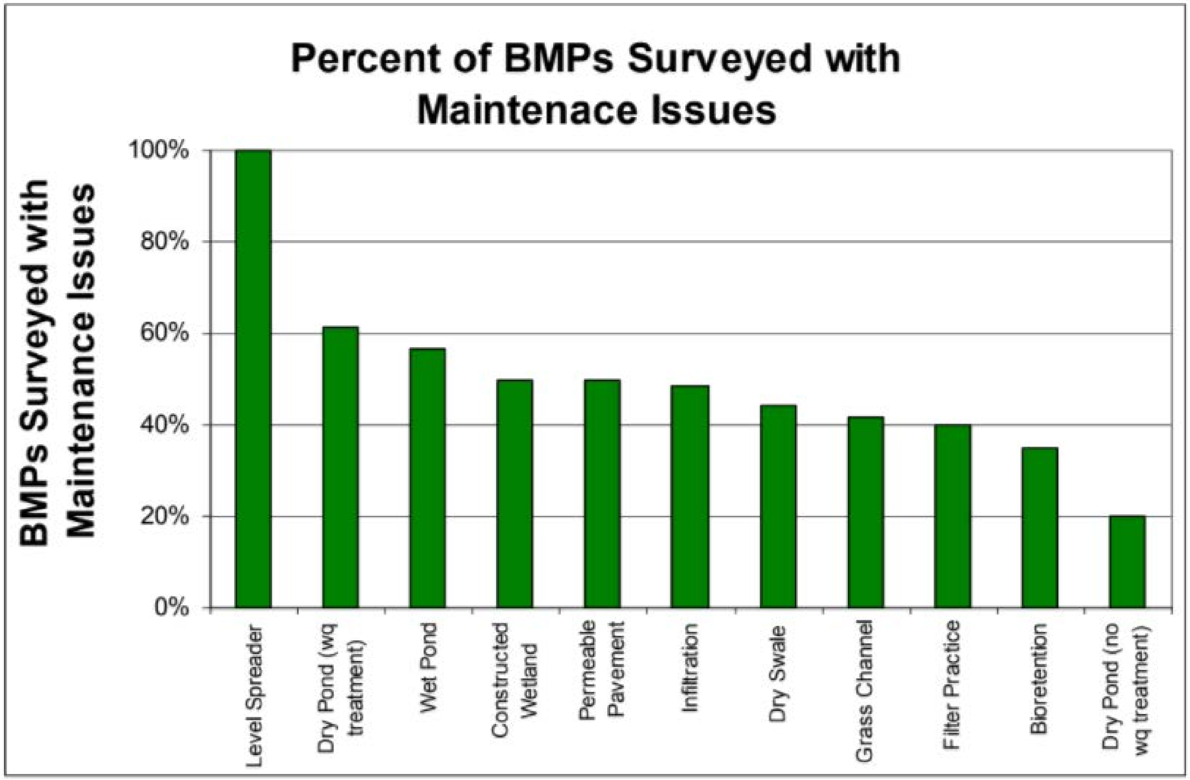


Figure 20. Percent of BMPs surveyed with maintenance issues by BMP type (n=87).

Case Study: CMAC on Cintas Property for CSO Mitigation - Philadelphia

8-acre Drainage Area
Adaptively Controlled Retention

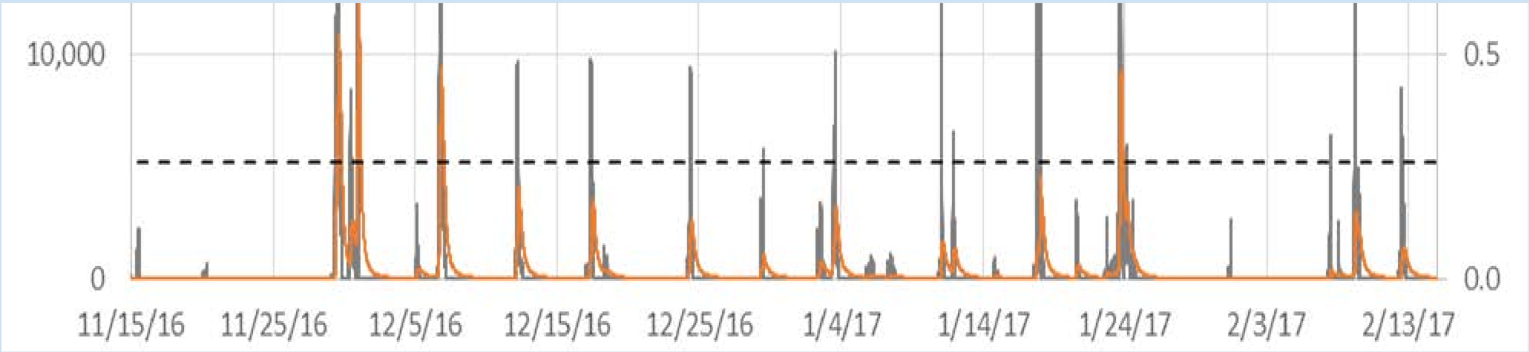
Opti

PHILADELPHIA WATER

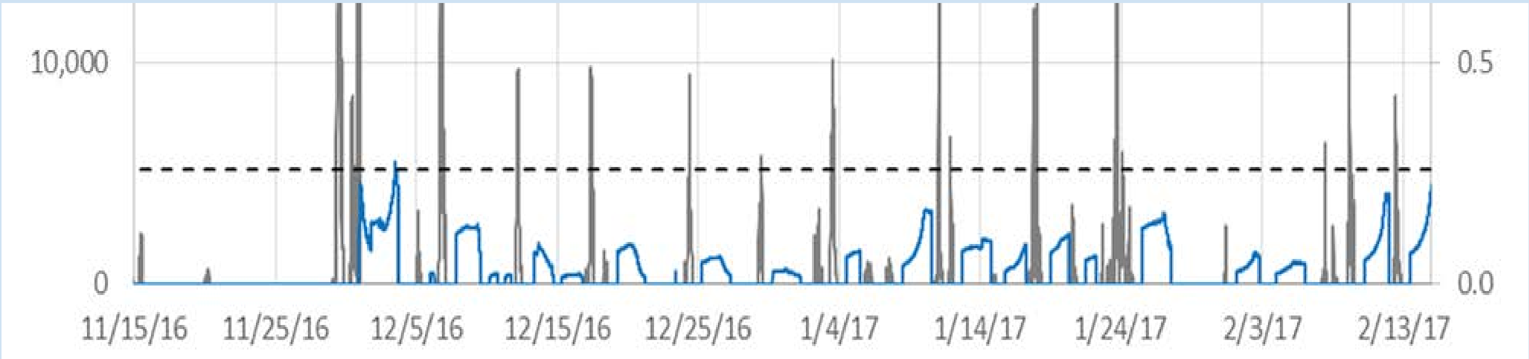
Case Study: CMAC Cintas Property - Philadelphia

Project Timeline (award to run)	**6 months**
Incremental Benefit	**3.3 Green Acres**
Capital Cost	**$48,000/GA**
Net Savings for Cintas	**~$17,000/yr**

Case Study: CMAC at Cintas Property - Philadelphia



Modeled flows with passive outlet control



Observed flows with Opti system control

CMAC resulted in a **96% reduction** in wet weather flow volume (1.01M gallons of runoff to 40K gallons)

Case Study: Beaver Creek Sewershed- Albany, NY

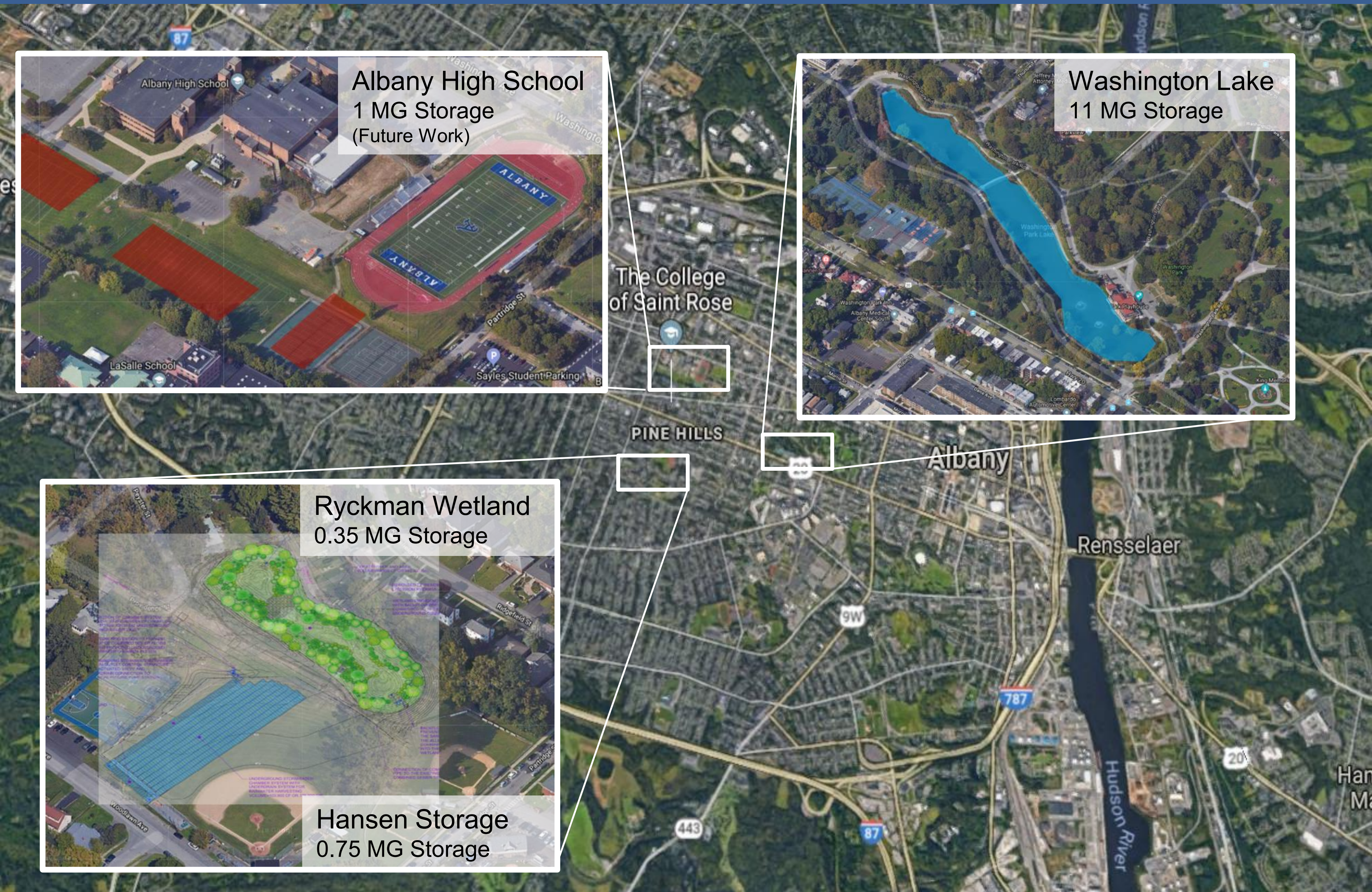
Adaptively Controlled On-site Detention for CSO Control

Opti

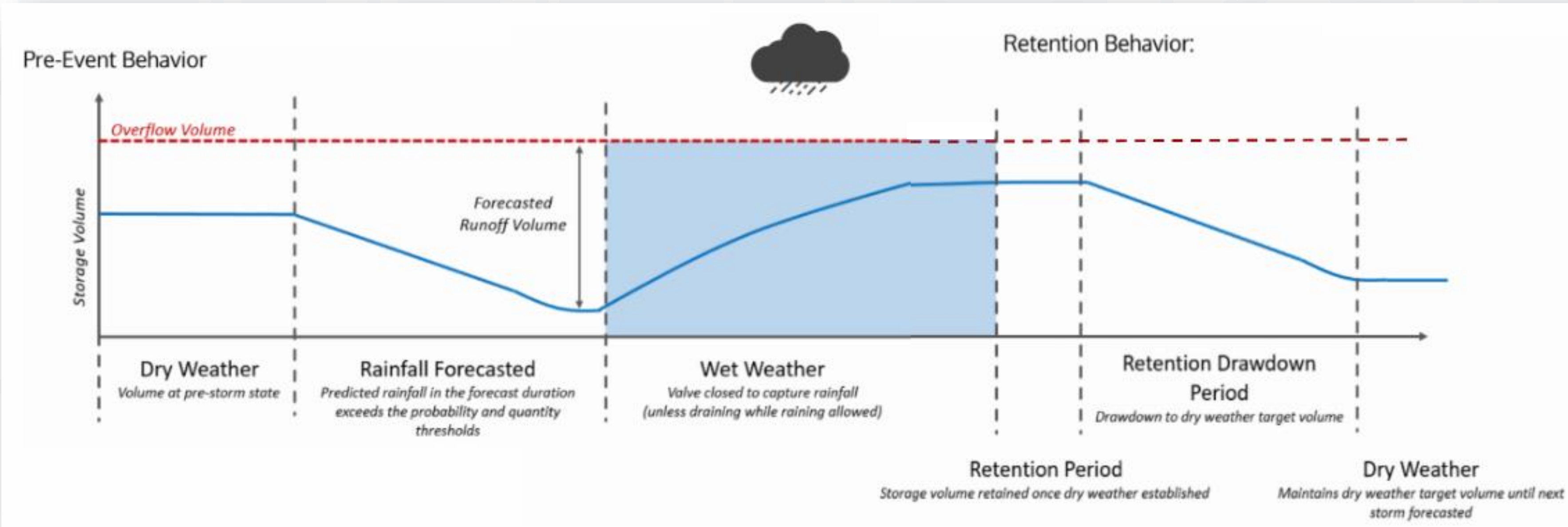
CITY OF ALBANY WATER DEPT.

CHA design/construction solutions

Controlled Assets in Beaver Creek Sewershed

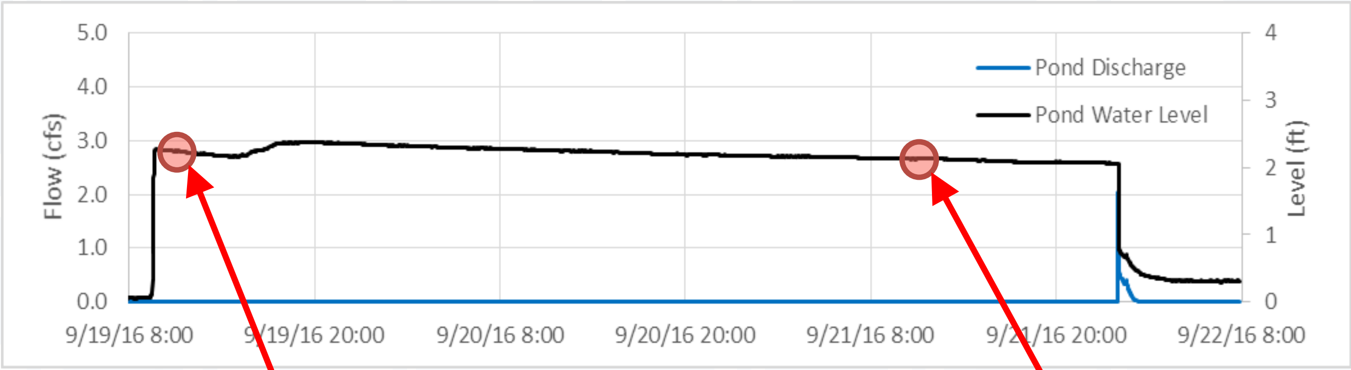


CMAC Behavior Modes



Albany CMAC Sites are Configured to Reduce Wet Weather Runoff

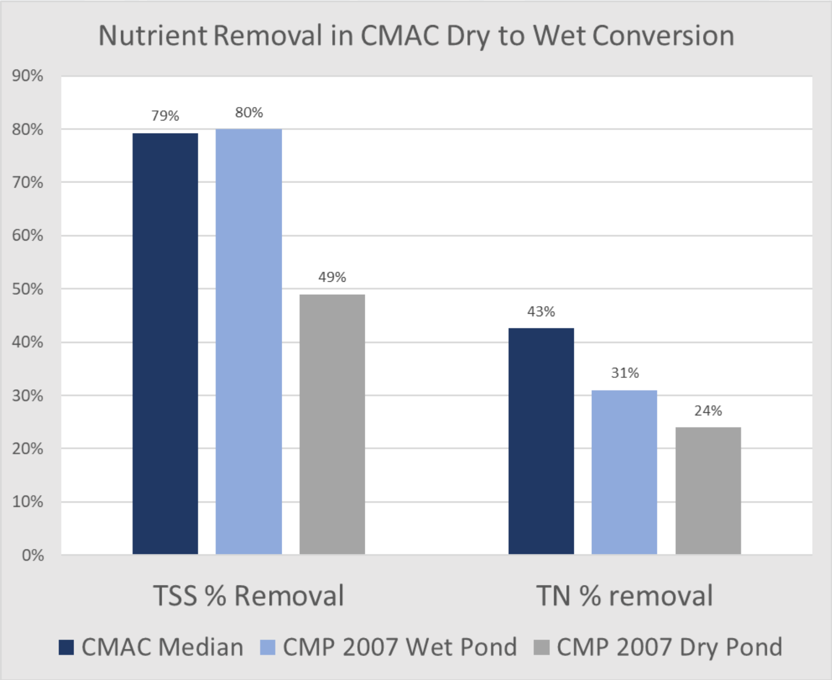
Case Study - Water Quality - Prince George's County - Frost Pond
CMAC Performance During a Single Rainfall Event



9/19/2016 9:35AM

9/21/2016 10:04AM

Frost Pond Water Quality Sampling



CMAC Median compared to the median reported from Center for Watershed Protection (CWP). 2007. National Pollutant Removal Performance Database Version 3.0. Center for Watershed Protection, Ellicott City, MD.

Opti

How can CMAC fit into a Stormwater Plan?

Offset and/or reduce capex by optimizing existing storage assets of all types

a. Improve water quality or hydrologic function
b. Adaptively control urban hydrology (e.g., timing, peak flows, volumes, flow rates)
c. Restore ecological flows to protect streams and built infrastructure

Reduce capex for building new green and grey infrastructure

a. Adaptively controlled facilities can be smaller while also exceeding the performance of passive traditional systems.
b. Use storage for more than one purpose (e.g., rainwater harvesting AND effective reliable flow control). Can cut capex >50%.

Reduce opex

a. Target zero unplanned maintenance of green and grey infrastructure
b. Continuous monitoring of functions and outcomes (e.g., failure monitoring, performance monitoring)
c. Cameras as out-of bandwidth sensor and secondary source of truth

Invest in eco-services and quality-of-life with savings and/or deliver some of the benefits to meet multiple objectives

Directly connect communities to resources

a. Transparency of outcomes through continuous monitoring
b. Public outreach and education

Support and drive local blue tech job creation

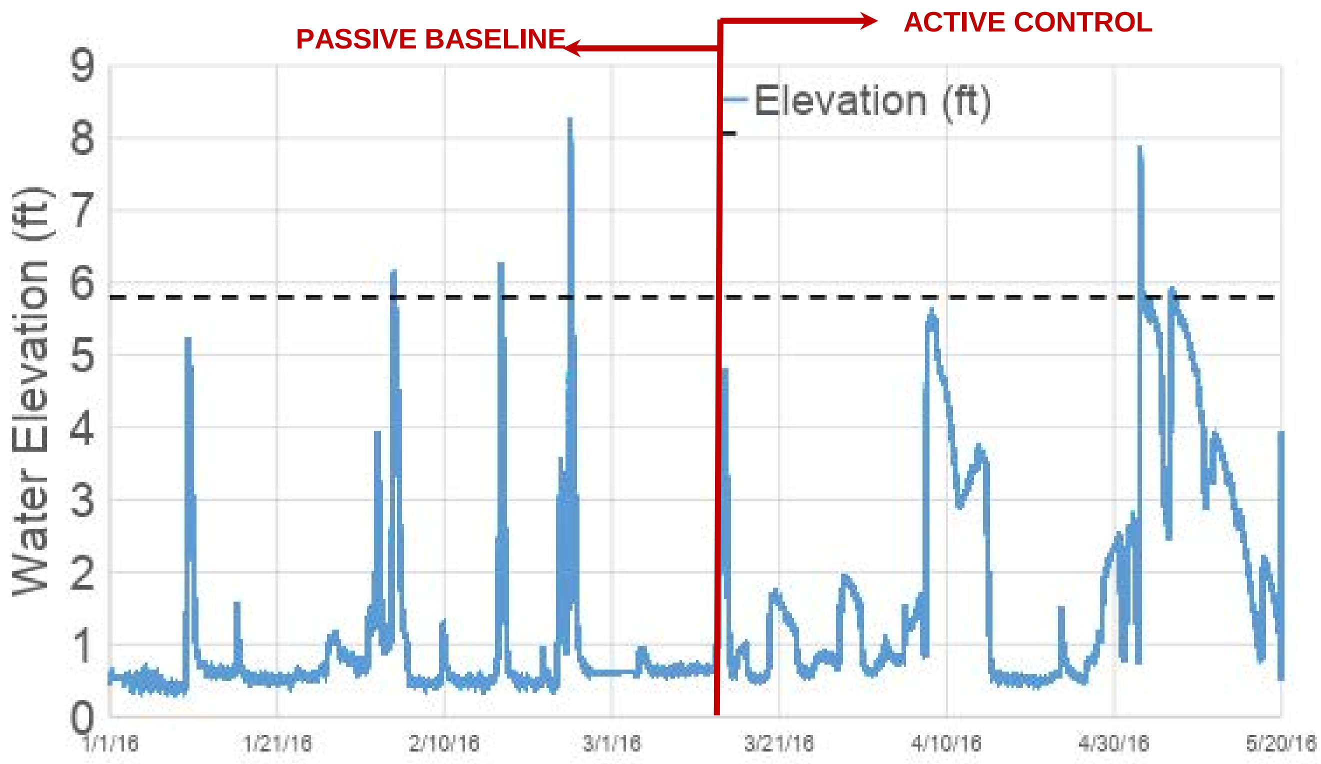
a. High-wage job growth, creation, and training

Case Study: Montgomery County, MD
peak flow reduction + water quality

15 ac-ft
Adaptively Controlled Detention/Retention

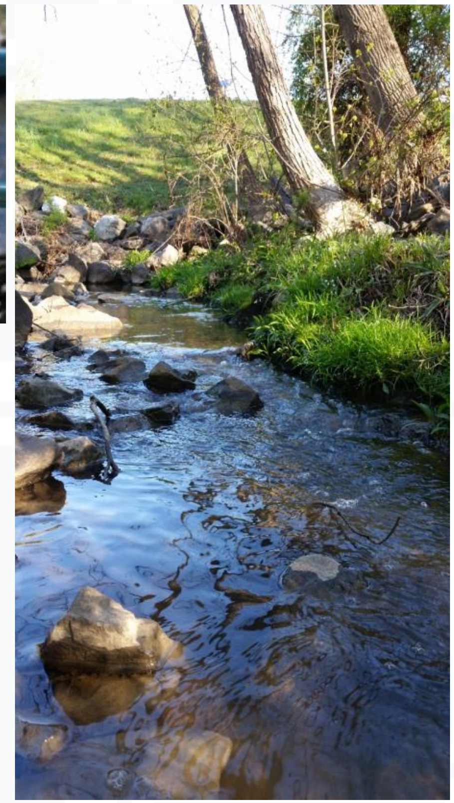
University Blvd Wet Pond – Montgomery County, MD

Passive vs. Active



University Blvd Wet Pond	
Passive	15.8 hrs
Active	39.0 hrs

University Blvd Wet Pond – Montgomery County, MD



- 440 acre drainage; 36% imp.
- 15 ac-ft wet pond
- In line on Sligo Creek
- Retrofit December 2015
- Impaired for nutrients and sediment

Passive vs. Active