HURRICANE IAN OS | EXPERTS TRY TO HOLD BACK FLOODS DURING HISTORIC RAINS

NOVEMBER 17, 2022

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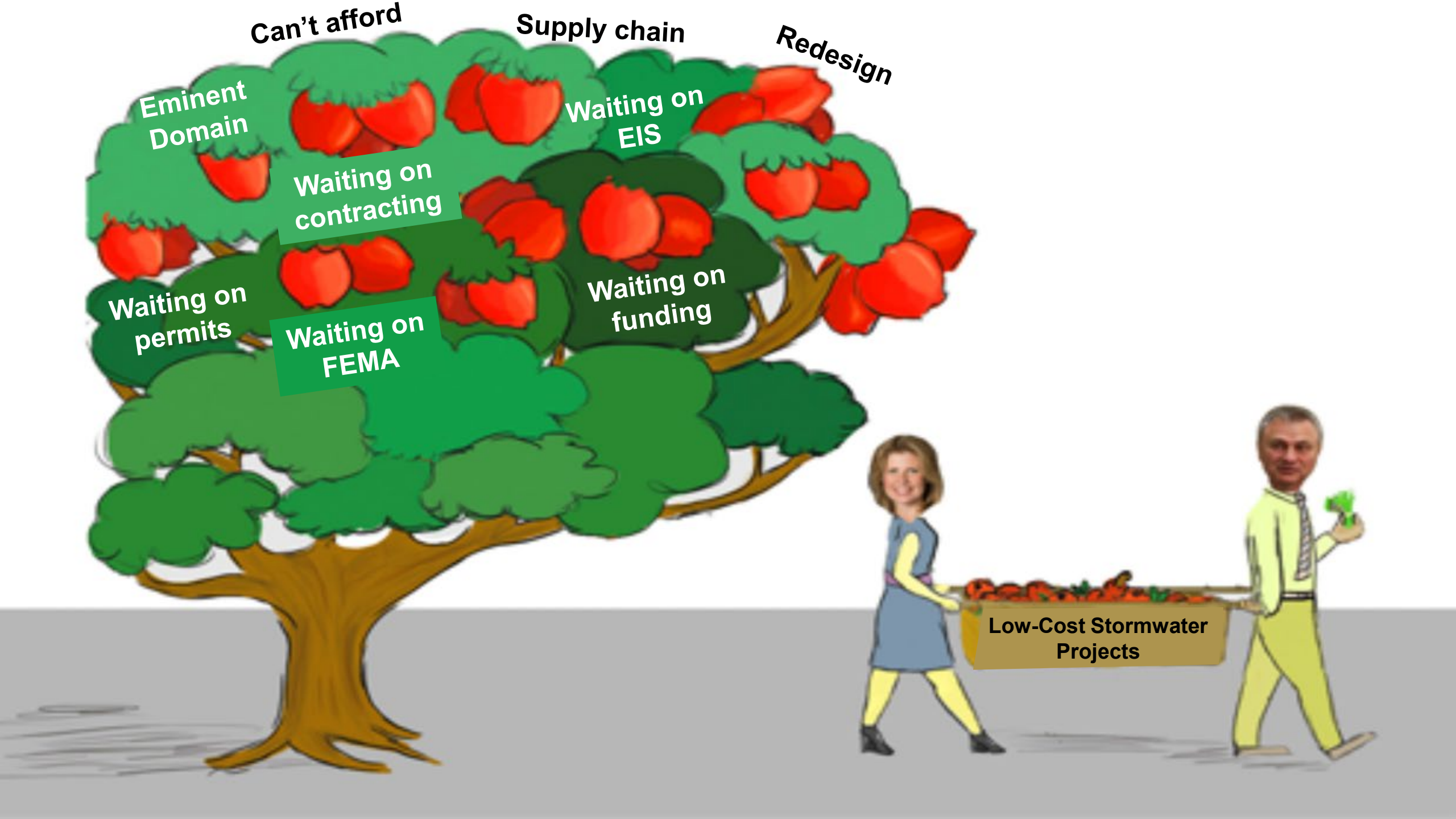
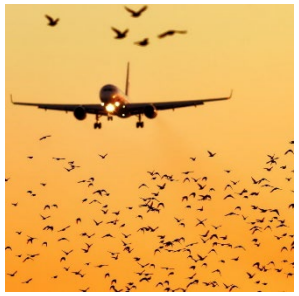
If Orlando Flooded After Ian, Are Other Cities Safe?

By Trevor Fraser

Mid-state lakes and retention ponds couldn't handle Hurricane Ian's deluge, leading other Fla. leaders to wonder how vulnerable their city is to a changing climate.


Can't afford
Supply chain
Redesign
Eminent Domain
Waiting on EIS
Waiting on contracting
Waiting on permits
Waiting on FEMA
Waiting on funding
Low-Cost Stormwater Projects



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Smart Stormwater Ponds

Meeting ~~tomorrow's~~ today's stormwater challenges today.

(Rethinking Stormwater)

Jeff Littlejohn, P.E.

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Addressing Stormwater Challenges

Resilience & Innovation

Real-Time Control Systems

Impacts from climate change will have variable effects on the form and frequency of extreme events across the nation. To withstand these effects, stormwater infrastructure should be implemented with a context-sensitive approach, namely a localized understanding of flood risk in combination with an awareness of land-use practices and regulatory expectations. This approach should inform the types, designs, locations, and long-term sustainability of stormwater systems. Resilience for stormwater infrastructure should increasingly reflect a mix of optimized green, gray, and natural infrastructure, land planning and urban growth, updated asset management, and, in water-scarce areas, the productive reuse of stormwater.

Current innovations include the use of real-time control systems that leverage complex modeling, cloud computing, data storage, and predictive analysis. Large datasets can be used to optimize the capacity of stormwater conveyance, storage and treatment systems, investments in O&M activities, and other costs. The affordability of sensors has also improved, expanding the potential for system implementation of real time data and control.

Finally, some areas employ a regional approach to stormwater management through volume and nutrient trading within watersheds. This can economically incentivize stormwater innovation.

2021 REPORT CARD FOR AMERICA'S INFRASTRUCTURE

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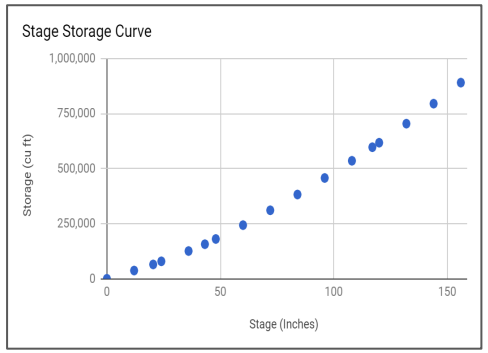
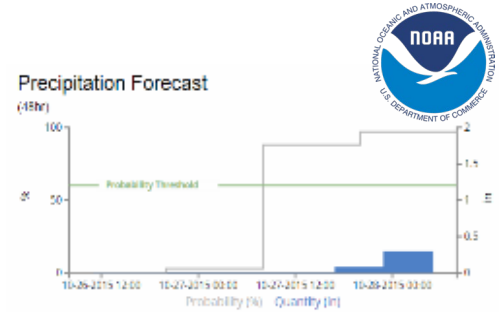
Continuous Monitoring and Adaptive Control (CMAC)



web-based dashboard

Cloud Platform

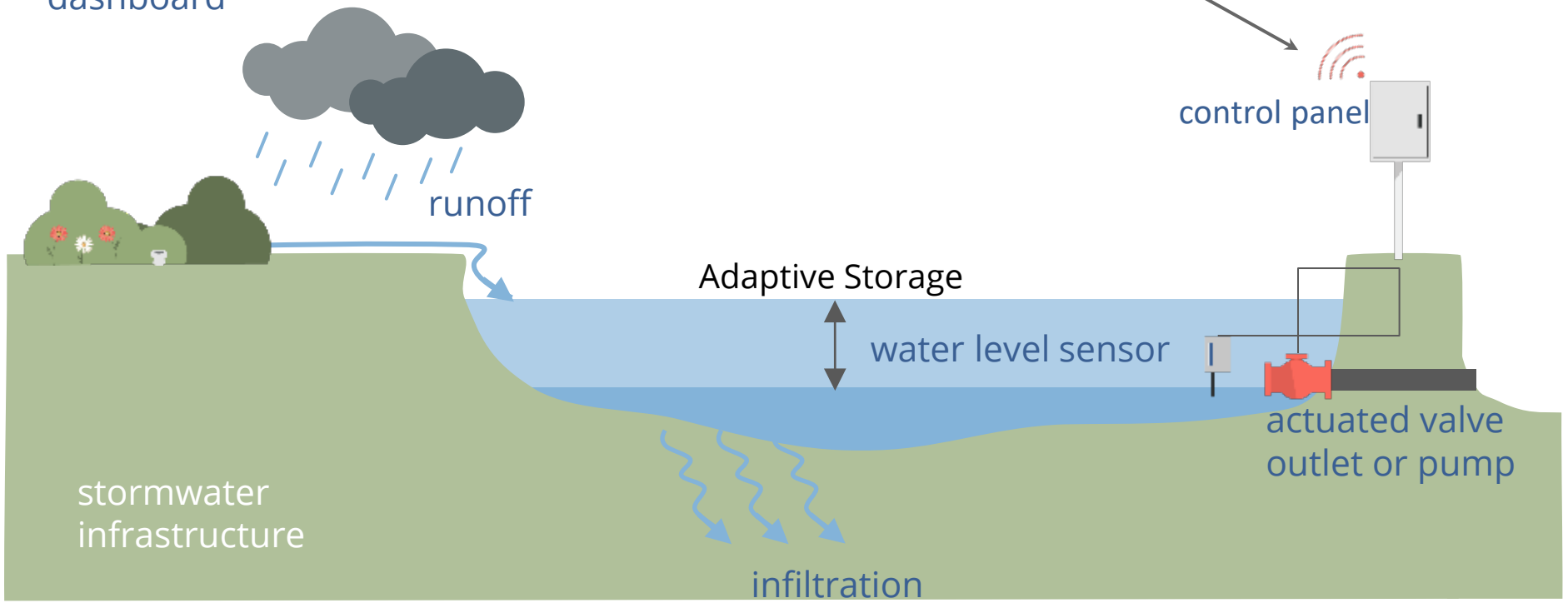


Real-Time Inputs → Model → Output

Product Configuration

Example Parameters

- Watershed Area
- Impervious Area
- Valve Diameter
- Overflow Invert
- Peak Discharge
- Retention Period
- PoP Threshold



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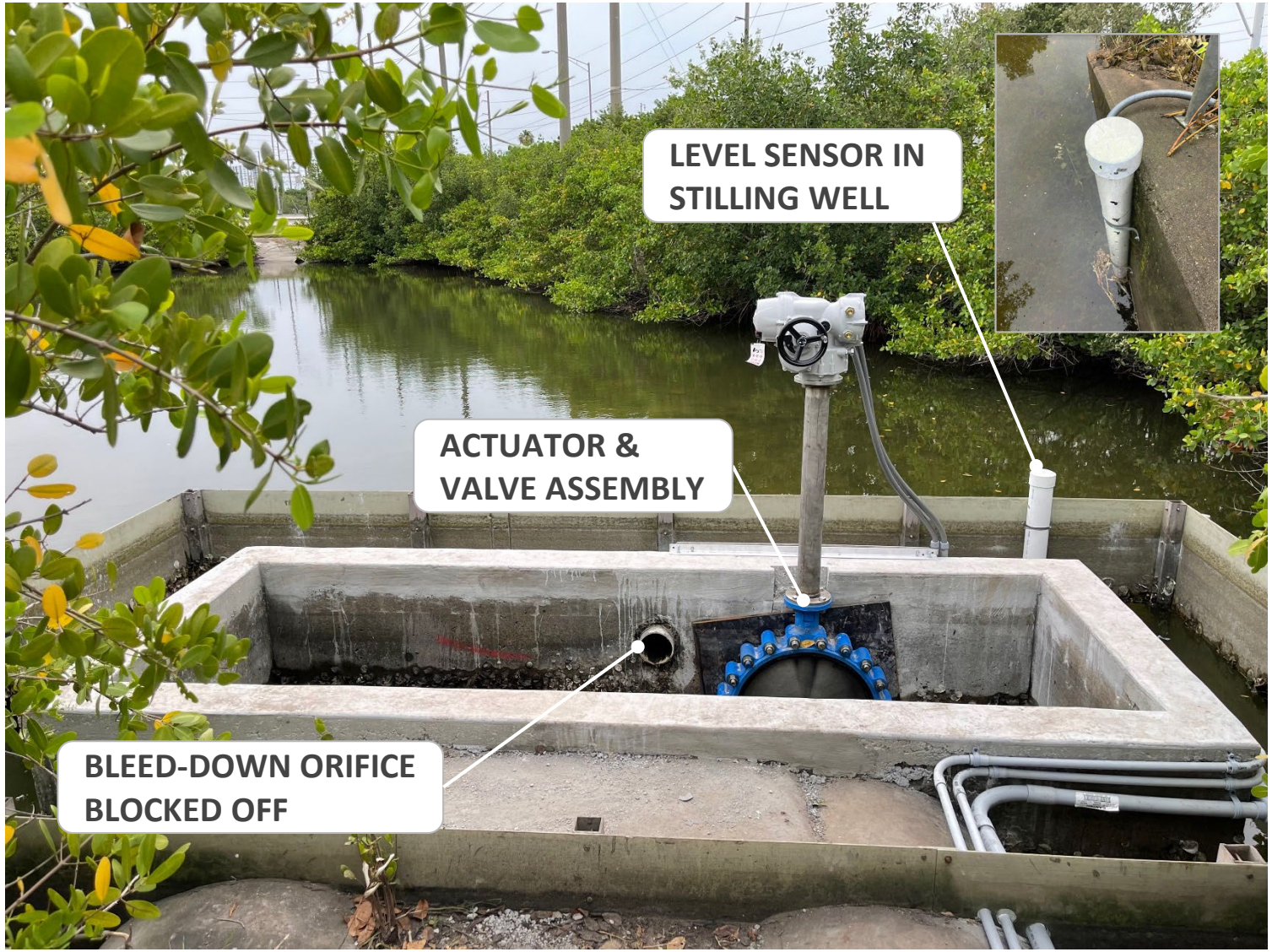
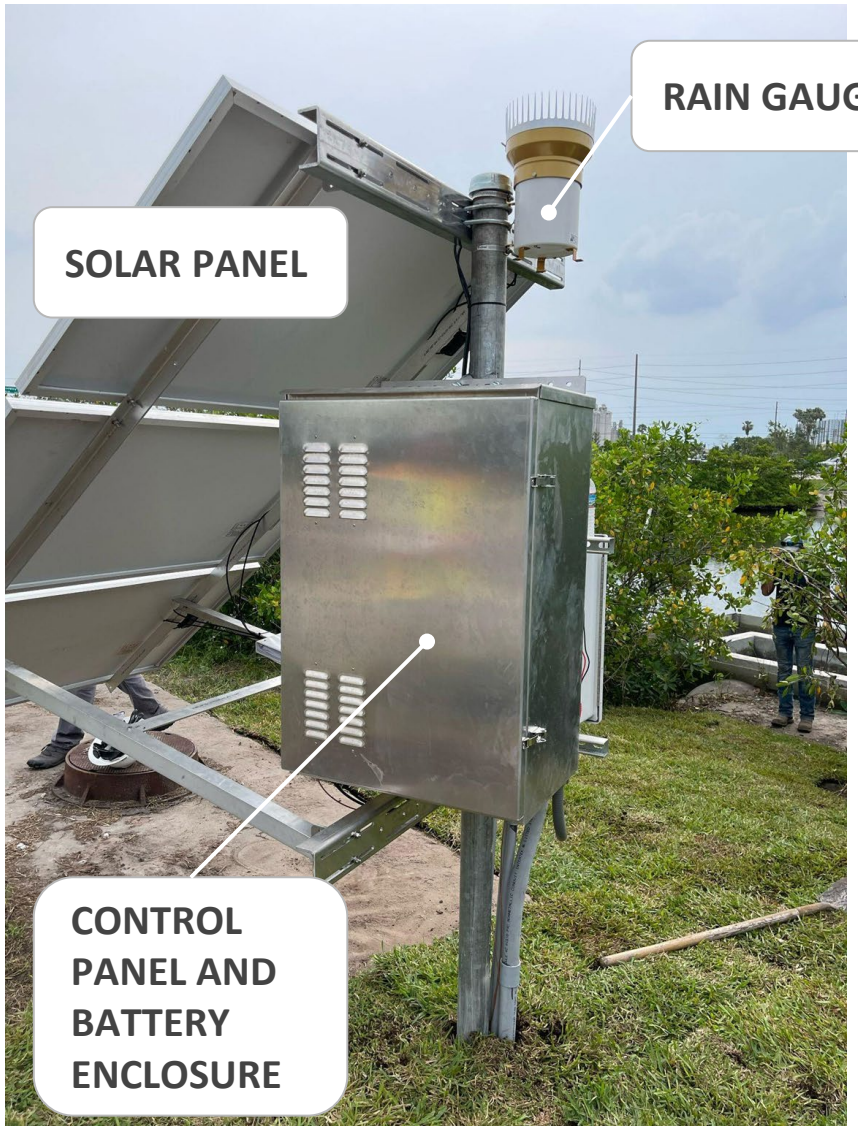
NST/FDOT P3 – 2,617 Regional Facilities

FDOT (SR 45 Pond 1) CMAC Retrofit





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Software Setup

Software configured with **over 100 different parameters**

- Site characteristics (watershed area, drainage coefficient, etc.)
- Operational parameters (normal pool elevation, max drawdown rate, etc.)
- Forecast response (probability and quantity thresholds)

Opti
active intelligence | clean water

Configuration Report
NST - FDOT SR 45 Pond 1

Site Overview

Client Name	National Stormwater Trust
Project Name	NST - FDOT
Site Name	SR 45 Pond 1
Subscription Type	Opti Plus
Location	1701 Maritime Blvd, Tampa, FL
Coordinates	27.93742977, -82.4350432
Commissioning Date:	5/27/2022
OptiPlatform Subscription Start Date:	Upon Commissioning
OptiPlatform Subscription Renewal Date:	12 months from OptiPlatform Subscription Start Date
Configuration Report Date:	6/21/2022

Note: Google Earth used as map source

Site Image

Site Goals

This site is two hydraulically-connected ponds on either side of S 20th St (SR 45), collectively forming Pond 1. The East Pond has an outlet structure that sends water to the southeast, under S 22nd St., and out to McKay Bay. A 24-inch orifice has been cored in the outlet structure below the pond bottom and an actuated butterfly valve has been installed. The goal of this site is to improve water quality by maximizing retention time and capturing TN and TP. The normal pool elevation will be set at the overflow weir, and this site's primary behavior will be pre-event drawdown. There is no attenuation/peak-flow reduction requirement for this project as it discharges directly to the Bay through two parallel 36-inch pipes.

Key Settings

Site Characteristics

The following settings represent physical characteristics of the site and are used to model expected inflows, outflows, and storage volumes.

Watershed Area (acres)	26.13
Impervious Area (acres)	17.40
Runoff Coefficient (Rv)	0.67
Valve Diameter (inches)	24
Sensor Location (ft NGVD 29)	-0.55
Valve Invert (ft NGVD 29)	-0.24
Permanent Pool (ft NGVD 29)	2.97
Passive Overflow Invert (ft NGVD 29)	2.97
Controllable Volume *(cf)*	191,194

Stage Storage Curve

Key Elevations	
Valve Invert (inches)	0.00
Permanent Pool (inches)	38.52
Overflow Invert (inches)	38.52

Depths relative to valve invert

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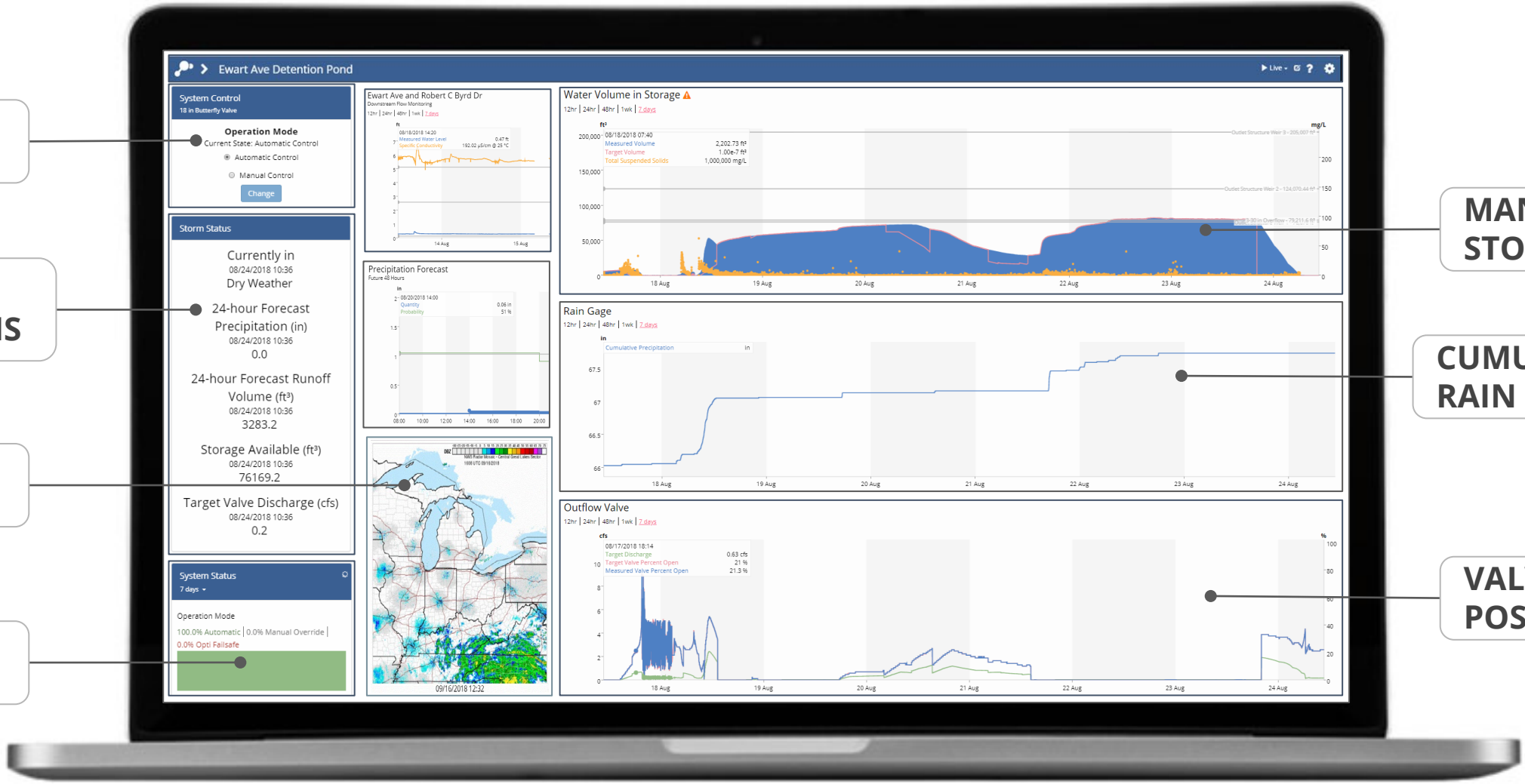
Data-Driven Behavior

MANUAL OVERRIDE

CURRENT CONDITIONS

FORECAST VIEW

ONLINE STATUS



MANAGED STORAGE

CUMULATIVE RAIN GAUGE

VALVE POSITION

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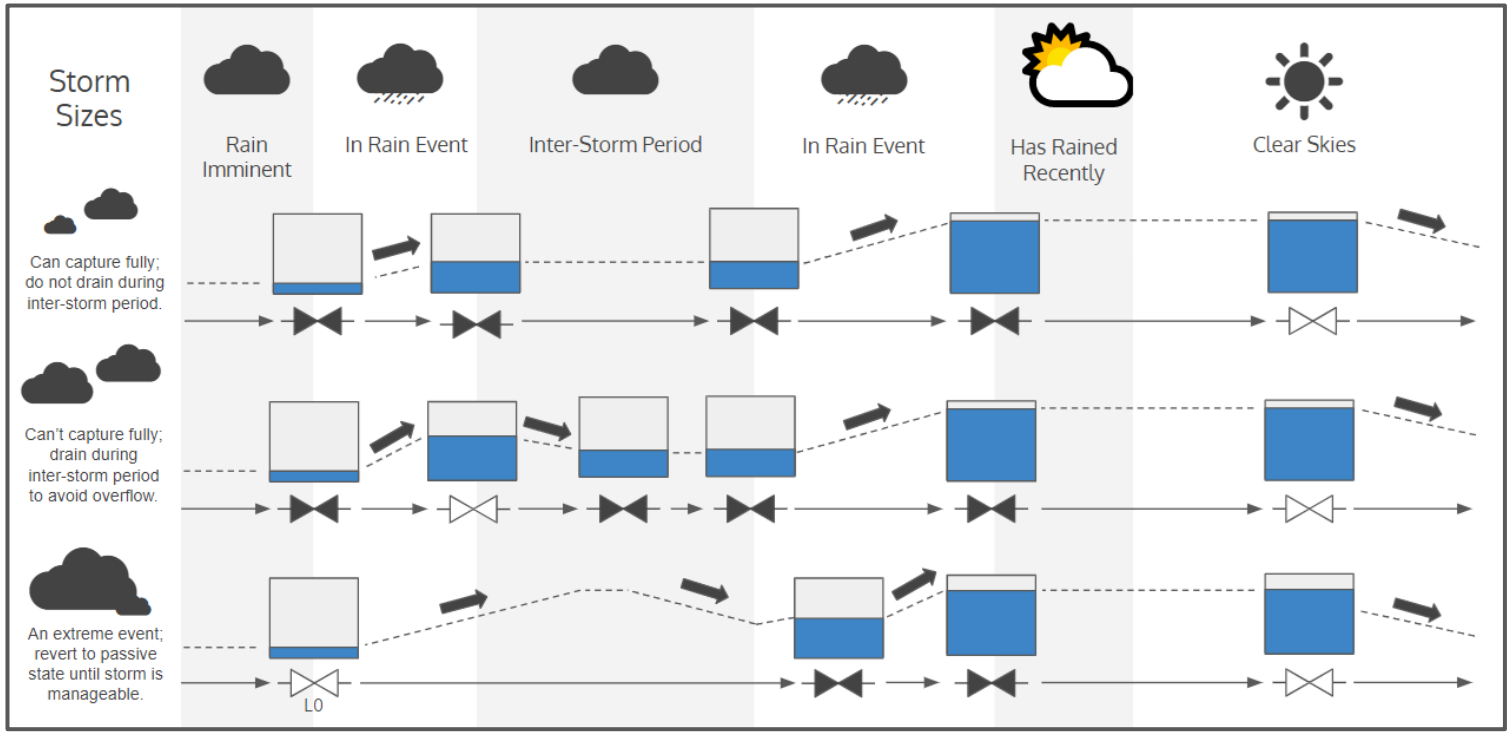
Control Decisions are Continuously Updated

In a 24-hour period, there are…

- 96 weather forecasts
- 4,416 monitored input data points
- **1,440 control decisions**

… for one facility



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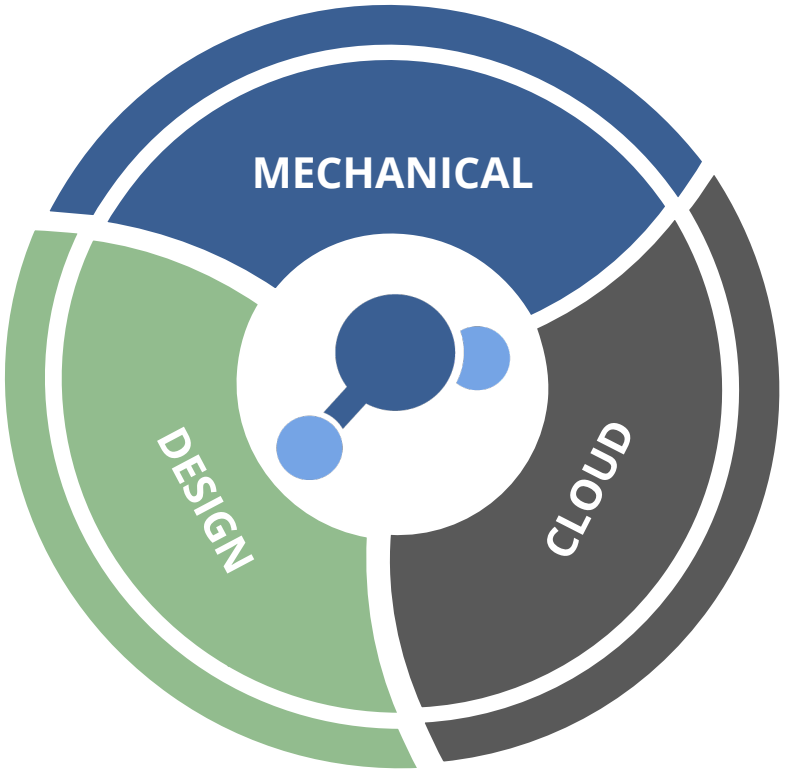
Designing Redundancy and Security



Cloud-Based:

- Alarms
- Remote Manual Control
- Internationally Certified Data Centers
- Product Release Cycles
- 3rd Party Security Audit

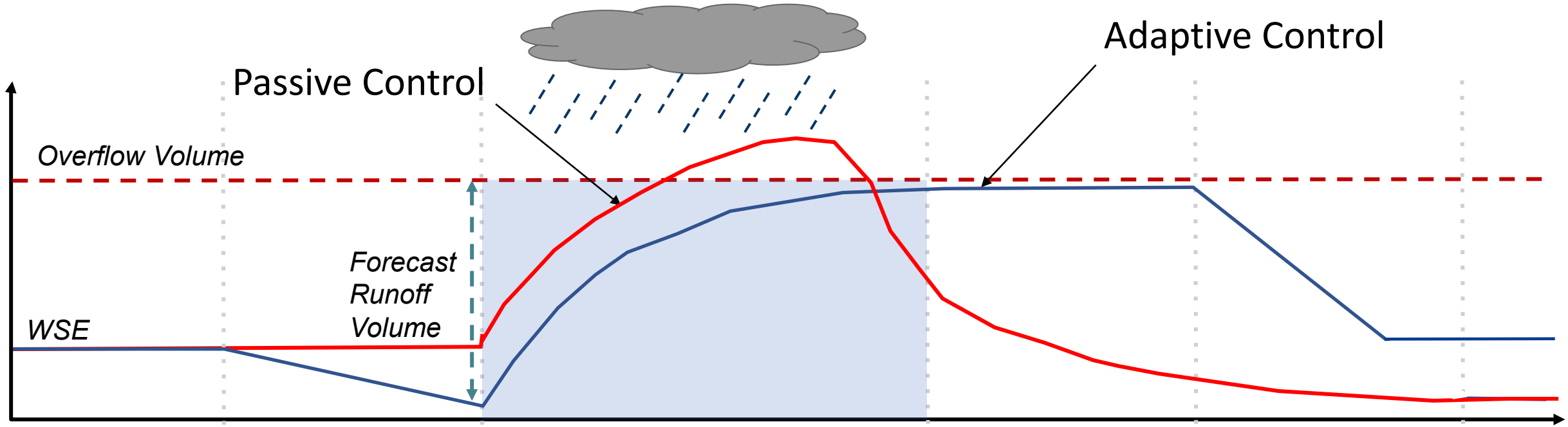
Mechanical:

- Battery Backups
- Local Fail-Safe Logic
- Onsite Manual Control

Civil Design:

- Passive Overflow
- Downstream Condition Assessment

Optimized Control



Dry Weather
Volume at Pre-Storm State

Forecast Period
Pre-Event Drawdown if Necessary to Fully Capture Storm

Wet Weather
Minimum Discharge During Storm Events

Post-Event Retention
Hold Water to Settle Nutrients and Reduce Outflow

Post-Retention Drawdown
Controlled Release

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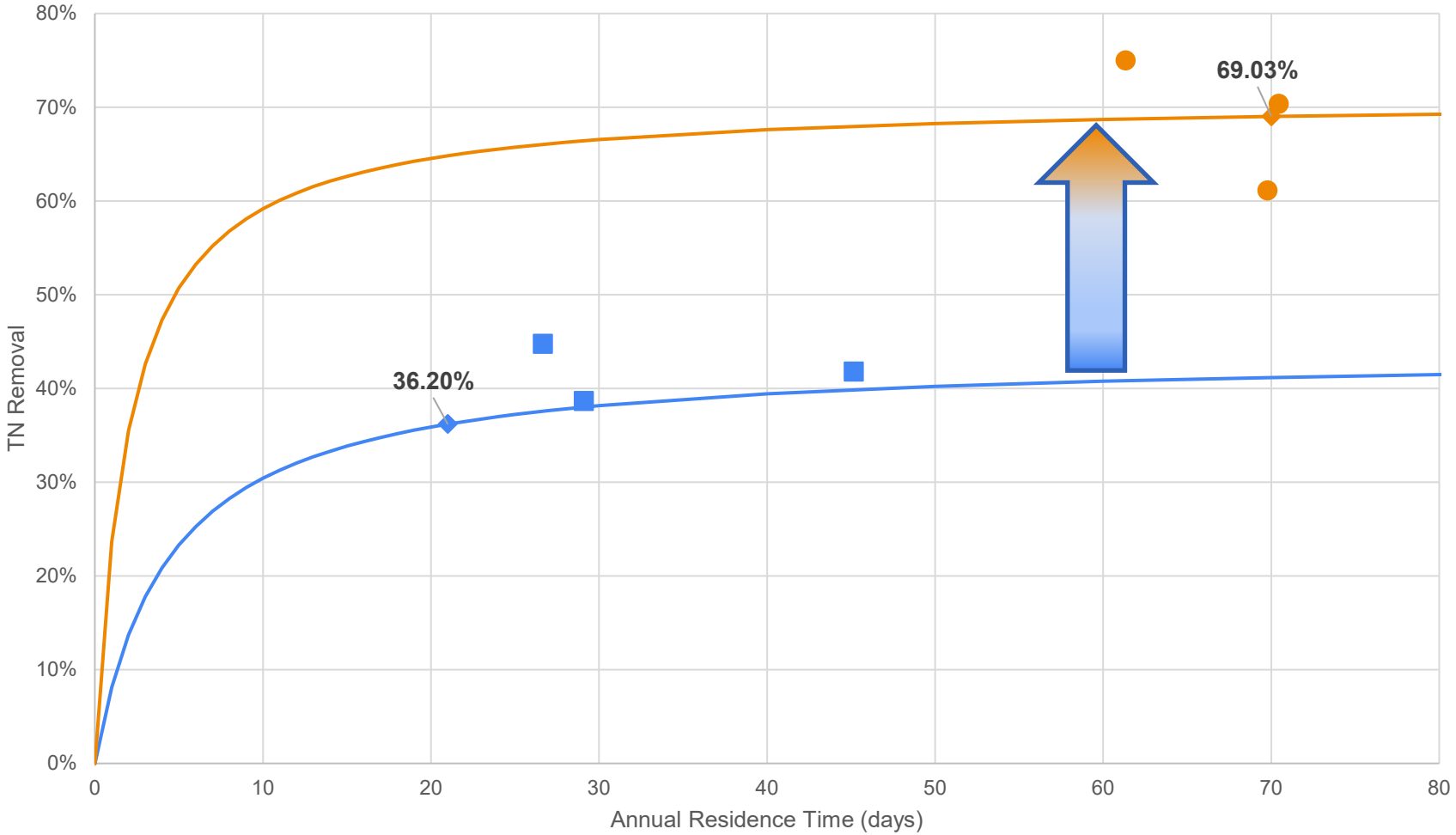
How does CMAC affect TN Removal?



CMAC Modelled TN Removal Efficiencies

Traditional Harper TN Removal Curve

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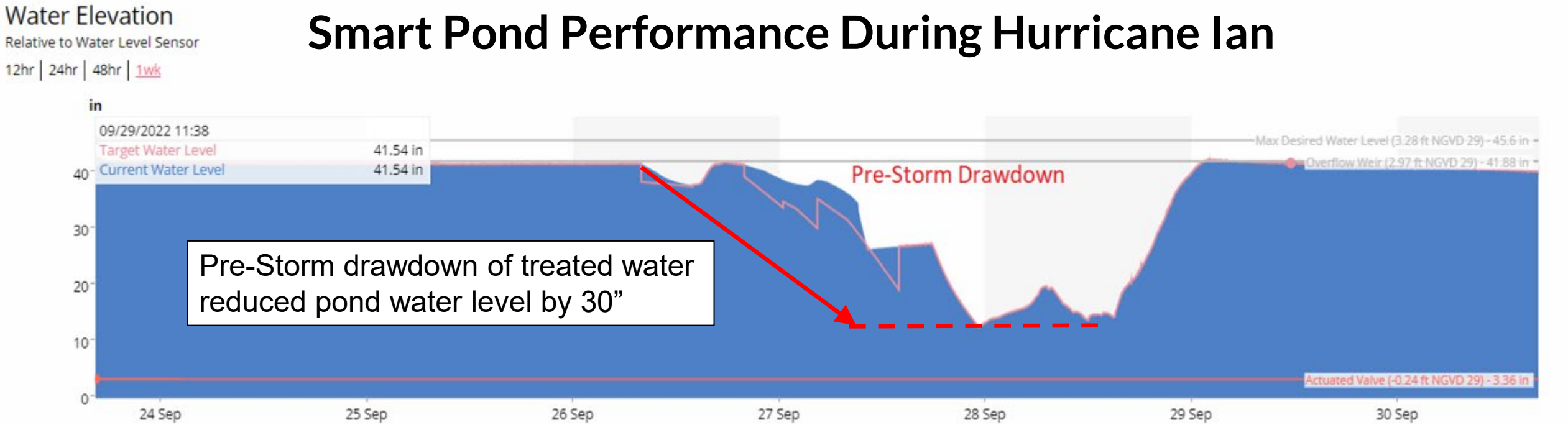
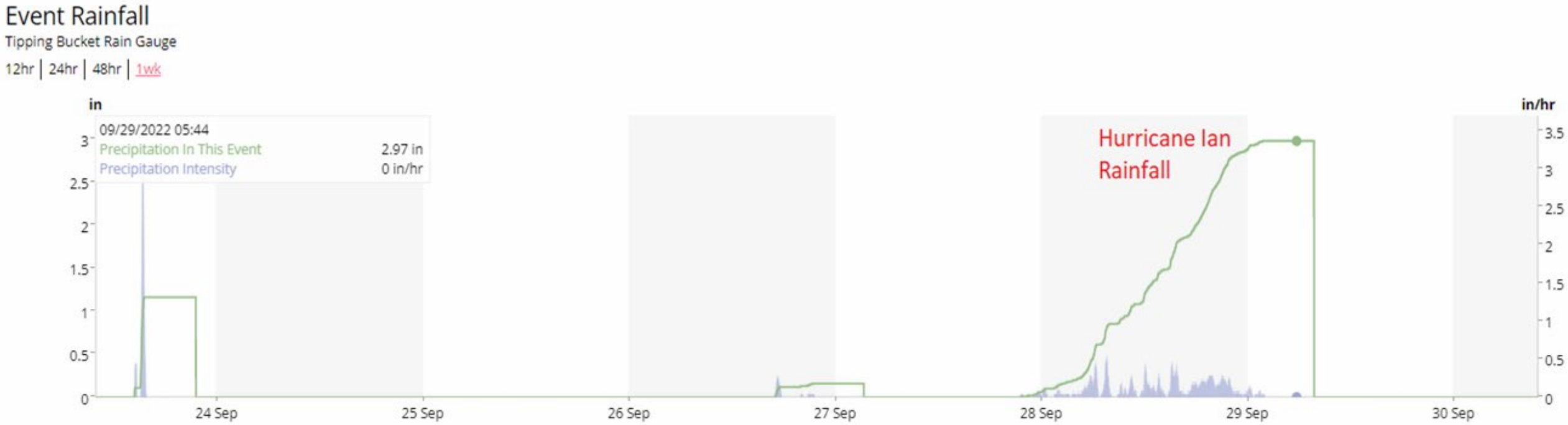
Smart Pond Performance During Hurricane Ian



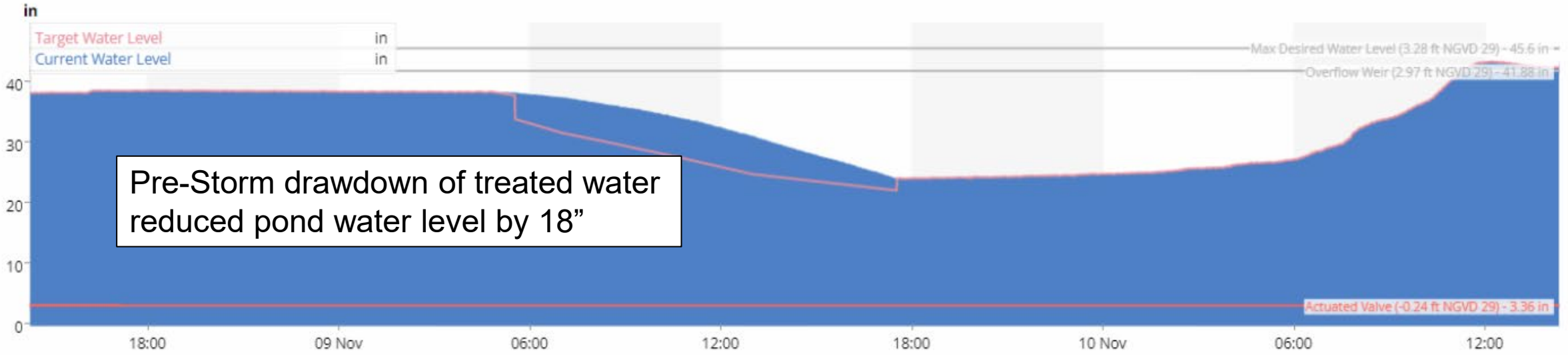


Smart Pond Performance During Hurricane Nicole

Water Elevation

Relative to Water Level Sensor

12hr | 24hr | 48hr | 1wk

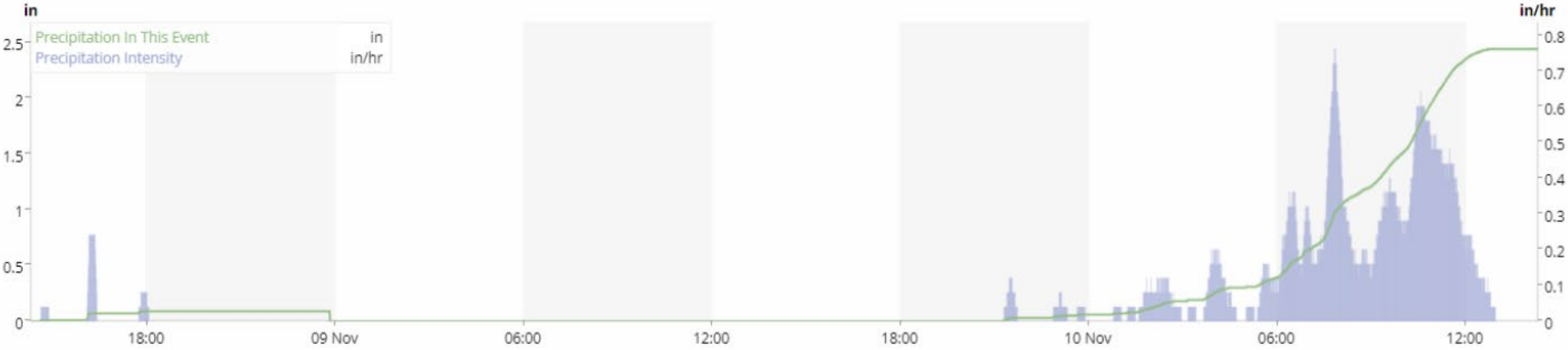


Pre-Storm drawdown of treated water reduced pond water level by 18”

Event Rainfall

Tipping Bucket Rain Gauge

12hr | 24hr | 48hr | 1wk



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FDOT

PORT TAMPA BAY

CASE STUDY
February 1, 2022

Cost-Saving, Smart Stormwater Solution for Berth 214

The stormwater treatment for the project will be provided in an offsite FDOT "Smart Pond," allowing the Port to **utilize 100% of available land for cargo** and **saving the port over $1.12 million** compared to conventional treatment costs.

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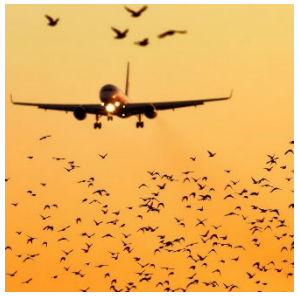
BABCOCK RANCH

CASE STUDY

March 1, 2022

BABCOCK RANCH SMART STORMWATER

Enhancing the Babcock Ranch lake system with continuous monitoring and adaptive control (CMAC) technology to prepare for storm events provides **flood mitigation**, leverages real-time **data** to improve community **resilience**, and offers an opportunity for outreach and **education**.



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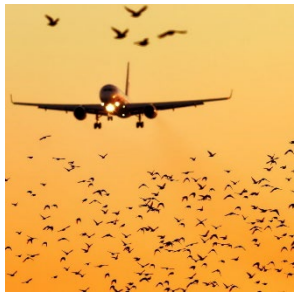
www.nationalstormwater.com

*Our Partners are **Rethinking Stormwater***

- Smart Ponds improve water quality
- Pre-storm drawdowns reduce flood risk
- Quick, effective and affordable improvements
- Future-proof your community

(Meet next generation of SW Rules)



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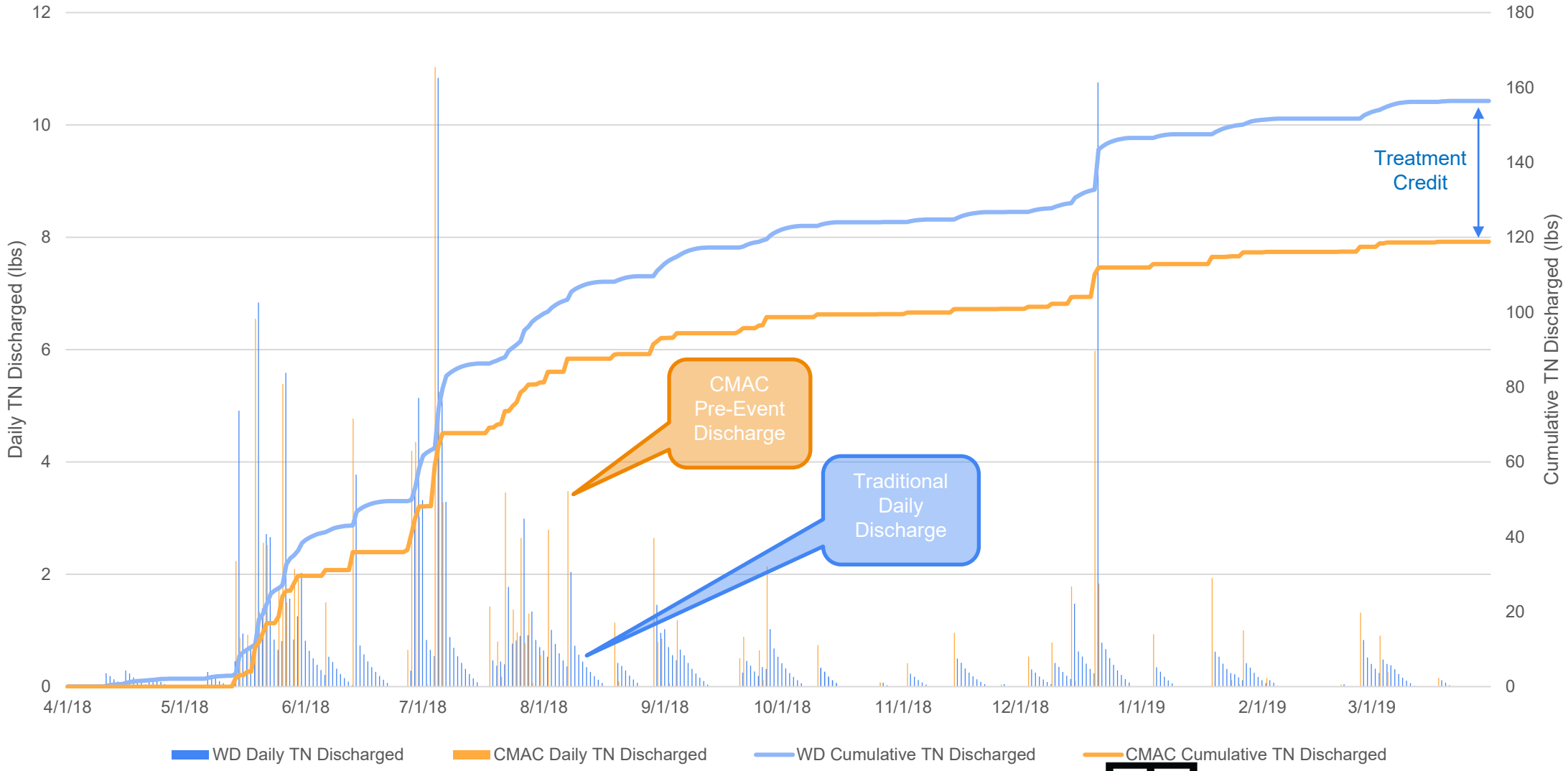
Summary

- Continuous monitoring and adaptive control (CMAC) is one advanced BMP in a portfolio approach to water quality in Florida
- CMAC or “smart ponds” improve nutrient removal, flood mitigation, attenuation, etc. through a highly-configurable approach
- Smart ponds have successfully been permitted to increase treatment efficiency, reduce flooding, and save land

TN Discharged Comparison



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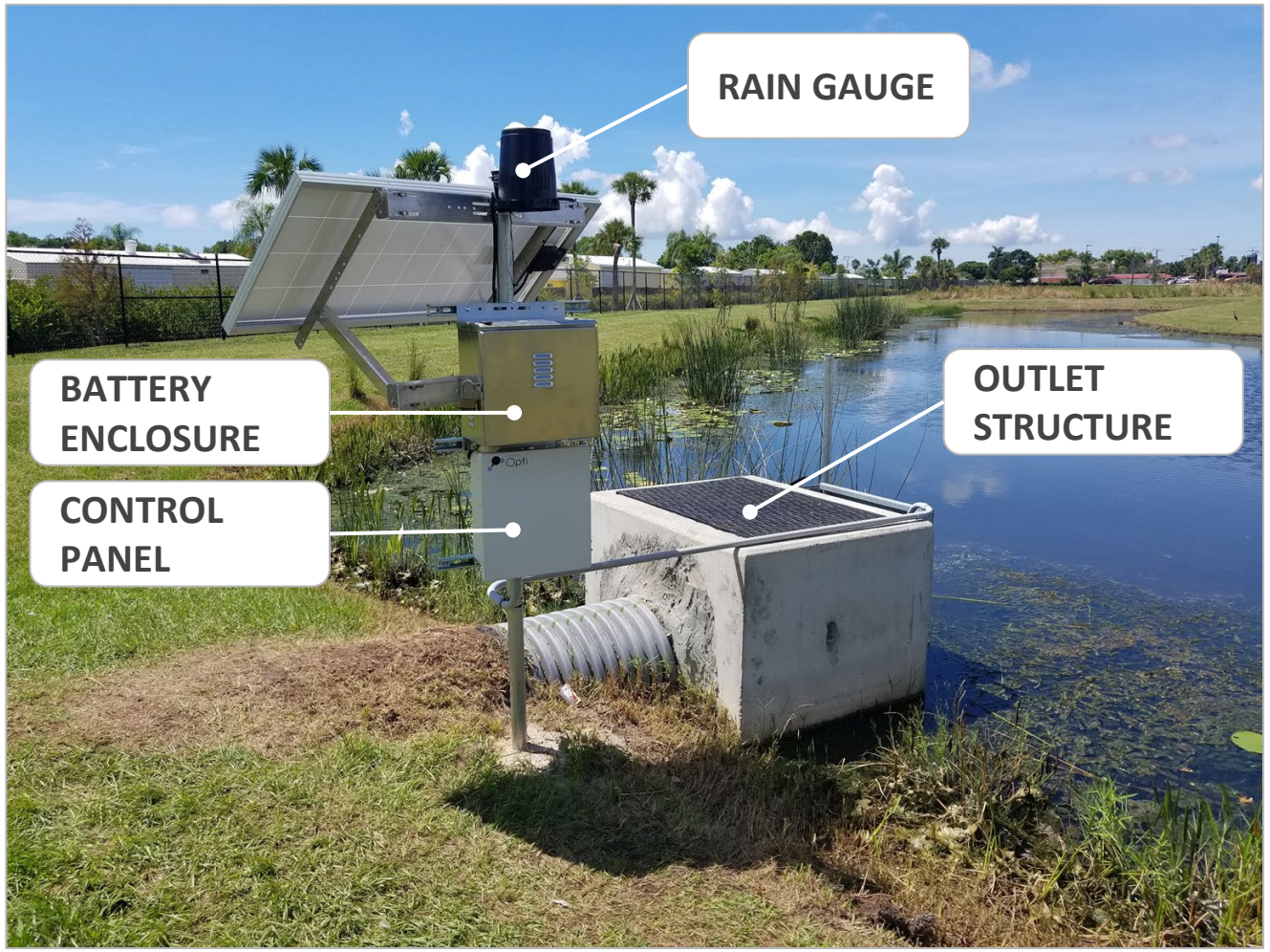
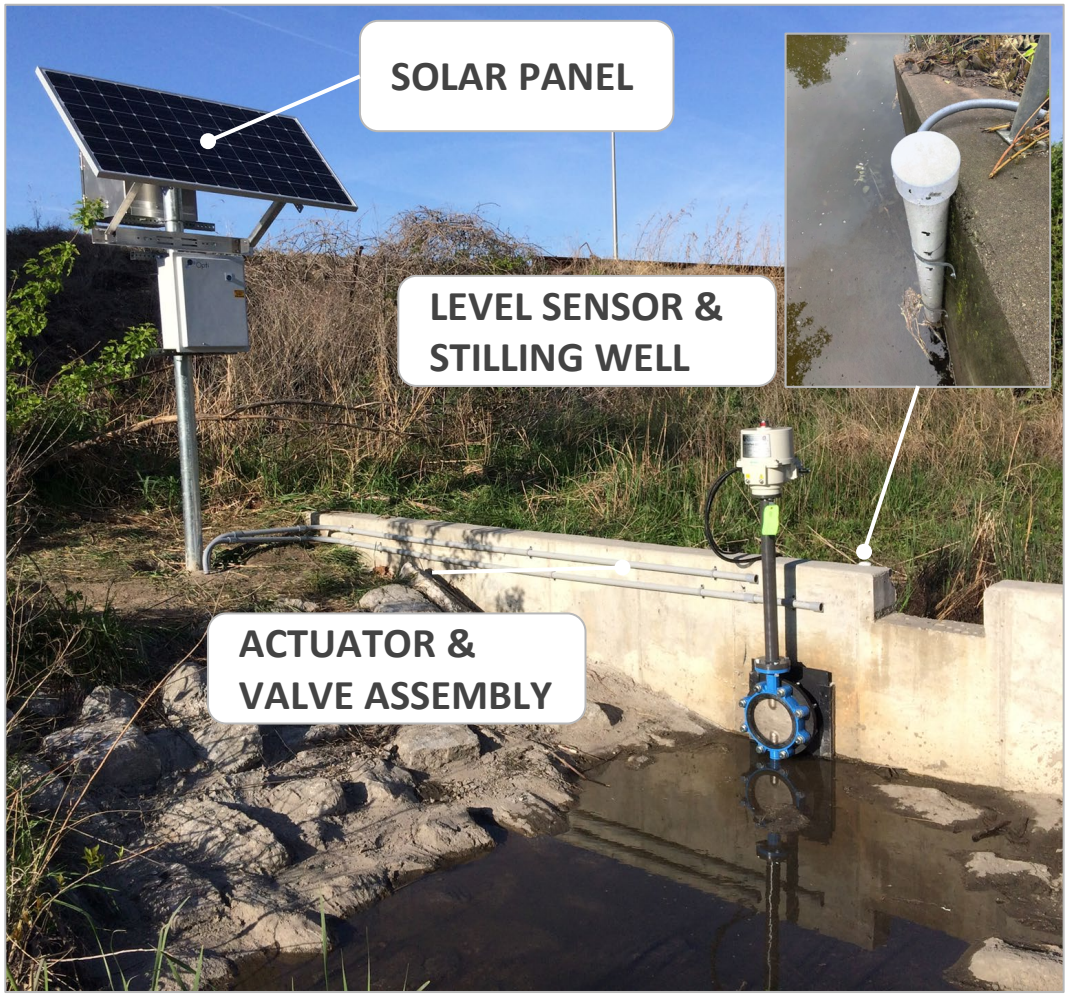
Field Equipment





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