New Directions for Clean Water: Intelligent Infrastructure

Opti

active intelligence | clean water

WEF eShowcase
July 22, 2015
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OptiNimbus
Intelligent Control of Stormwater

OptiStratus
Performance monitoring and predictive maintenance alerting

OptiCumulus
No effort monitoring of environmental conditions

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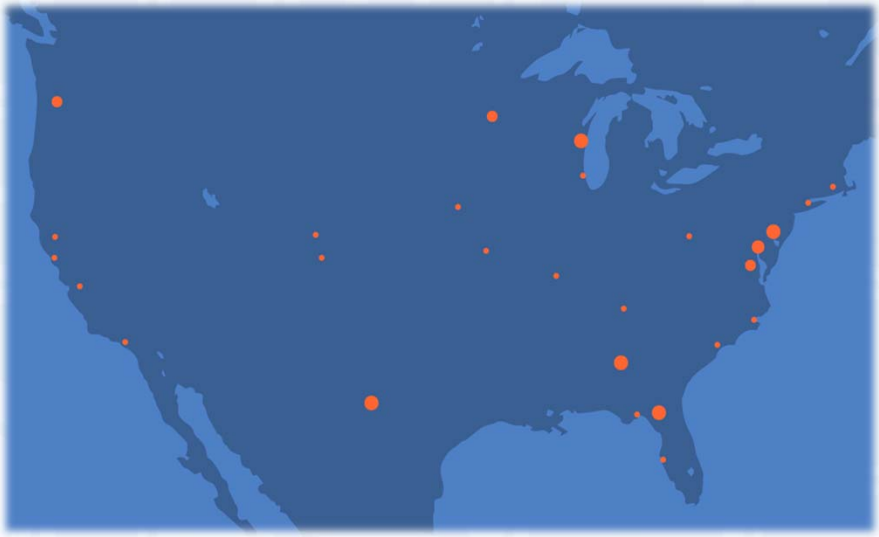
91 Deployments



Built for Distributed Systems

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Maximizes Performance & Reduces Cost and Risk

- Combined sewer overflow reduction
- Sediment and water quality retrofits
- Existing and new infrastructure (gray and green)
- Alerting of maintenance needs
- Providing auditable reports to regulators

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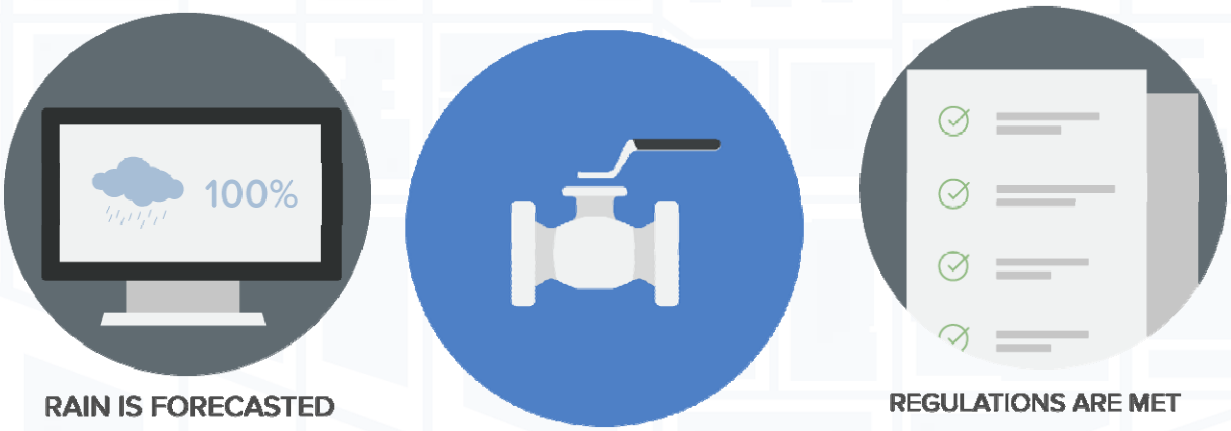
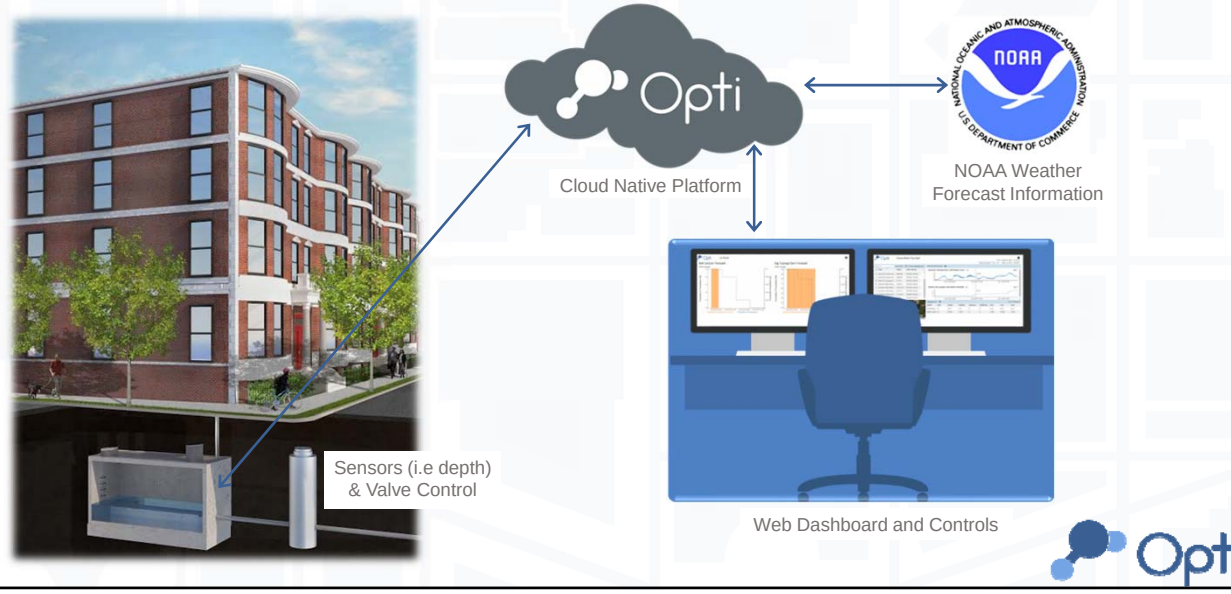
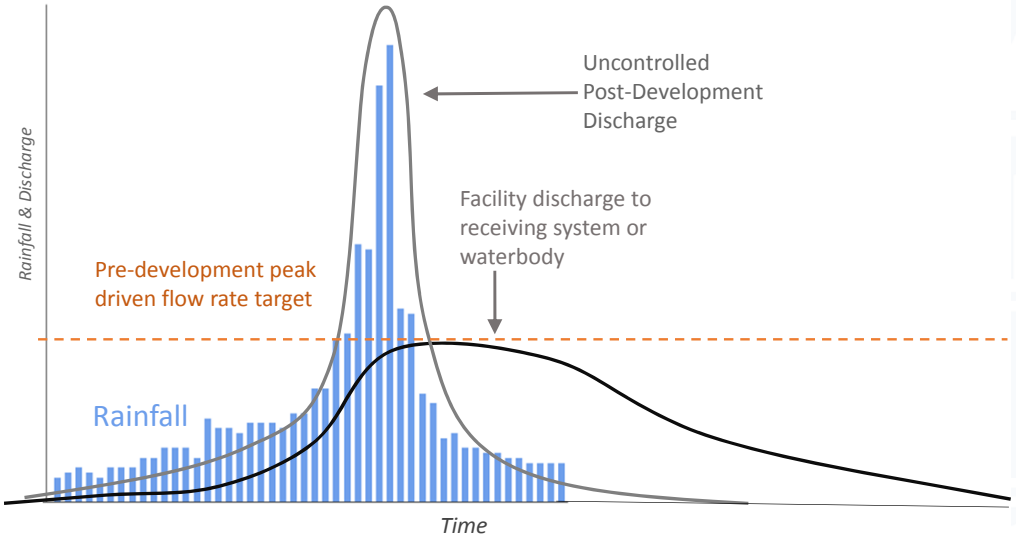
OptiNimbus: Measure and Improve Performance



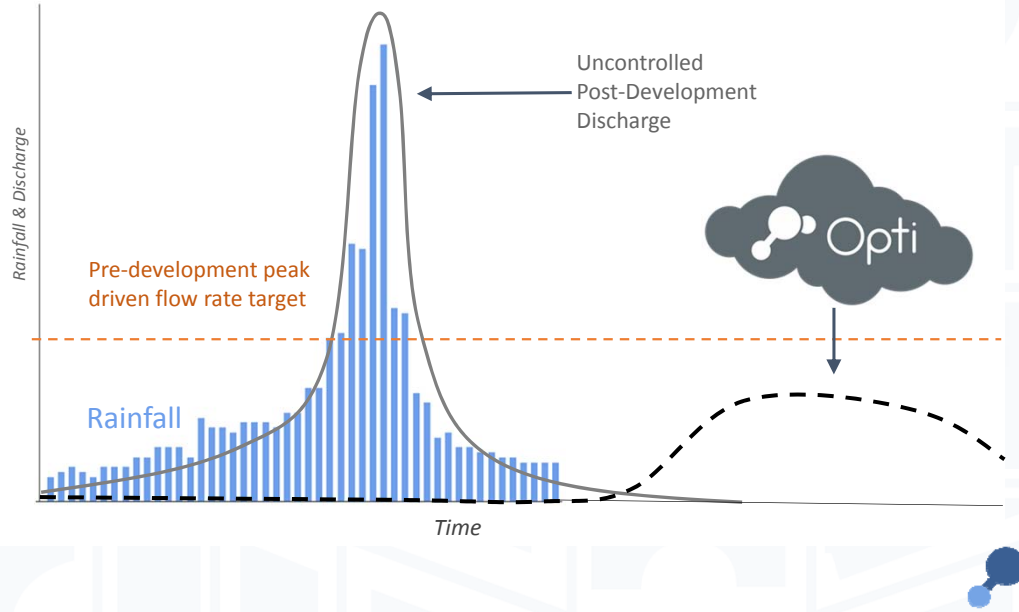
Cloud Based Monitoring and Active Control



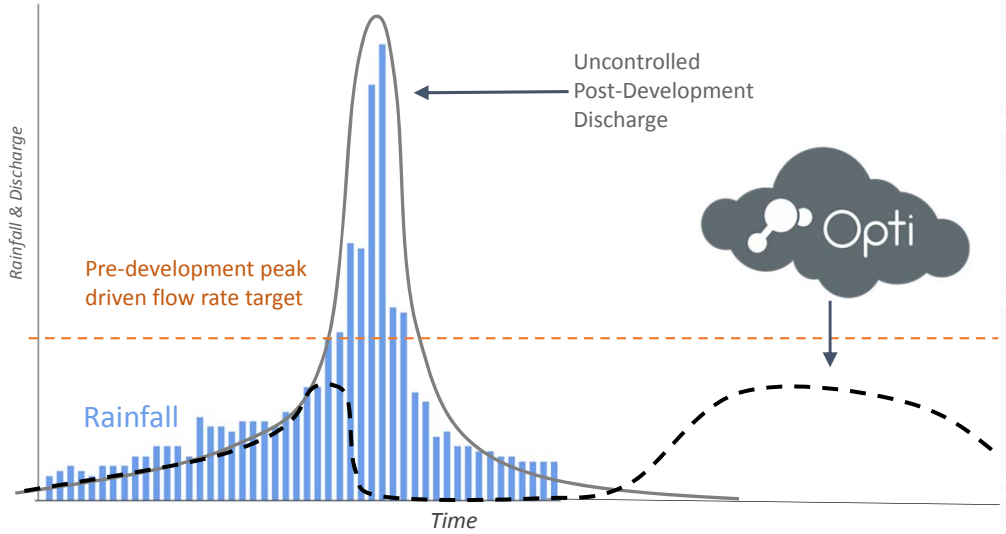
Traditional – Passive Controlled Discharge



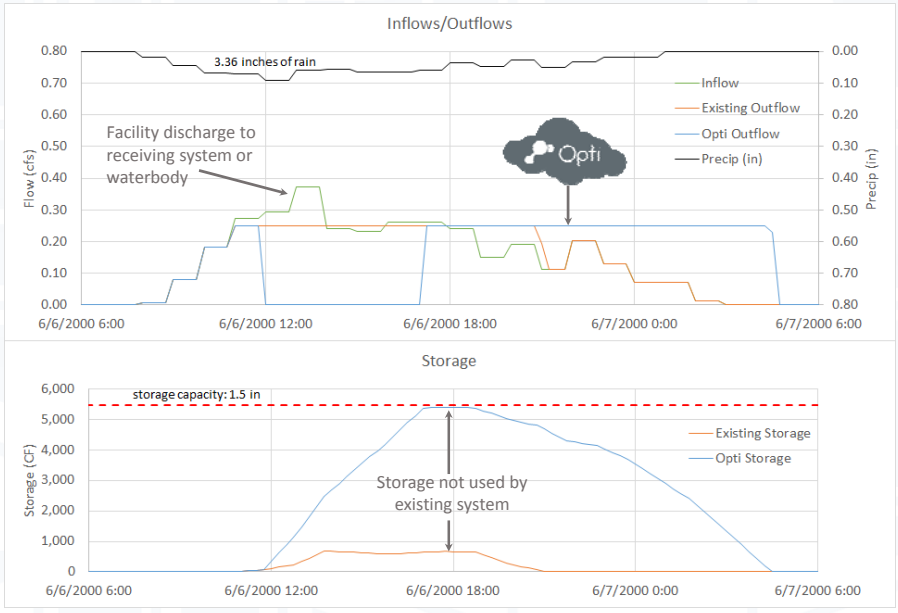
OptiNimbus – Intelligent Discharge + Water Quality, + Rainwater Harvesting



OptiNimbus – Intelligent Discharge + CSO Mitigation, + Flood Prevention



Example Rain Event



A Few Example Projects

Combined Sewer Overflow Control

Brooklyn Botanic Gardens

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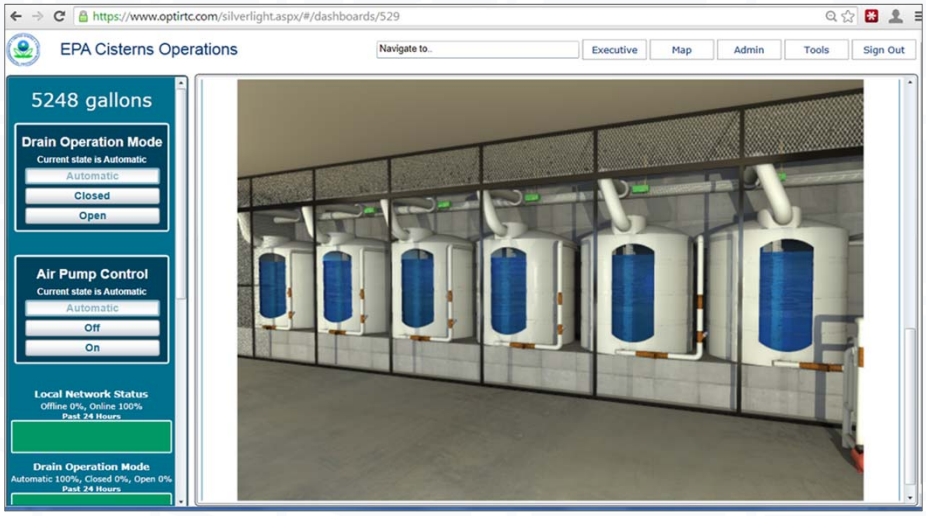
EPA Headquarters



Prevented over 100,000 gallons of wet weather flow in one year with only 6,000 gallons of storage

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Adjusting to Inaccurate Forecasts

	Storm #1 : 2/26/2014		Storm #2: 6/5/2014		Storm #3: 2/21/15	
	With OptiRTC	Without OptiRTC	With OptiRTC	Without OptiRTC	With OptiRTC	Without OptiRTC
Rainfall Depth (in):	0.14		0.56		0.65	
Storm Duration (days):	0.1458		0.5174		0.7813	
Maximum Intensity (in/hr):	0.84		0.96		0.60	
Average Intensity (in/hr):	0.040		0.045		0.035	
Volume Predicted (gal)	3908.6		2937.3		7313.7	
Volume Produced (gal)	1299.733768		1809.8		1826.9	
Peak Flow Rate (cfs):	0.0148	0.1847	0.0090	0.2111	0.0252	0.1319
Wet Weather Release (gal):	0.0	1299.7	98.0	1809.8	508.9	1826.9
Dry Weather Release (gal):	1123.5	0	2961.7	0	418.9	0
Peak Flow Reduction (%):	92%		96%		81%	
Volume Reduction (%):	100%		95%		72%	

Summary of storm characteristics and performance for events that were accurately predicted by the OptiRTC system

More Rain Than Expected

	Storm #1 : 7/8/14		Storm #2: 8/4/14		Storm #3: 1/23/15	
	With OptiRTC	Without OptiRTC	With OptiRTC	Without OptiRTC	With OptiRTC	Without OptiRTC
Rainfall Depth (in):	0.24		0.45		1.1	
Storm Duration (days):	0.0729		0.0347		0.5104	
Maximum Intensity (in/hr):	1.92		5.04		0.36	
Average Intensity (in/hr):	0.137		0.540		0.090	
Volume Predicted (gal)	1066.0		692.9		2747.8	
Volume Produced (gal)	1265.0		1153.0		3794.5	
Peak Flow Rate (cfs):	0.0012	0.4222	0	1.1083	0.0109	0.0792
Wet Weather Release (gal):	12.1	1265.0	0	1153.0	441.6	3794.5
Dry Weather Release (gal):	0	0	0	0	3425.8	0
Peak Flow Reduction (%):	99.7%		100%		86%	
Volume Reduction (%):	99.0%		100%		88%	

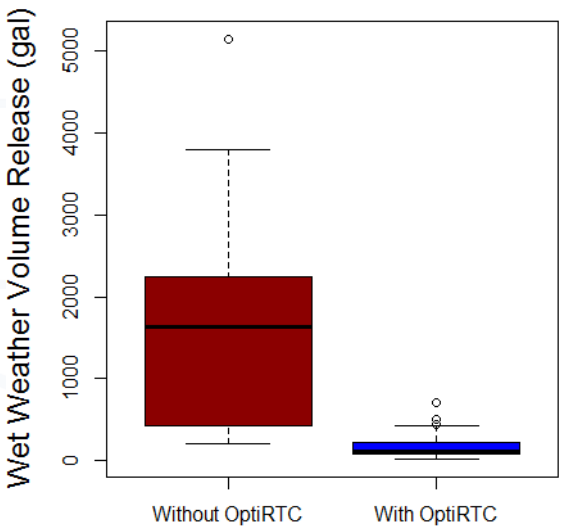
Summary of storm characteristics and performance for events that were under-predicted by the OptiRTC system

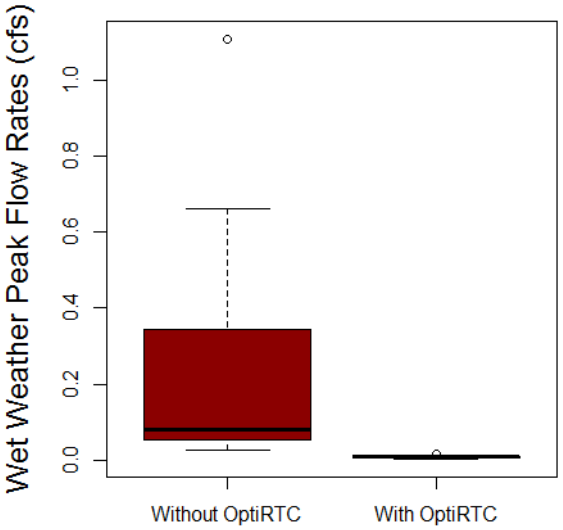
Less Rain Than Expected

	Storm #1 : 2/26/2014		Storm #2: 6/5/2014		Storm #3: 2/21/15	
	With OptiRTC	Without OptiRTC	With OptiRTC	Without OptiRTC	With OptiRTC	Without OptiRTC
Rainfall Depth (in):	0.14		0.40		0.63	
Storm Duration (days):	0.1736		0.1424		2.1597	
Maximum Intensity (in/hr):	0.12		1.56		0.63	
Average Intensity (in/hr):	0.034		0.117		0.012	
Volume Predicted (gal)	473.7		2398.4		3600.6	
Volume Produced (gal)	421.8		2330.6		3703.3	
Peak Flow Rate (cfs):	0.0096	0.0264	0.0088	0.3431	0.0089	0.0528
Wet Weather Release (gal):	31.7	421.8	60.6	2330.6	716.4	3703.3
Dry Weather Release (gal):	390.1	0	2268.5	0	2673.8	0
Peak Flow Reduction (%):	**64%**		**97%**		**83%**	
Volume Reduction (%):	**92%**		**97%**		**81%**	

Summary of storm characteristics and performance for events that were over-predicted by the OptiRTC system

IF Wet Weather Discharge Occurs…





>95% Reduction in both Wet Weather Volume and Peak Flow (n=22)

+ Water Quality Benefits

	Mass Released Without OptiRTC (lbs)	Mass Released With OptiRTC (lbs)	Mass Reduction (%)
Total Suspended Solids (TSS)	43.89	4.94	89%
Total Nitrogen (TN)	1.76	1.50	14%
Total Phosphorus (TP)	0.24	0.06	77%

Estimated stormwater water quality benefits provided by the OptiRTC system from May 1, 2014 until May 1, 2015.

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Hydromodification

Polygon at North Bethany Falls

Consulting Services for Project by: CleanWater Services Geosyntec consultants

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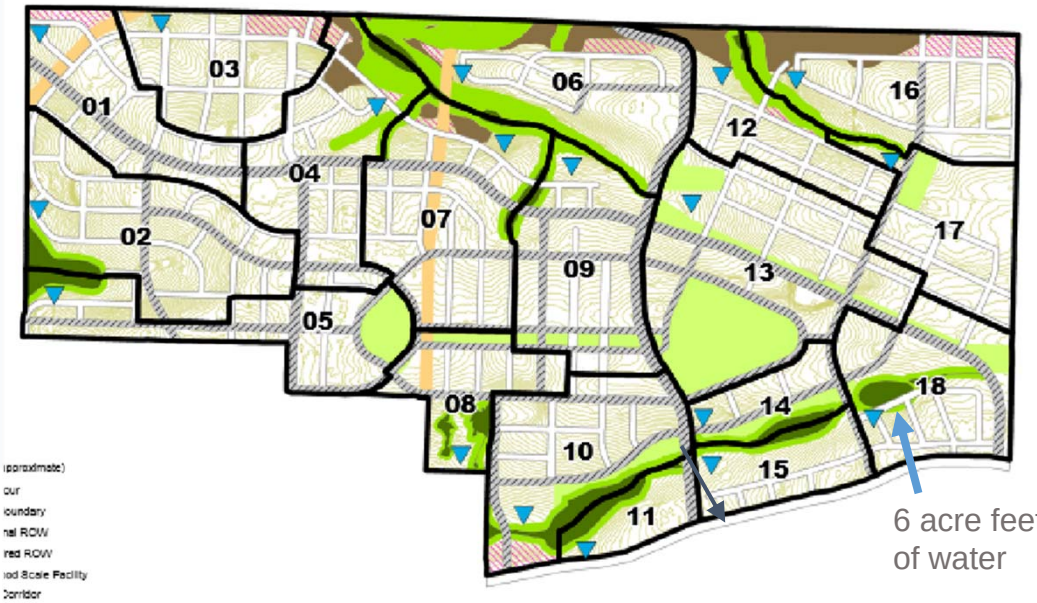

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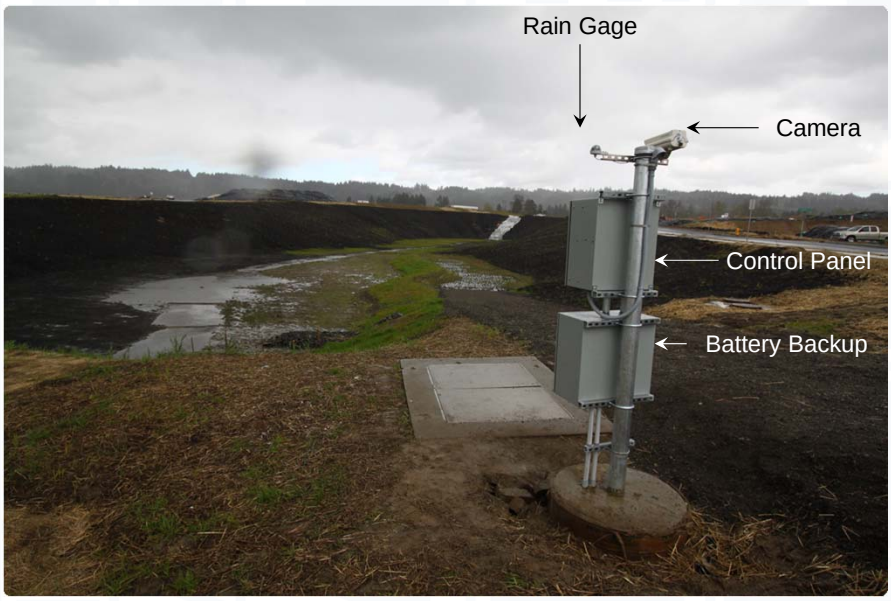

Consulting Services for Project by:

CleanWater Services

Geosyntec consultants

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Butternut Creek

Consulting Services for Project by:

CleanWater Services

Geosyntec consultants

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CleanWater Services

Geosyntec consultants

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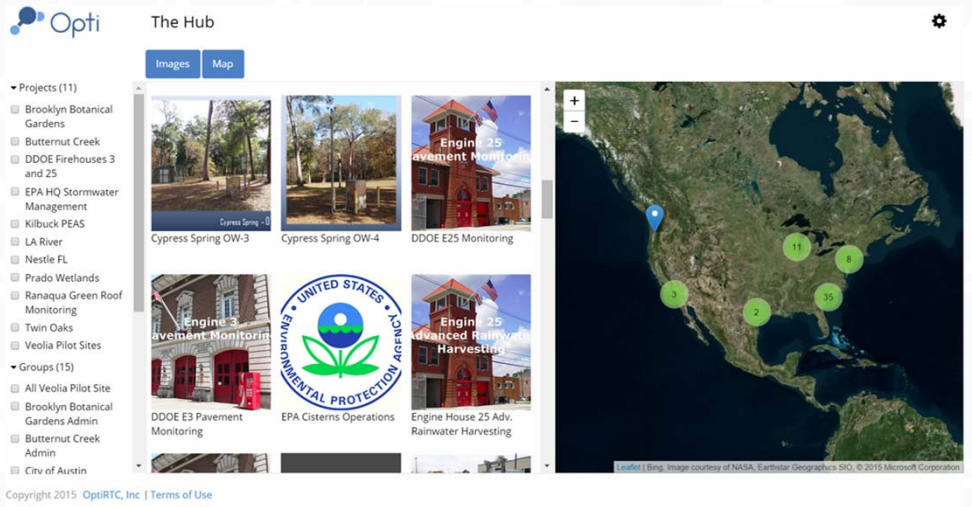
OptiNimbus is also a solution for:

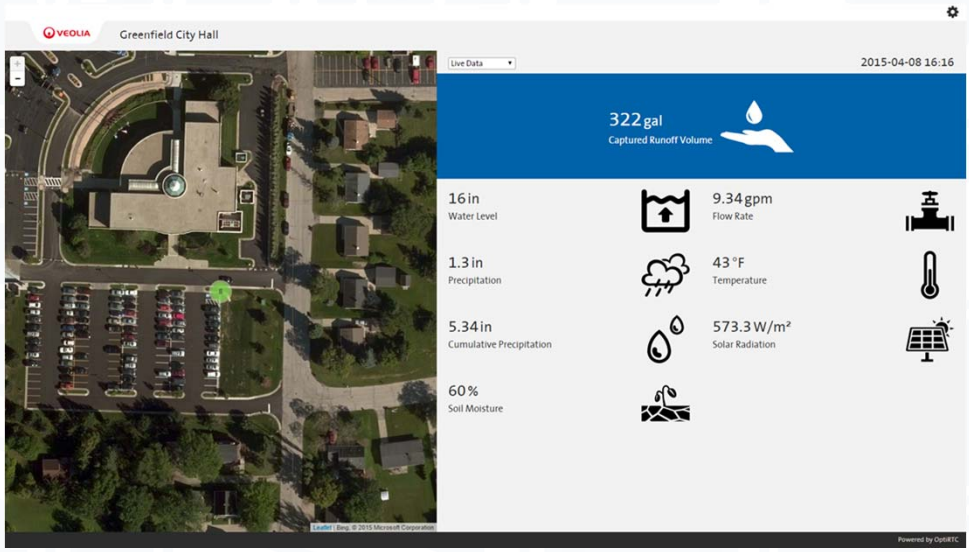
- Rainwater Harvesting
- Flood Control
- Improving Water Quality
- Stormwater Credit Markets

Opti Web Interface

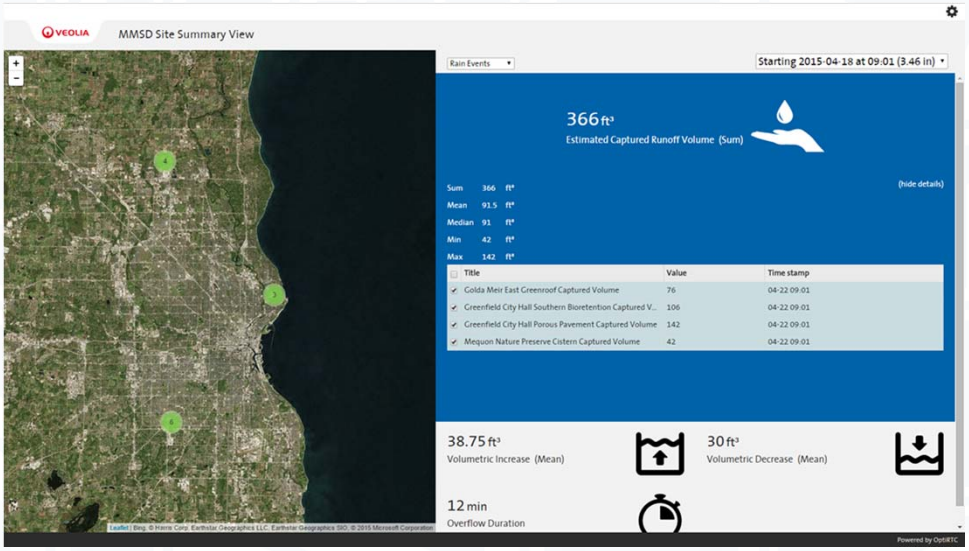
Select Site & Dashboard



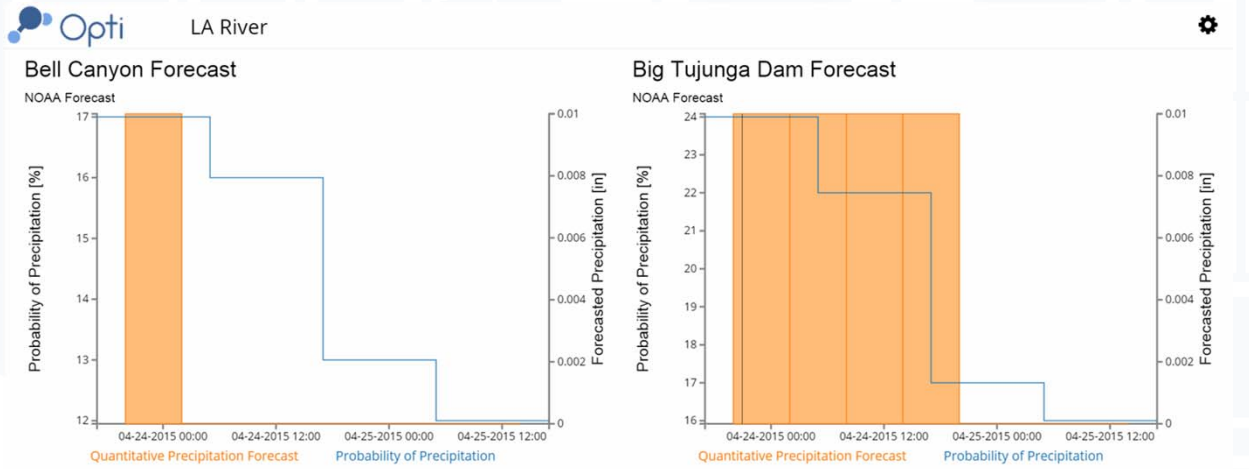
View Key Data & Performance Indicators



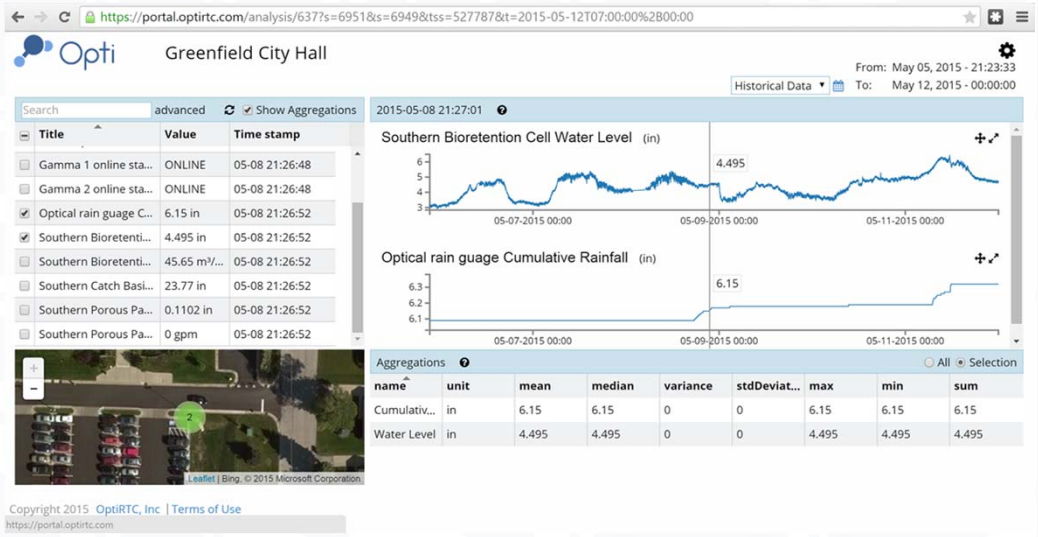
Aggregate Site Data



Interact with Graphical Forecasts



Analyze



Installed Hardware Examples

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OptiNimbus – A Smarter Approach

Costs

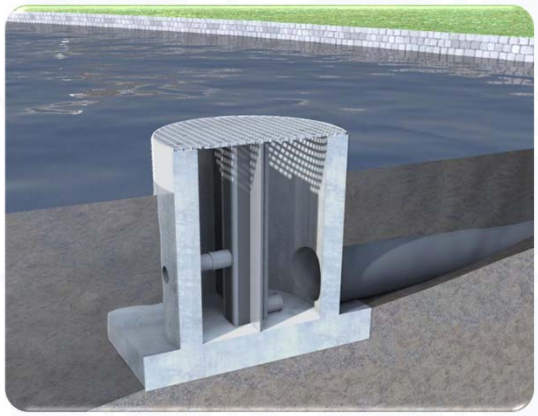
- Reduced capital investment
- Reduced labor
- Reduced maintenance

Stay in Compliance

- Water quality
- Alerts

Environmental Benefits

- Wet weather flow decrease of 70 to 99%
- Water reuse



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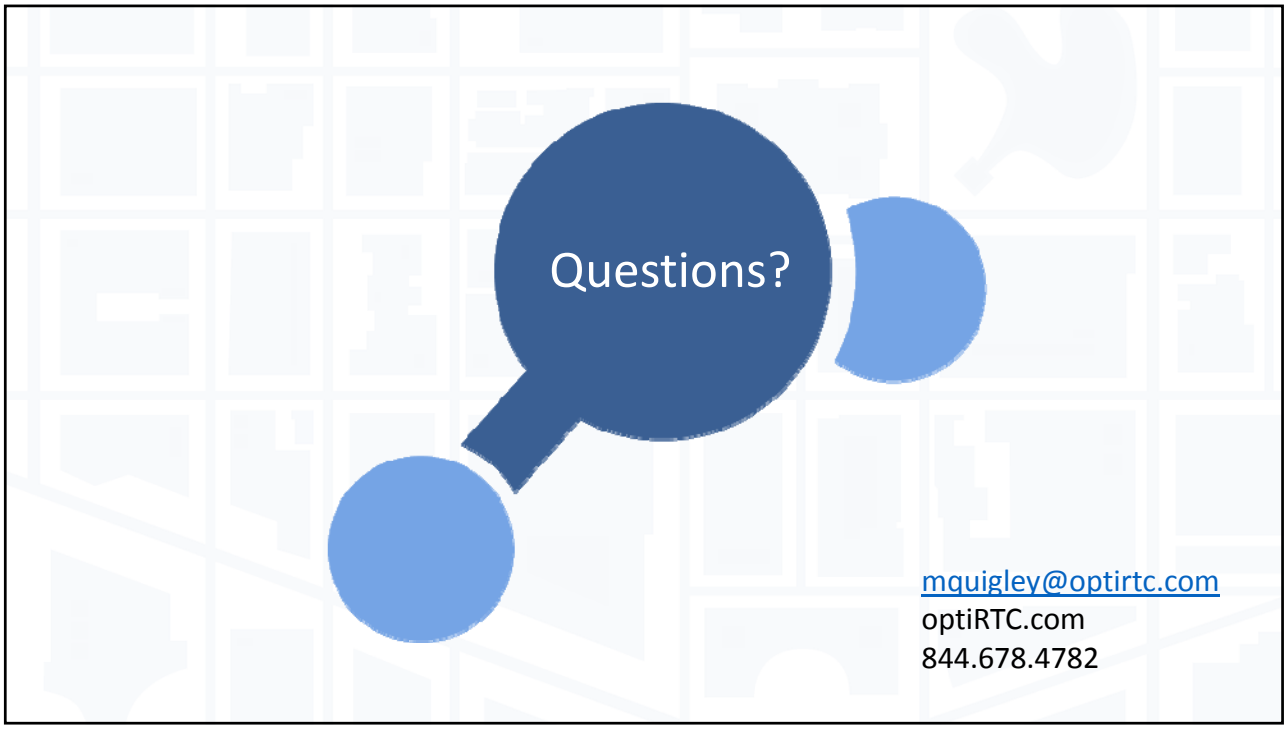
Questions?
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