

New Directions for Clean Water: Intelligent Infrastructure

WEF eShowcase
July 22, 2015
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OptiNimbus
Intelligent Control of Stormwater



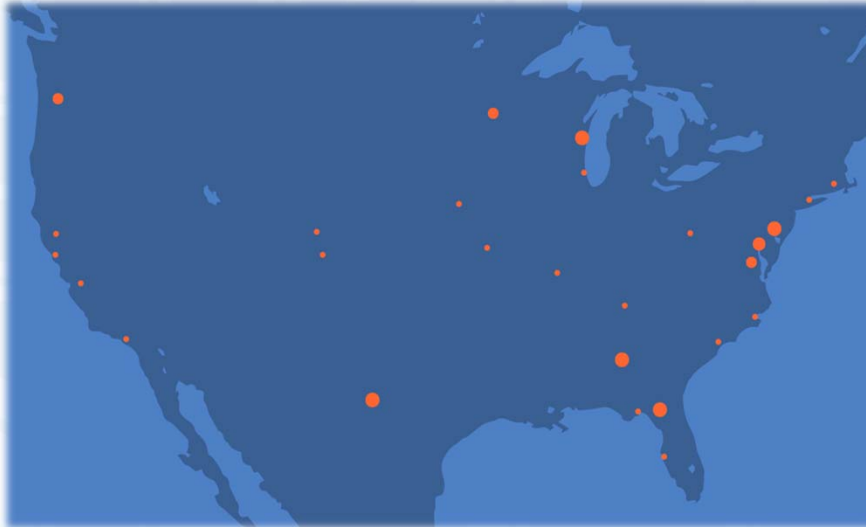
OptiStratus
Performance monitoring and
predictive maintenance alerting



OptiCumulus
No effort monitoring of
environmental conditions



91 Deployments



Built for Distributed Systems



Maximizes Performance & Reduces Cost and Risk

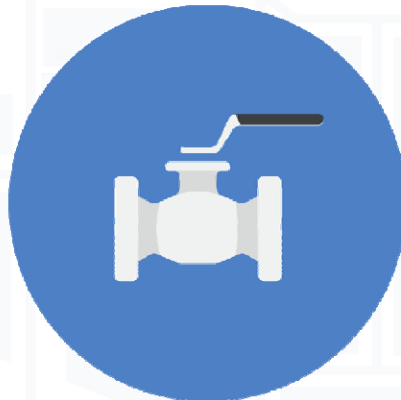
- Combined sewer overflow reduction
- Sediment and water quality retrofits
- Existing and new infrastructure (gray and green)
- Alerting of maintenance needs
- Providing auditable reports to regulators



OptiNimbus: Measure and Improve Performance



RAIN IS FORECASTED



**VALVE CLOSES
AUTOMATICALLY**



REGULATIONS ARE MET



Cloud Based Monitoring and Active Control



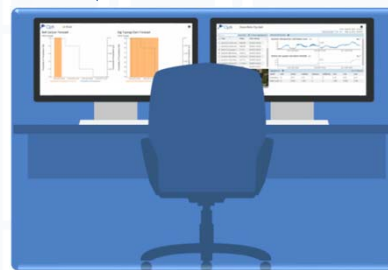
Sensors (i.e depth)
& Valve Control



Cloud Native Platform



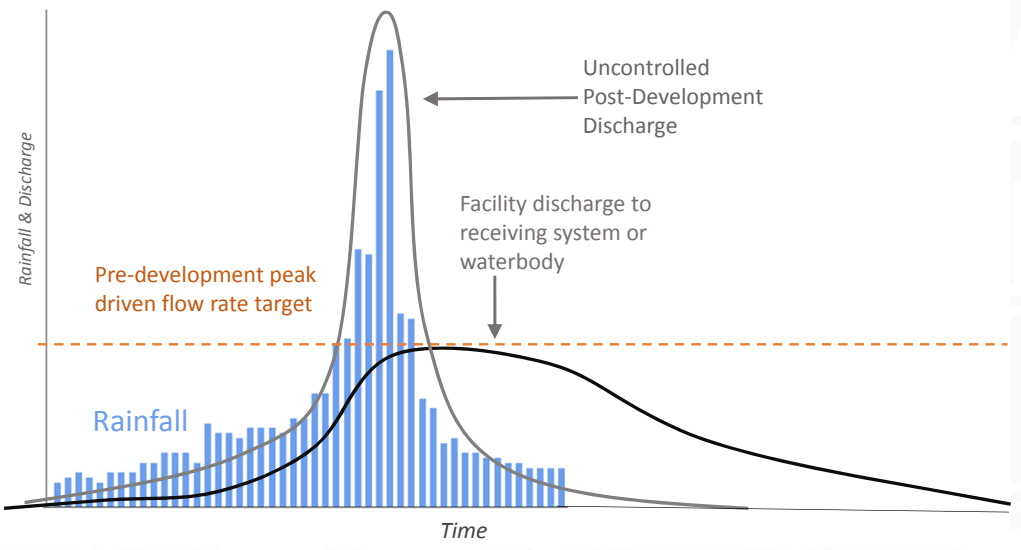
NOAA Weather
Forecast Information



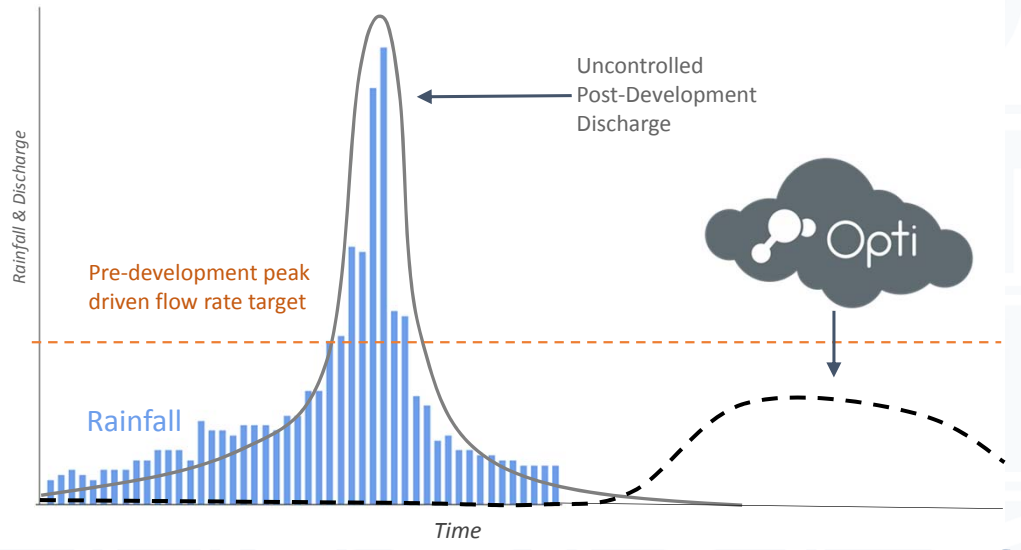
Web Dashboard and Controls

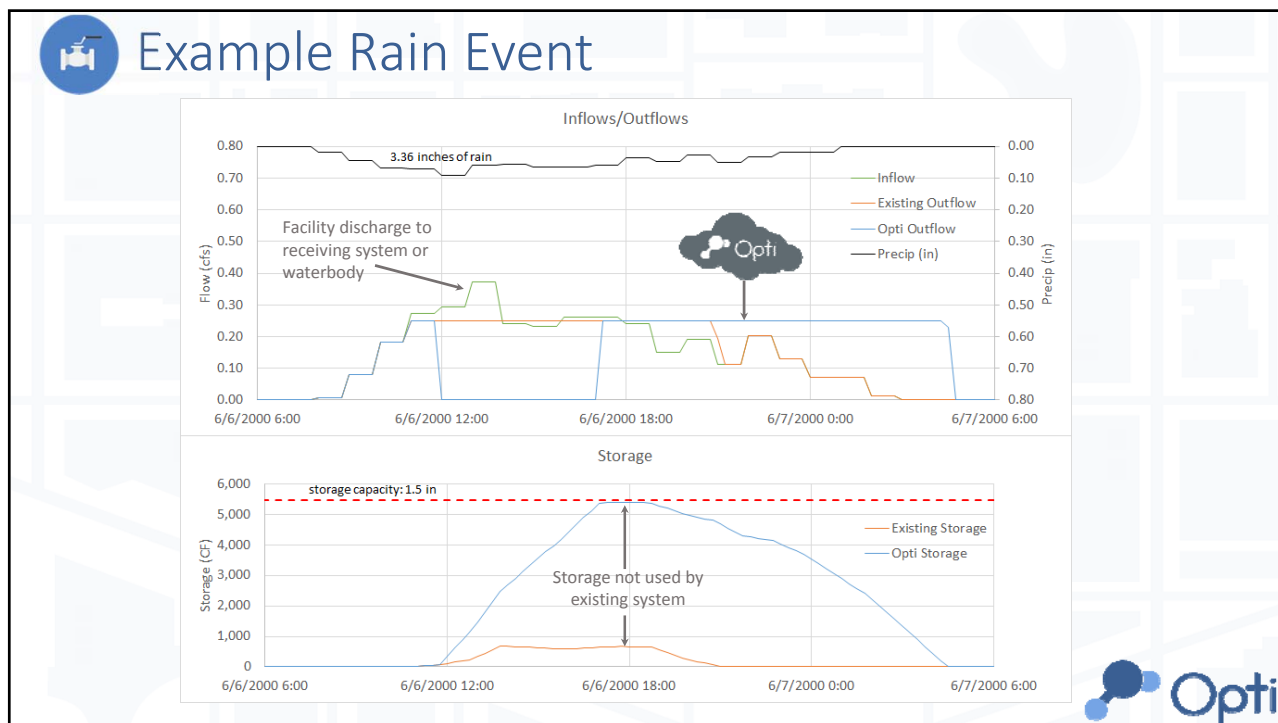
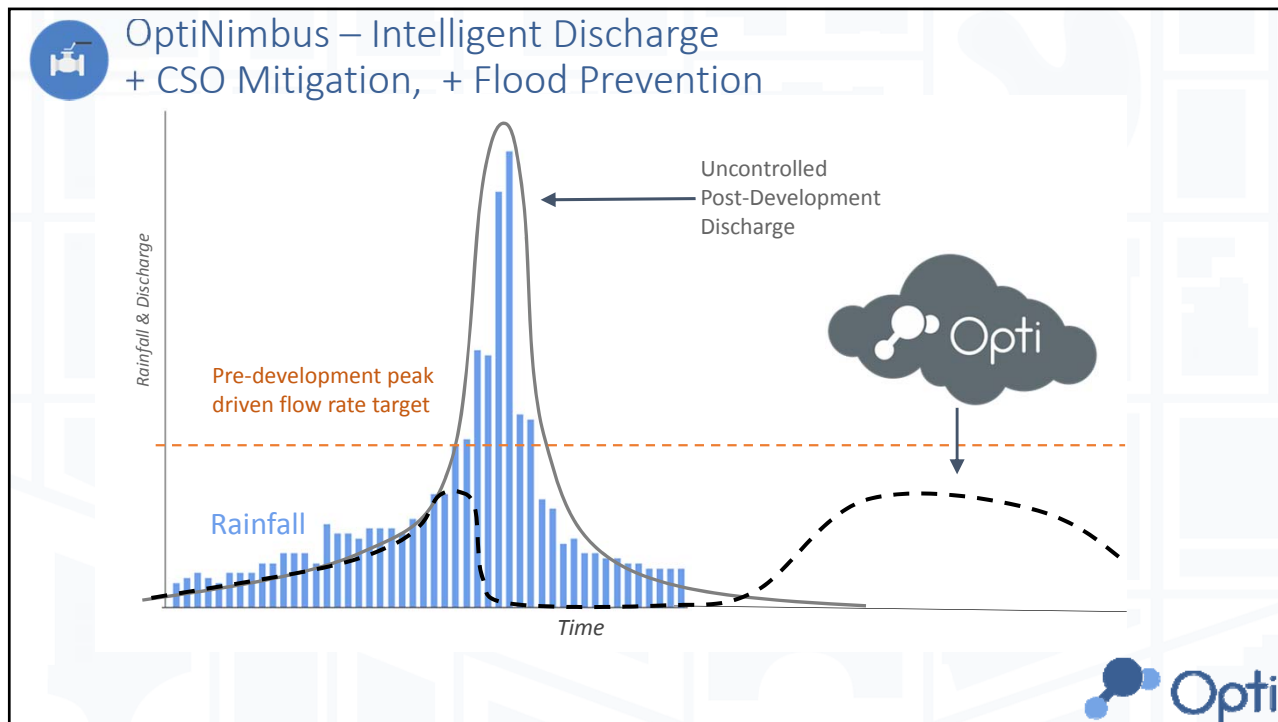


Traditional – Passive Controlled Discharge



OptiNimbus – Intelligent Discharge + Water Quality, + Rainwater Harvesting







A Few Example Projects



Combined Sewer Overflow Control



Brooklyn Botanic Gardens



EPA Headquarters

5248 gallons

Drain Operation Mode
Current state is Automatic

Automatic
Closed
Open

Air Pump Control
Current state is Automatic

Automatic
Off
On

Local Network Status
Offline 0%, Online 100%
Past 24 Hours

Drain Operation Mode
Automatic 100%, Closed 0%, Open 0%
Past 24 Hours

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



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



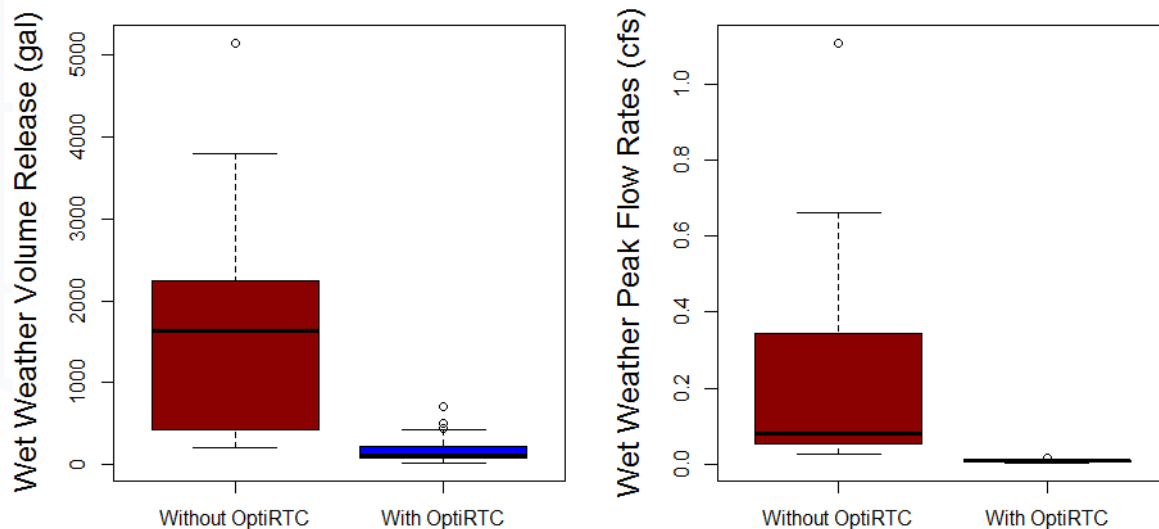
Less Rain Than Expected

	Storm #1 : 2/26/2014		Storm #2: 6/5/2014		Storm #3: 2/21/15	
	With <u>OptiRTC</u>	Without <u>OptiRTC</u>	With <u>OptiRTC</u>	Without <u>OptiRTC</u>	With <u>OptiRTC</u>	Without <u>OptiRTC</u>
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.



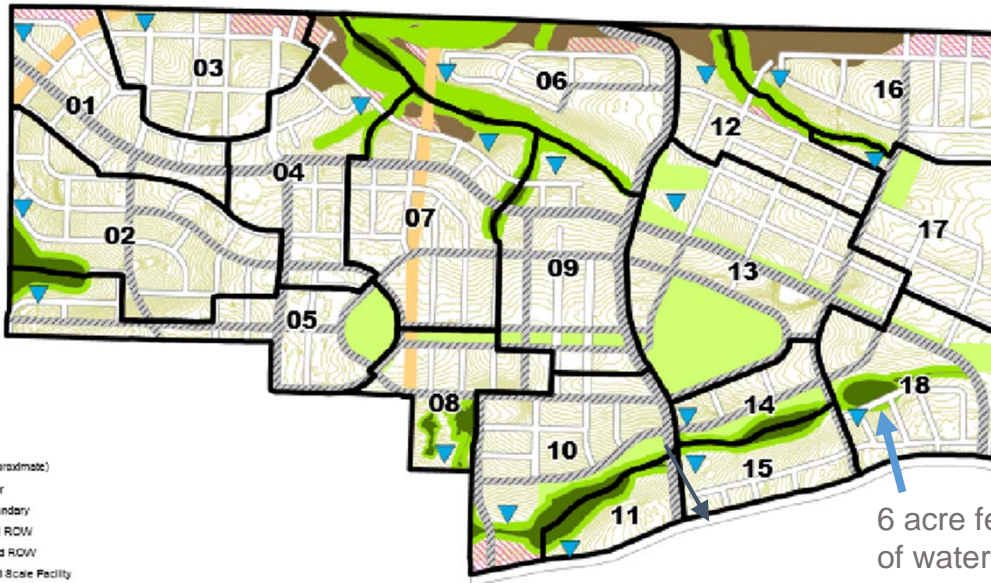
Hydromodification



Polygon at North Bethany Falls



Consulting Services
for Project by:



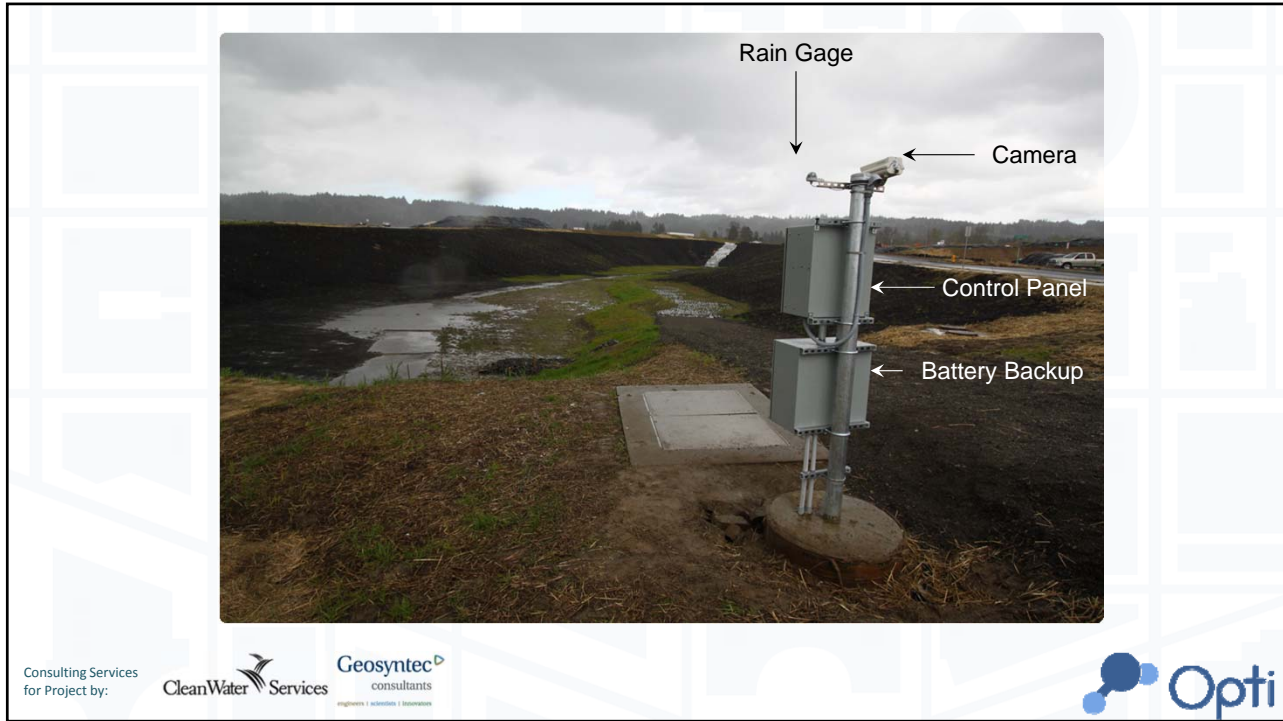
120 acre watershed

6 acre feet of water

(approximate)
our
boundary
red ROW
red ROW
road Scale Facility
Corridor

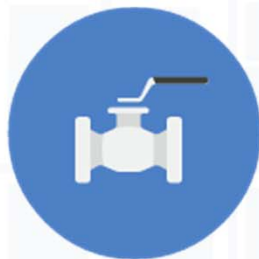
Consulting Services
for Project by:







OptiNimbus is also a solution for:



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

Opti Web Interface

Select Site & Dashboard

The screenshot displays the Opti web interface. At the top left is the Opti logo. The main header is "The Hub" with a settings gear icon on the right. Below the header are two tabs: "Images" and "Map".

On the left side, there is a sidebar menu with the following sections:

- ▼ Projects (11)
 - Brooklyn Botanical Gardens
 - Butternut Creek
 - DDOE Firehouses 3 and 25
 - EPA HQ Stormwater Management
 - Kilbuck PEAS
 - LA River
 - Nestle FL
 - Prado Wetlands
 - Ranaqua Green Roof Monitoring
 - Twin Oaks
 - Veolia Pilot Sites
- ▼ Groups (15)
 - All Veolia Pilot Site
 - Brooklyn Botanical Gardens Admin
 - Butternut Creek Admin
 - City of Austin

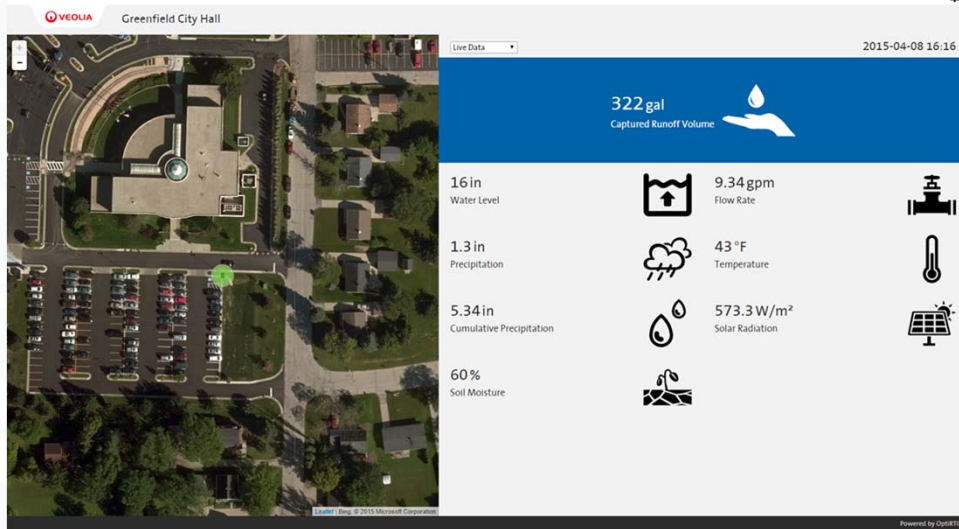
The main content area features a grid of site images and a map. The images include:

- Cypress Spring OW-3
- Cypress Spring OW-4
- DDOE E25 Monitoring
- Engine 3 Pavement Monitoring
- EPA Cisterns Operations (with the United States Environmental Protection Agency logo)
- Engine House 25 Adv. Rainwater Harvesting

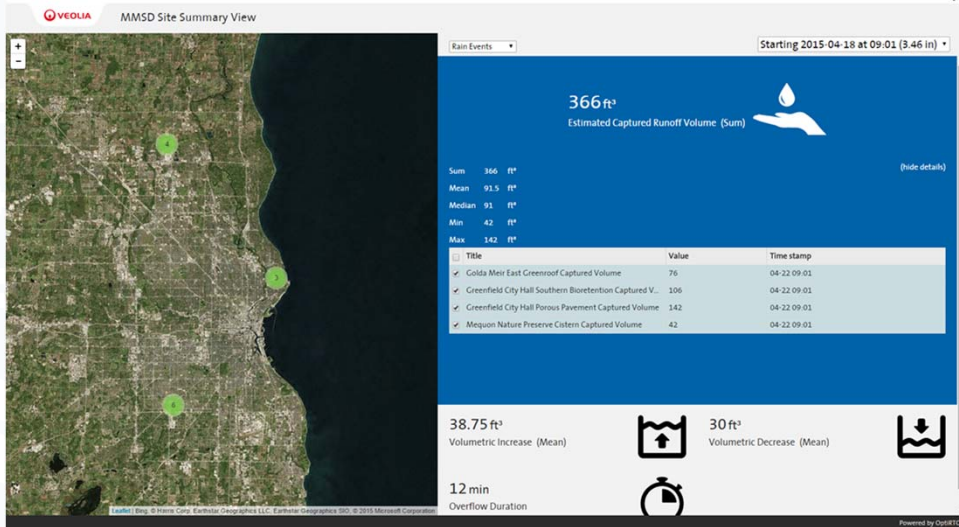
On the right, a map of the United States shows several green location markers numbered 2, 3, 8, 11, and 35. A blue location pin is visible on the West Coast. At the bottom left of the map, there is a small attribution: "Leaflet | Bing, Image courtesy of NASA, Earthstar, GeoGraphics, SIO, © 2015 Microsoft Corporation".

At the bottom left of the interface, the text reads: "Copyright 2015 OptiRTC, Inc | Terms of Use".



View Key Data & Performance Indicators



Aggregate Site Data

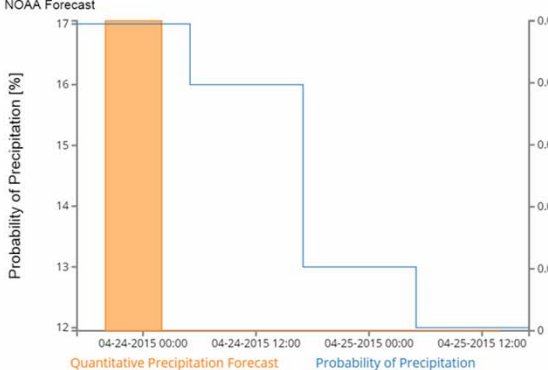


Interact with Graphical Forecasts


LA River


Bell Canyon Forecast

NOAA Forecast



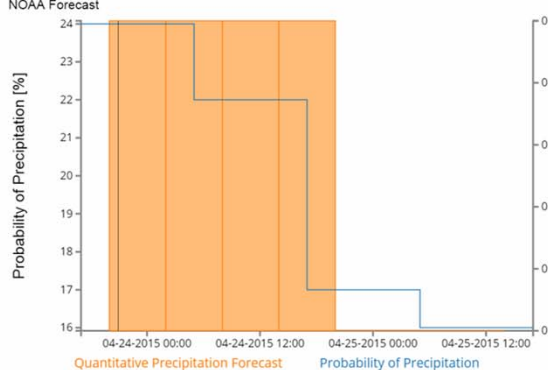
Probability of Precipitation [%]

Forecasted Precipitation [in]

Quantitative Precipitation Forecast Probability of Precipitation

Big Tujunga Dam Forecast


NOAA Forecast





Probability of Precipitation [%]

Forecasted Precipitation [in]

Quantitative Precipitation Forecast Probability of Precipitation



Analyze


Greenfield City Hall


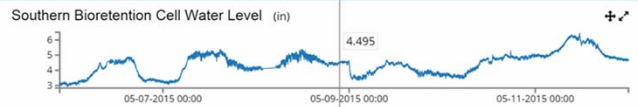
From: May 05, 2015 - 21:23:33
 To: May 12, 2015 - 00:00:00

Search advanced Show Aggregations


Title	Value	Time stamp
<input type="checkbox"/> Gamma 1 online sta...	ONLINE	05-08 21:26:48
<input type="checkbox"/> Gamma 2 online sta...	ONLINE	05-08 21:26:48
<input checked="" type="checkbox"/> Optical rain guage C...	6.15 in	05-08 21:26:52
<input checked="" type="checkbox"/> Southern Bioretenti...	4.495 in	05-08 21:26:52
<input type="checkbox"/> Southern Bioretenti...	45.65 m³/...	05-08 21:26:52
<input type="checkbox"/> Southern Catch Bas...	23.77 in	05-08 21:26:52
<input type="checkbox"/> Southern Porous Pa...	0.1102 in	05-08 21:26:52
<input type="checkbox"/> Southern Porous Pa...	0 gpm	05-08 21:26:52

2015-05-08 21:27:01


Southern Bioretention Cell Water Level (in)




Optical rain guage Cumulative Rainfall (in)



Aggregations								
name	unit	mean	median	variance	stdDeviat...	max	min	sum
Cumulativ...	in	6.15	6.15	0	0	6.15	6.15	6.15
Water Level	in	4.495	4.495	0	0	4.495	4.495	4.495



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<https://portal.optirtc.com>



Installed Hardware Examples





OptiNimbus – A Smarter Approach

Costs

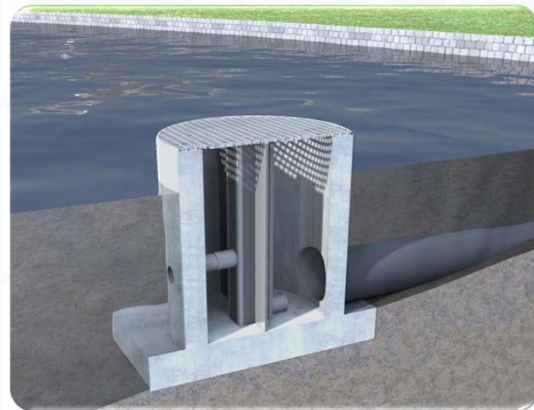
- Reduced capital investment
- Reduced labor
- Reduced maintenance

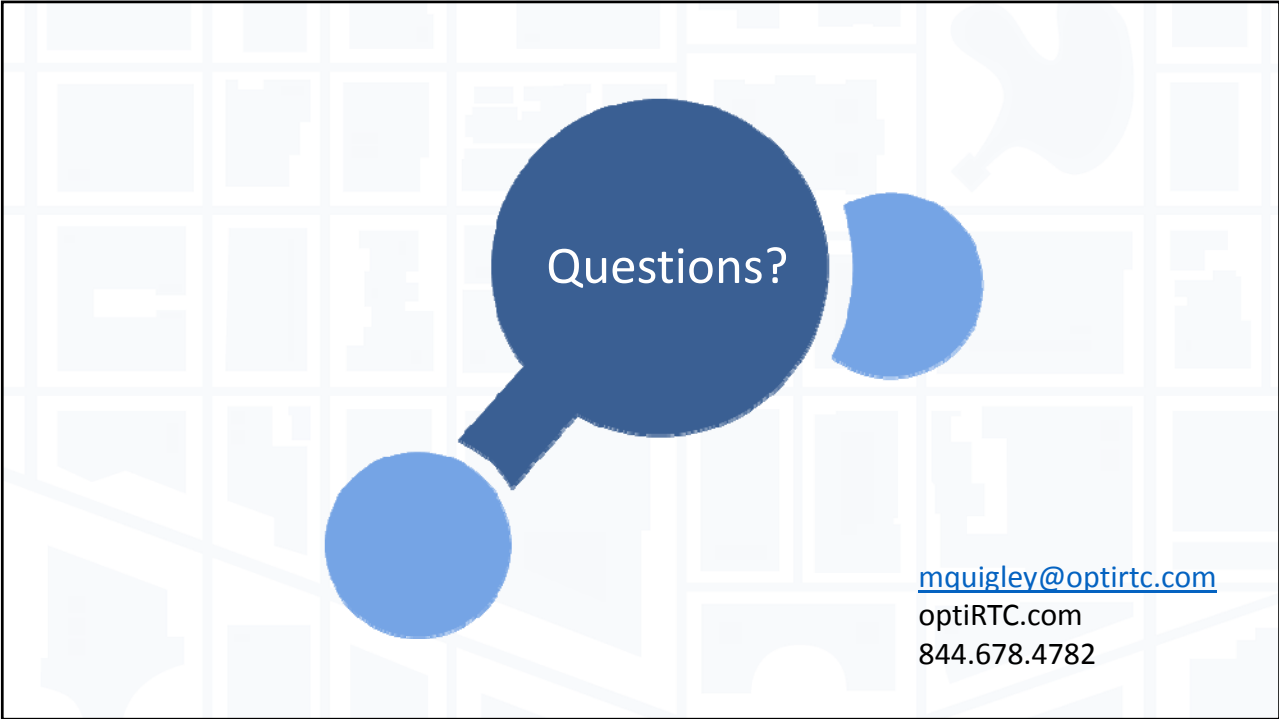
Stay in Compliance

- Water quality
- Alerts

Environmental Benefits

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





Questions?

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optiRTC.com
844.678.4782