NETWORKED APPROACH TO REAL-TIME MONITORING

Predictive Analytics in Stormwater

Step 1: Build the Knowledge Base

Augment the guy in the office & in the field who knows a thing or two about the stormwater system

Real-Time Monitoring data network that knows EVERYTHING about the stormwater system

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(what we are building in 2019)

Step 2: Build & Train the Predictive Algorithms

Real-Time Pattern Recognition (time series) + Weather Data

Real-Time Pattern Recognition (spatial series) + Weather and Historical System Data

COST SAVINGS

By implementing just real-time monitoring, the EPA estimates that the costs paid by communities from flooding and sewage overflows can be reduced dramatically.

$88.5B
Total

ELIMINATE SANITARY SEWER OVERFLOWS
by tracking and identifying undersized pipes and rainfall-derived I/I (inflow & infiltration), sediment & debris buildup, pipe breaks and leaks, offset joints

$7.5B – 50%
of estimated O&M, annual

MINIMIZE OPERATING COSTS
by reducing high electricity costs for pump & gate ops

$7.5B – 50%
of estimated O&M, annual

MINIMIZE MAINTENANCE COSTS
by tracking and identifying equipment failure rates and sedimentation issues

$6B
Fines, fixes, and litigation, annual

MINIMIZE CSOs
by tracking and identifying rainfall-derived I/I and undersized facilities.

$270B
Flood damages in 2017

REDUCE FLOODING RISKS
by tracking and identifying rainfall-derived I/I and undersized facilities

BUT WE STILL HAVE SOME LIMITATIONS: RTC REQUIRES DATA

BUT

DATA ARE EXPENSIVE

So I asked myself: how do we get AS MUCH DATA as possible from AS LARGE AN AREA as possible… underground?

…and how do we make it actionable?

NETWORKED APPROACH TO REAL-TIME MONITORING

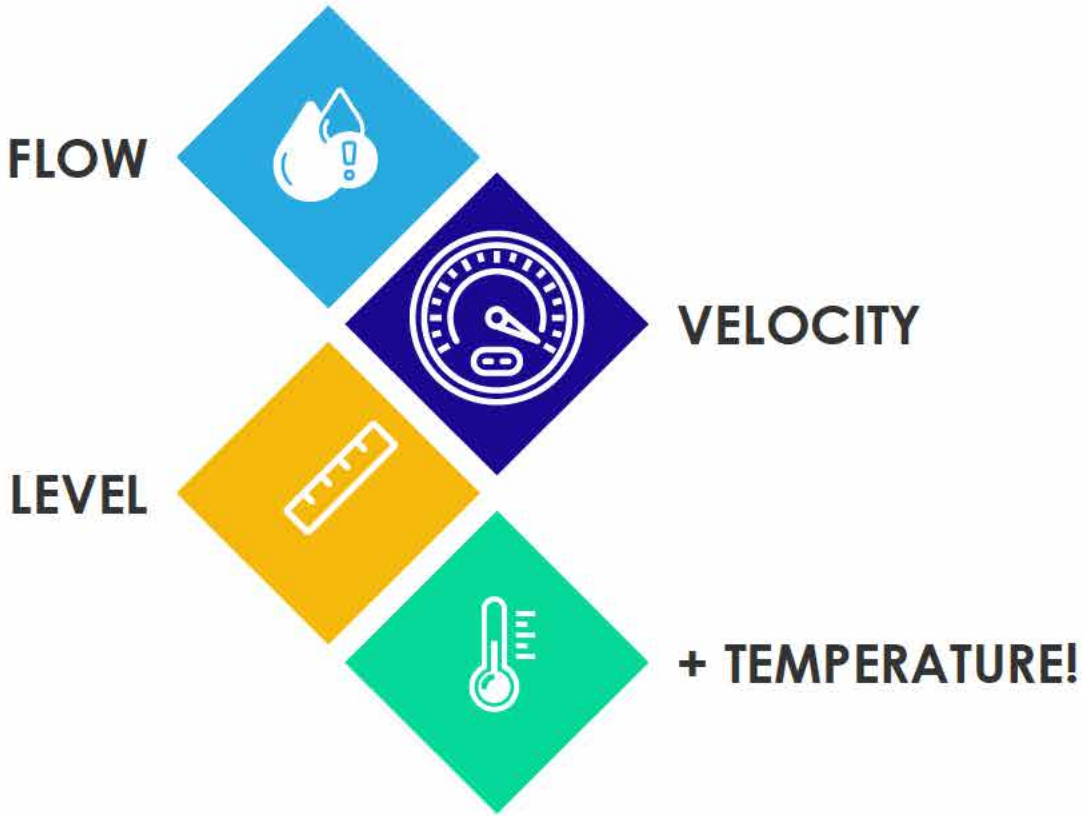
DATA: Advanced Infrastructure Analytics and Mapping

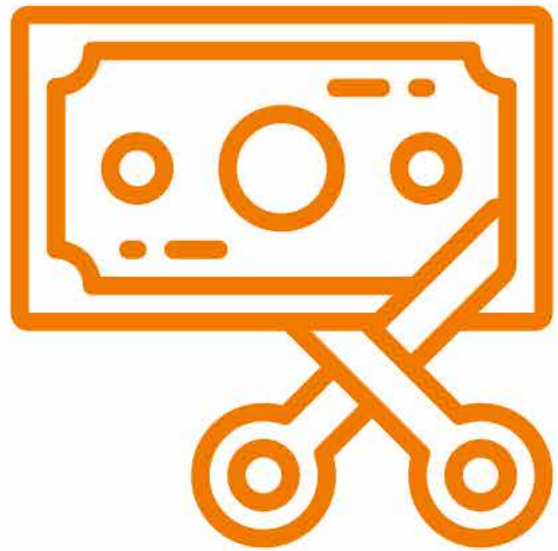
VIA

Patented design for low-cost, high-reliability sensors (Scutes™)

Cloud-connected via IoT

NETWORKED APPROACH TO REAL-TIME MONITORING





10X

COST REDUCTION

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(MY PIPE DREAM)

NETWORKED APPROACH TO REAL-TIME MONITORING

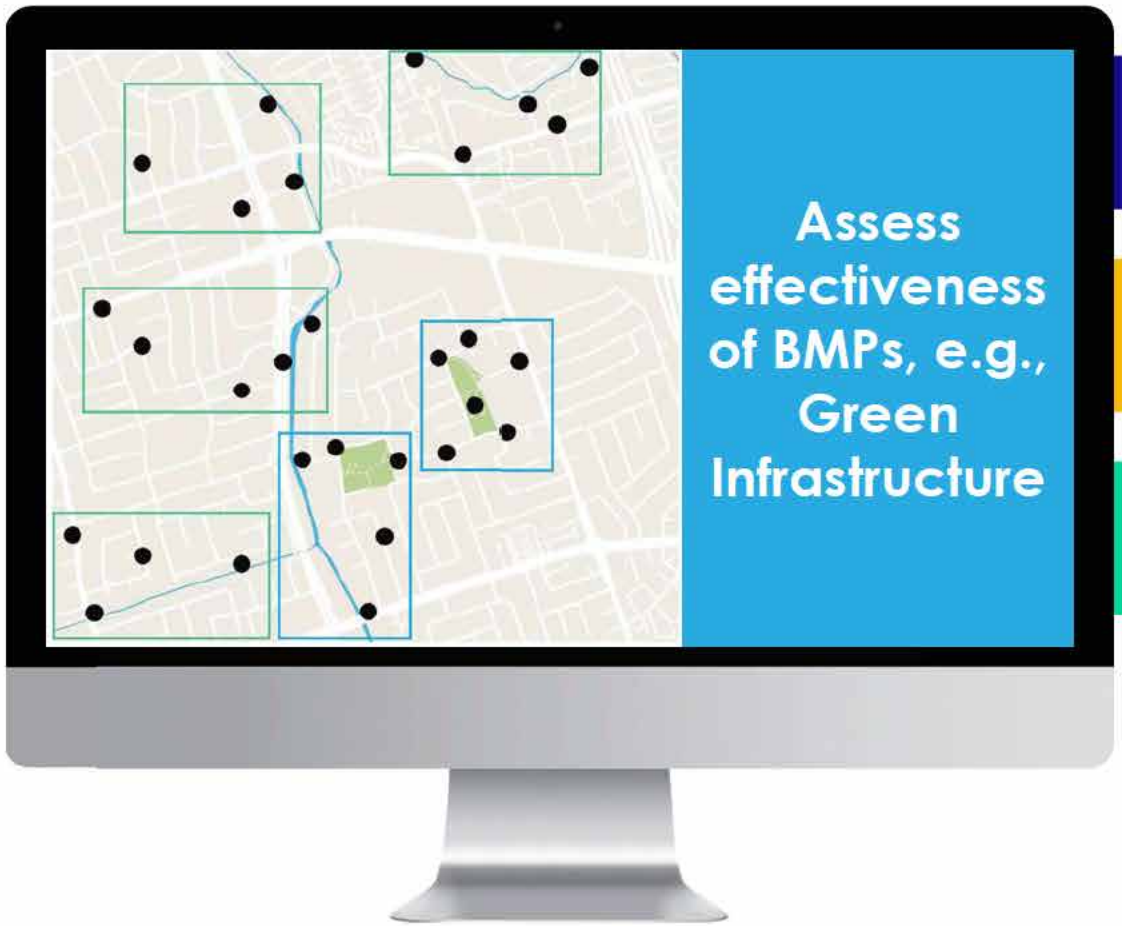
CSOs

IDDE

FLOODING & COASTAL MANAGEMENT

GREEN INFRASTRUCTURE ASSESSMENT

NETWORKED APPROACH TO REAL-TIME MONITORING: BMPs



CURRENT | EFFECTIVENESS

FUTURE | BASELINE

REFERENCE | COMPARISON

USE CASE: GREEN STORMWATER INFRASTRUCTURE ASSESSMENT

Current Situation: Many green infrastructure (GI) projects are **disconnected and small in scale**, making their impacts on the larger system difficult and costly to evaluate. Using a networked approach to real-time monitoring, you can evaluate the **cumulative impacts** GI projects are having on your urban watershed.

For GI projects, we suggest that you **employ a paired-watershed monitoring approach** using test and reference sub-watersheds. Insights gathered while monitoring GI with a StormSensor network can be used to evaluate changes in **infiltration**, **bulk flow**, and **thermal pollution** within your watershed.

ONE
CITY

INCREASED RECREATION ($520M)
HIGHER PROPERTY VALUES ($1.1B)
LOWER DEATH RATE AND IMPROVED HEALTH ($1.2B)
15,000 NEW JOBS ($125M)

THE VALUE OF NETWORKED MONITORING:

- Know the "who, what, and where" in real-time: **spatially track and quantify volume reductions** across project and reference sites.
- Quantify your savings: comparisons on a long-term basis allow you to **evaluate project effectiveness over time** which can aid in cost-effective maintenance, and long-term planning, and **project funding**.
- Move Forward: comparisons between project types help **determine operational efficiencies** under varying conditions so you can empirically determine the best fit for a given land use.
- Get Smarter: keeping an eye on parameters **upstream and downstream** of GI projects help **evaluate local effects** of projects. Further comparisons to values at outfalls **help evaluate the spatial extent of project benefits** within the test region.

KEEP MOVING FORWARD

Continuous, networked monitoring means you do not have to reinvent the wheel every time you want to monitor something new.

Once your monitoring network is in place, you can use the data and insights generated for much more than monitoring green infrastructure. Quantify storm flows to local waters as you work to comply with TMDLs. Track potential illicit discharges throughout your system.

Use Data to Improve the aesthetics of your community and the health of your human and aquatic ecosystems.

Erin K Rothman, CEO
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REFERENCES

Bipartisan Policy Center. 2017. Understanding America's Water & Wastewater Challenges.
https://bipartisanpolicy.org/library/understanding-americas-water-and-wastewater-challenges/

1 million miles of sewer pipes
$1.4 trillion required for sewer and wastewater infrastructure upgrades
$400/year in average sewer/wastewater fees per household per year in 2015
$48 billion required to address combined sewer overflows

National Weather Service. 2019. Flood-Related Hazards.
https://www.weather.gov/safety/flood-hazards

75% of declared disasters in the U.S. are from flooding

Axios. 2018. Sea level rise already causing billions in home value to disappear.
https://www.axios.com/sea-level-rise-costing-billions-in-home-prices-7920a7a8-8db4-45b1-ad21-357c4d522fcb.html

First Street Foundation. 2018. As the Seas Have Been Rising, Tri-State Home Values Have Been Sinking.
https://assets.floodiq.com/2018/08/17ae78f7df2f7fd3176e3f63aac94e20-As-the-seas-have-been-rising-Tri-State-home-values-have-been-sinking.pdf

$14.1 billion drop in property values along the east coast between 2005 and 2017 due to flooding and sea level rise

Axios. 2018. Rising Sea Levels Could Cost the U.S. Trillions
https://www.axios.com/sea-level-rise-will-be-costly-if-we-dont-take-action-8d63cf4a-db07-4512-a97b-5718920aaa38.html

$3.6 trillion through 2100 if there are no actions taken to protect coastal infrastructure and property from rising seas.
The cost could be reduced to $820 billion under the same scenario if those measures are implemented.