



Applications of Real Time Decision Support Systems (RT-DSS) in Conveyance Systems

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Client Solutions Manager



Increasing intensity and frequency of extreme wet weather
Major infrastructure cost & construction effort
Unequal economic and environmental burdens

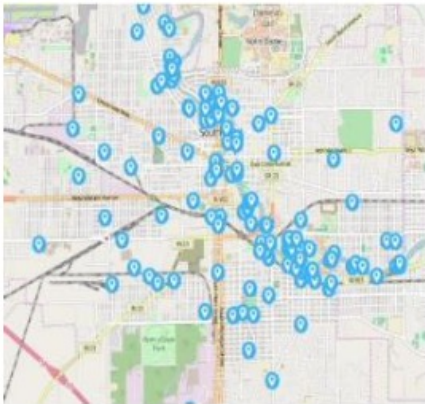


Industry Status Quo

Desktop simulation based on “Typical” conditions
Dig, dig, dig.

A More Elegant Way

Internet of Things/
Edge Computing



Sense

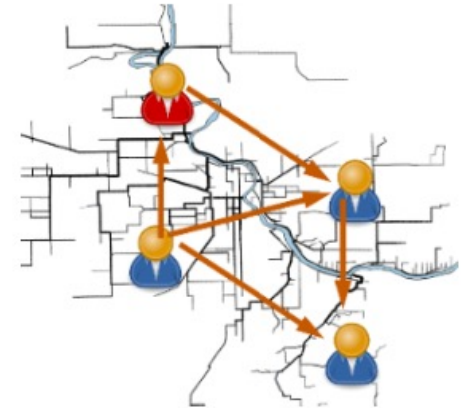
Machine Learning

Digital Twin



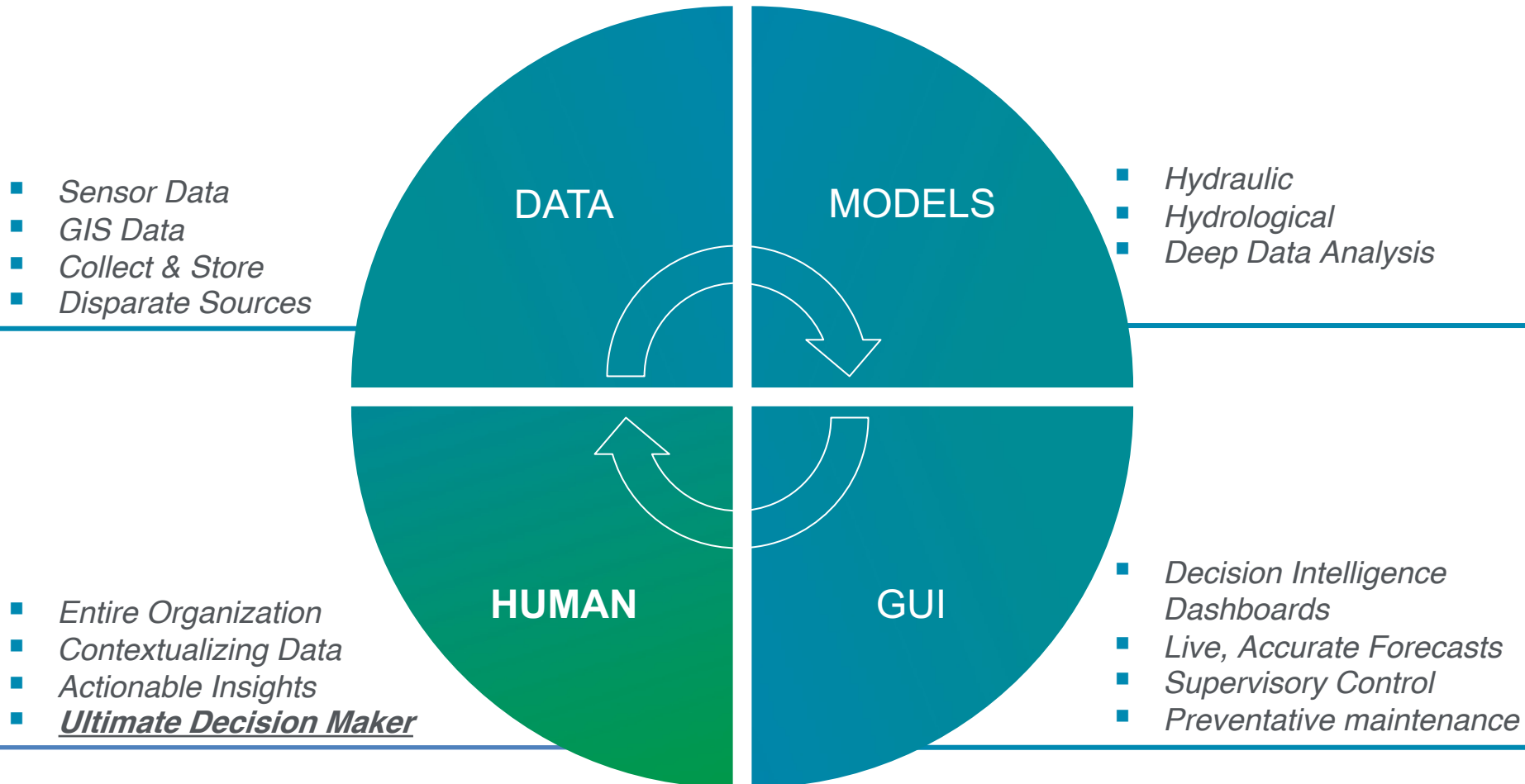
Predict

Dynamic Control



Act

RT-DSS Components





9:41 AM

100%

Vandam St

toward Hudson St



Then



RE-CENTER



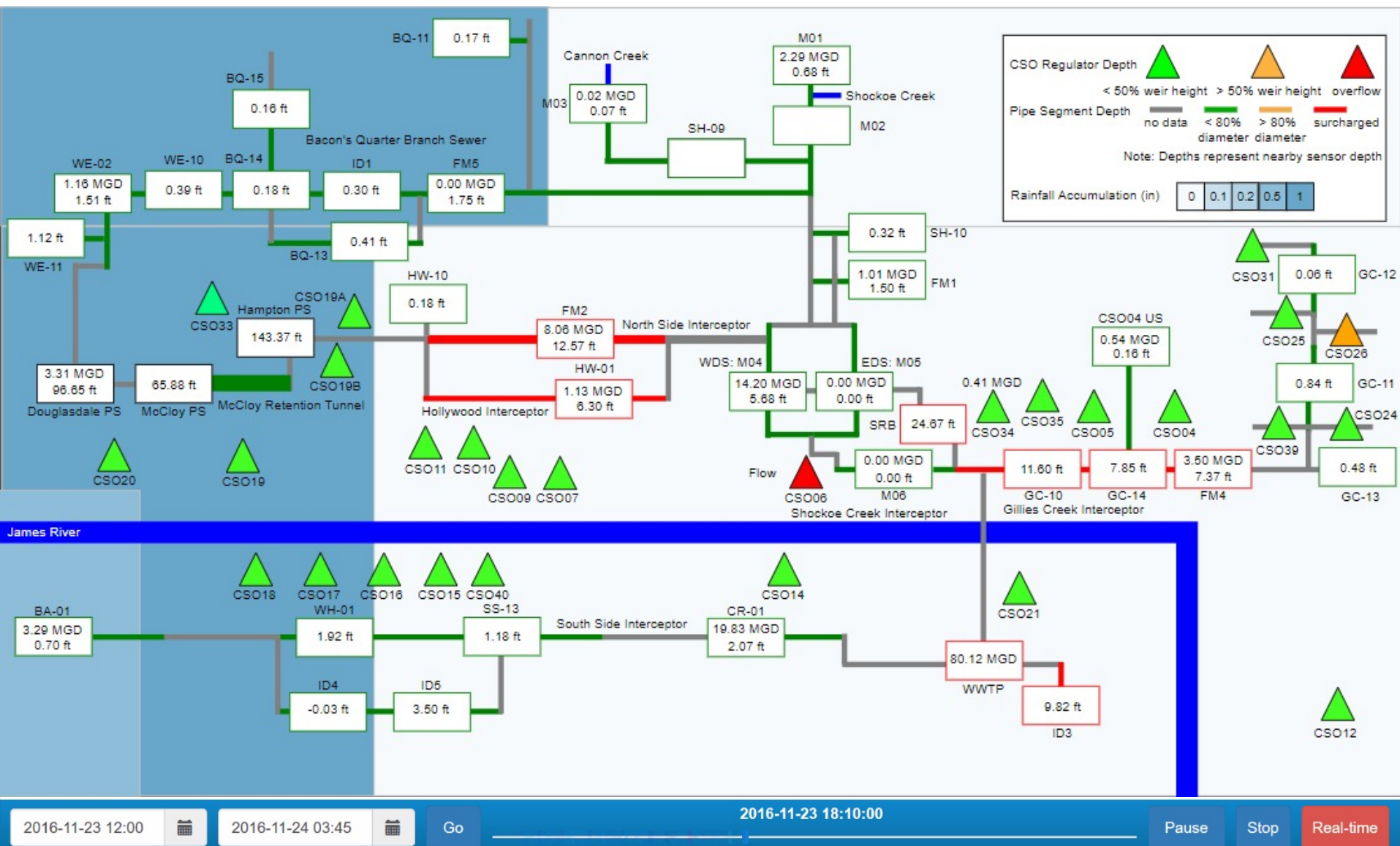
7 min
slower



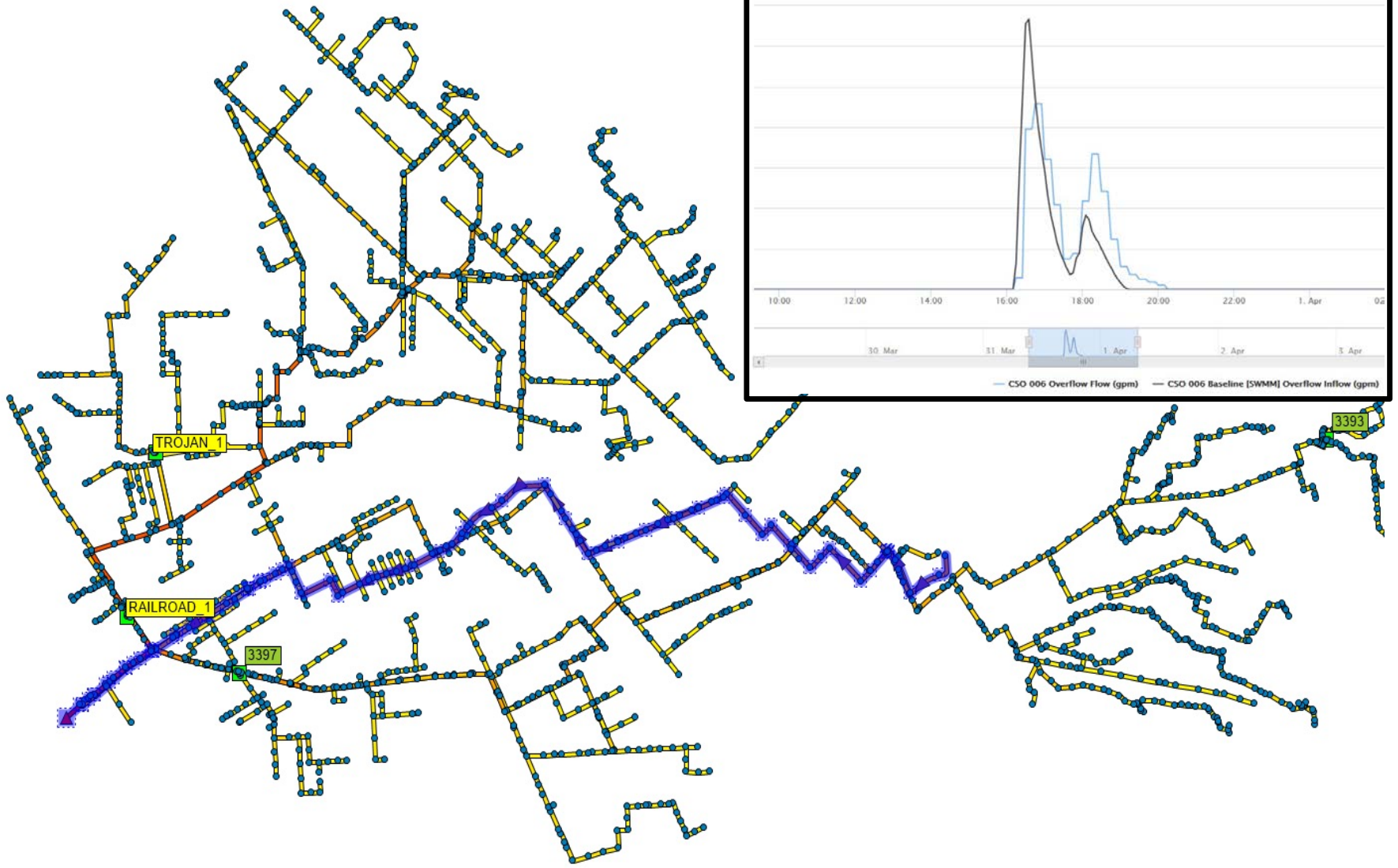
19 min · 5.2 mi · 9:59 AM



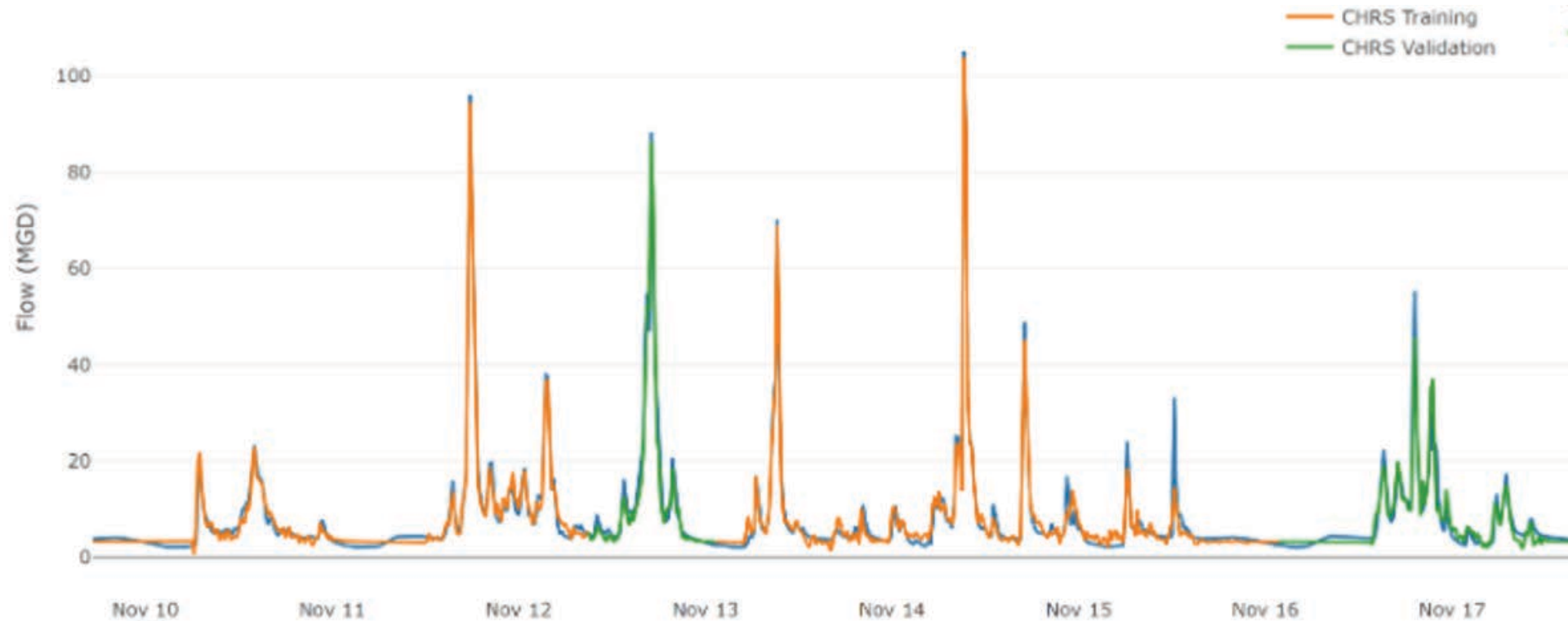
Sense: Turn on the Lights!



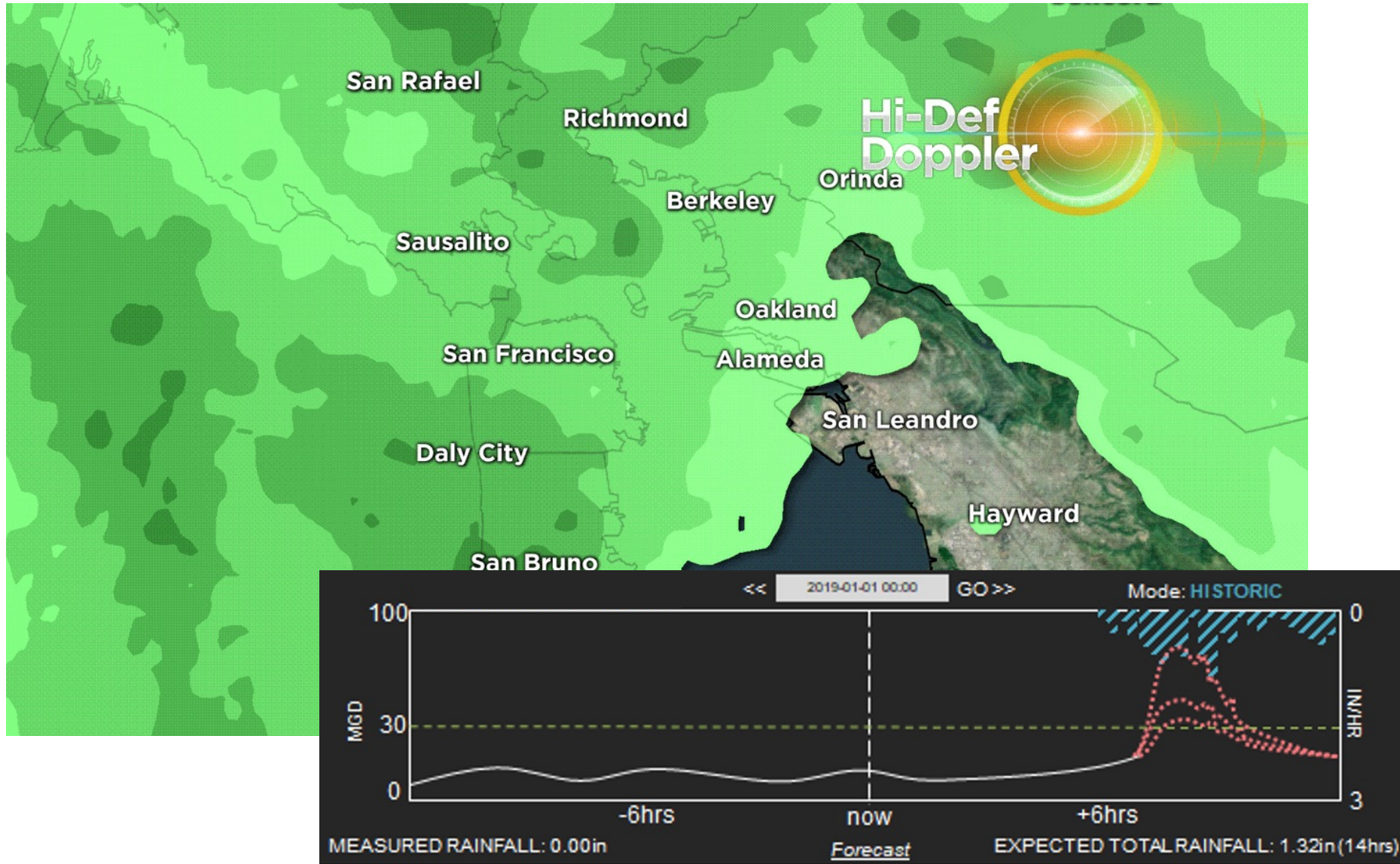
Predict: Models



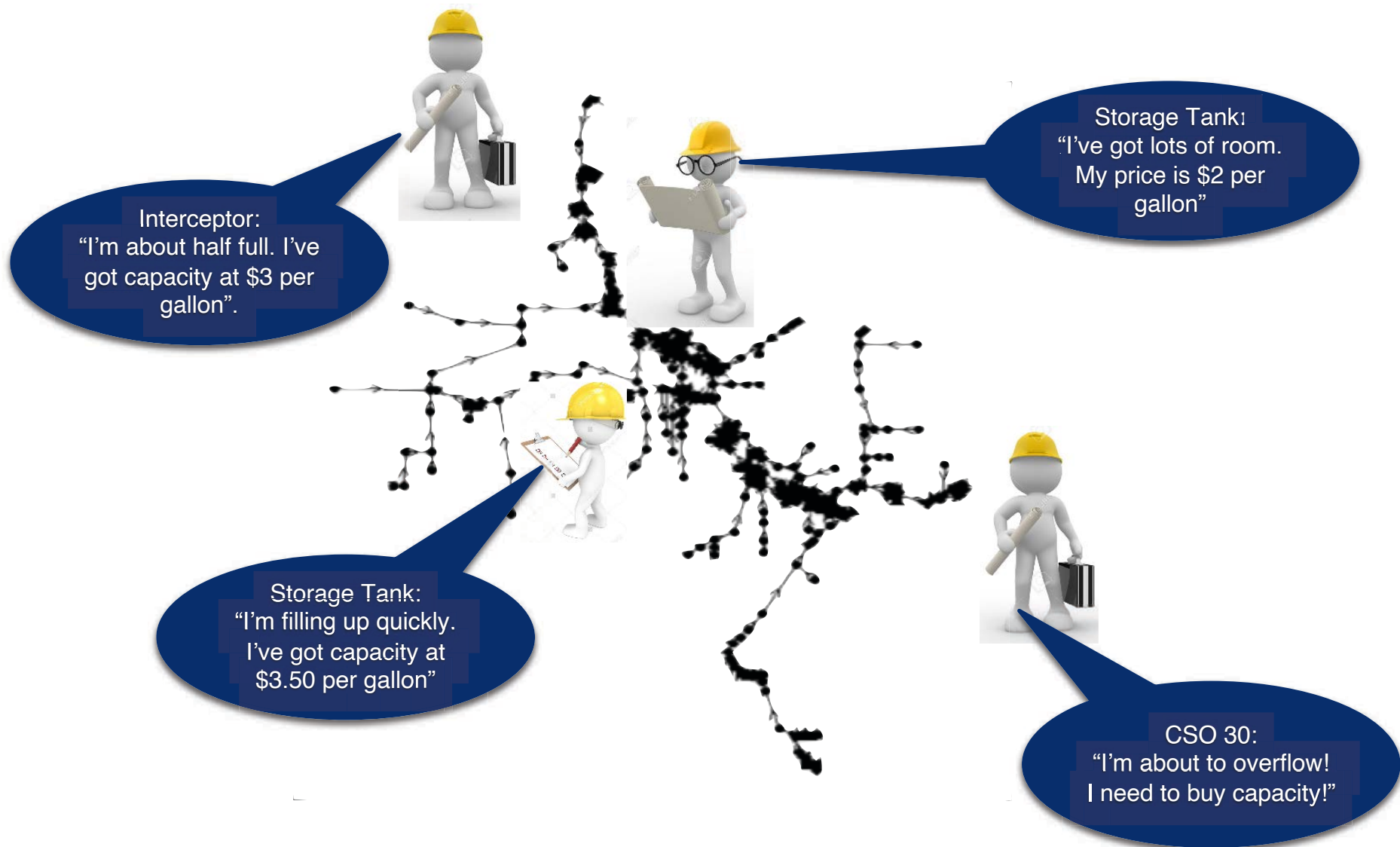
Predict: Cognitive Hydraulic Response System (CHRS)



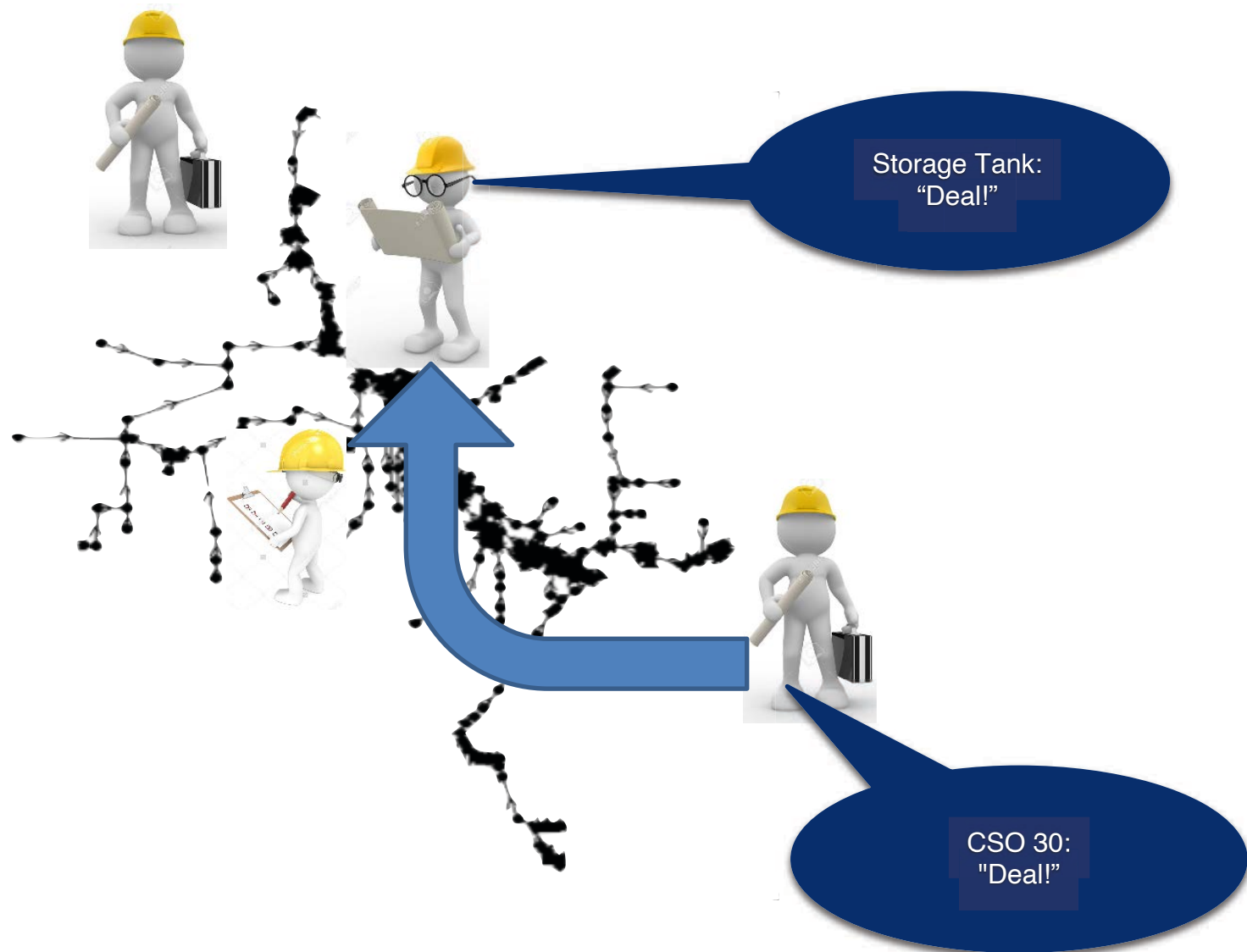
Predict: CHRS



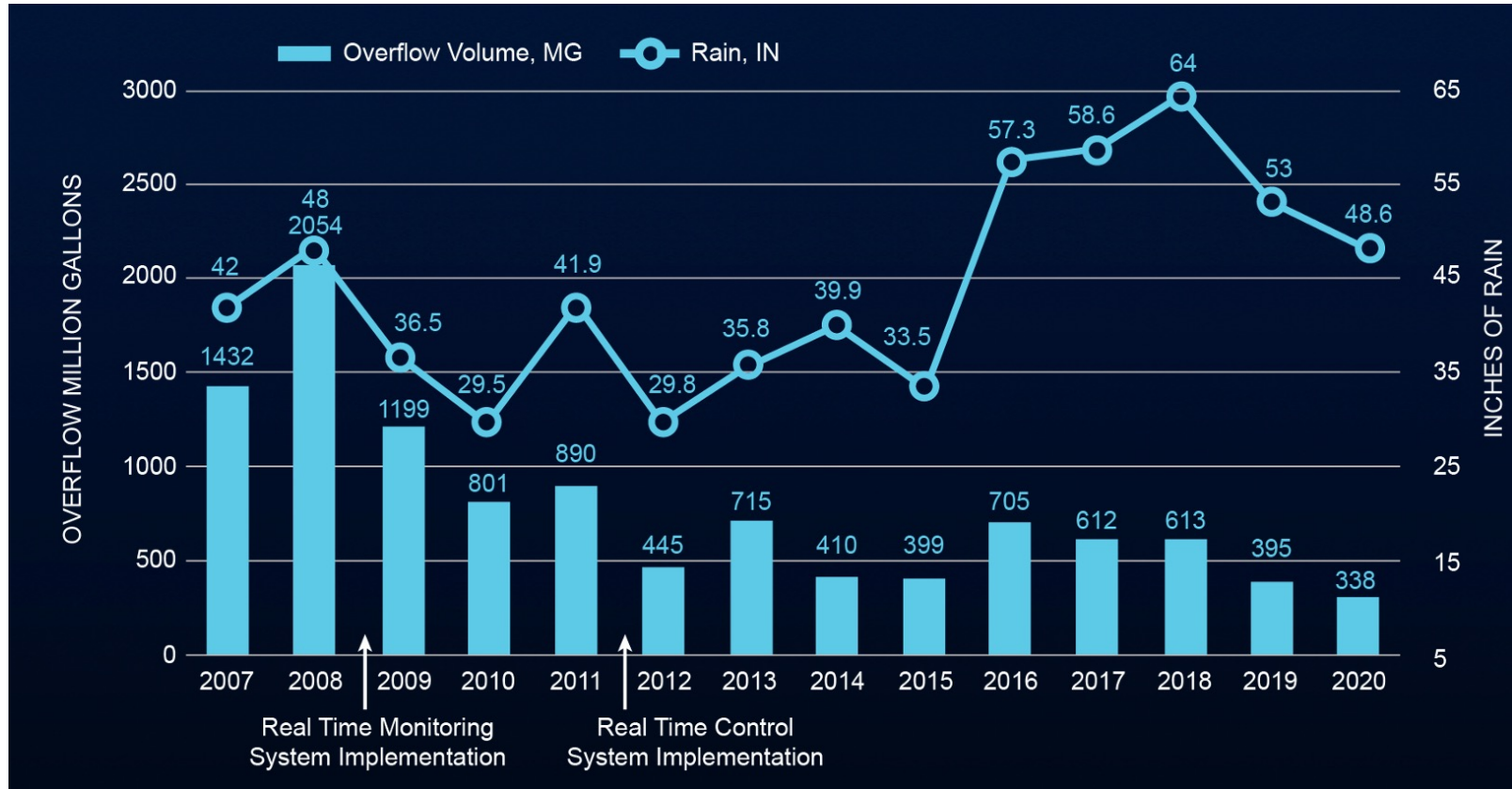
Act: Operate the Urban System



Act: Operate the Urban System



Outcomes: South Bend, IN



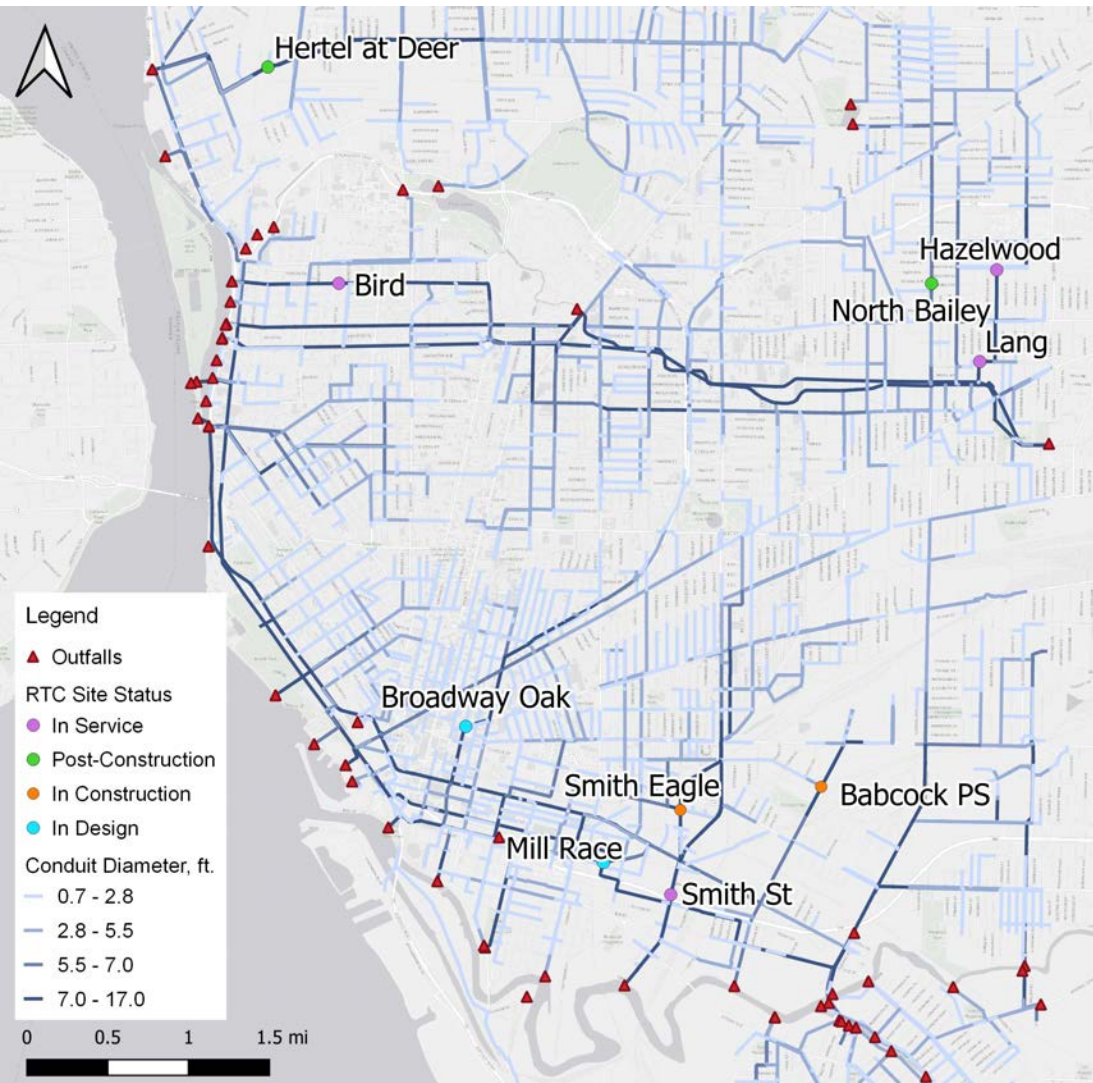
Components:

- 14 coordinated RTC sites
- 140 RT sensors (improved O&M)
- Machine learning enhanced model
- Global RTC integrated into LTCP

Outcomes:

- Eliminated dry weather overflows
- Reduced CSO 75%
- Reduced E. coli contribution to St. Joseph River by 55%
- New plan saves \$437 million, approved by DOJ/EPA

Buffalo, NY

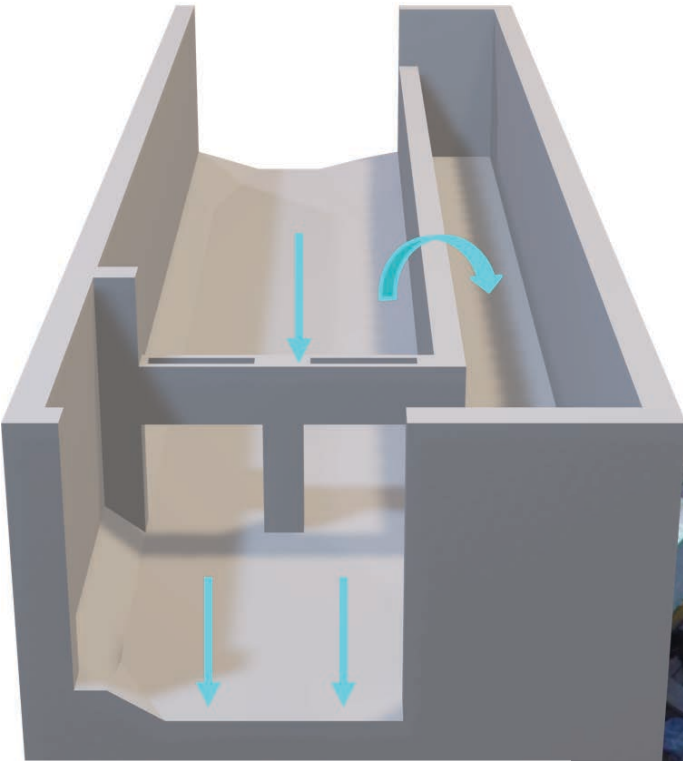


- **In Service:**
 - Smith St, Lang, Hazelwood, and Bird
- **Completed, undergoing tuning:**
 - North Bailey and Hertel at Deer
- **In Construction:**
 - Smith Eagle and Babcock PS
- **In Design:**
 - Broadway Oak and Mill Race

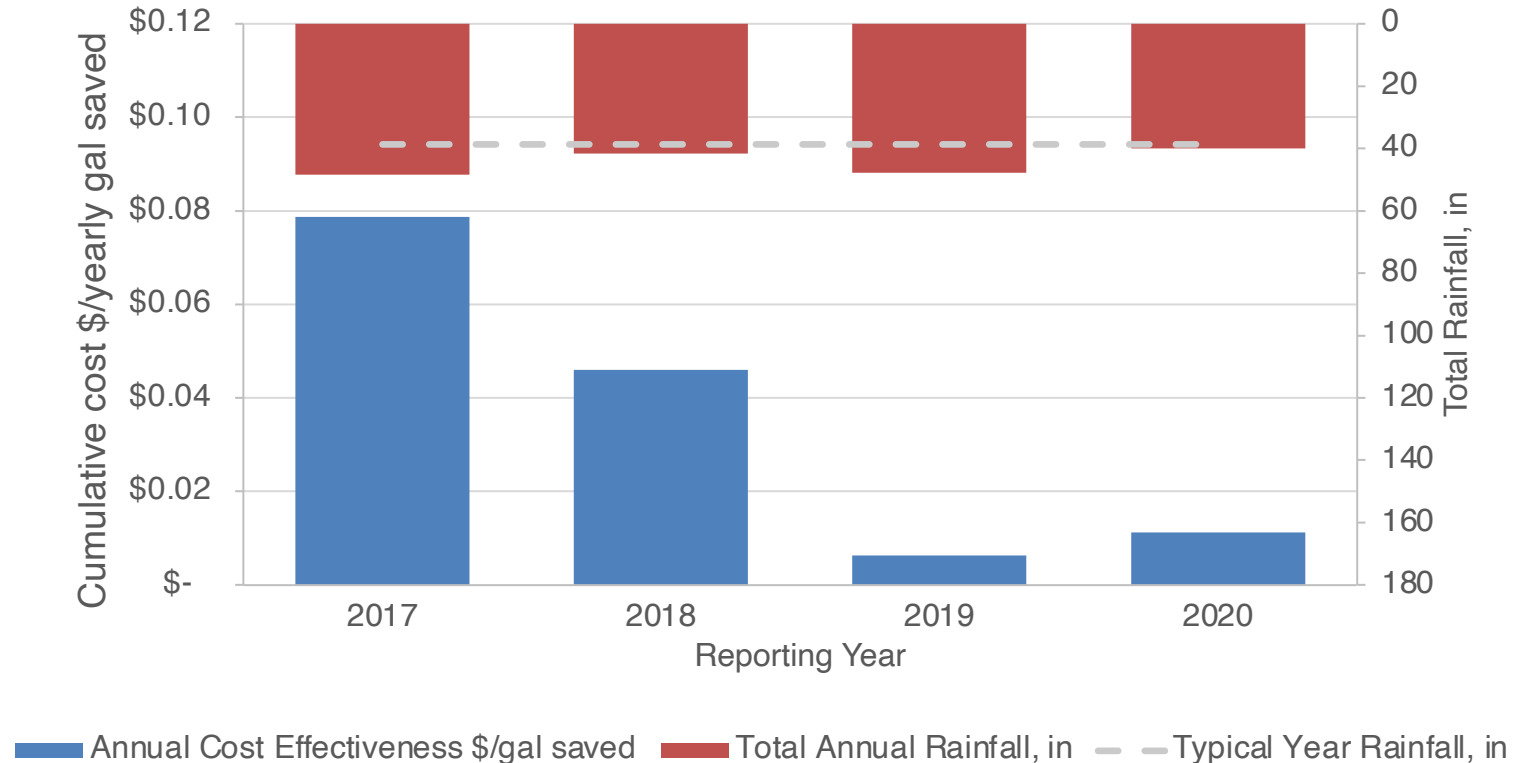
Buffalo, NY

Underutilized trunklines provide a cost-effective opportunity for inline storage to reduce overflows

Real Time Control (RTC) systems maximize the storage for any given storm



Outcomes: Buffalo, NY

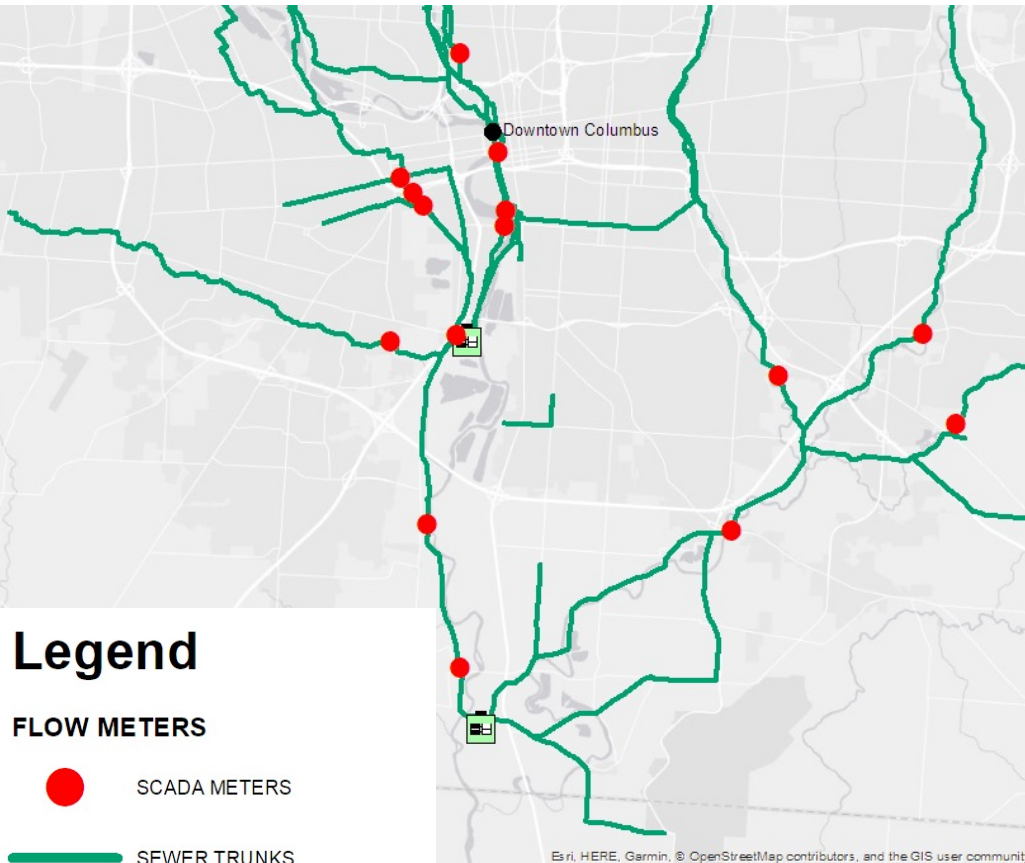


- 10 coordinated RTC sites
- \$145M saved from \$380M administrative order
- 3 Billion+ gallon reduction in CSOs to date

“Our real-time control program, led by the team at Xylem, has delivered more than four times the expected performance. It is hands down the most cost-effective program in our long-term control plan.”

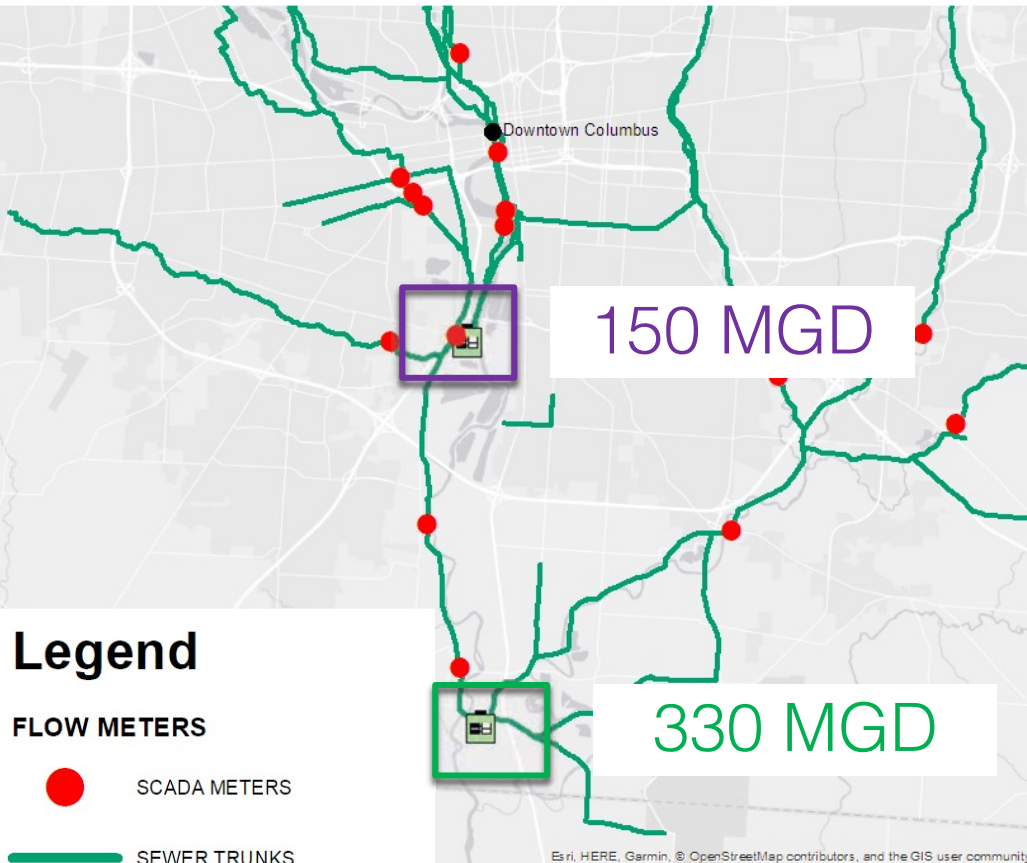
– OJ McFoy, General Manager

Columbus, OH



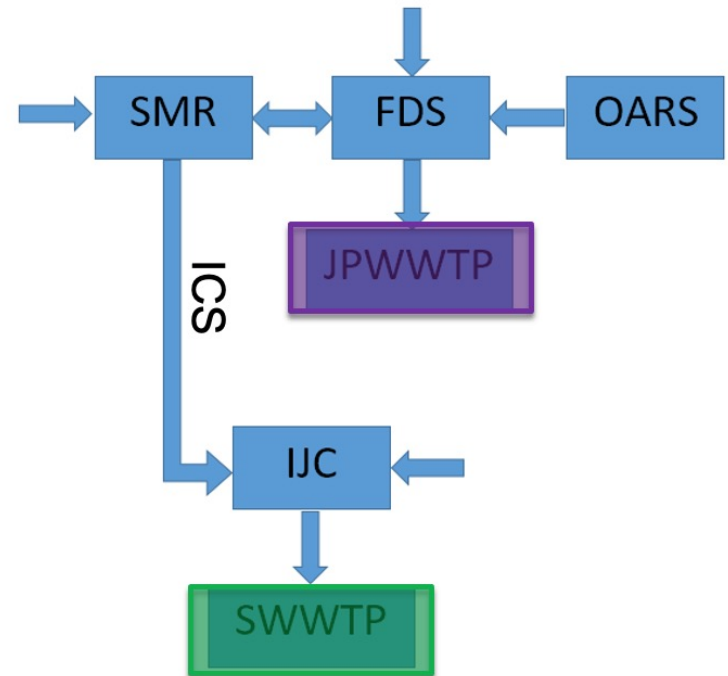
- **Columbus' Sewer System**
- **Two major treatment plants**
- **Service for Columbus, OH and 25 contracting suburban communities**
- **170 miles of Combined Sewers**
- **2,500 miles of Sanitary Sewers**

Columbus, OH

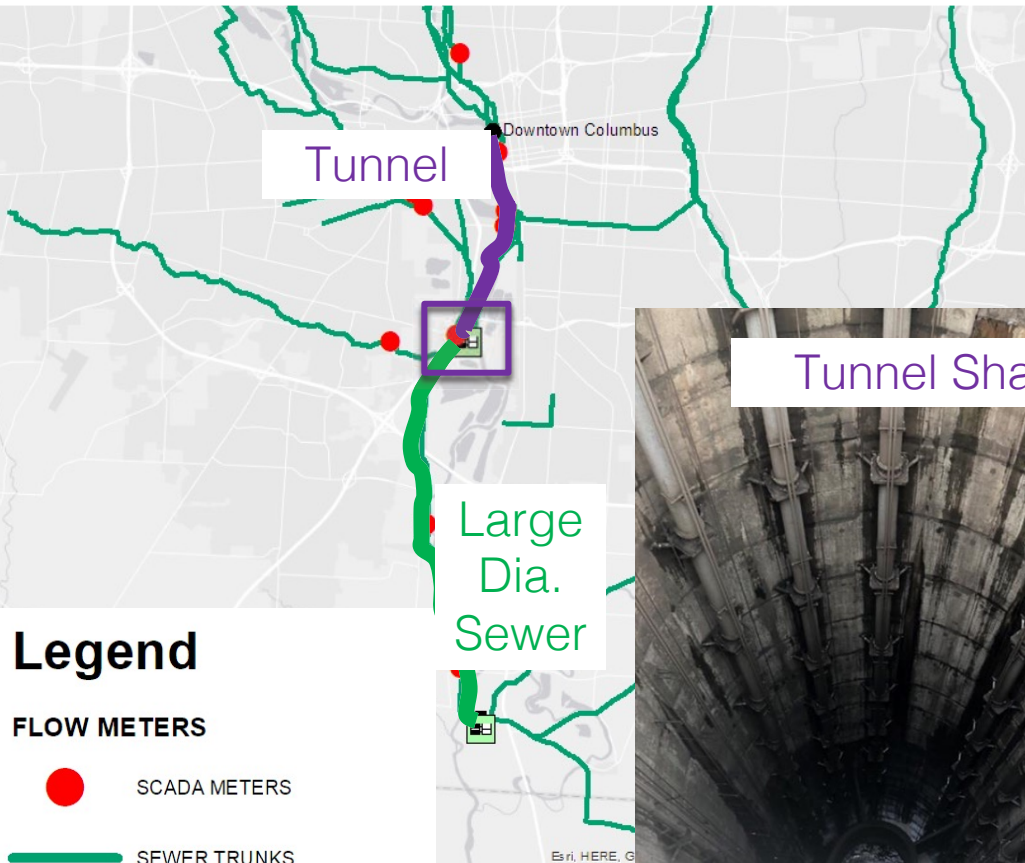


■ Treatment Plants

- Jackson Pike WWTP
- Southerly WWTP

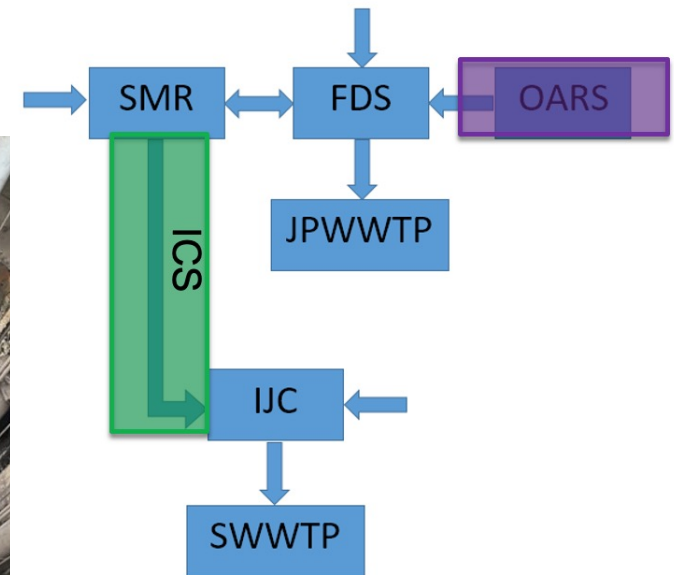


Columbus, OH

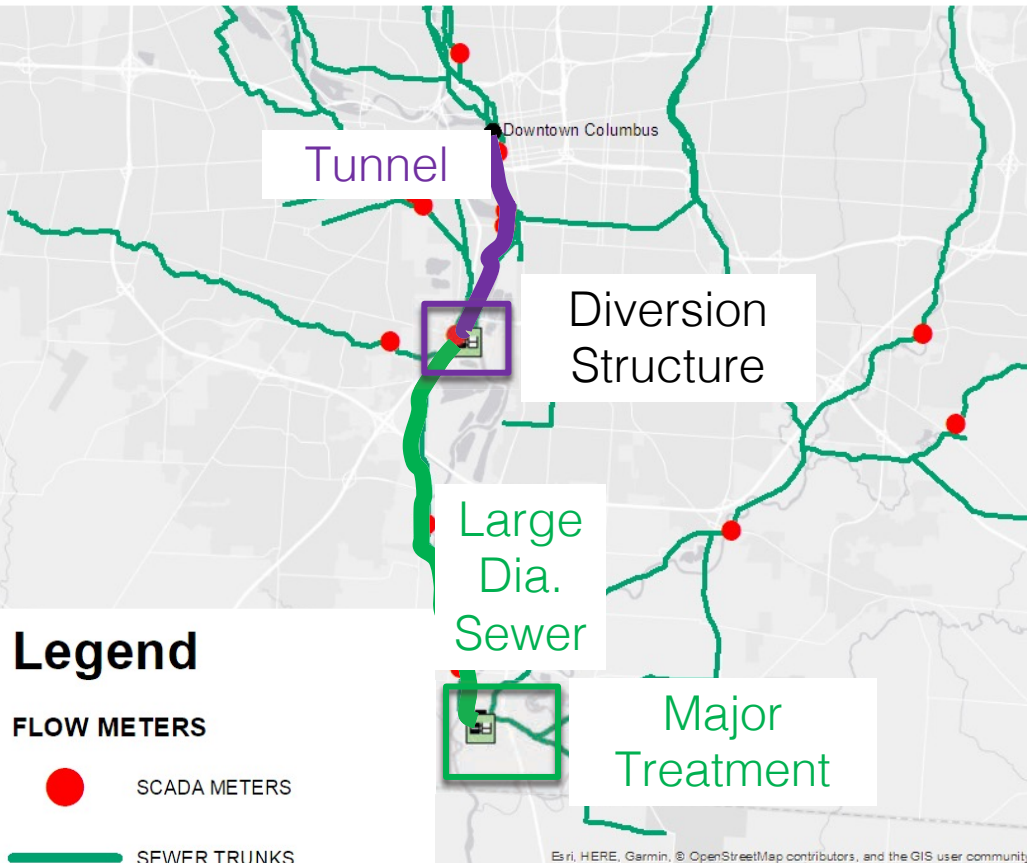


Storage Assets

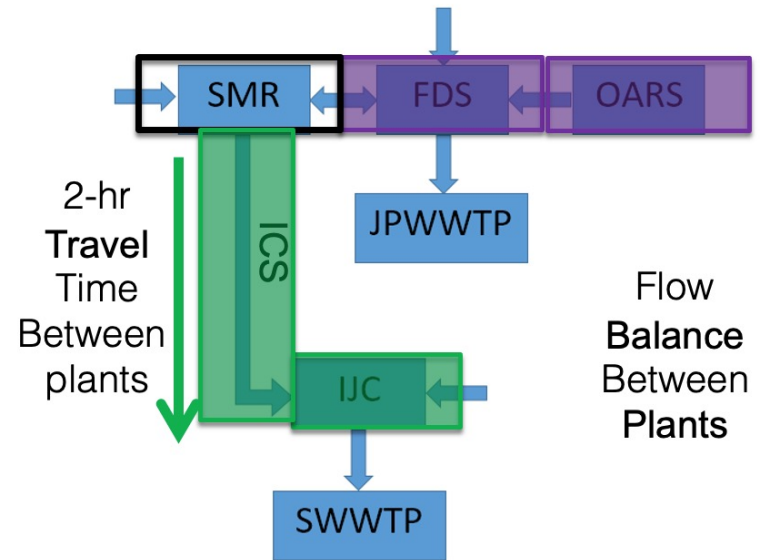
- OARS Tunnel
- Interconnector Sewer (ICS)



Columbus, OH



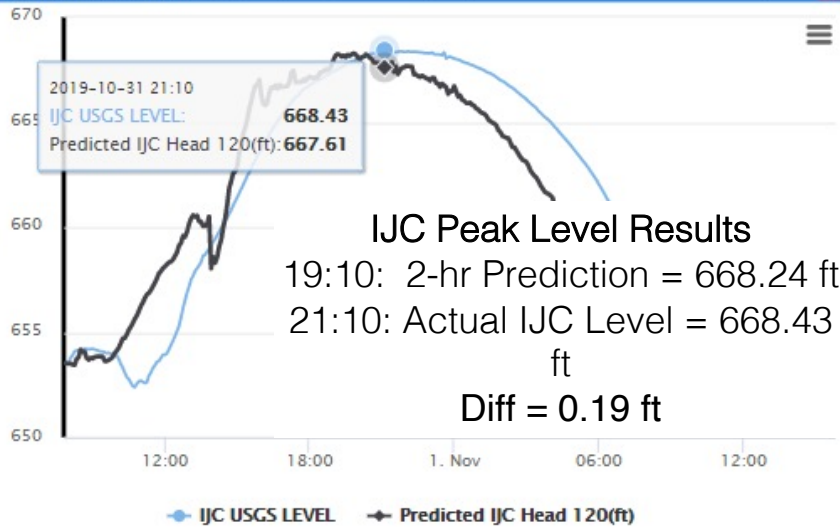
- Flow balancing control gate
- Scioto Main Relief (SMR) Gate



No guidance for operations team to manage 2-hr travel time

Columbus, OH

Time Series Viewer

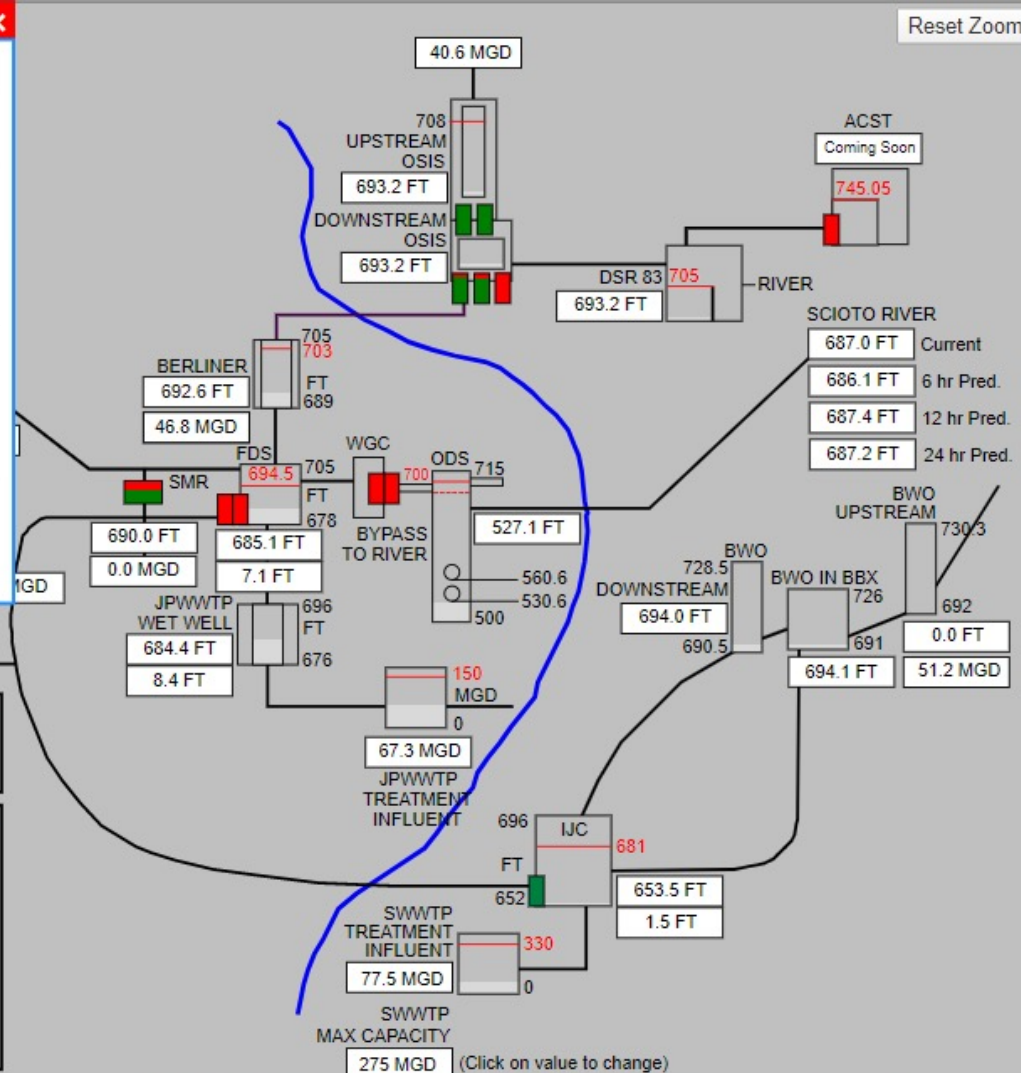


Forecast

03/17/2020 07:57:44

	Current	Predicted
IJC Level (FT)	653.5	653.5
SWWTP Treat. Target (MGD)	77.5	71.7

	Current	Recommend
OSIS Gate 1 (% open)	99.1	100.0
OSIS Gate 2 (% open)	99.1	100.0
FDS Gate 1 (% open)	0.1	0.0
FDS Gate 2 (% open)	0.0	0.0
WGC Gate 1 (% open)	-0.1	0.0
WGC Gate 2 (% open)	0.0	0.0
OARS Upper Pumps (MGD)	0.0	0.0
OARS Lower Pumps (MGD)	0.0	15.0
SMR (% open)	60.8	100.0



2019-10-31 07:50

2019-10-31 07:50

2019-11-01 15:50

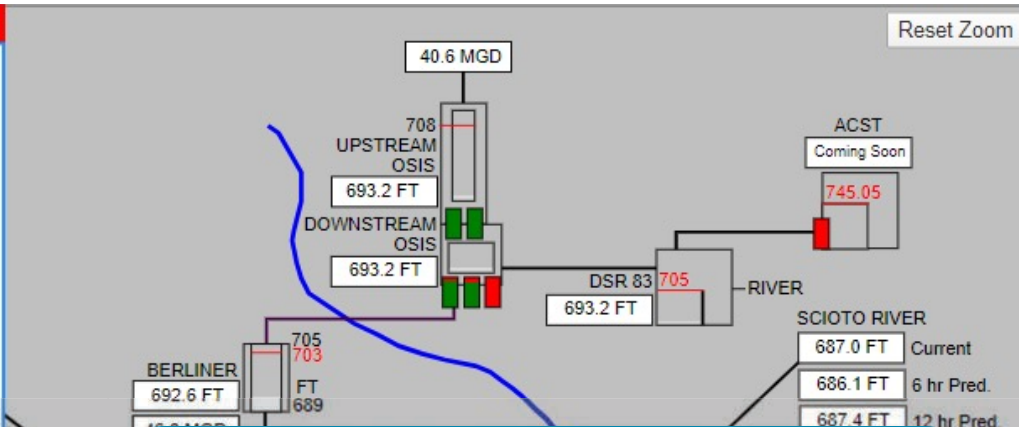
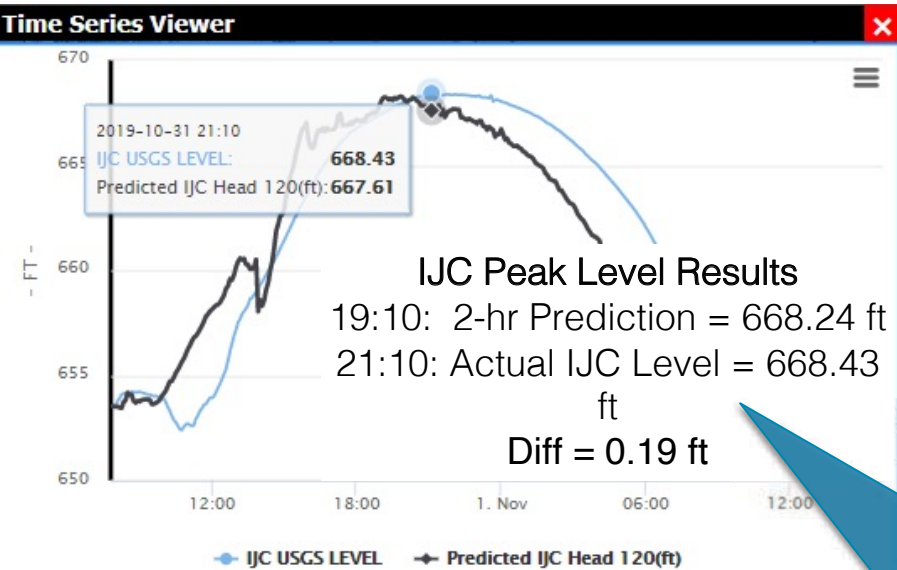
Go

Play

Stop

Historic

Columbus, OH



Using RTC, Columbus Plants have achieved:

- Real-time use of data driven predictions
- Noted decrease in overflow by diverting more flow to SWWTP

Updated RTC modeling indicates:

- Drastic decrease in OARS Tunnel overflow

As part of RTC Program, Columbus, OH will:

- **Decrease overflow by 20%**
- **Decrease OARS Tunnel activations by 35%**



Forecast

03/17/2020 07:57:44

BIG RUN		
8.3 MGD		
	Current	Predicted
IJC Level (FT)	653.5	653.5
SWWTP Treat. Target (MGD)	77.5	71.7
	Current	Recommend
OSIS Gate 1 (% open)	99.1	100.0
OSIS Gate 2 (% open)	99.1	100.0
FDS Gate 1 (% open)	0.1	0.0
FDS Gate 2 (% open)	0.0	0.0
WGC Gate 1 (% open)	-0.1	0.0
WGC Gate 2 (% open)	0.0	0.0
OARS Upper Pumps (MGD)	0.0	0.0
OARS Lower Pumps (MGD)	0.0	15.0
SMR (% open)	60.8	100.0

275 MGD (Click on value to change)

2019-10-31 07:50

Play Stop Historic

RT-DSS:

- Has >15 years of earned experience & reference architecture
- Can multiply the value of live data
- Operationalize the model to assist ops. and other utility teams
- Provides a platform for optimization of existing assets and investments
- Has helped clients save >\$2B in projected infrastructure & operational costs

Thank you!

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