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Operating a Collection System Like a Stock Exchange to Optimize Operations

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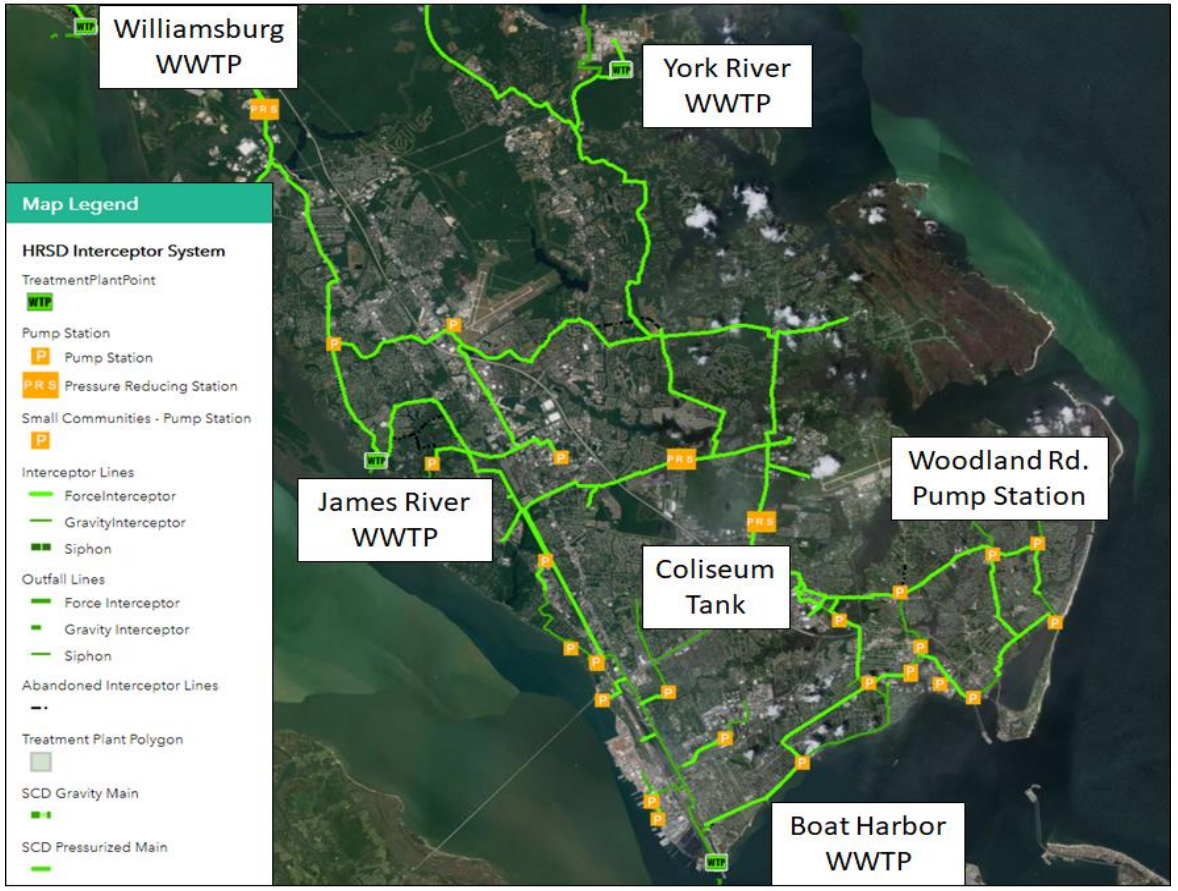
HRSD System Overview

- Serves 18 cities and counties in Southeast Virginia
- Population of 1.7 million
- 9 major treatment plants

HRSD System Overview

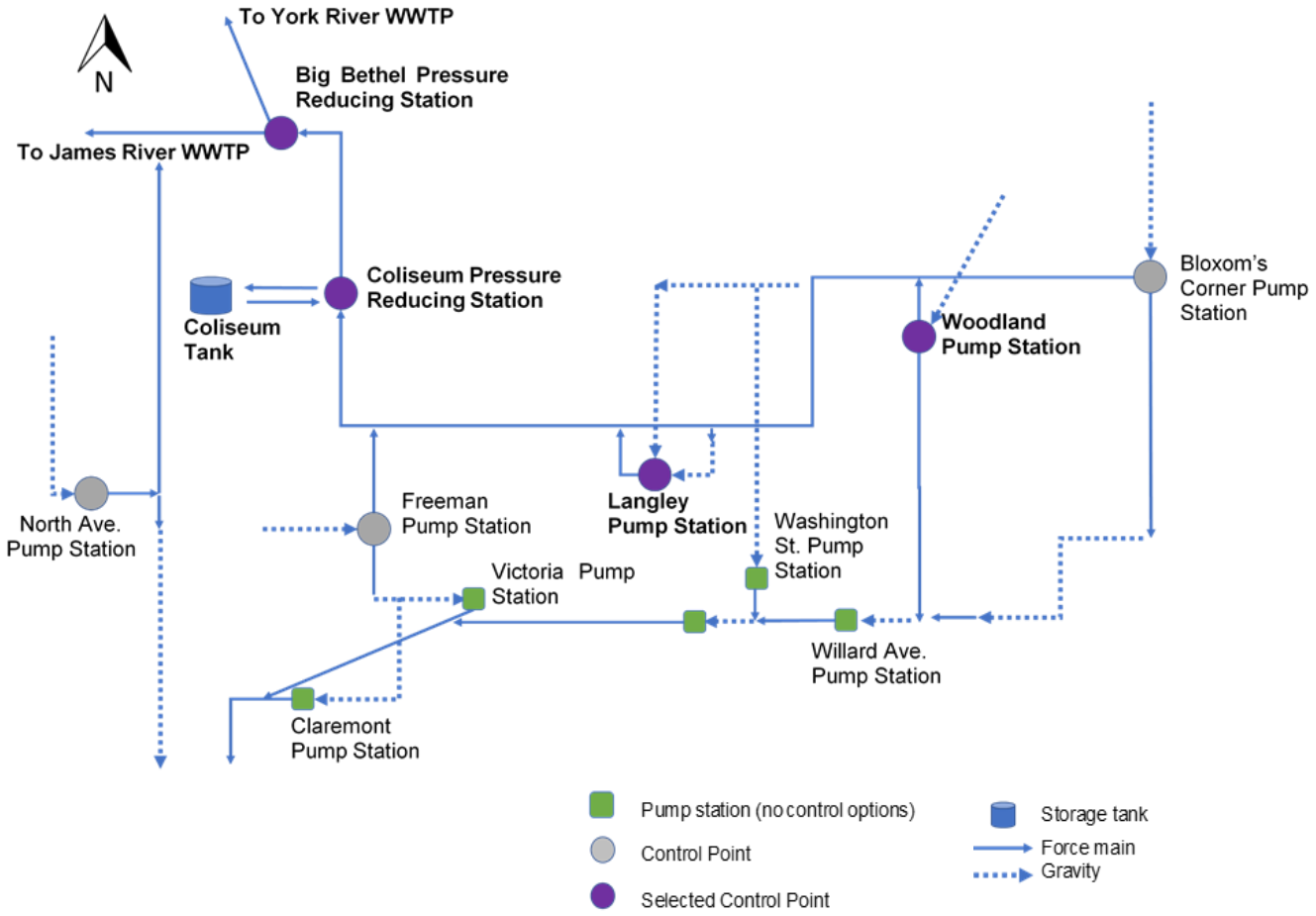


- Opportunities for flow balance in the North Shore system
- Optimize system operation at all times

Real Time Decision Support Systems

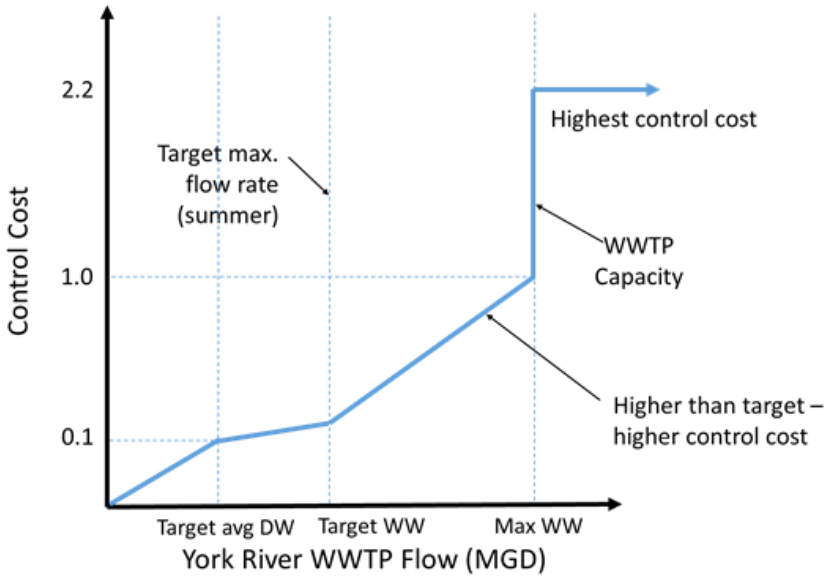
Objectives:

- Reduce peak flows at treatment plants
- Prioritize treatment plants
- Minimize time plants operate near peak treatment capacity
- Minimize operating costs

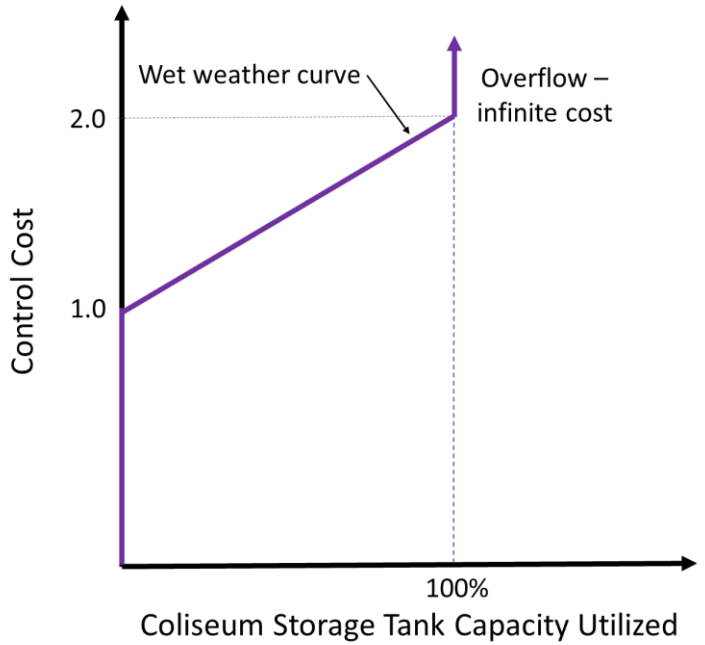


Coordinated Control

Cost Curve for WWTP



Cost Curve for Storage Tanks

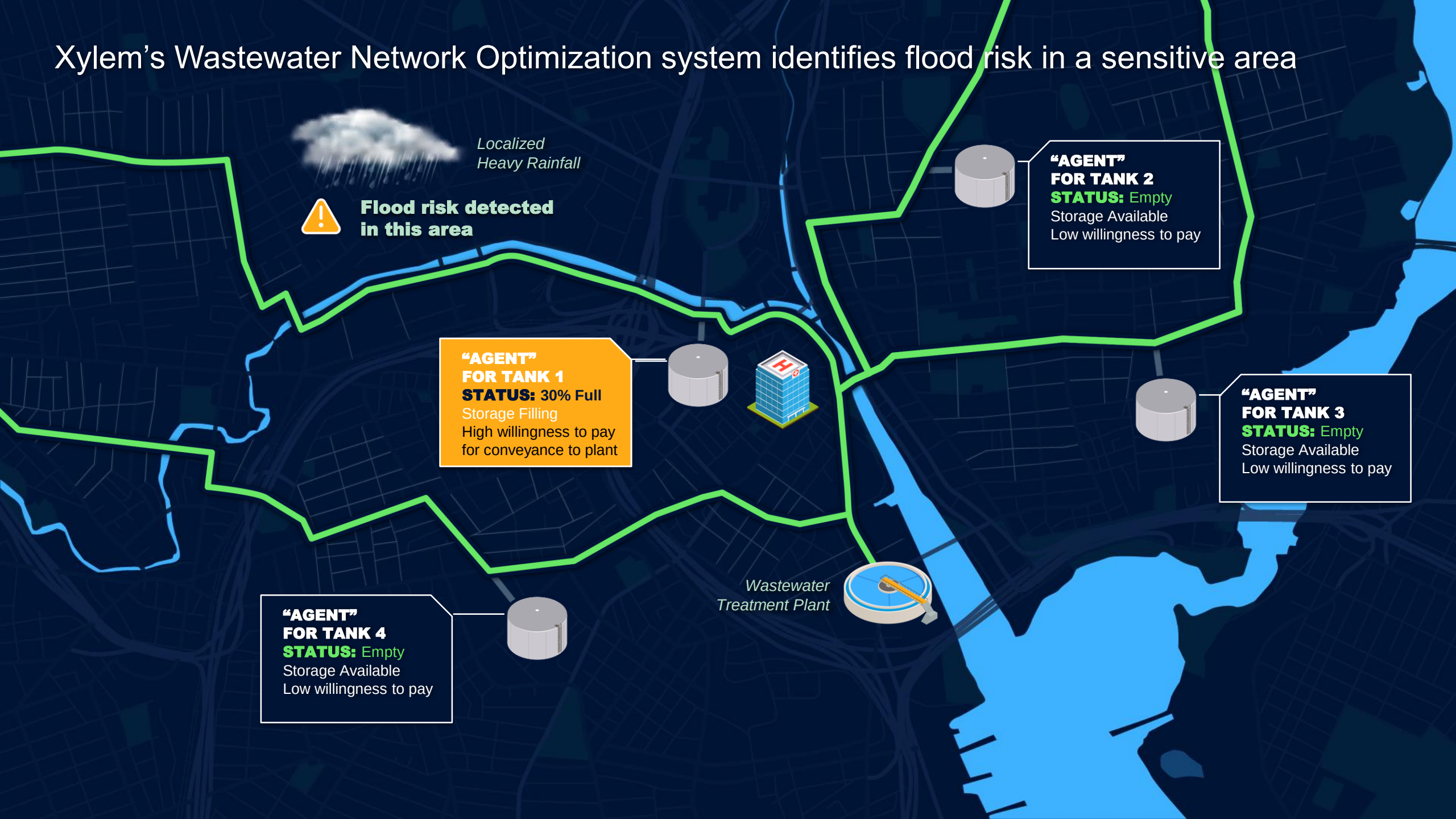


Pilot RT-DSS Strategy

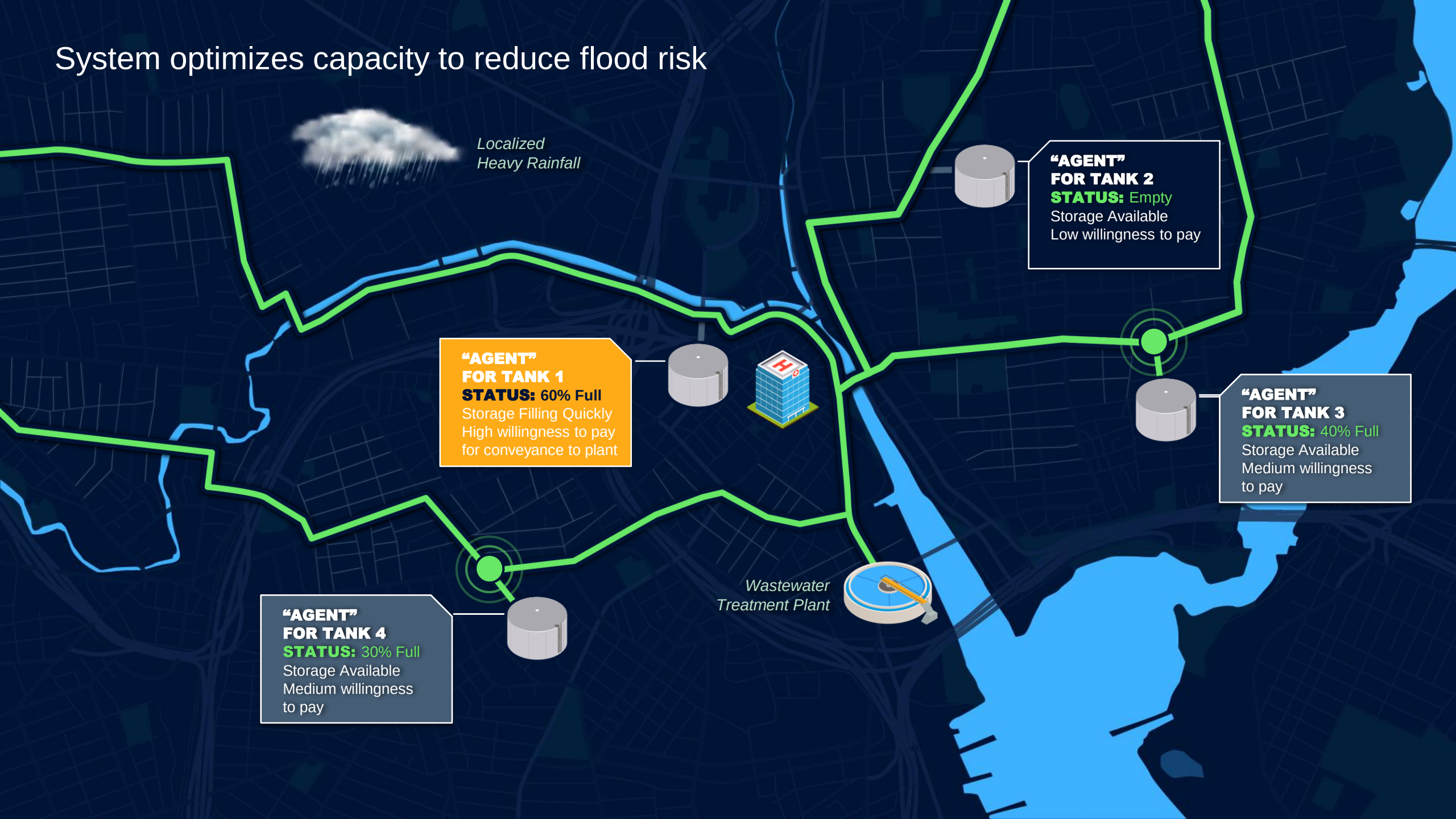
- Balance flow between York River WWTP and James River WWTP
- Use existing storage capacity to equalize dry weather flows and reduce peak wet weather flows

Hydraulic capacity available on all lines in dry weather conditions

Xylem's Wastewater Network Optimization system identifies flood risk in a sensitive area



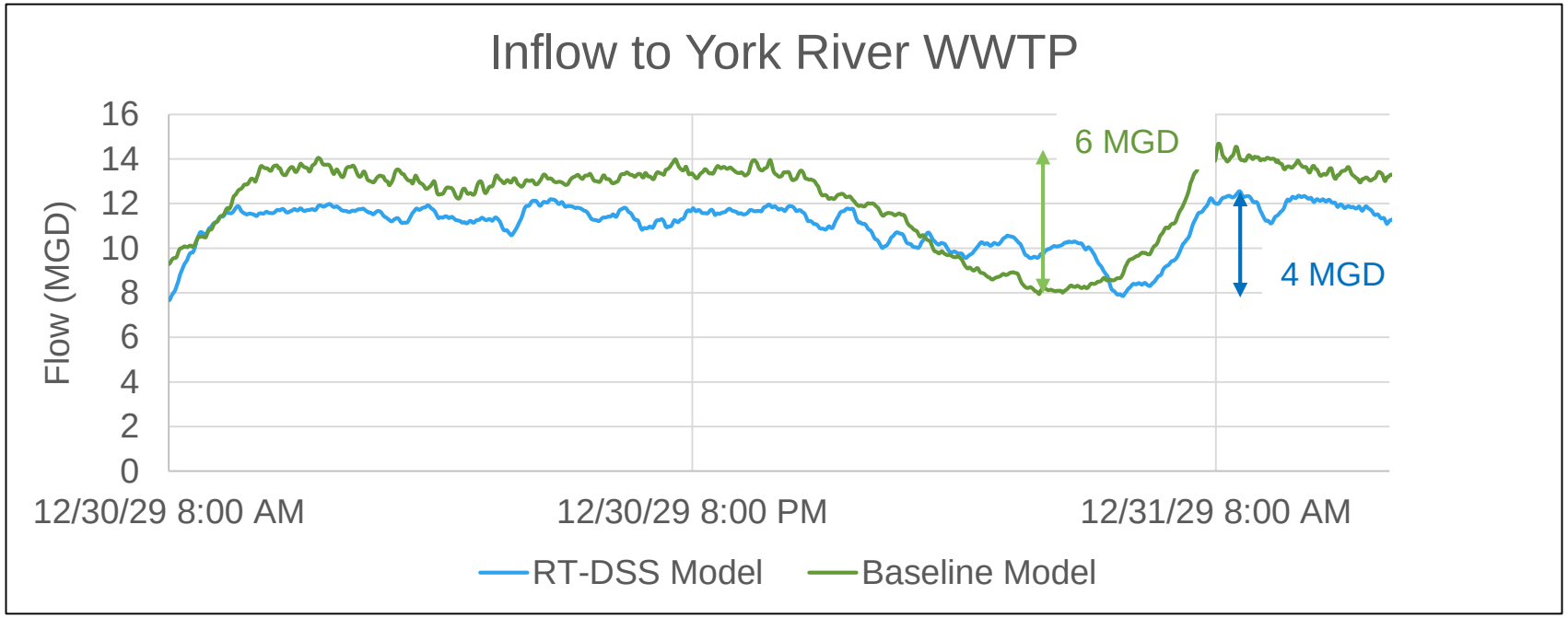
System optimizes capacity to reduce flood risk



System returns to dry weather operations

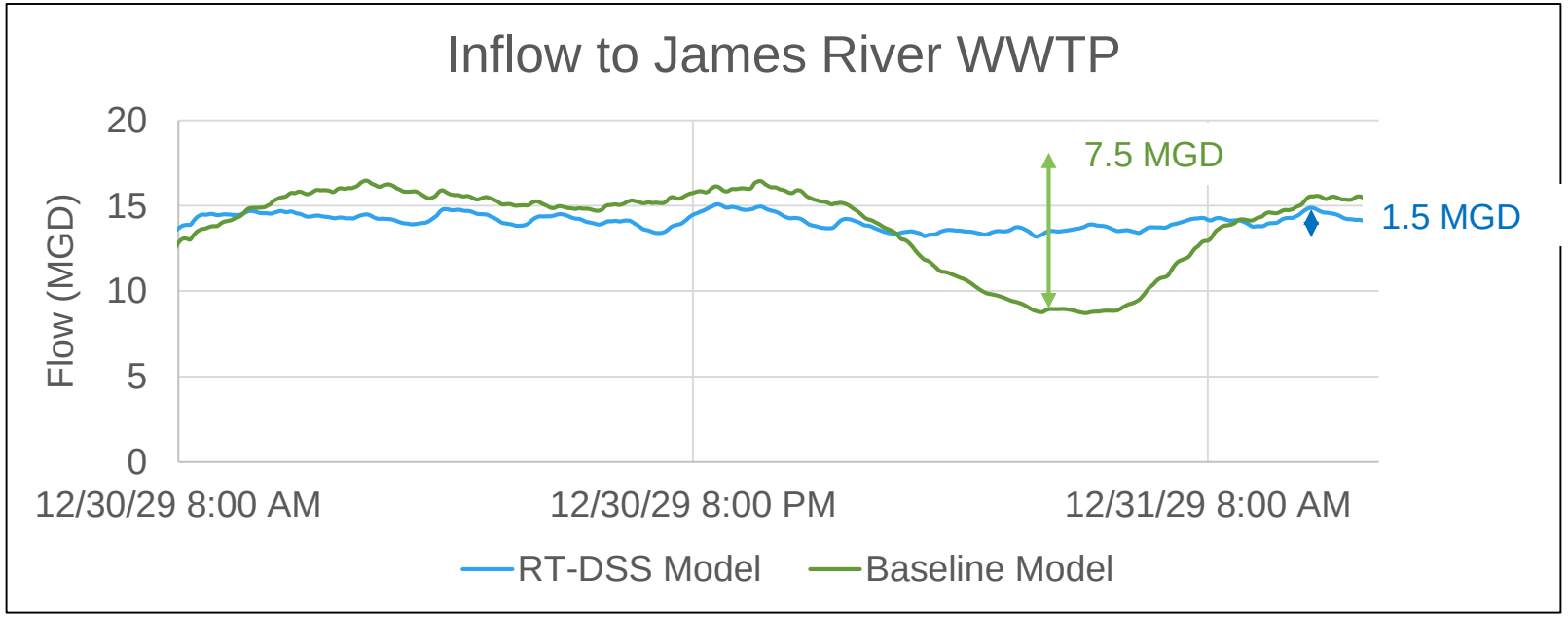
RT-DSS Dry Weather Strategy

- Goal: Utilize storage tank to equalize diurnal pattern
  - 2 MGD reduction in span at York River WWTP



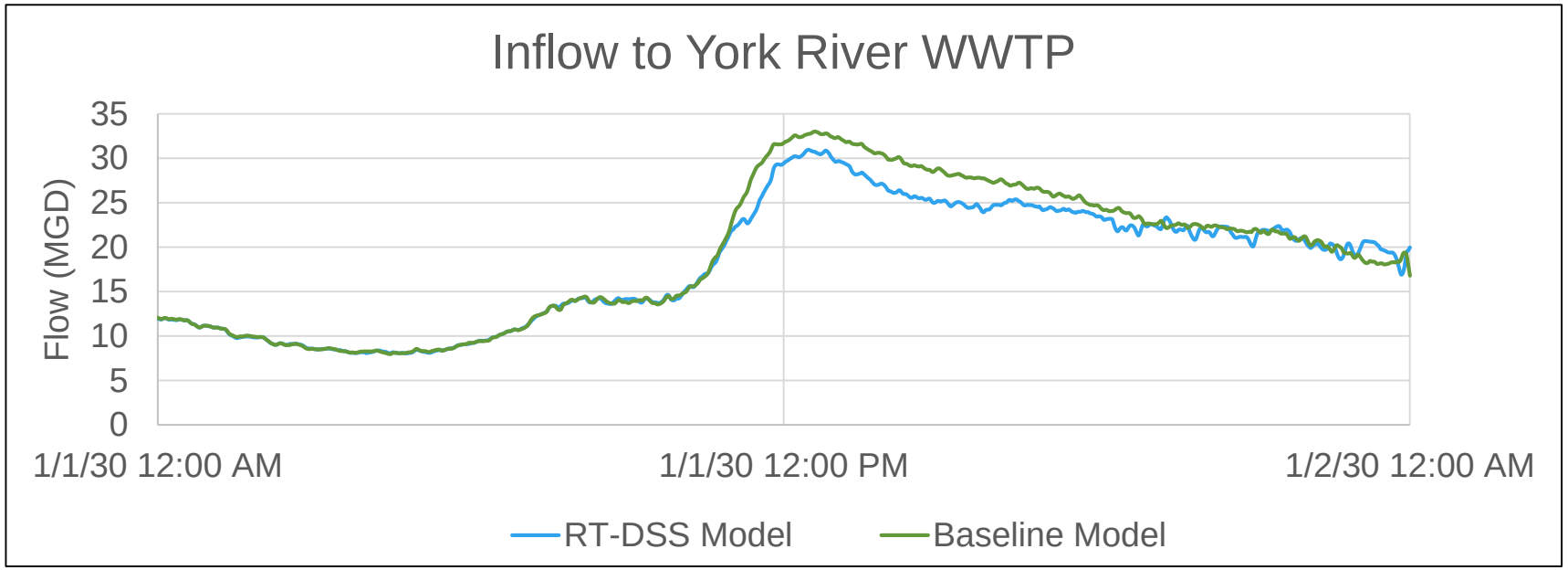
RT-DSS Dry Weather Strategy

- Goal: Utilize storage tank to equalize diurnal pattern
  - 6 MGD reduction in span at James River WWTP



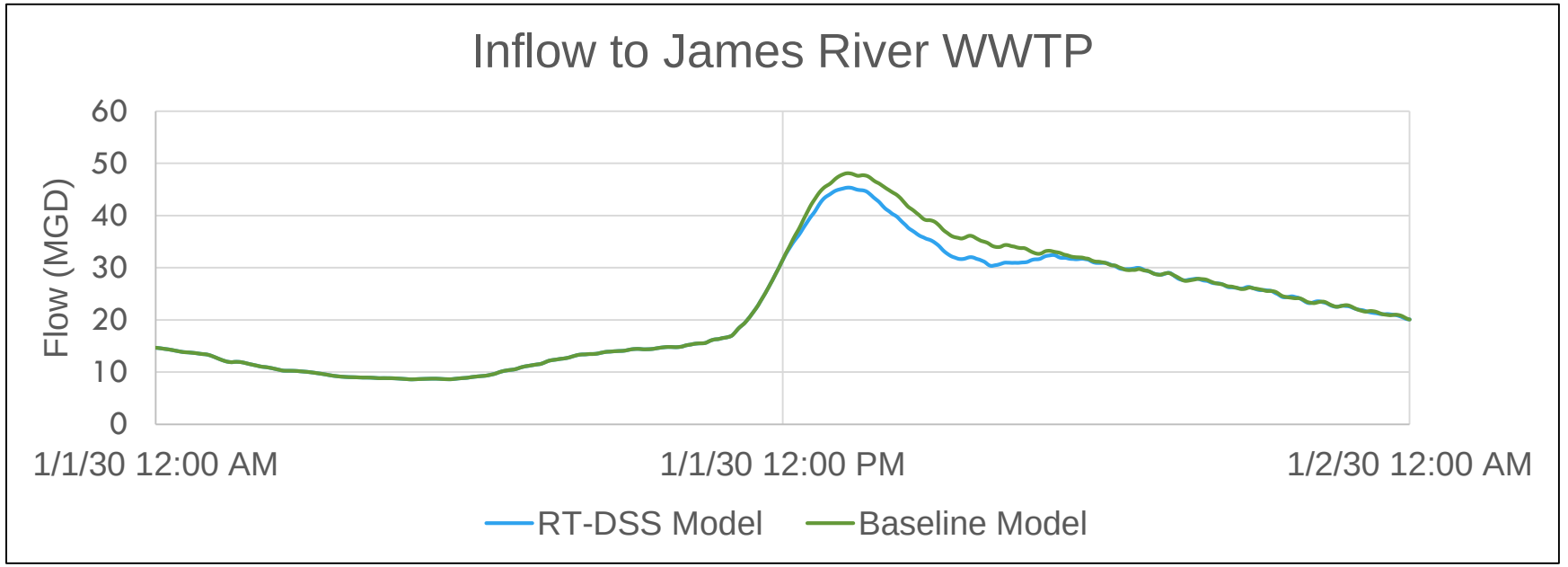
RT-DSS Wet Weather Strategy

- Goal: Utilize storage tank to reduce peak wet weather flow for 2-year design storm
  - 2 MGD reduction in peak flow at York River WWTP



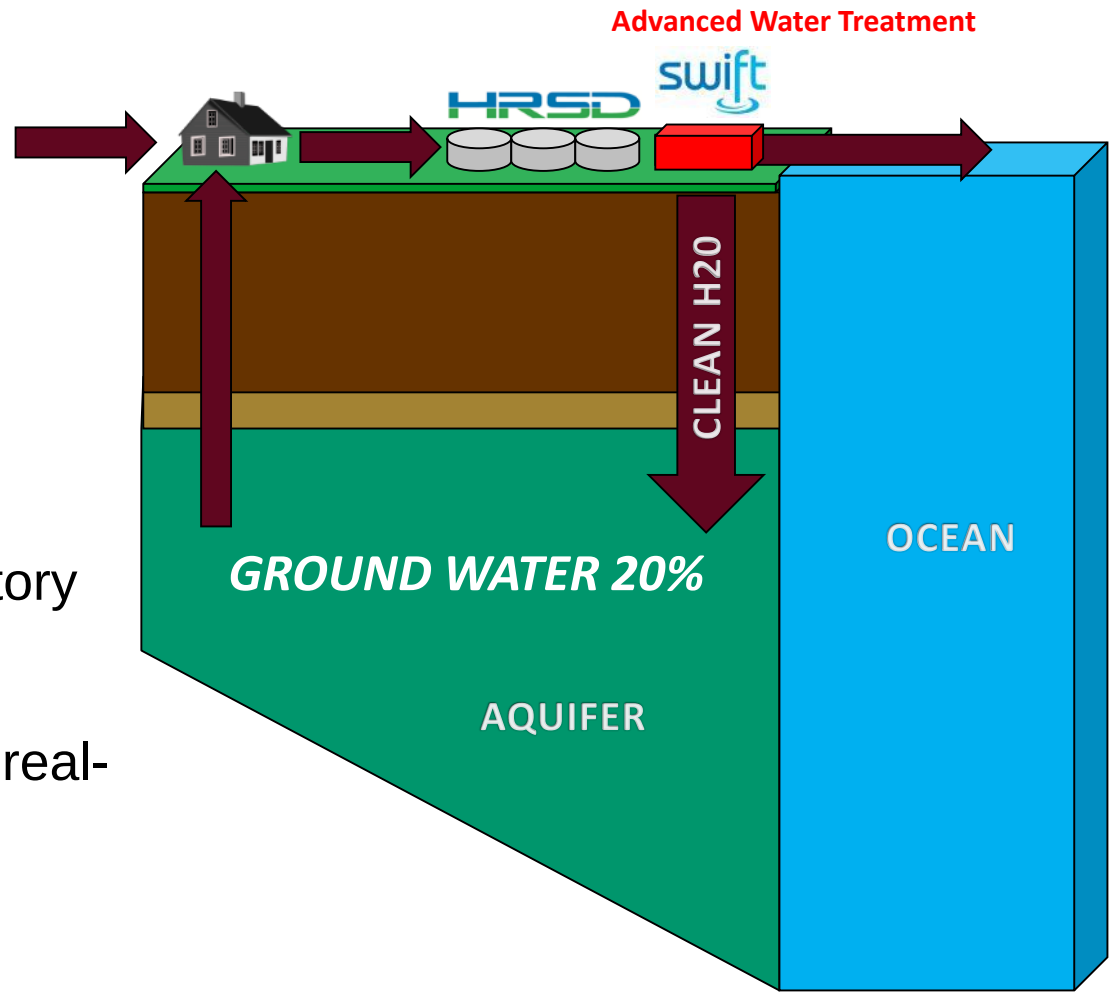
RT-DSS Wet Weather Strategy

- Goal: Utilize storage tank to reduce peak wet weather flow for 2-year design storm
  - 2.7 MGD reduction in peak flow at James River WWTP

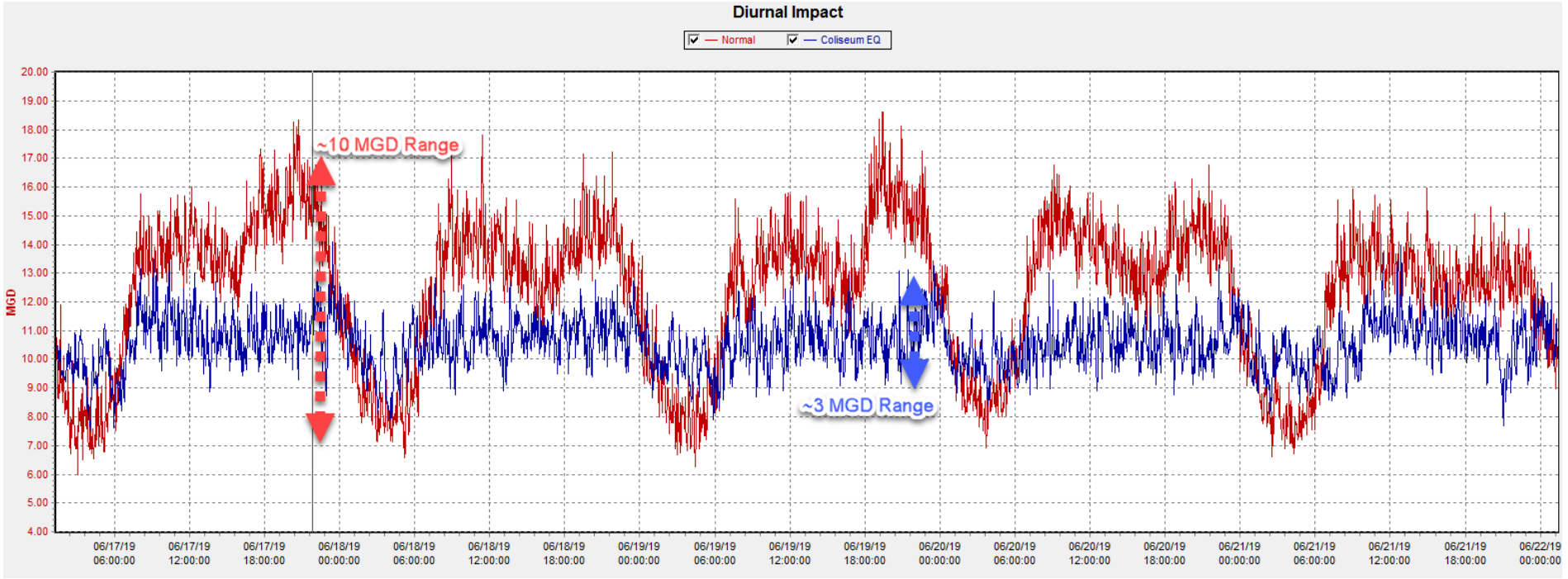


Systemwide Impacts – SWIFT Program

- Water quality concerns
- Groundwater depletion
- Sea level rise
- Managing cost in fluid regulatory environment
- Meet all US-EPA MCLS near real-time critical control points



Daily EQ Pilot



Systemwide Impacts

System Impact	Cost Savings	Type of Savings	Rationale
Treatment cost at plants	$ ↓	Operational	Treatment process is more efficient with less variance
EQ basins needed for SWIFT at treatment plants	$ ↓	Capital	Smaller EQ facility may be sufficient due to more effective use of Coliseum
Operational cost of Coliseum Tank	$ ↑	Operational	Tank will be operated more frequently
Environmental benefit	--	--	Maximizes environmental benefit by distributing WW flows based on available capacity
Industrial dischargers	--	--	RT-DSS strategy may need to balance where industrial flows go based on water quality requirements at each plant

Return on Investment

- What is the impact of implementing the RT-DSS approach at this location?
  - Retrofit pump station: ~$500,000 (already included in CIP)
  - Establish SCADA connections, finalize and update control logic, perform startup: ~$100,000 - $200,000
  - Conservative project cost: $750,000
  - Prevented infrastructure improvements: ~$3 million (more now with inflation)

Return on Investment up to **12x**

Conclusions

- HRSD has an interconnected collection system that is currently underutilized
- A Real-Time Decision Support System can take advantage of existing assets and optimize system operations under different storms
- Can lead to a 12x ROI for HRSD
- Further integration and visibility to data may enable further improvements in system capabilities and performance.

Thank You!

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