TETRA TECH

NEW ENGLAND WATER ENVIRONMENT ASSOCIATION
NEWEA
WORKING FOR WATER QUALITY

Application of Smart Data Infrastructure for Integrated Wet Weather Management

NEWEA 2020
Session 7

Tony Omobono, PE. Tony.Omobono@tetratech.com
Diana Tao, Qing. M.Eng., Dianaqing.Tao@tetratech.com

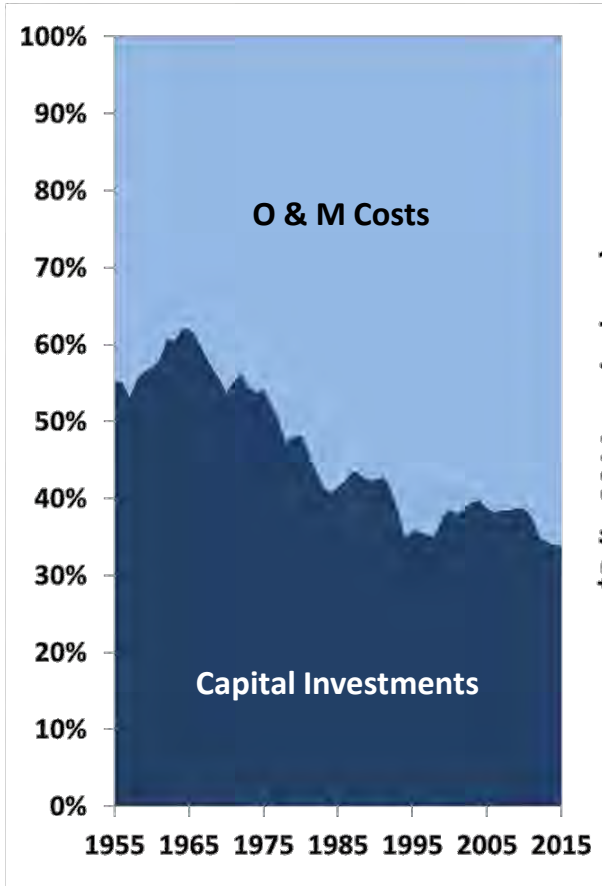
Agenda

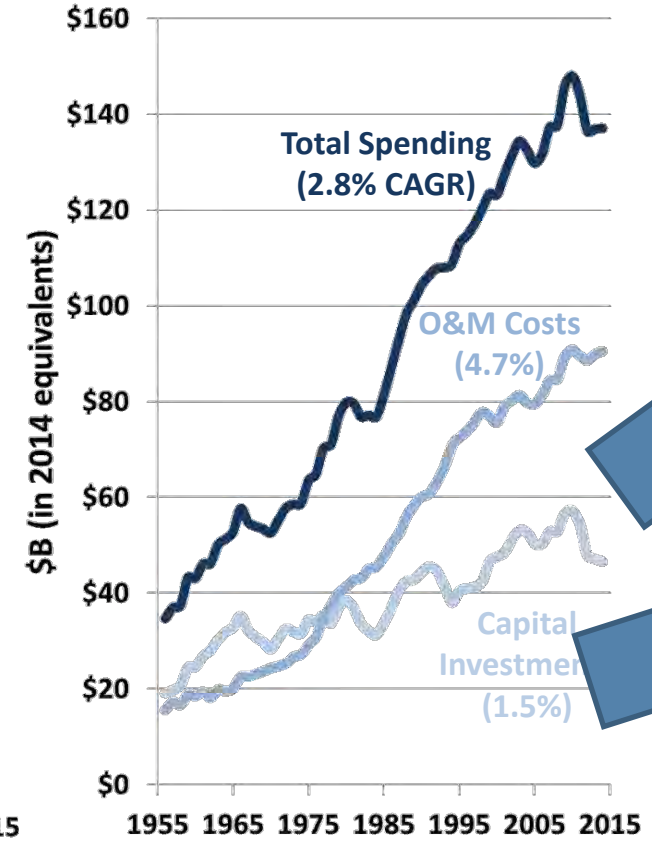
- Drivers for Smart Data Infrastructure
- Roadmap for Phased Implementation
- Case Studies
- Benefits for Smart Data Infrastructure
- Lessons Learned

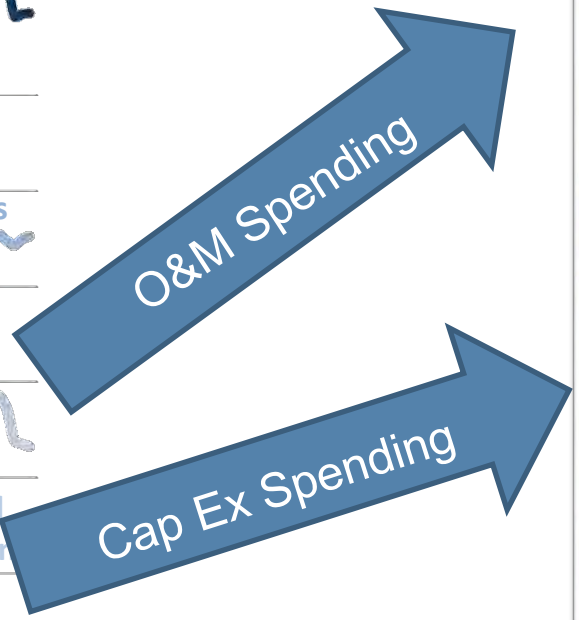
Utilities are faced with complex and varied wet weather issues and associated infrastructure impacts

Deferred maintenance/replacement of aging infrastructure is driving increases in O&M cost

Historical Trends - Investments in U.S. Water & Wastewater Infrastructure

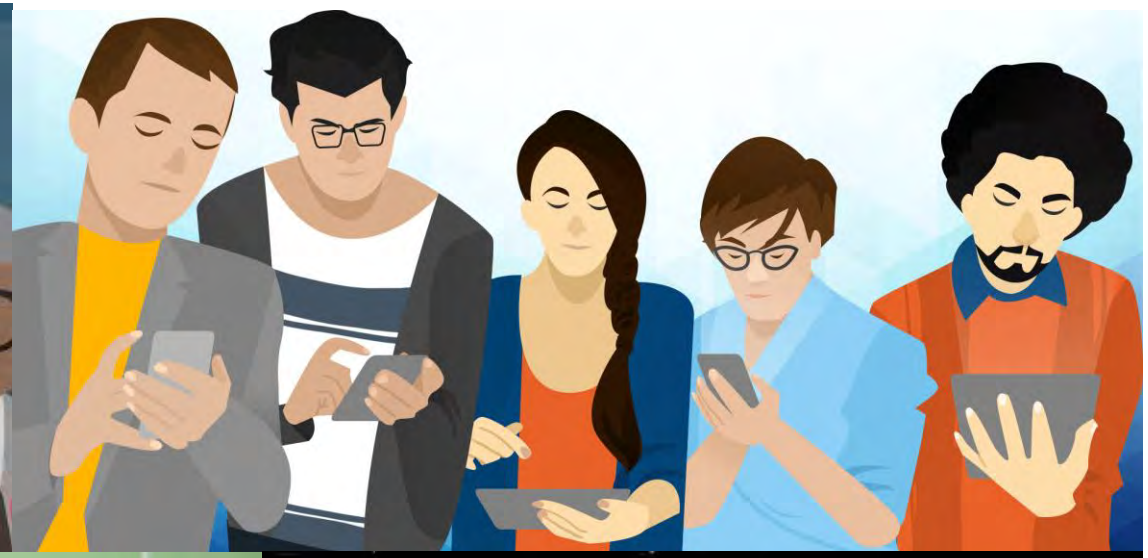


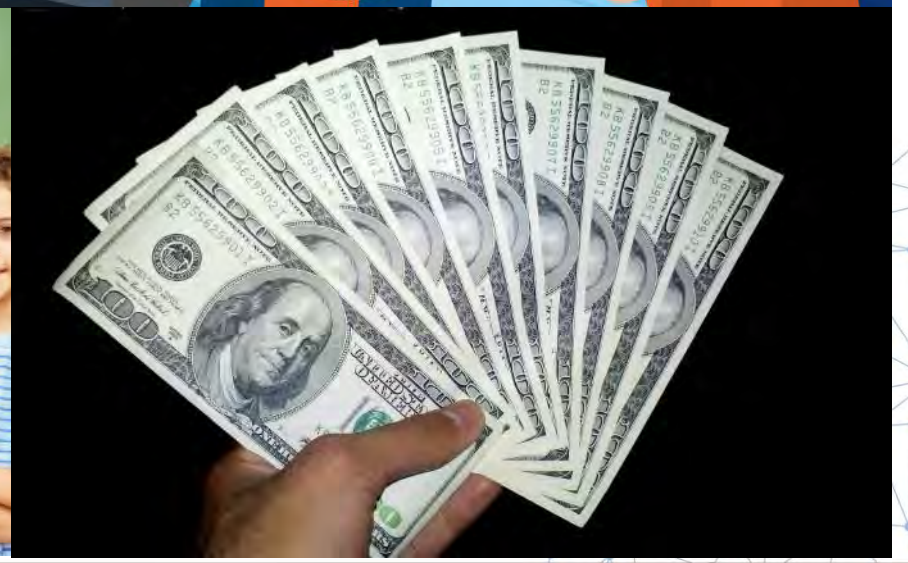




Source: Congressional Budget Office

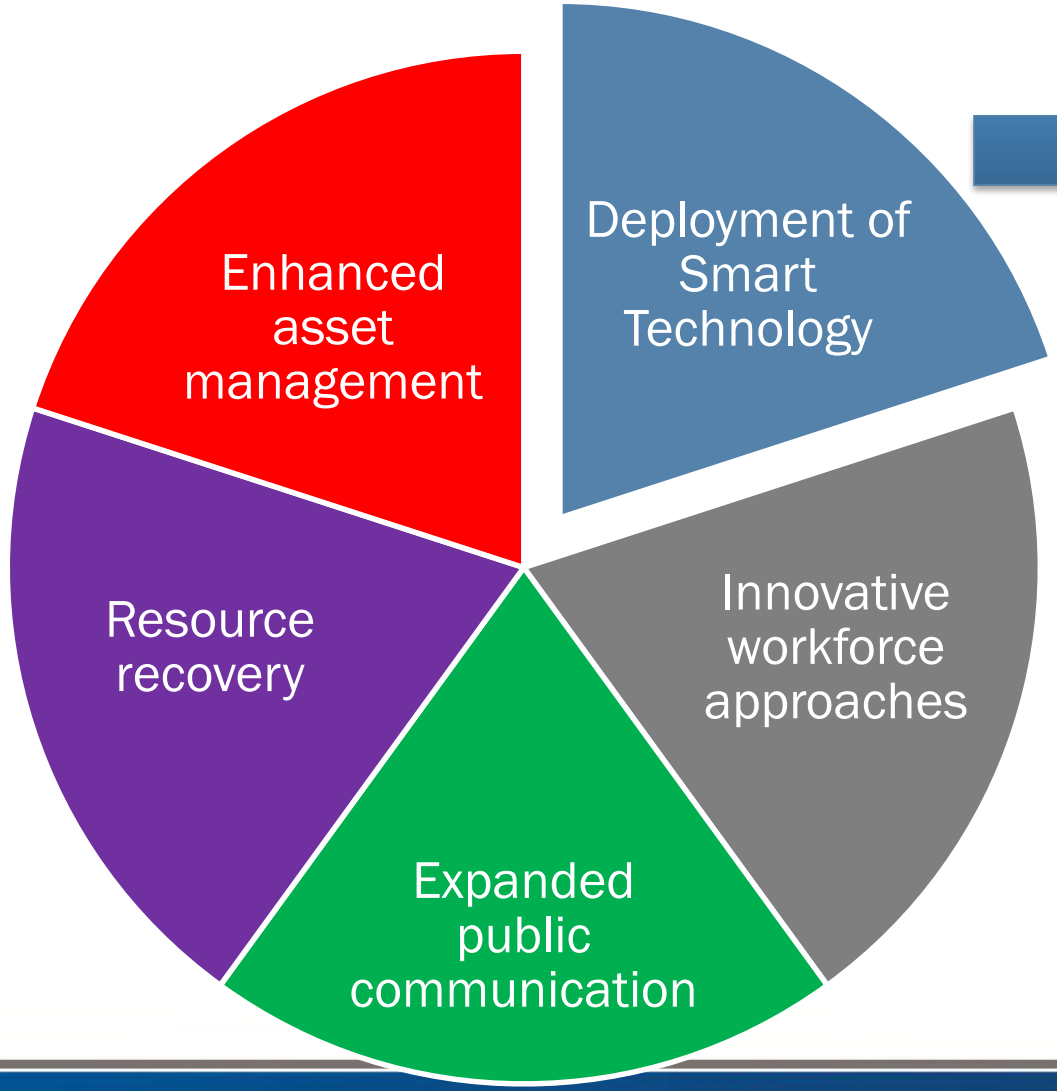
Workforce challenges require innovative solutions

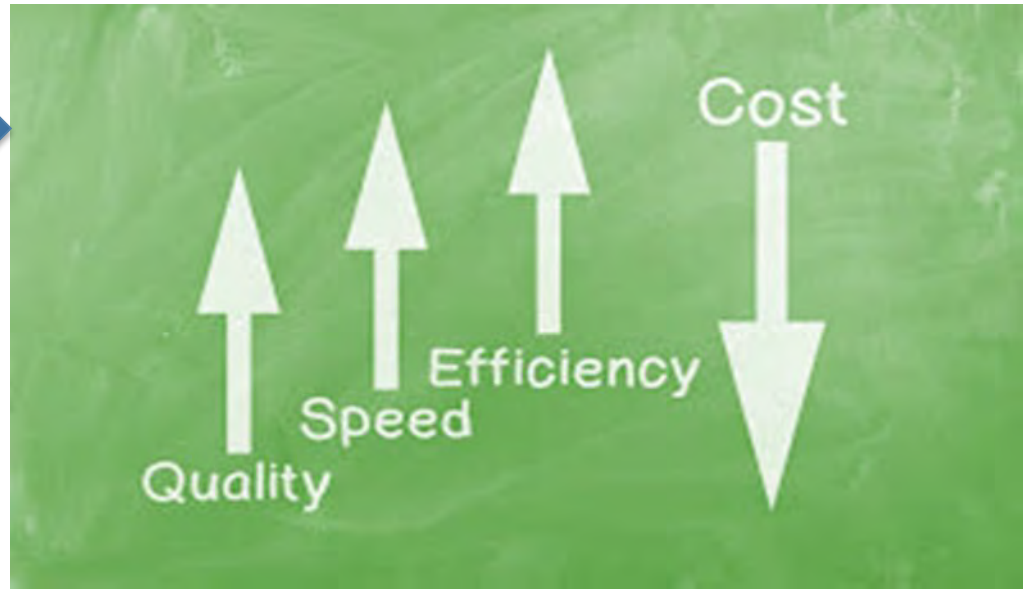




The public expectation of high service and low rates drives the need for increased efficiency

“Smart” systems are increasingly becoming a part of sustainable utility operations





Improve efficiency and overall system performance

Innovation helps to expand the capabilities and adoption of smart systems

- **Technology Improvements**
  - Instrumentation and control
  - Data analytics/services
  - Forecasting software/services
  - Battery technology
  - Communication and security
- **Innovation trends: Leverage data for “smart” utility**

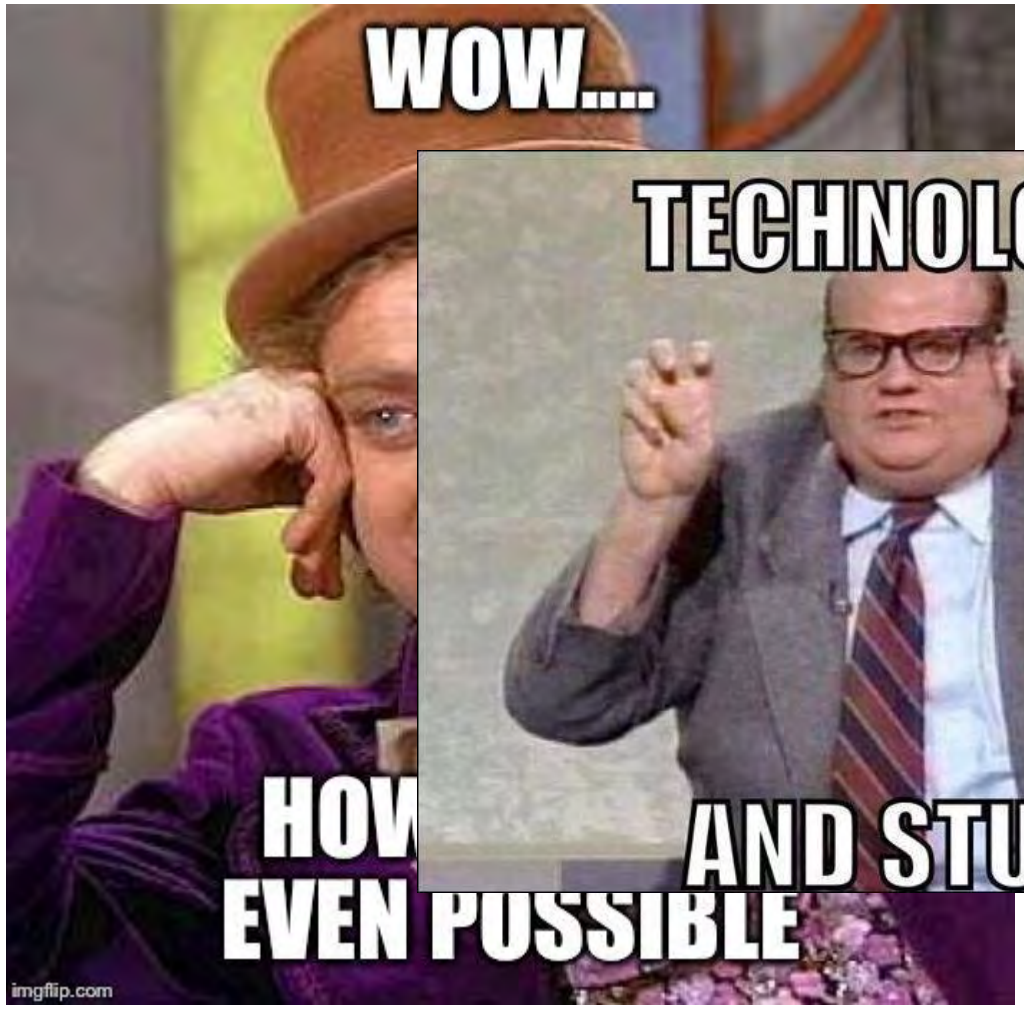
What do we mean by Smart Data Infrastructure?

- Integrated data, analytics, hardware, and software solutions to improve the efficiency, reliability, and lifespan of the physical layer of assets through better data utilization.

- Scalable – right data at right time to fit utility goals and objectives

TETRA TECH

Implementing Smart Infrastructure


WOW....
HOW
EVEN POSSIBLE
imgflip.com

TECHNOLOGY
AND STUFF


IT IS SIMPLE
JUST FOLLOW THESE EASY STEPS
memegenerator.net

Roadmap for smart infrastructure implementation

- Develop a Vision
- Technology evaluation: initial investment and annual cost + Staffing
- Detailed planning: funding and implementation plan
- Schedule: change management timeframe
- Adaptive management

Step 1: Transforming data into wisdom

- Leverage data to increase O&M wisdom and decision making
- Staged approach to implementing smart utility to limit re-work

Information

What is happening?

Insights

Why?

What will happen?

Decision

What-if?

Cost/Benefit

Action

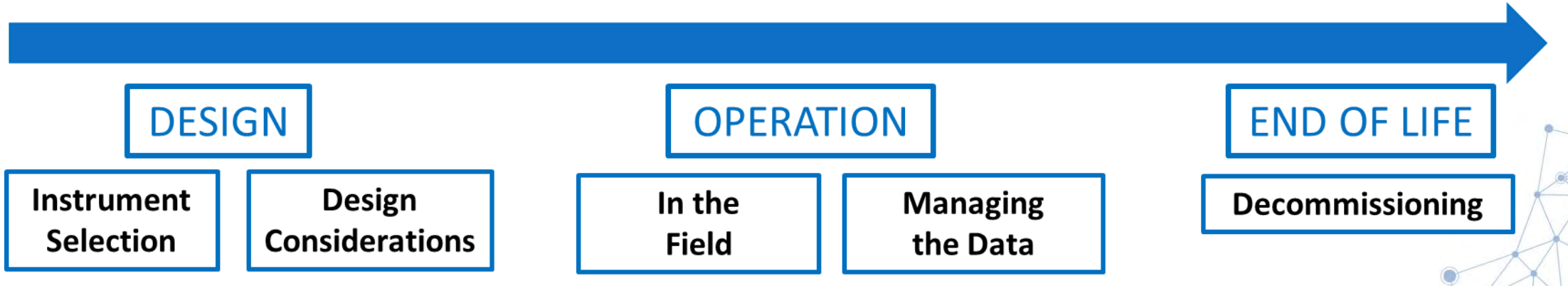
Real time operation

Preventative/ predictive maintenance

Gray/Green

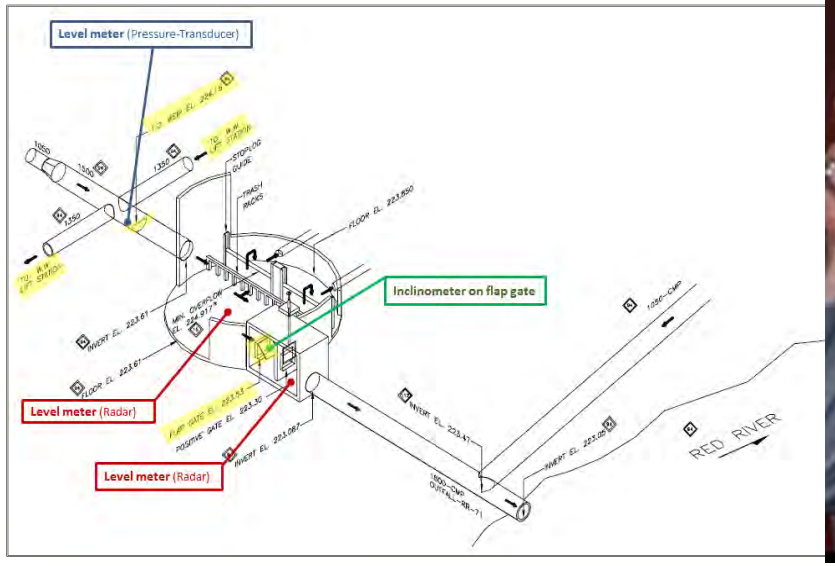
Step 2: Monitoring – Real-time information

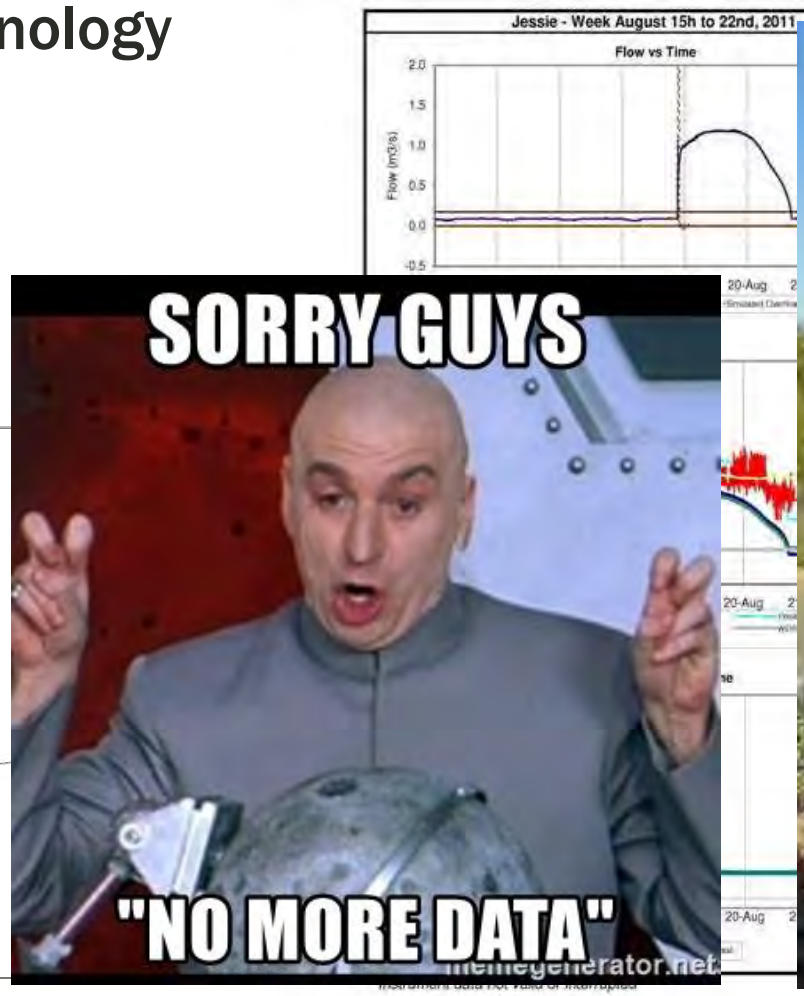
- **Real time monitoring**
  - Sensor ownership
  - Maintenance
  - Data collection and management

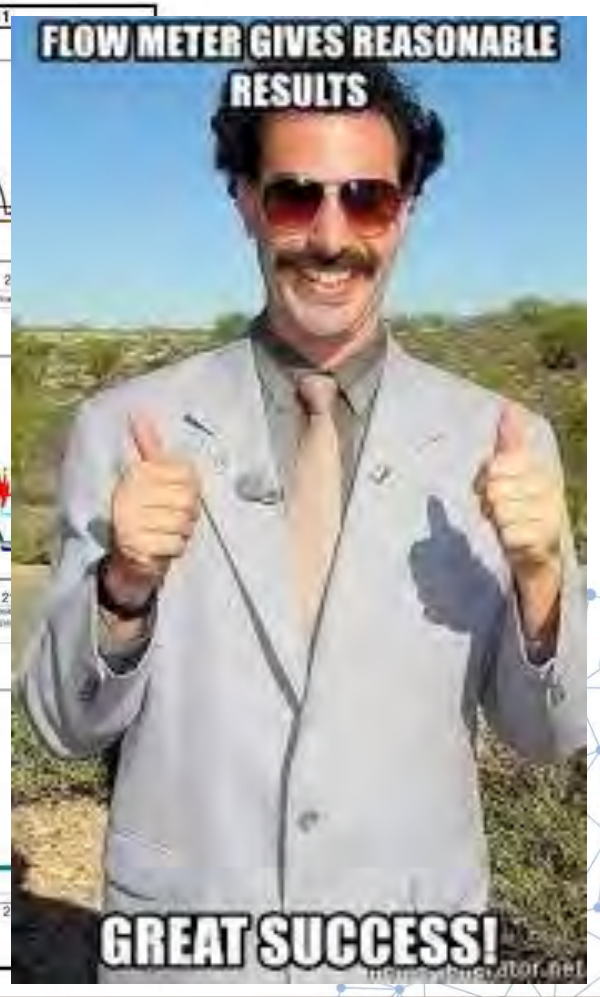


Monitoring Considerations

- Selection of appropriate technology
- Data verification plan
- Automate data QA
- Maintenance tracking





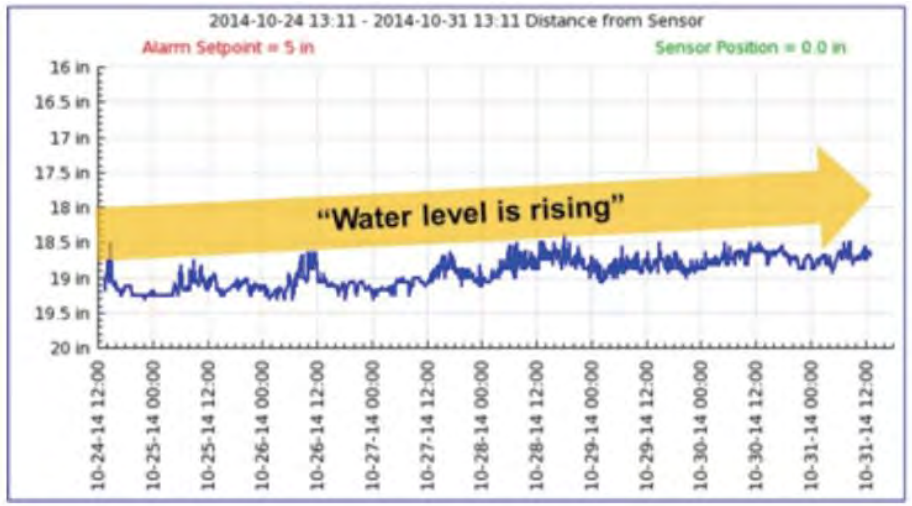


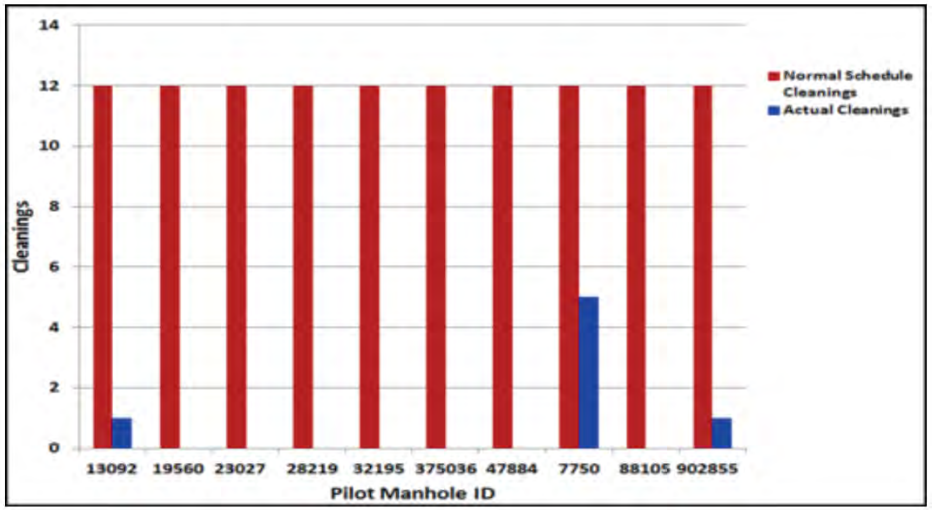
Step 3: Actionable insights

- Level 1: Alarm management and prioritization
- Level 2: Operational Situational Awareness
- Level 3: Automated diagnostic and predictive data analytics

Case Study – San Antonio Water

- Decreased cleaning frequency by 94% at 10 pilot sites with no increase in spill risk
- Identified potential savings of $4,000 per location per year

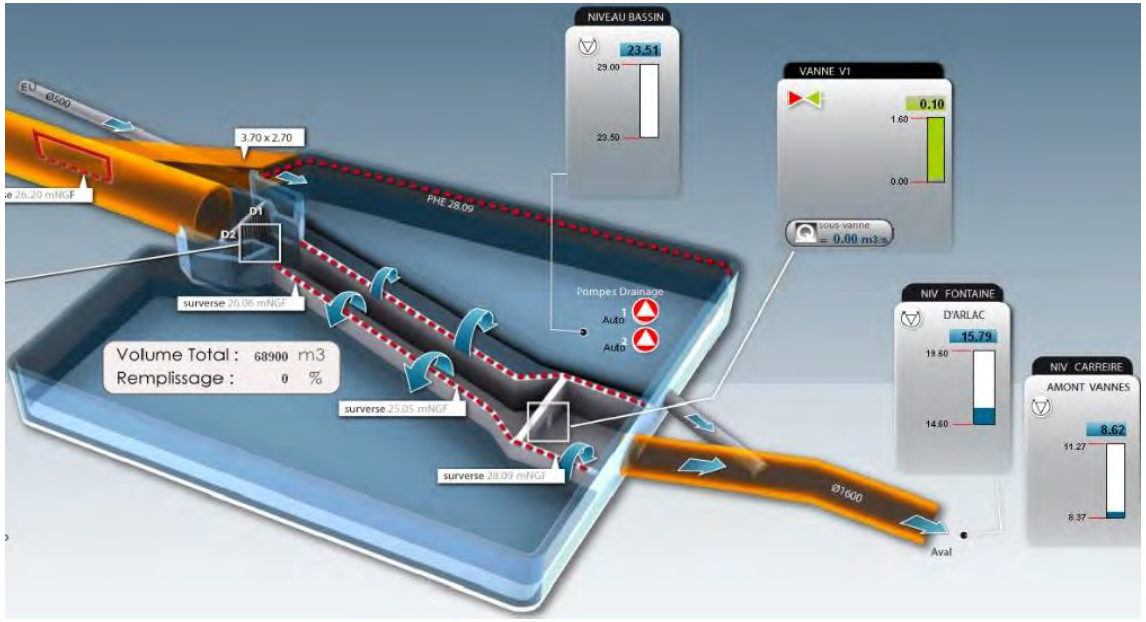




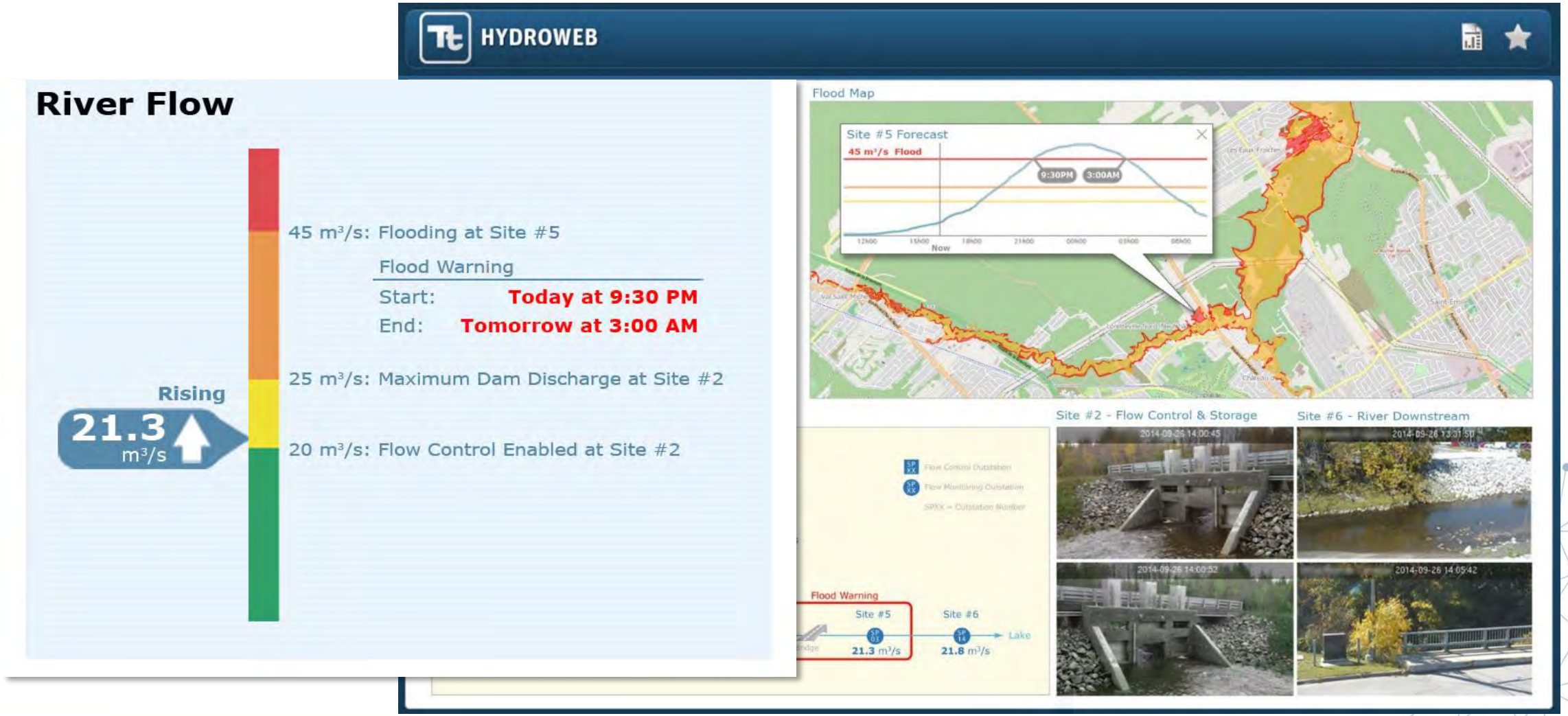
Flow prediction: real time modeling + dashboard

Step 4: Decision support for operational enhancement

- Centralized database management
- Effective data visualization in real time
- Key performance indicators

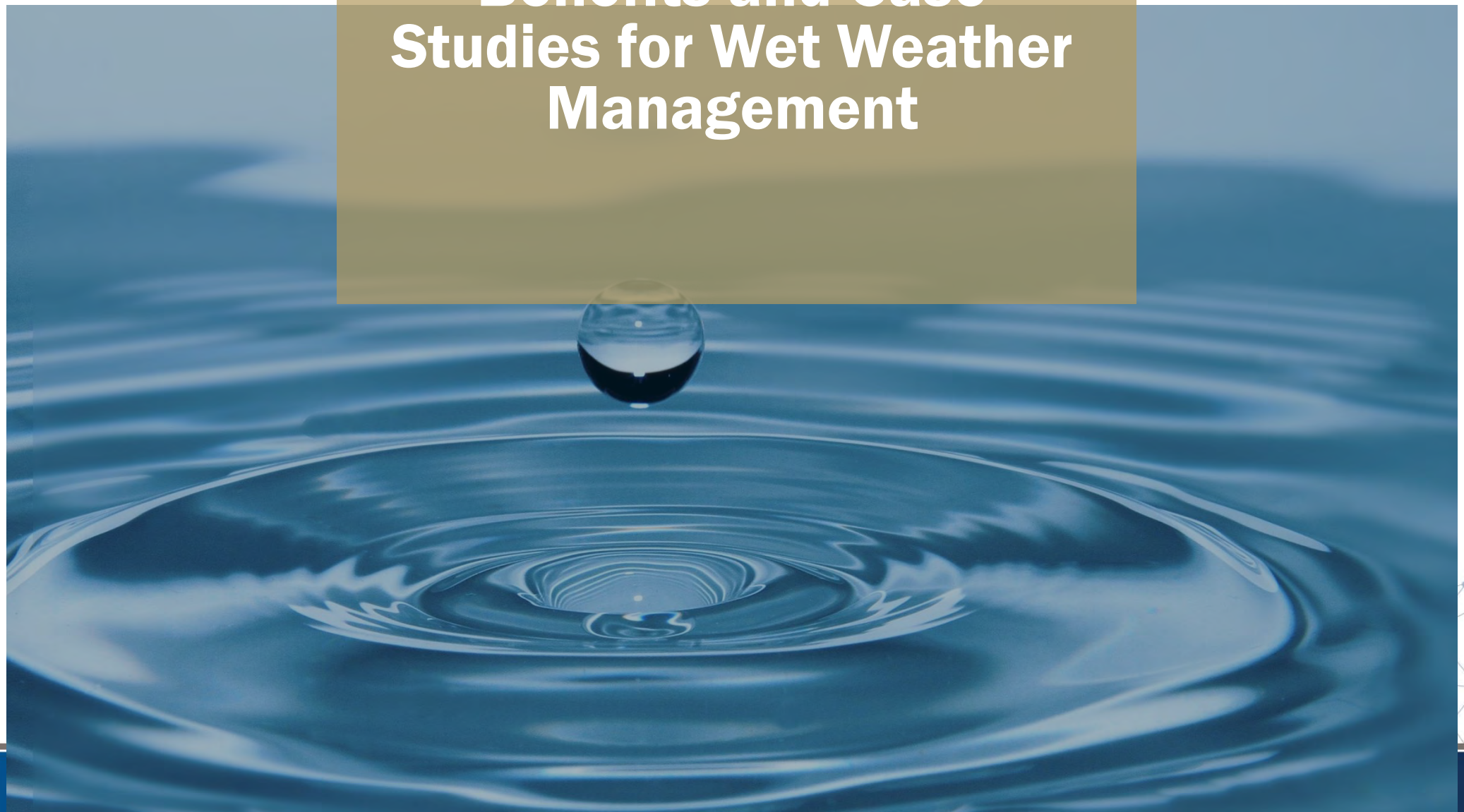


Case study: Quebec flood mitigation decision support



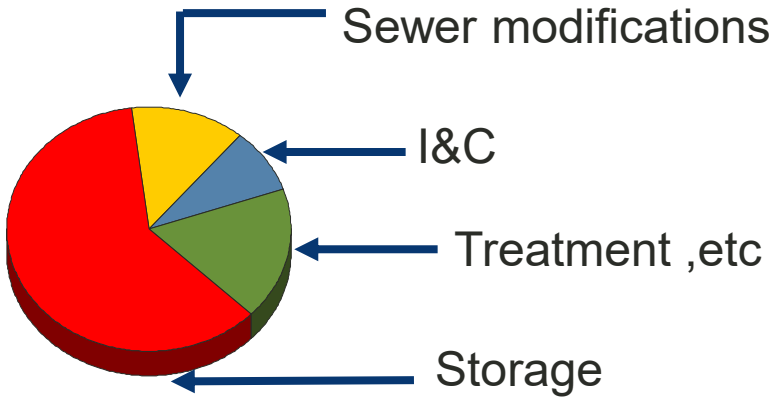
TETRA TECH

Benefits and Case Studies for Wet Weather Management



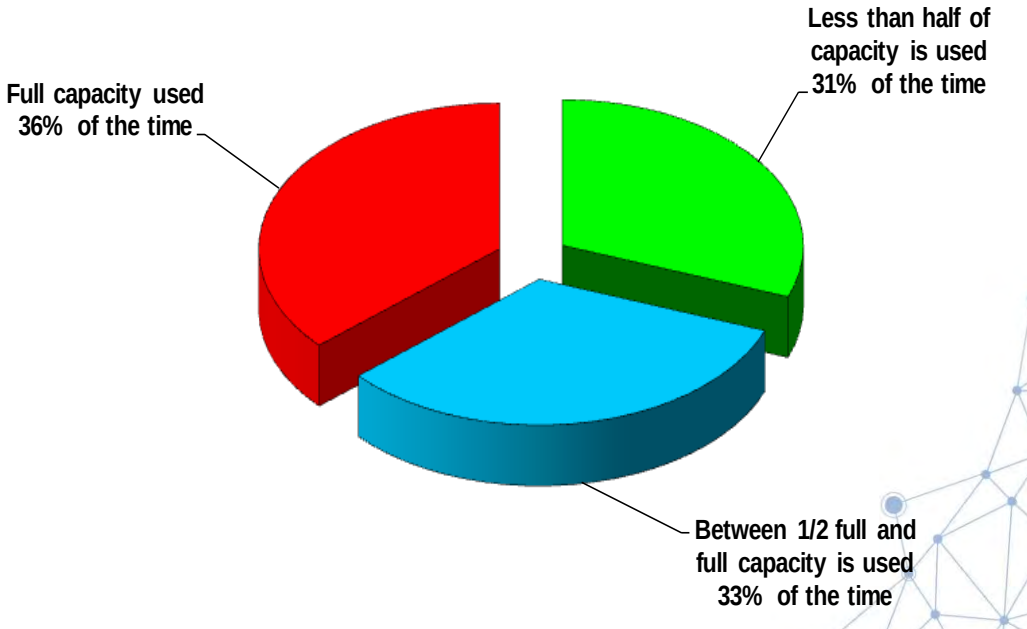
Benefit: Data to support system optimization and enhancements

- **Meeting compliance?**
  - Are capacities utilized when overflowing?
  - Conveyance, storage and treatment



EPA figure

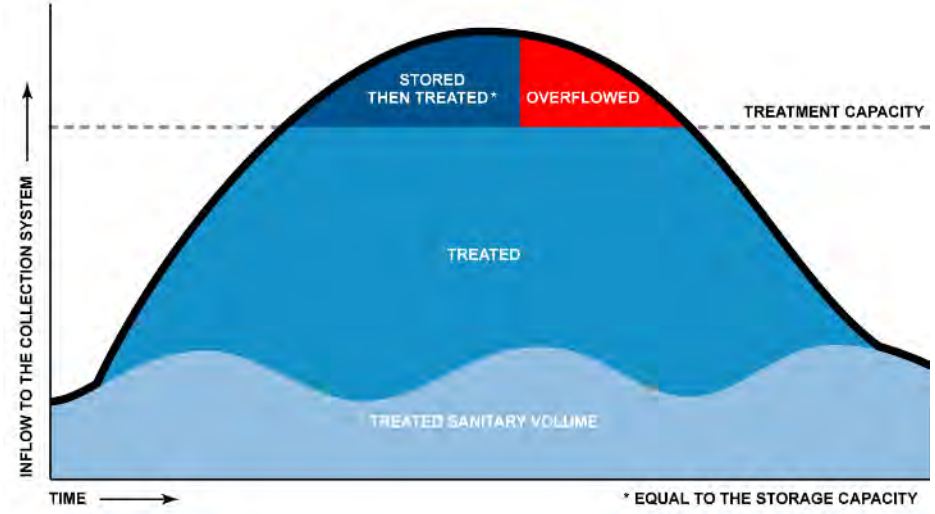
System Capacity Usage During Overflows



Benefits: System Optimization

- Maximize return on investment: existing and planned facilities
- Takes advantage of **unused capacity** during wet weather through real time control

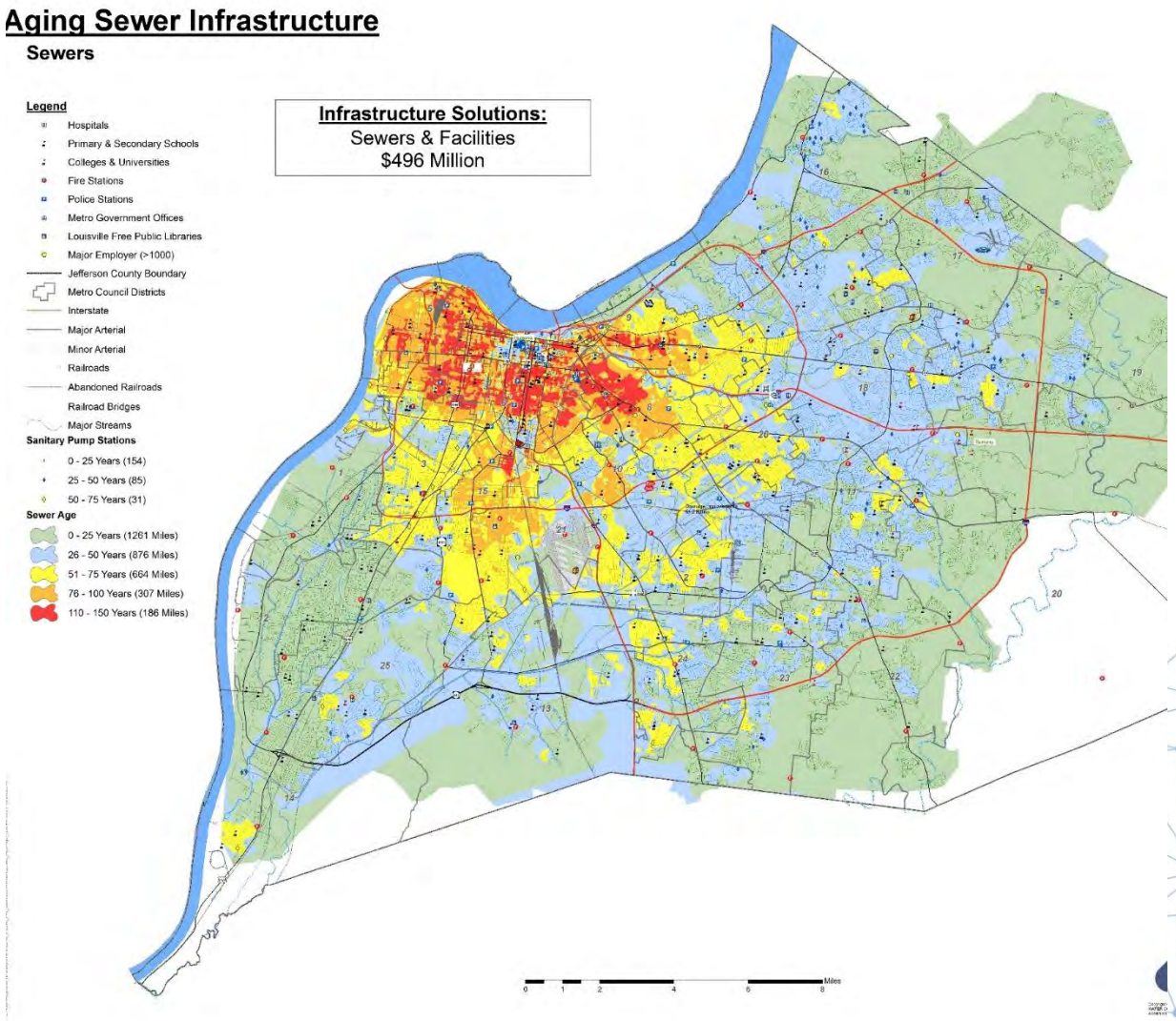
Optimal



"A system that dynamically **adjusts** the operation of a facilities in response to online measurements in the field to maintain and meet the operational objectives, both during dry and wet weather conditions." – USEPA

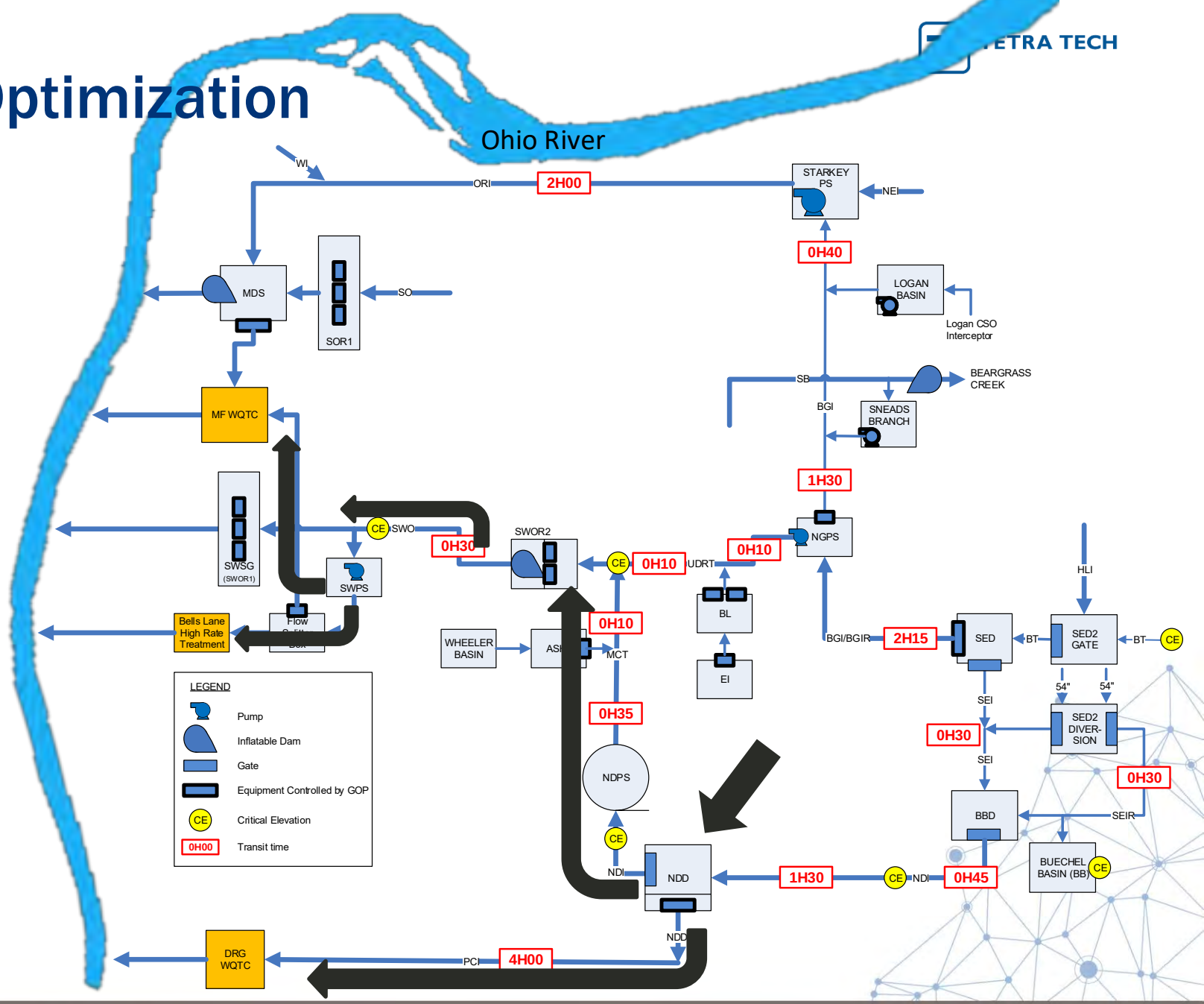
Louisville, KY SSO and CSO overflow abatement

- Complex and large system
- 5 regional WWTP
- 260+ pump stations
- 3,200 mi of sewer
- Ohio River Flood Protection System

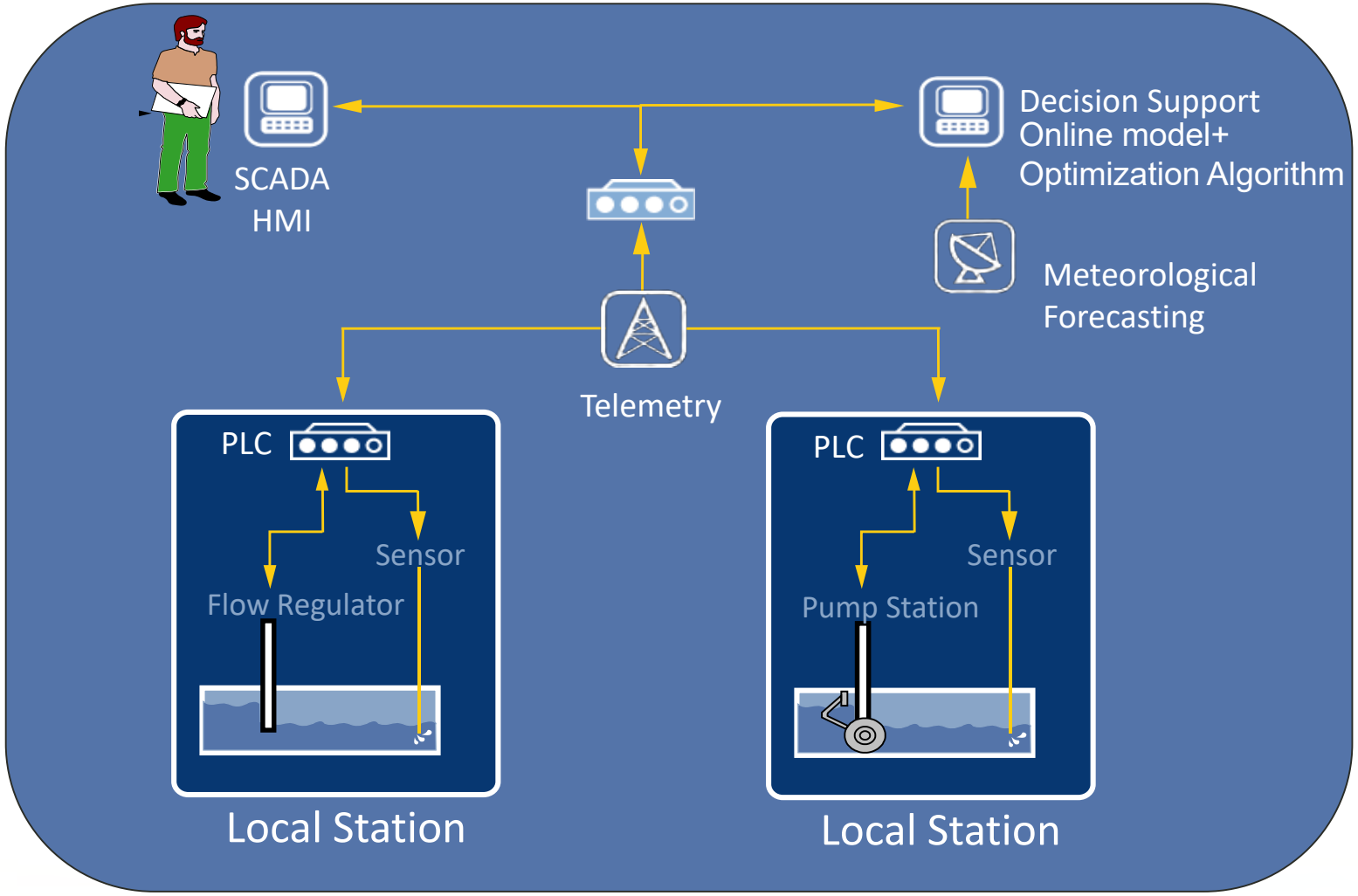


Vision: Total System Optimization

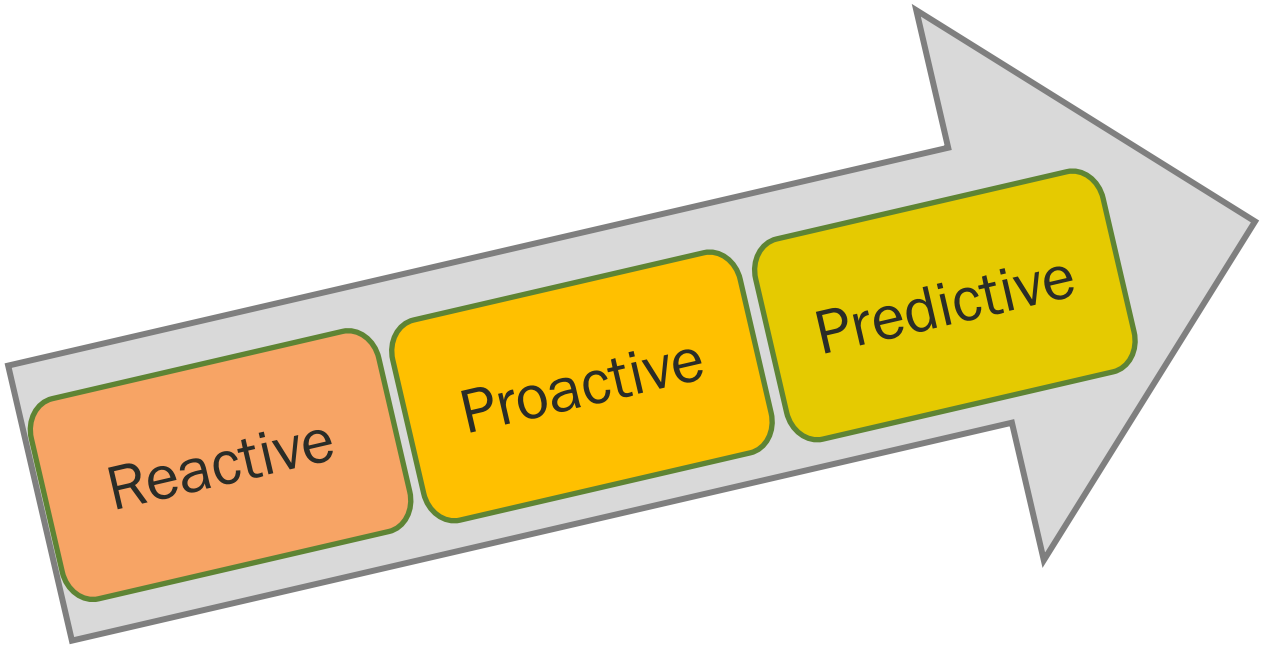
- **Operational challenges:**
  - Maximize WWTP
  - Maximize storage
  - Spatial and temporal variability of flows
  - Changing conditions at any time
- **Requires smart data and control:**
  - Prediction
  - Optimization
  - Repsect contraints

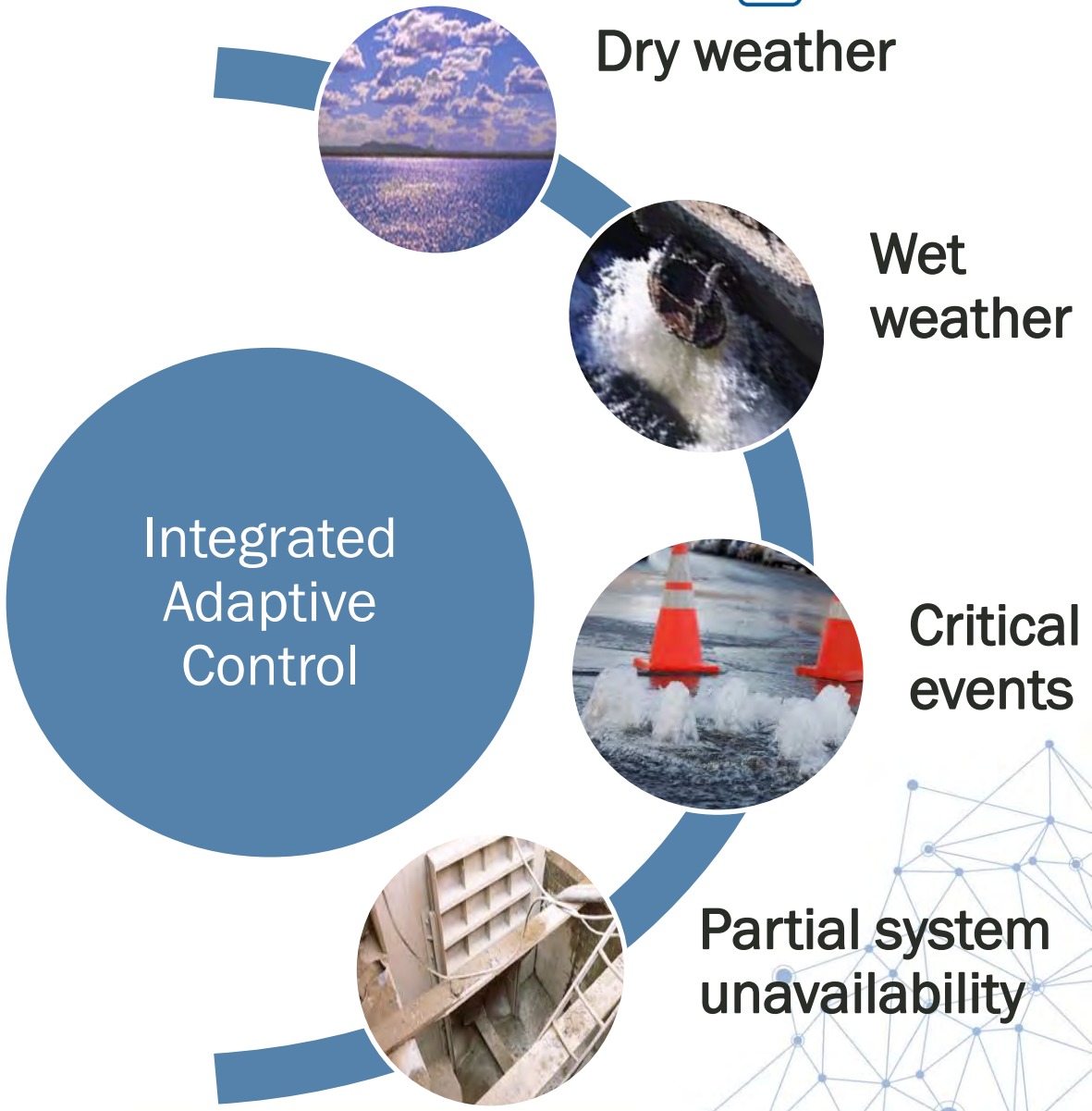


Tool: Real Time Control System

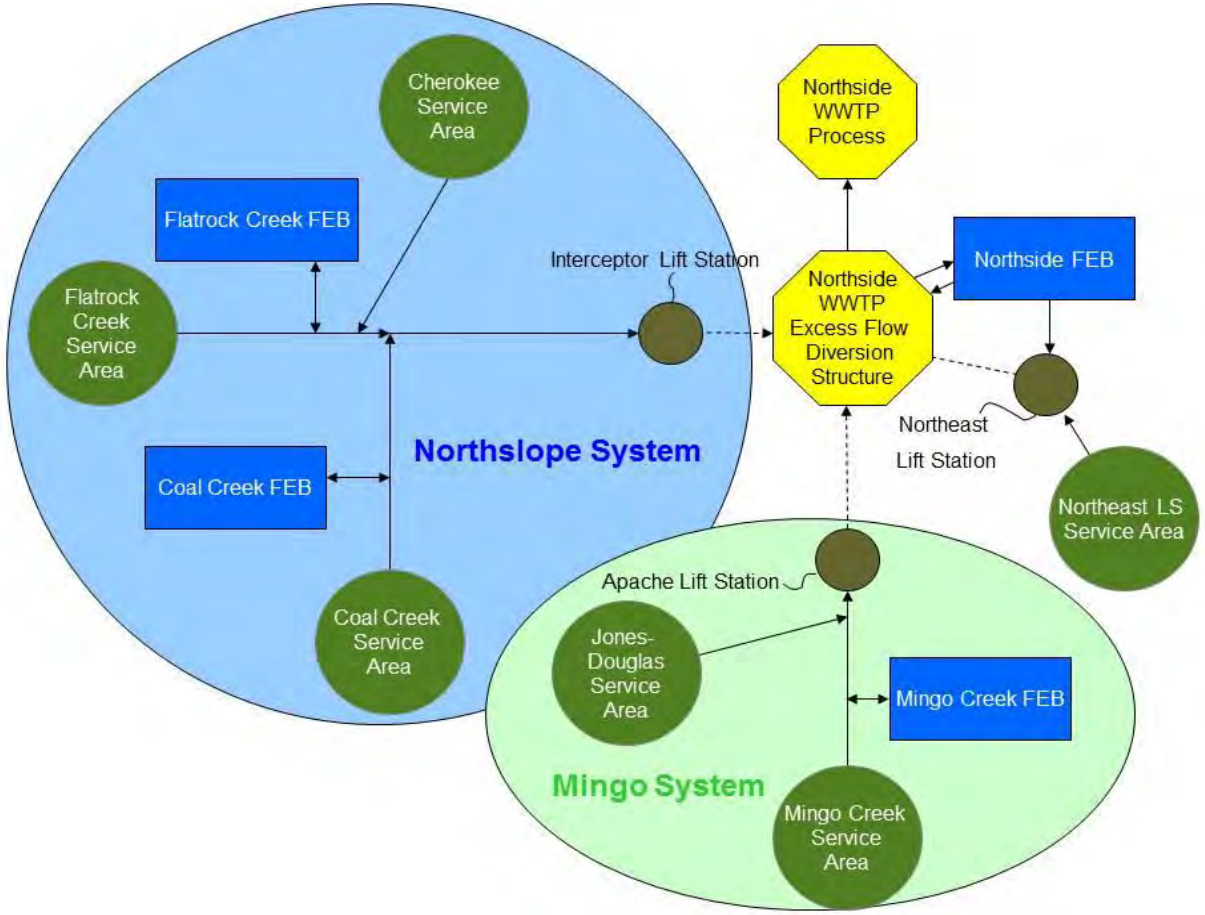


Operational benefits



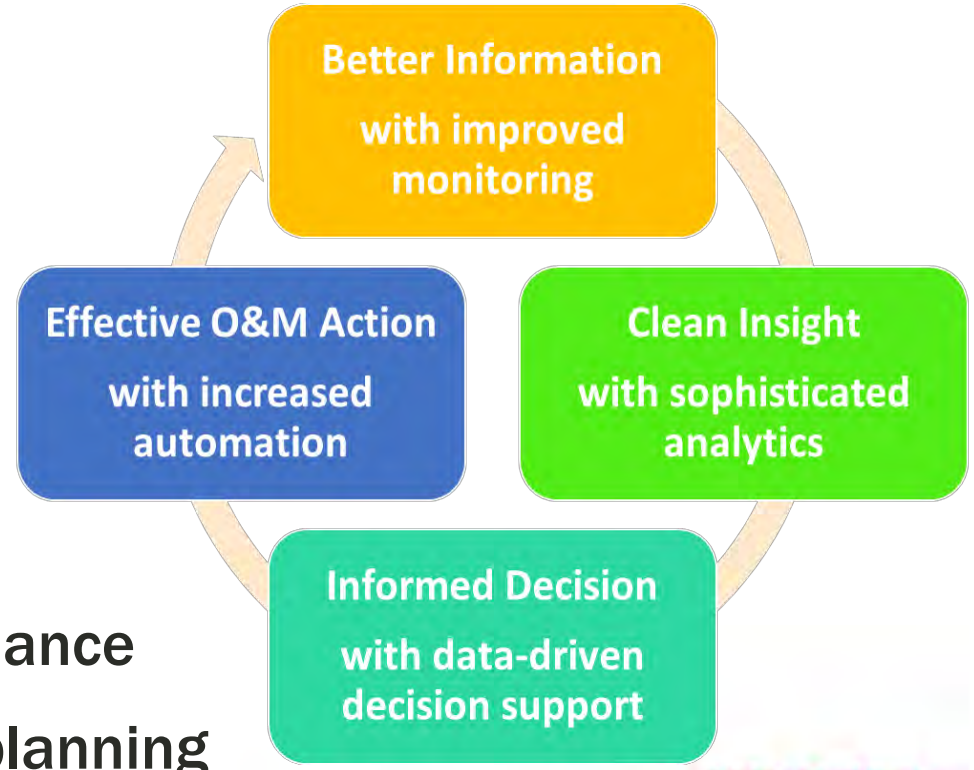


Tulsa, OK Sanitary System
Flow Equalization Basin Control



Lessons Learned

- Data governance
- Sweat the details
- Involve operations early
- Communications and staff buy-in
- Operational data to assess system performance
- Inform asset management and long term planning



Communication, communication and communication

Conclusion – benefits of smart data infrastructure

- Maximizing infrastructure
- Optimizing storage to reduce peak and overflows
- Understanding of system performance
- Proactive operations and responses
- Meeting regulatory requirements
- Improving asset management
- Adaptive management of LTCP implementation
- Prioritizing critical assets and future capital planning
- Enabling effective customer service and enhancing public notification.

Thank you!

Questions?