CDM Smith - Digitalizing: Harnessing the potential of digital transformation in data-driven water solutions

E. Popat, I. Prinz*, A. Corriveau**, R. Bufler**

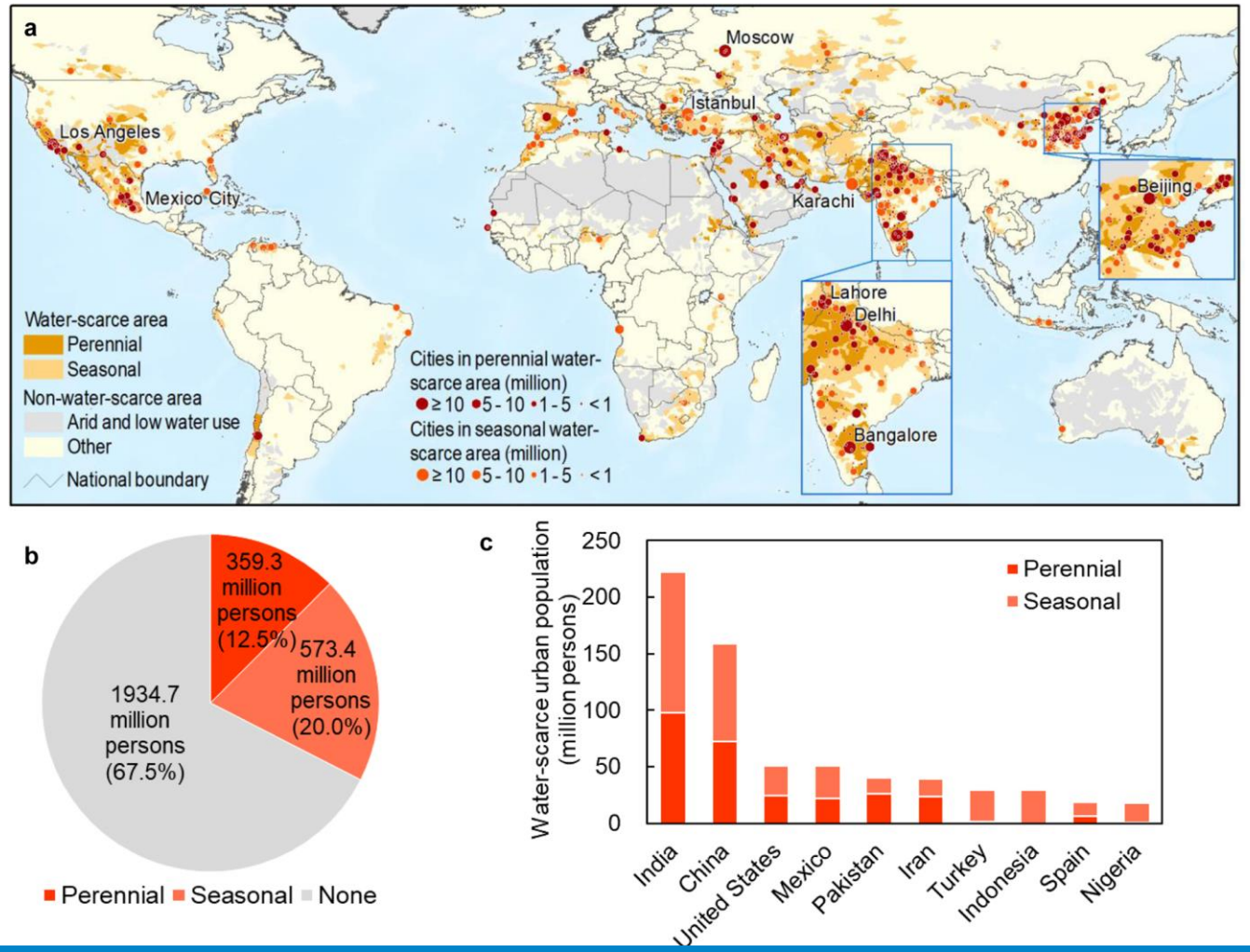
04-2022

CDM Smith

trinnex
Trust in what's next.

Introduction

The Challenge



Source: "He, C., Liu, Z., Wu, J. et al. Future global urban water scarcity and potential solutions. Nat Commun 12, 4667 (2021)."

DIGITAL TRANSFORMATION AND DATA-DRIVEN SOLUTIONS AT CDM SMITH

CAST Approach

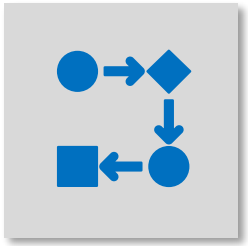
trinnex
Trust in what's next.

Capture

Leverage existing GIS and real-time operational data sources such as SCADA, flow meters, and other IOT devices

Assess

Construct a digital twin, utilizing the hydraulic model and real-time operational data sources and diagnose variances from real-world observations



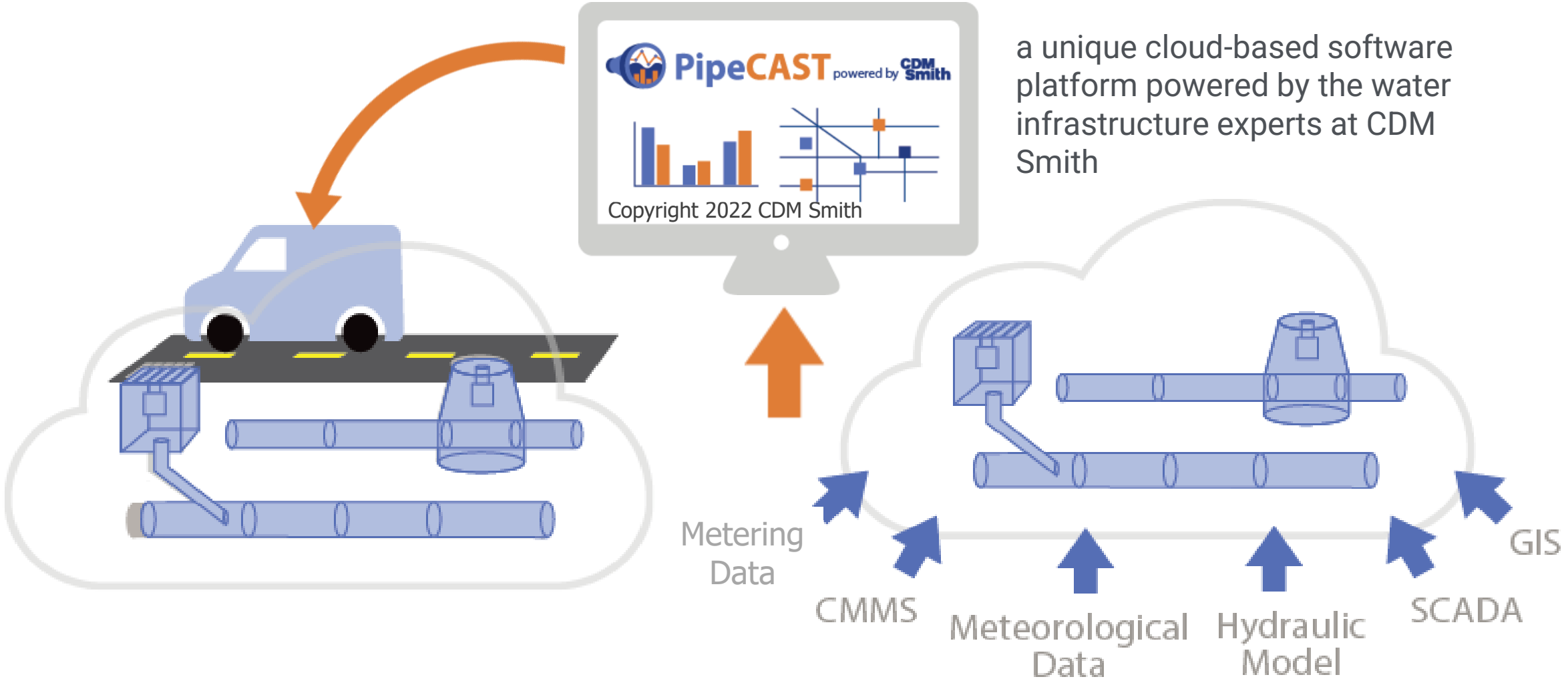
Simulate

Generate real-time performance insights of system response during storm events and perform what-if analyses of future build-out scenarios

Take Action

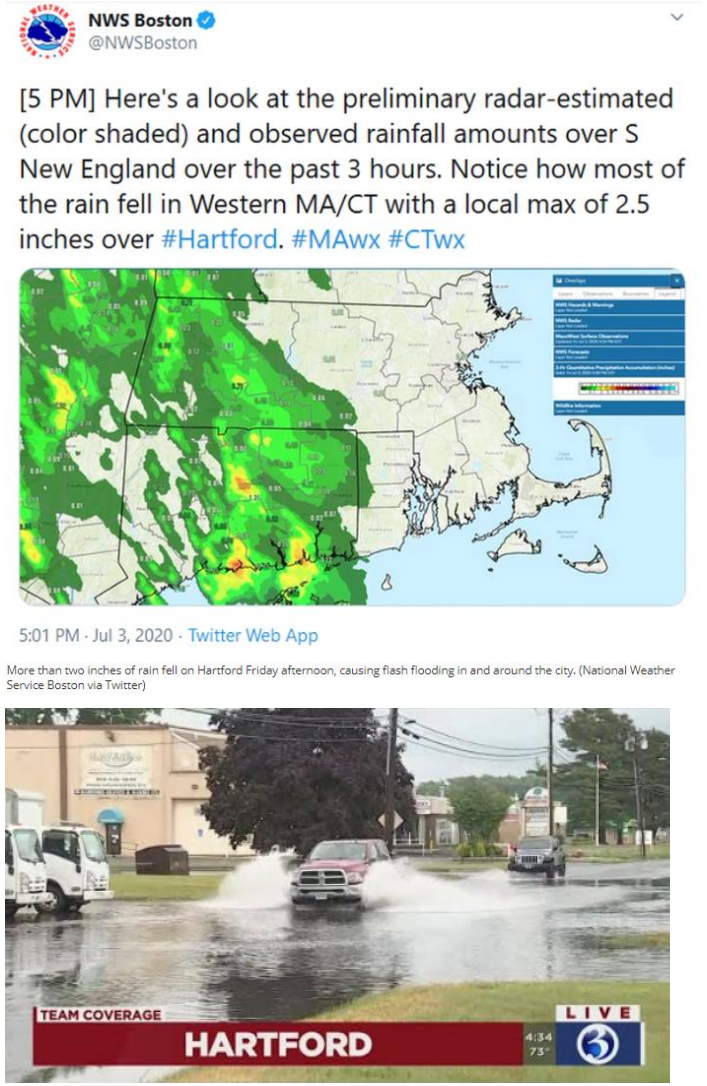
Diagnose flooding causality, operational issues, and maintenance-related performance issues using data-driven insights and direct resources to assets in-need

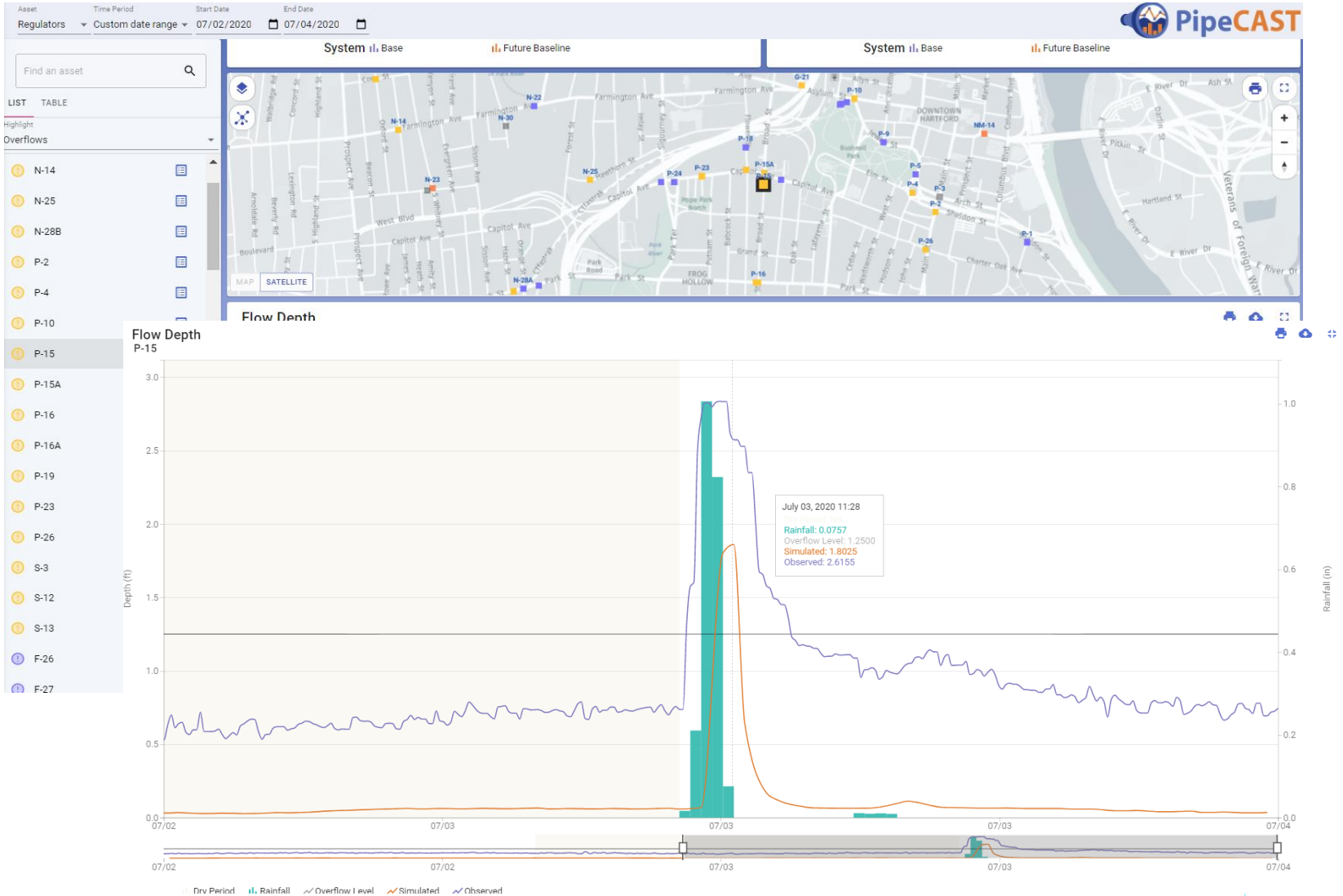
pipeCAST™ - Digital Twin For Sewer Systems



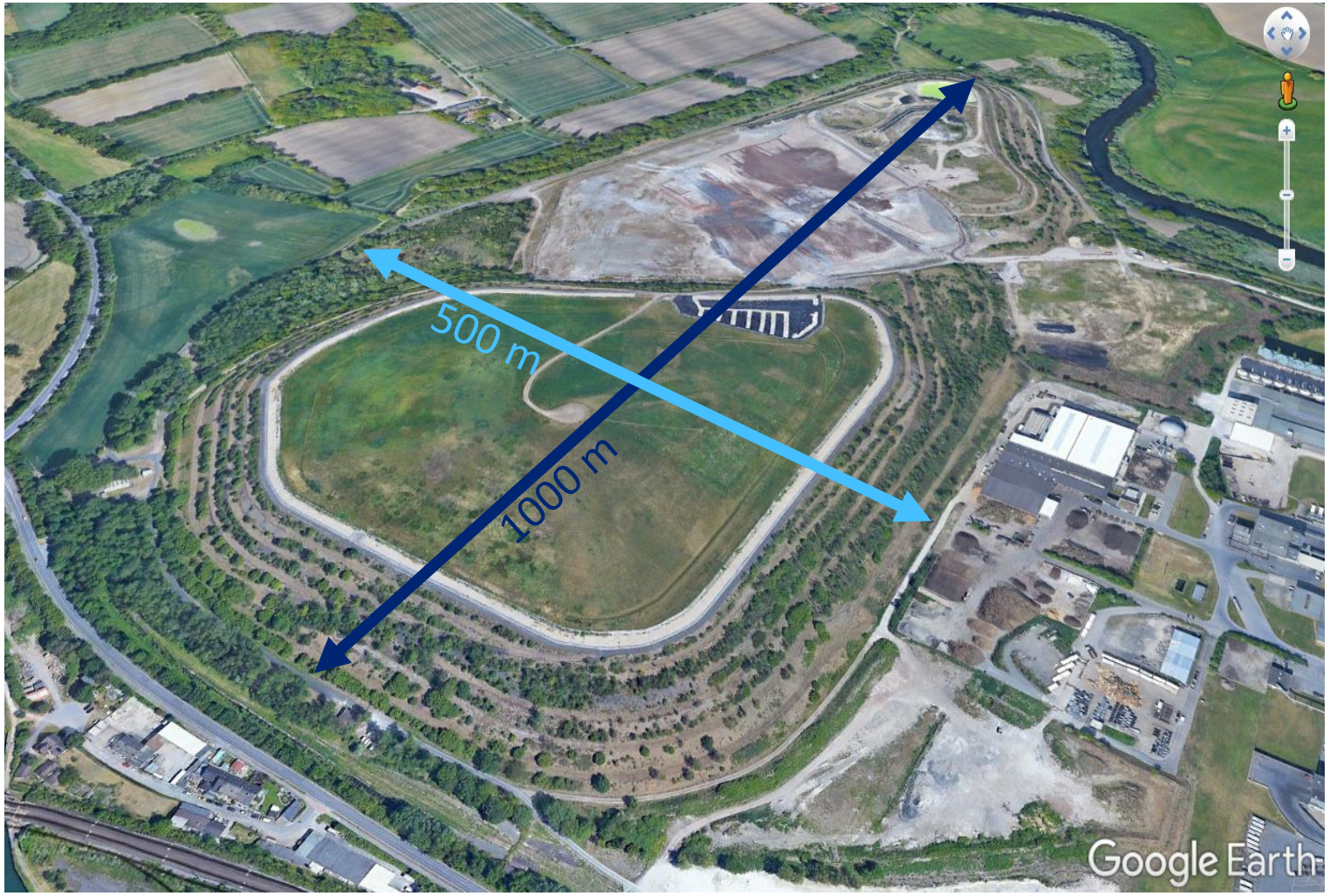
a unique cloud-based software platform powered by the water infrastructure experts at CDM Smith

Emergency Response using pipeCAST at Hartford Metropolitan District Commission (HMDC) - proactively monitors and analyzes extreme weather events





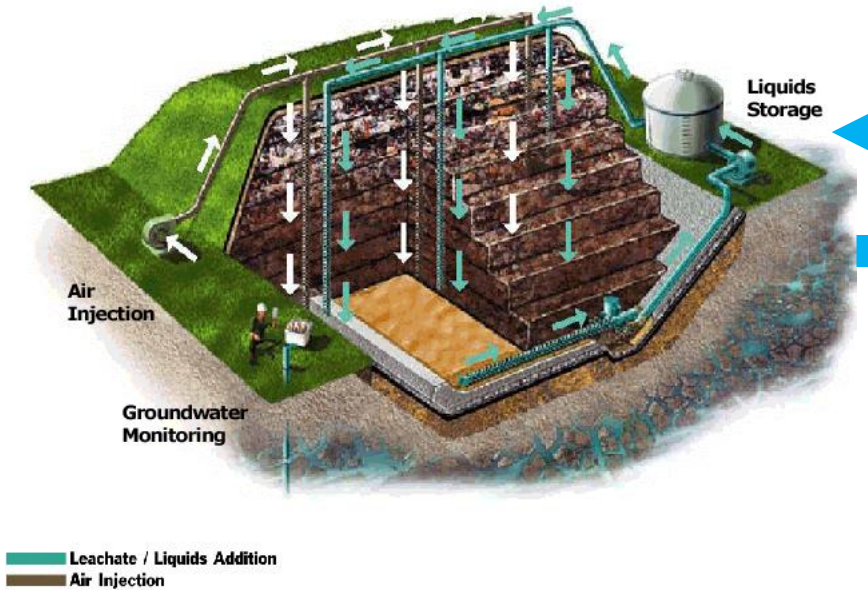
Project example: Digital Twin – Landfill Lippewerk



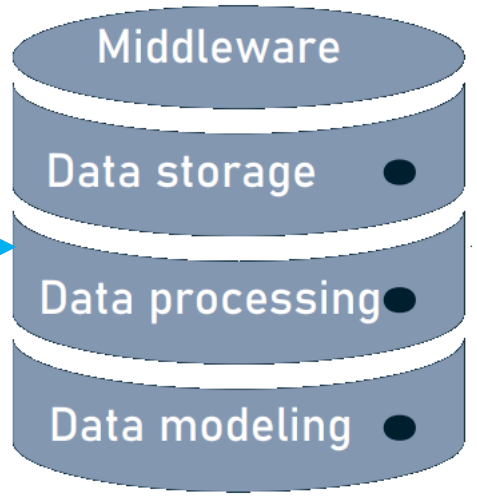
- Landfill in use since the late 30s
- History in construction and documentation

Project example: Digital Twin – Landfill Lippewerk

Landfill with IOT sensors



IOT-Digital Twin Systems



Data Generated from IoT Devices

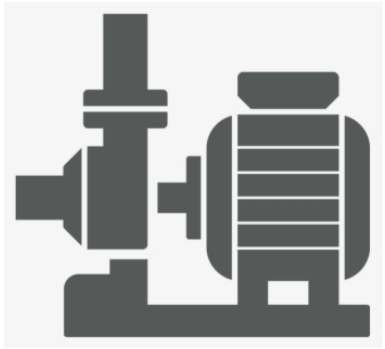
IoT device details & Data Synced from IoT Devices

CDM Smith

Pump optimization for Grafton Massachusetts
Traditional programming method

Pumping system

Field instruments (level, flow, and pressure transmitters)



Level, flow, pressure, and pump speed

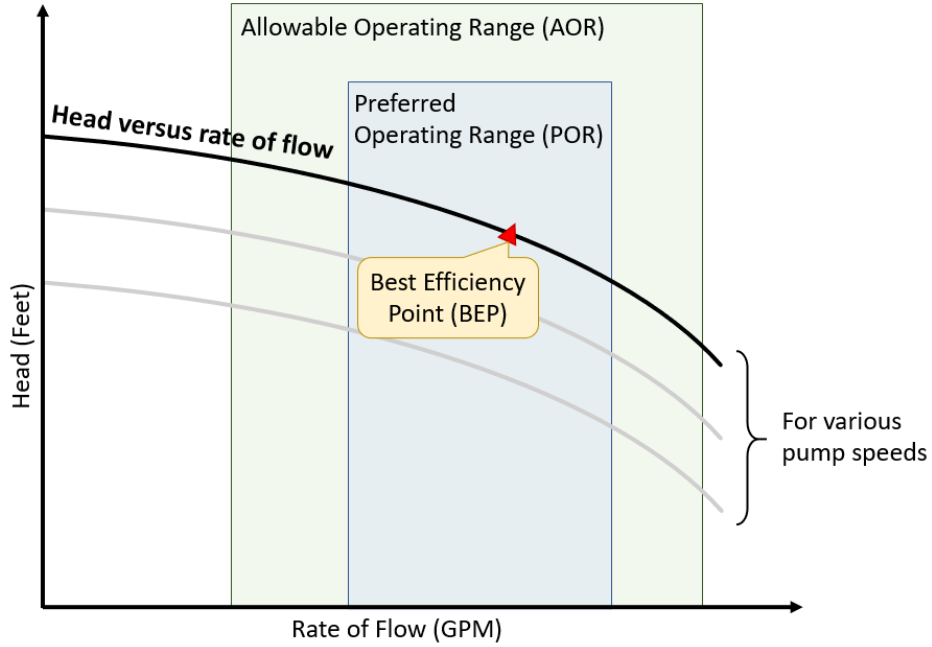
Pump start/stop

Pump speed %

Programmable Logic Controller (PLC)

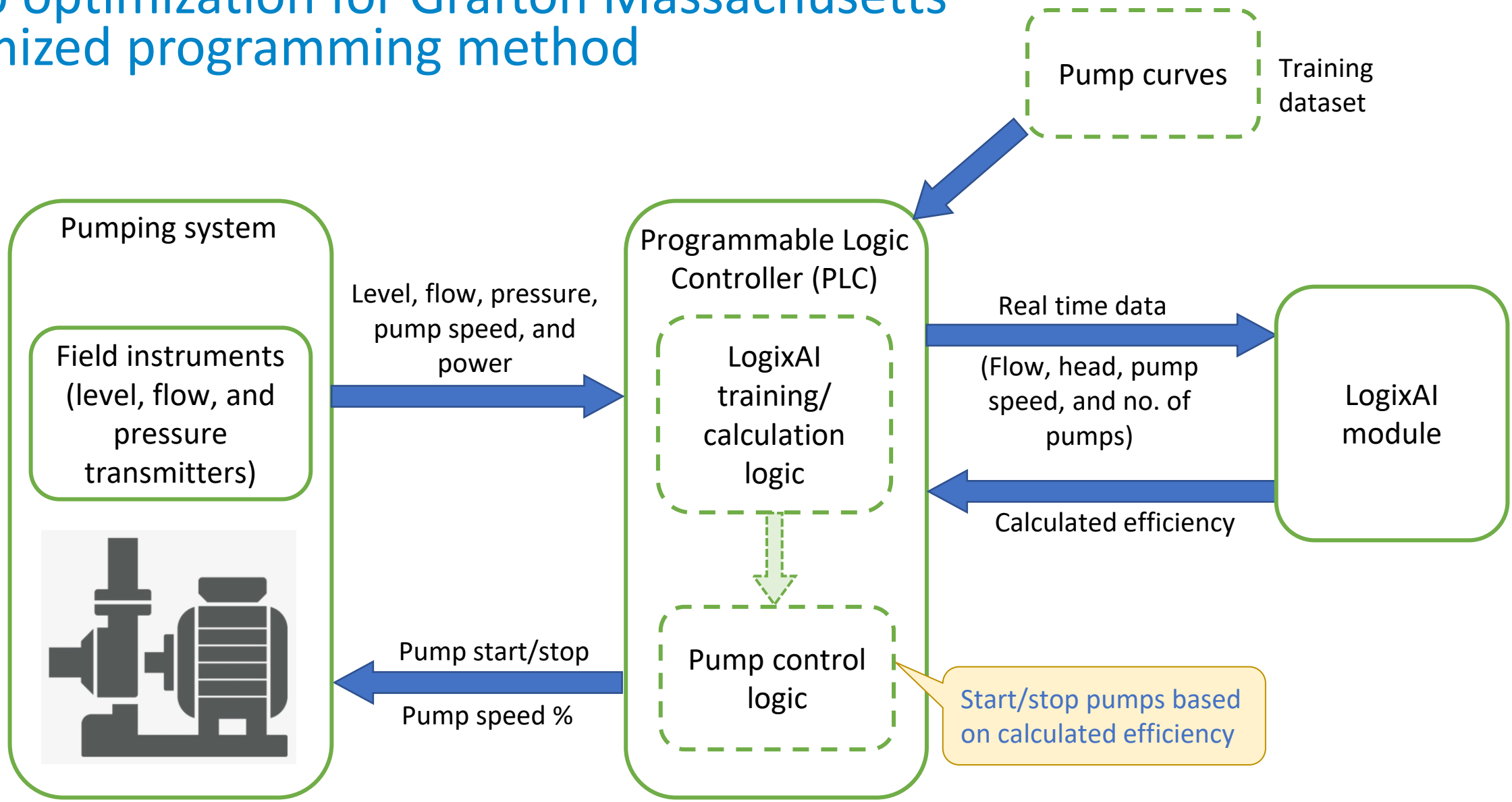
Pump control logic

Start/stop pumps based only on speed % or level



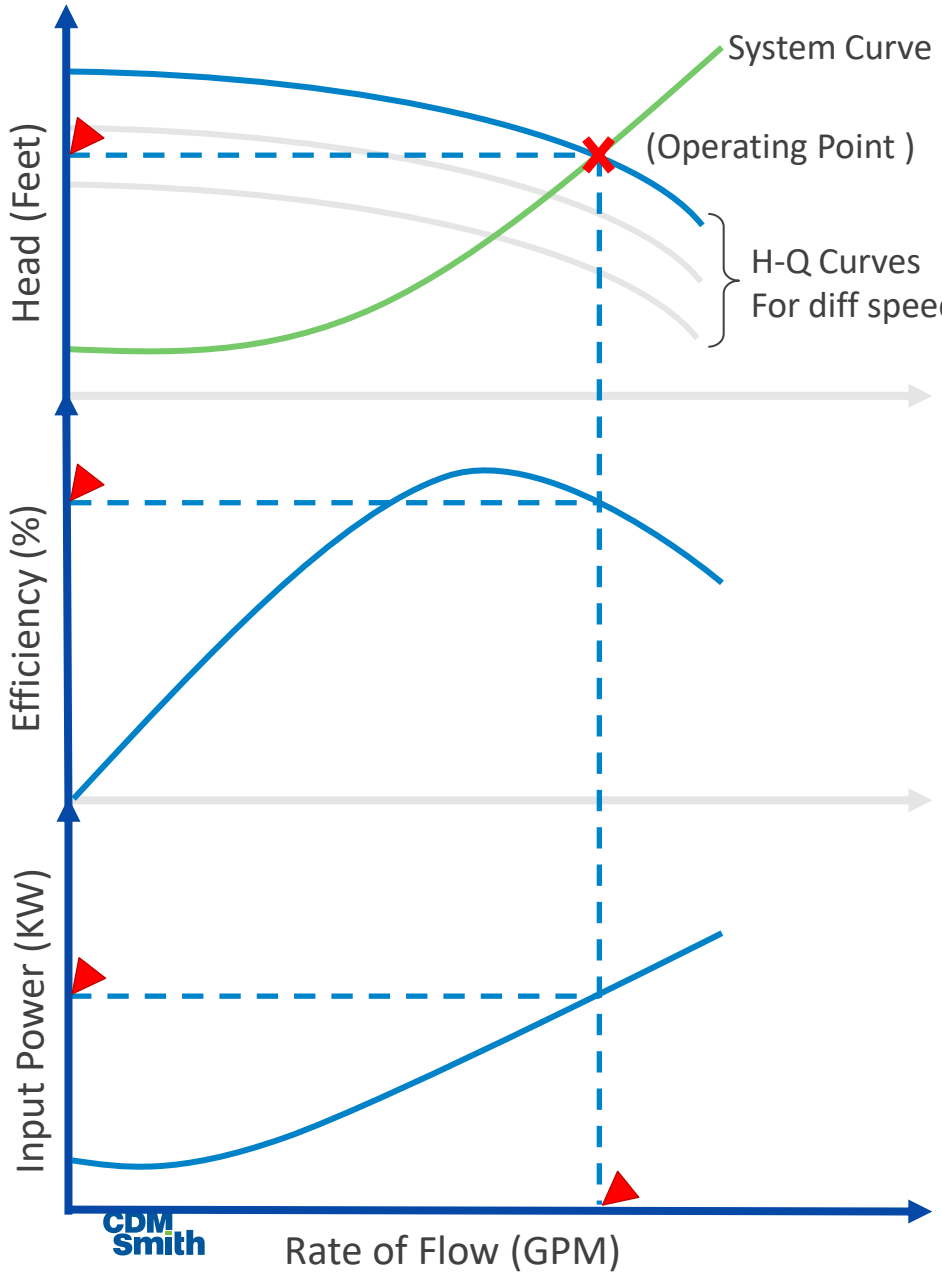
CDM Smith

Pump optimization for Grafton Massachusetts
Optimized programming method



CDM Smith

System flow (Q), Head (H), Efficiency & Power computed from Pump Curves (▲)



(Sample data for visualization)

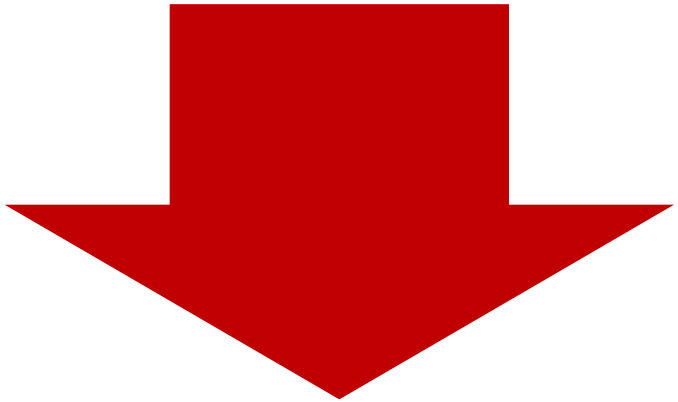
System Flow (cu.m per hr)	System Efficiency (%)	Speed (%)	No. Pumps Running	Input Power (KW)	Specific Energy (KW/cu.m per hr)	Operating Time (Hours/Year)	Energy consumed (KWh)	Cost Incurred ($)
213.36	69.22	56.13	1	17.35	0.0813	15.9	275.78	35.85
214.78	69.18	56.22	1	17.49	0.0814	15.9	278.09	36.15
216.39	69.14	56.33	1	17.66	0.0816	15.9	280.73	36.5
218.2	69.09	56.45	1	17.85	0.0818	15.9	283.76	36.89
220.19	69.03	56.59	1	18.06	0.082	15.9	287.16	37.33
222.35	68.97	56.75	1	18.3	0.0823	15.9	290.88	37.81
224.67	68.89	56.91	1	18.55	0.0826	15.9	294.93	38.34
227.14	68.8	57.1	1	18.83	0.0829	15.9	299.3	38.91
229.76	68.69	57.29	1	19.12	0.0832	15.9	303.99	39.52

** Electricity cost assumed @ 13 cents/KWh*

Control mode	Annual Energy	Annual cost ($)
traditional	991,890.90 KWh	$128,945.82
Optimized	827,191.90 KWh	$107,534.95
Savings	***164,698.9 KWh***	***$21,410.87***

CONCLUSION

CHALLENGES AND POSITIVE IMPACTS OF DIGITAL TRANSFORMATION



Challenges

- Human factor
  - Lack of trust & Hesitation
  - Lack of expertise
- IT-infrastructure
- Data availability
- Data and Cyber Security concerns

Positive impacts of digital solutions

- System transparency
- Insights and ad-hoc information availability
- Supply security
- Efficiency gain (cost & operation)


trinnex
Trust in what's next.

trinnex
Trust in what's next.

Not buying digital platforms, Rather delivering solutions..

With 75 years of Classic Engineering experience

Building Data-Driven Digital Solutions

Source: https://www.esri.com/arcgis-blog/products/arcgis/water/digital-twins-water-utilities/