Data Collection and Analytics for Assuring Water Quality

Devin Doring

Brandon Lake

The City of Salem

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The Santiam River

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Detroit Lake, Oregon

Source:
Zach Urness/Statesman Journal

National Oceanic and Atmospheric Administration

U.S. Department of Commerce

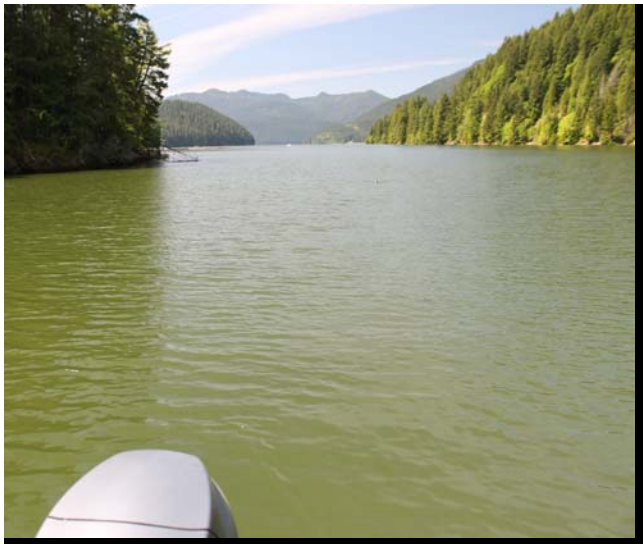
What is a harmful algal bloom?

Sometimes tiny algae can cause big problems

Oceans & Coasts | harmful algal blooms (HABs)

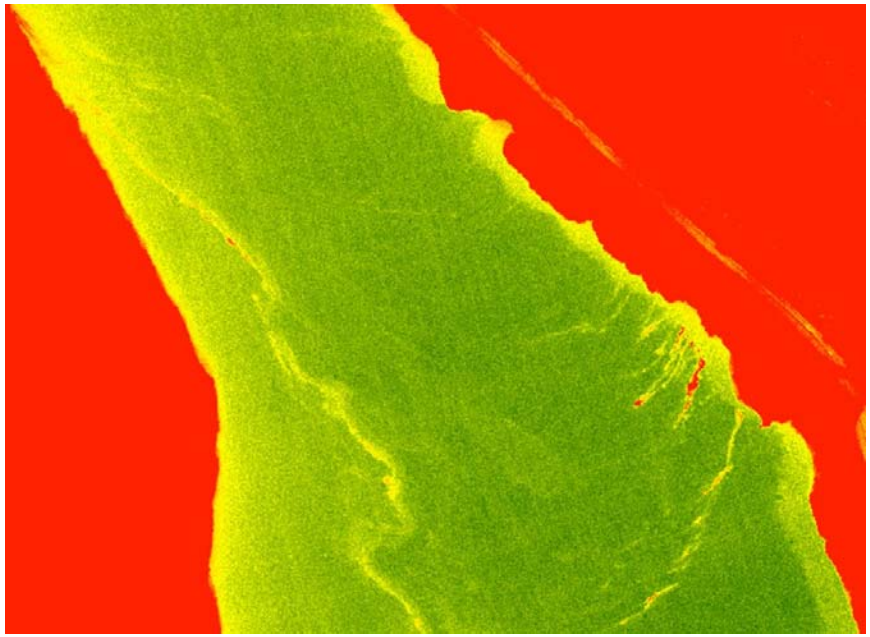
SHARE

Harmful algal blooms, or HABs, occur when colonies of algae — simple plants that live in the sea and freshwater — grow out of control and produce toxic or harmful effects on people, fish, shellfish, marine mammals and birds. The human illnesses caused by HABs, though rare, can be debilitating or even fatal.



City of Salem
AT YOUR SERVICE
Willow Lake Laboratory
LIMS#
Date 5-21-18
Time 1100
By TJ
Sample ID BD
Analysis Nutrients
Preserv

Sometimes you can't see algae blooms



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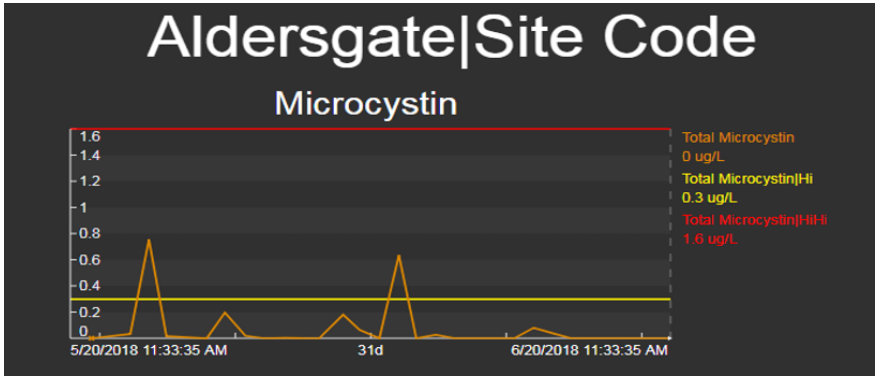
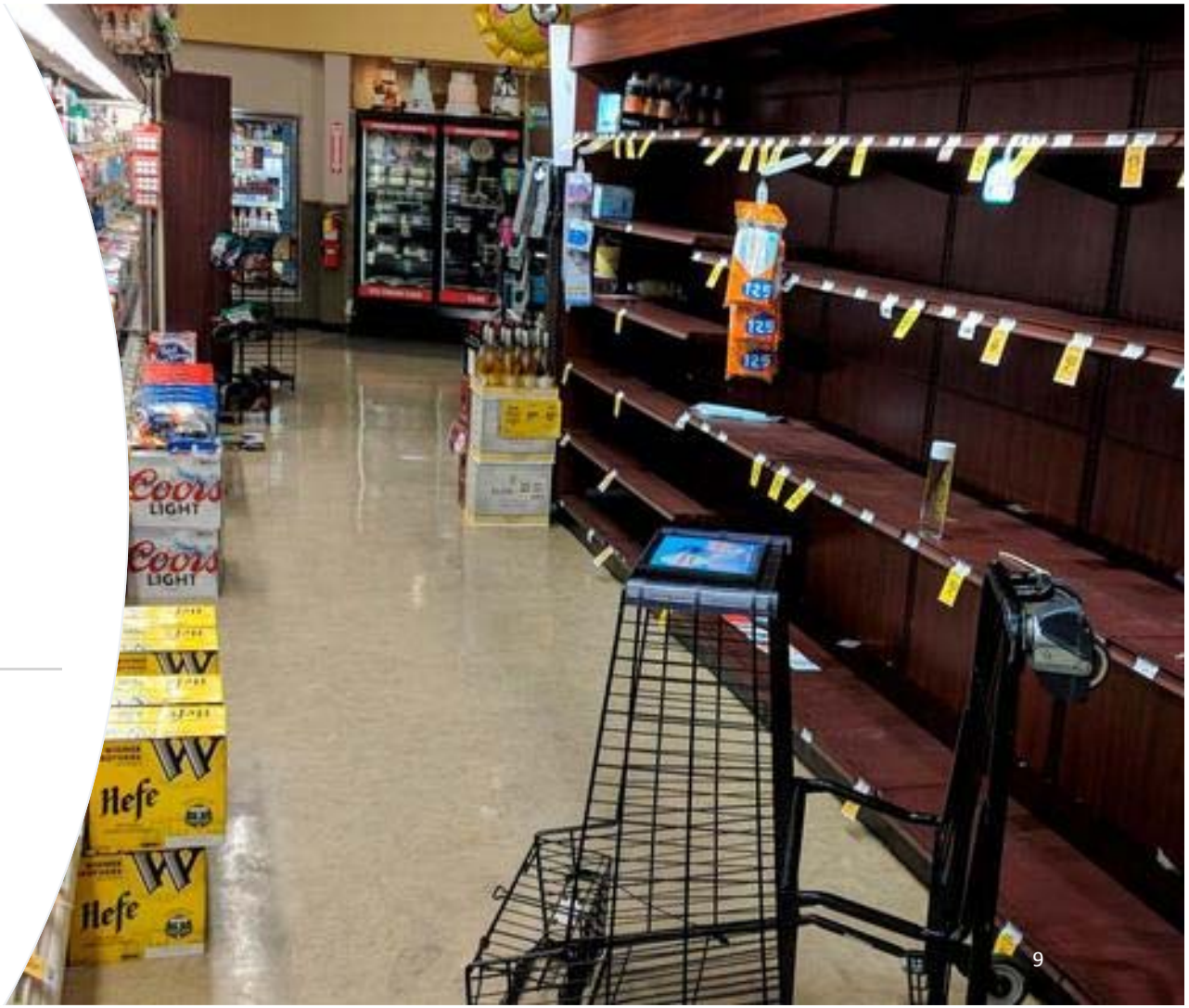
May and June 2018

- EPA Guideline is 0.3 ug/L for a health advisory for sensitive populations. Children, elderly, nursing mothers.
- More a communication challenge than a technical one. Panic created by Emergency Alert.



The bottled-water aisle, Salem area store, circa 2018

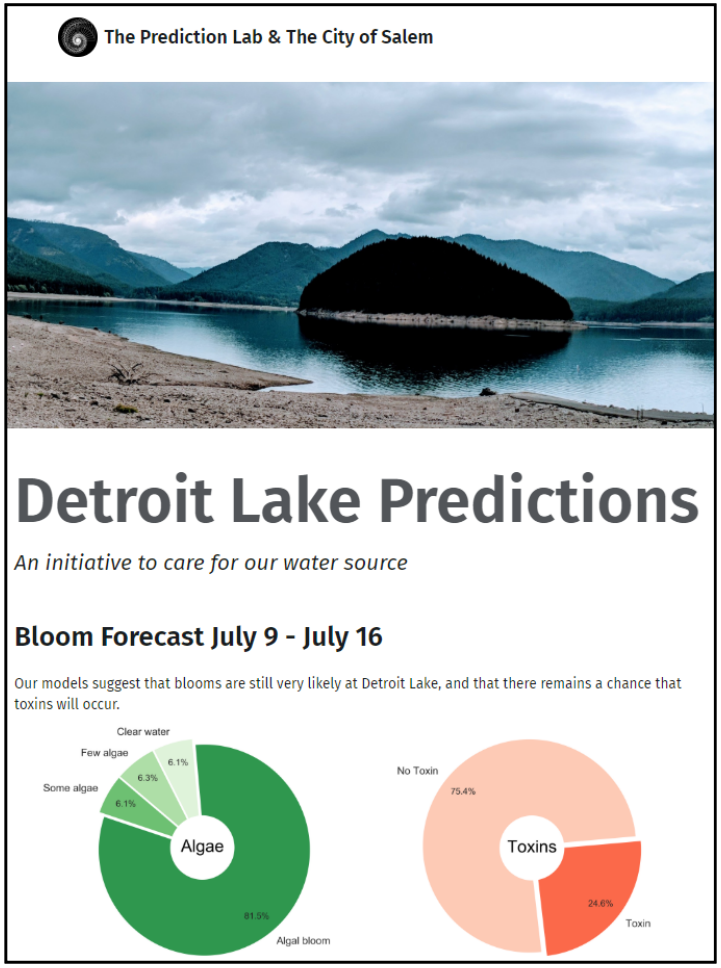


All Hands-on Board…24x7

- All city staff manning water distribution stations
- National Guard activated
- Experts contacted nation-wide
- Opportunity to leverage the PI System for a predictive HAB solution
- Oregon State engaged, partnered with The Prediction Lab

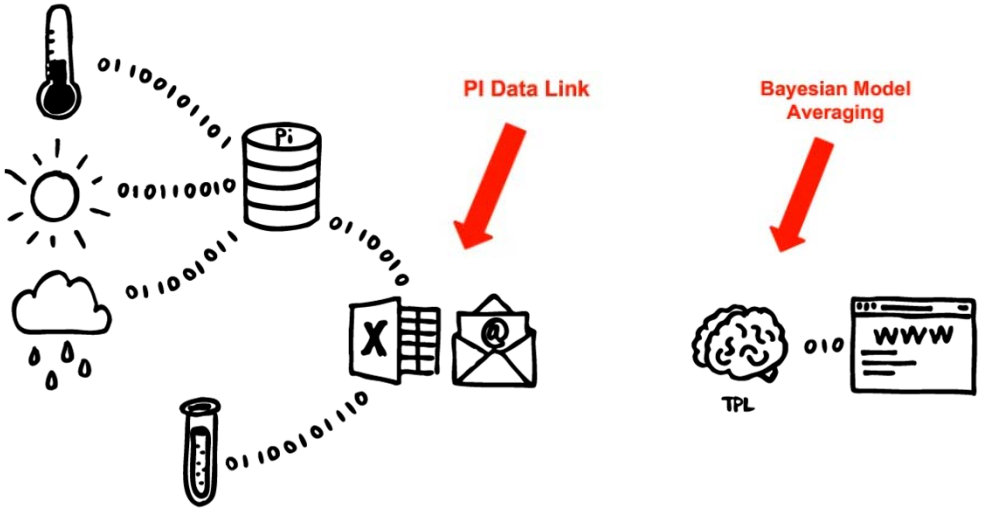
Good Stewardship thru a Predictive System

- Traditional sampling 24 hour turnaround
- Lab kits are very expensive, $1000/sample x multiple samples/day x 365 days
- Need to adjust treatment before toxins arrive
- Prediction is technologically and scientifically feasible
- Machine learning and root cause analysis are available



First System Architecture

https://thepredictionlabllc.github.io/detroit-lake-predictions/



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Joint Success Story

CITY OF SALEM

CASNE ENGINEERING

OSISOFT

THE PREDICTION LAB (TPL)

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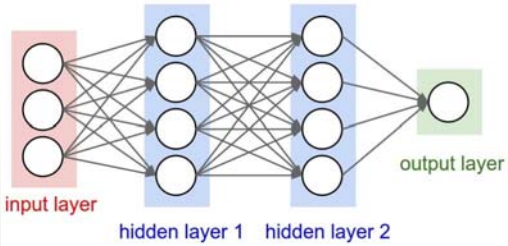
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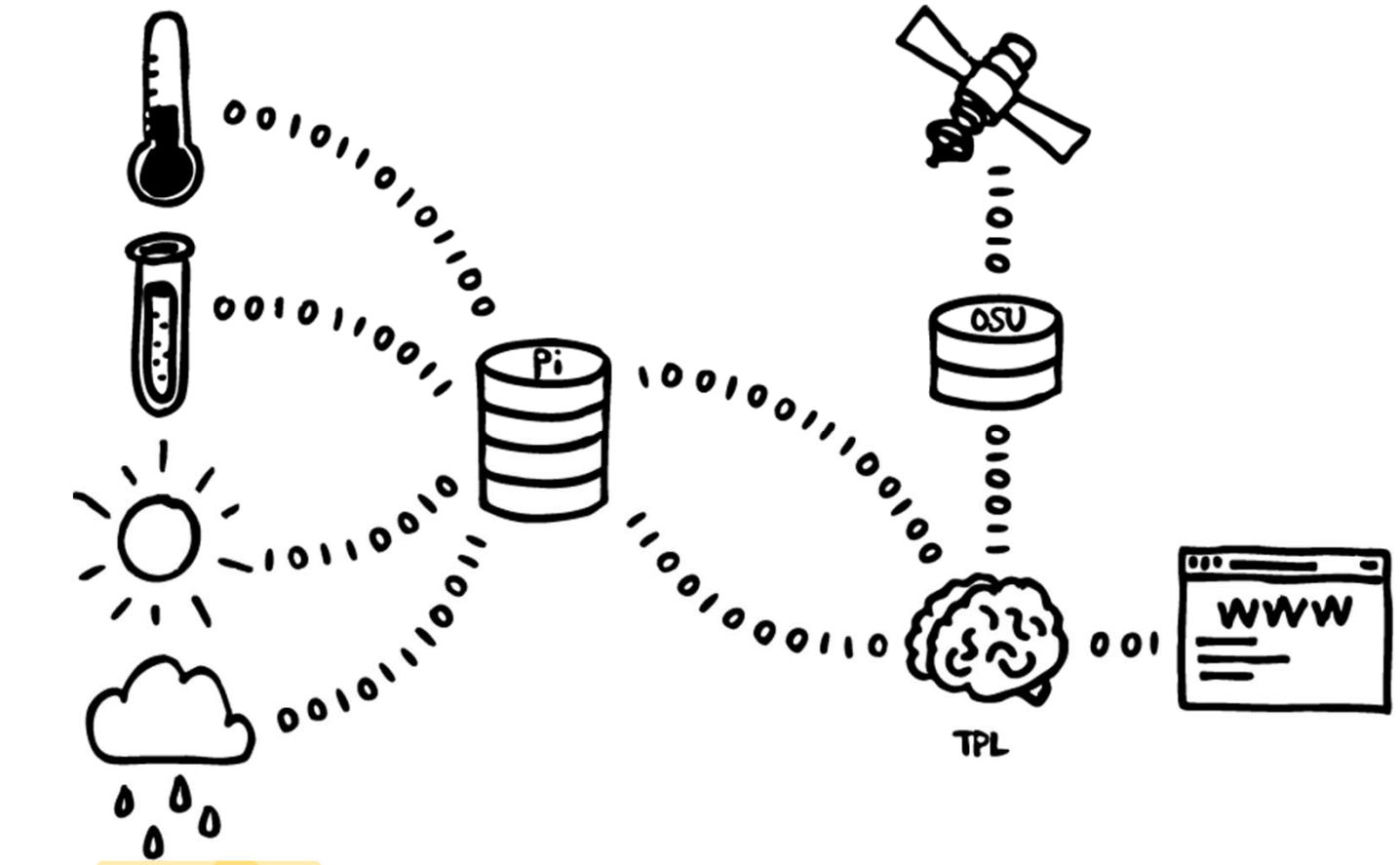
Pi
OSU
WWW
TPL

Technological Challenge

Data is needed for predictive analytics

Environmental data (e.g., weather) is available, but wasn't integrated	System / sensor data was not available

Using the PI System, Casne integrated new data sources

Satellite imagery from NOAA flyovers	Weather data	Floating data collection pontoon	Modeling program inputs and outputs

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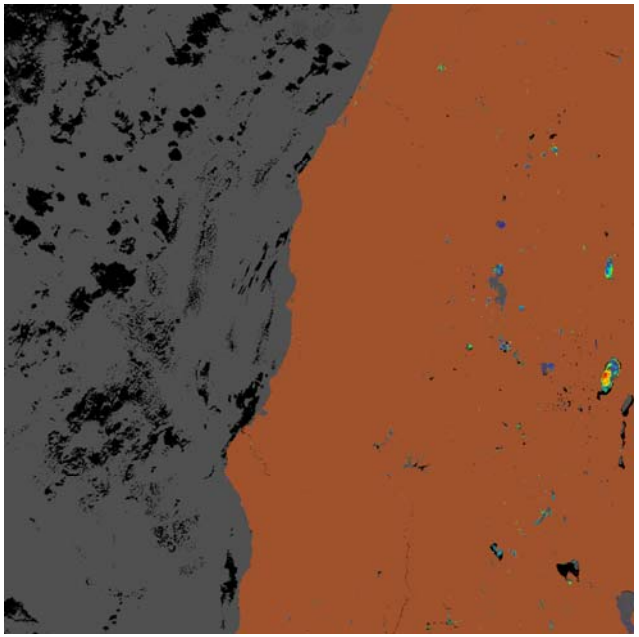
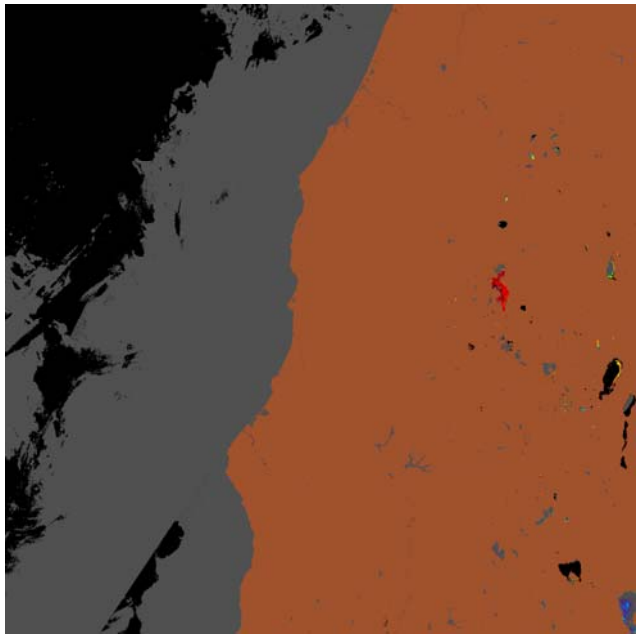
Story: Pontoon System Integration

Satellite Image Data





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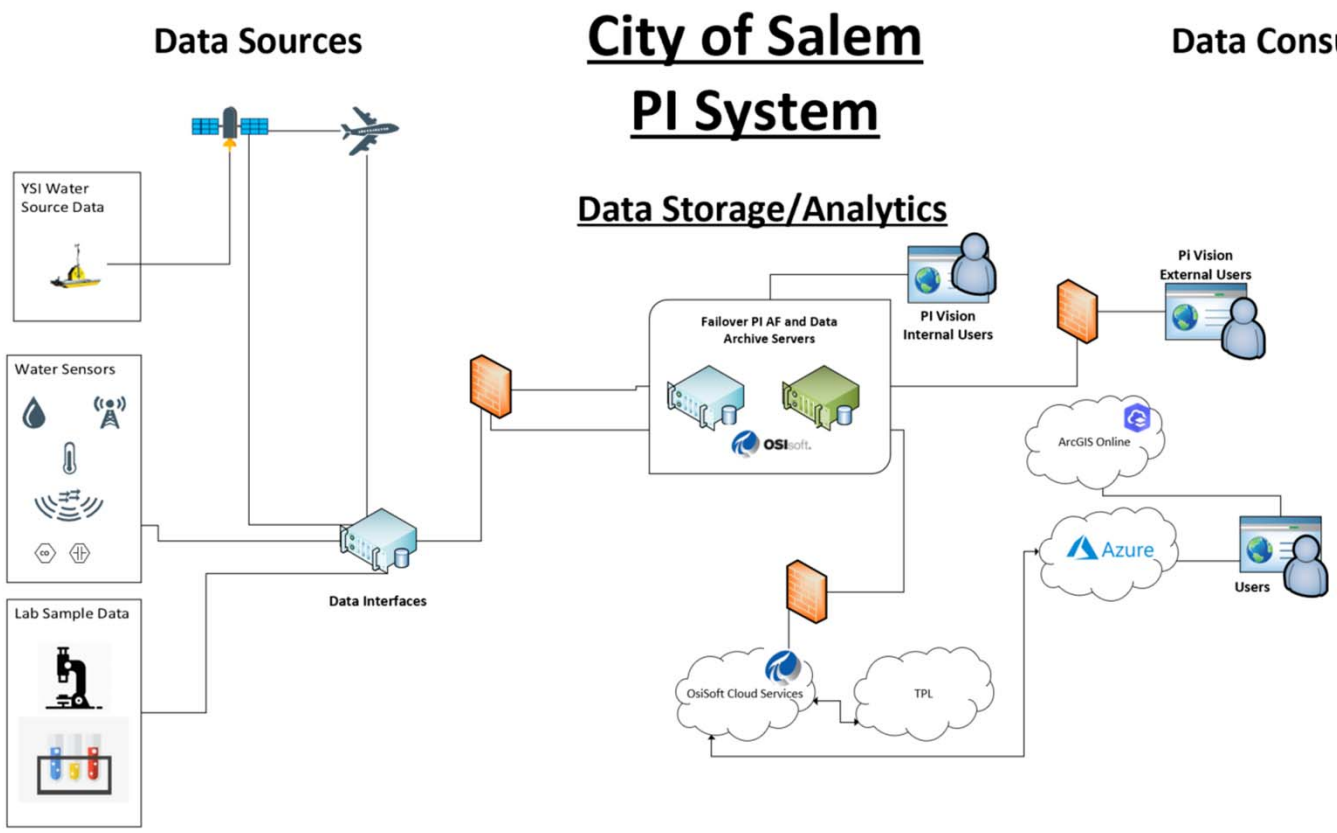
Data Sources
City of Salem
PI System
Data Consumer
Data Storage/Analytics
YSI Water Source Data
Water Sensors
Lab Sample Data
Data Interfaces
Failover PI AF and Data Archive Servers
OSIsoft.
PI Vision Internal Users
Pi Vision External Users
ArcGIS Online
Azure
Users
OsiSoft Cloud Services
TPL

Utility Management Challenge

- The public deserves access to safe and reliable drinking water.
- The climate is changing. HAB is not going away.
- Cyanotoxins will (very likely) be a regulated contaminate in the future for water systems.

CITY OF Salem AT YOUR SERVICE
Public Works Department

CHALLENGES

- Harmful Algal Bloom (HAB) threatens City of Salem drinking water supply
- Integrated tech and scientific solution required prediction and detection

SOLUTION

- The PI System acts as a foundation for the data
- Casne Engineering integrated numerous new data sources
- Modeling algorithms from TPL are integrated
- HAB events and cycles are seen earlier

BENEFITS

- Avoid drinking water quality surprises
- Predict and proactively manage future HAB events

> “Casne Engineering successfully integrated all of the systems we needed to address our HAB challenge. The PI System, field sensors, and a predictive model.”

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Future Priorities and Plans

- External facing visualizations
  - Field engineering
  - Public access dashboard
- Automated, high-availability
  - PI Cloud data storage
  - Environmental data refresh
  - Science partner data sharing
- Actionable intelligence based on prediction
  - Advanced warning for possible HAB events
  - Notification and Alerts

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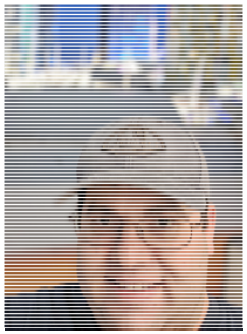
Thank you



Devin Doring
City of Salem
ddoring@cityofsalem.net

Brandon Lake
Casne Engineering
brandon.lake@casne.com

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Questions?

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State your **name & company**

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