CLEVELAND WATER ALLIANCE

Smart Lake Erie Watershed Driving Data for Water Management

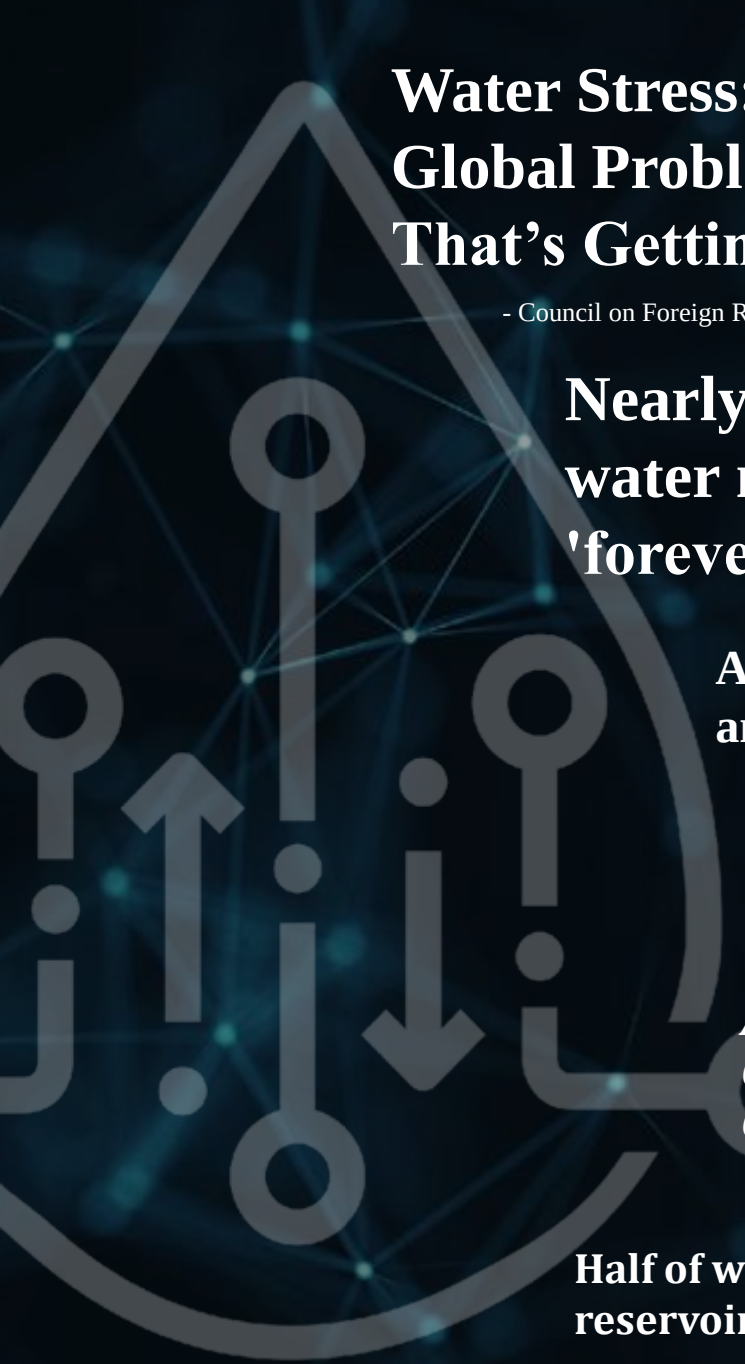
Max Herzog

Deputy Director, Programs & Partnerships

Agenda:

- Why Water?
- About CWA
- Smart Lake Erie Watershed (SLEW)
- Accelerating Innovation
- The Upshot

Why Water?



Water Stress: A Global Problem That's Getting Worse

- Council on Foreign Relations, April 3, 2023

A Tangle of Rules to Protect America's Water Is Falling Short

- New York Times, November 2, 2023

Plastic entering oceans could nearly triple by 2040 if left unchecked –research

- Reuters, March 8, 2023

Global water crisis could 'spiral out of control' due to overconsumption and climate change, UN report warns

- CNN, March 22, 2023

Here's a Look at the Water Crises That Might Be Coming to You Soon

- New York Times, June 25, 2023

Nearly half of US drinking water may contain toxic 'forever chemicals' - Reuters, July 7, 2023

Water worries hit the chip sector

- Financial Times, Sept 4, 2023

America Is Using Up Its Groundwater Like There's No Tomorrow

- New York Times, November 20, 2023

Amazon drought: Stranded boats and dead fish - BBC, October 12, 2023

Global water cycles are 'spinning out of balance', weather agency reports

- Financial Times, October 12, 2023

A quarter of humanity faces extreme water stress – and it's poised to get worse, new report finds

- CNN, August 16, 2023

A Water System So Broken That One Pipe Leaks 5 Million Gallons a Day

- New York Times, March 22, 2023

Some companies using lots of water want to be more sustainable. Few are close to their targets

- AP, October 27, 2023

The Colorado River Is Shrinking. See What's Using All the Water.

- New York times, May 22, 2023

Half of world's largest lakes, reservoirs losing water: Study

- Al Jazeera, May 19, 2023

European water: climate change creates case for liquid investment

- Financial Times, May 8, 2023

A Glimpse Into Spain's Future, Where Water Comes by Truck, Not Tap

- New York Times, October 22, 2023

The Entire Global Economy is Dependent on Water:

Chemicals
Pharmaceuticals
Polymers
Mining
Oil & Gas
Metals Processing
Textiles
Paper
Battery Manufacture
Chip Production
Power
Agriculture & Food Processing
Cloud Computing
Natural Ecosystems…

L I F E

clevelandwateralliance.org

The Good News is:

There are a lot of smart people doing smart things, developing technology to secure our water future.

About CWA

CLEVELAND WATER ALLIANCE

CWA centrally connects 100+ Water Industry Partners, 30+ Utility Partners and 23 Research Institutions

NGO established 2014

Cleveland Water Alliance (CWA) is an Ohio-based "water cluster" located on the shores of Lake Erie, in the heart of the United States. CWA is focused on helping to accelerate innovative and impactful solutions to market in an increasingly freshwater-stressed world.

clevelandwateralliance.org

CLEVELAND WATER ALLIANCE

- **Burning-River History:** Launched the Clean Water Act, one of the highest concentrations of water-industry expertise in the world: “ground zero” for water-industry innovation.
- **Industry Presence:** 300+ water-solutions companies and public utilities, support over 16,000 water-economy jobs in the region.
- **Water Job Creation:** Fastest-growing regional sector.
- **Robust Industry Investment:** Water and wastewater utilities invest $500M/year in infrastructure.

clevelandwateralliance.org

Smart Lake Erie Watershed (SLEW)

clevelandwateralliance.org

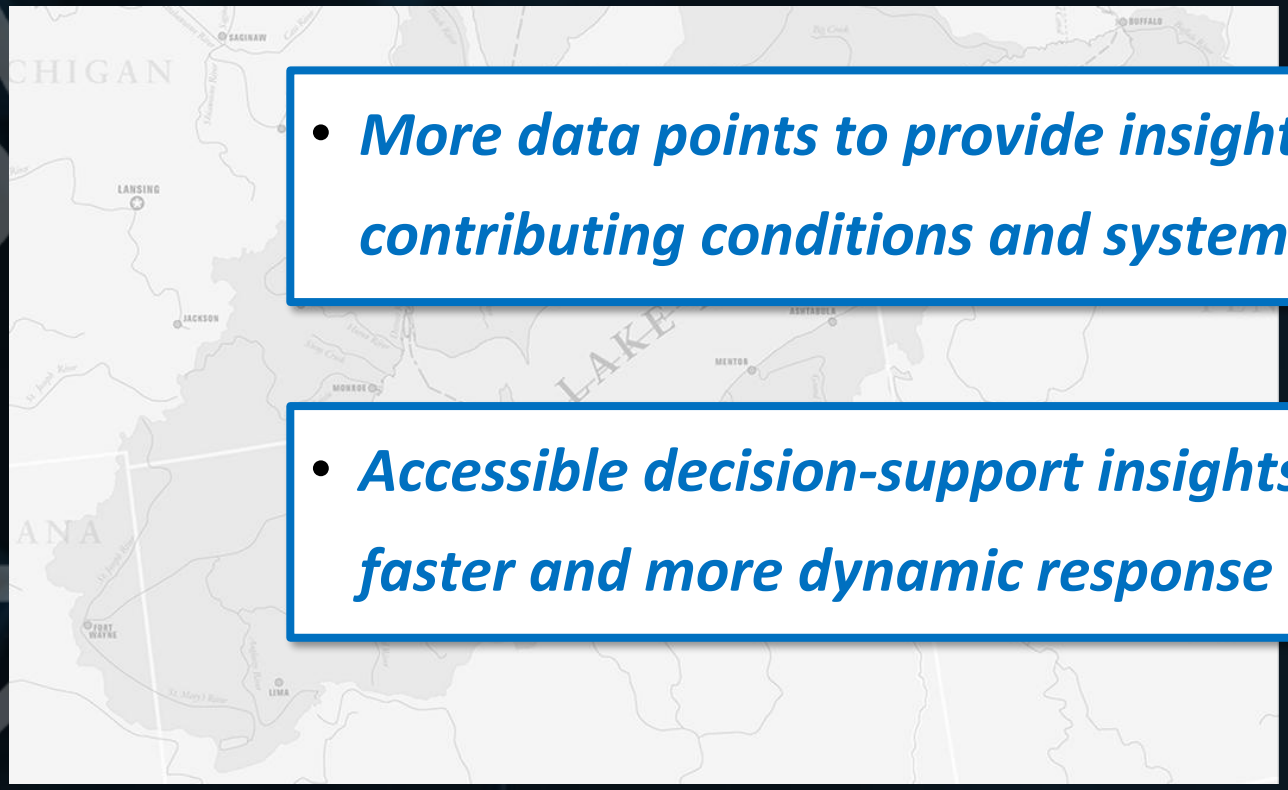
The Lake Erie Watershed

As the shallowest and warmest of the Great Lakes, Lake Erie is not only the most biodiverse and bioproductive, but the most vulnerable to the region's agricultural, community, maritime and manufacturing dynamics.

- ***Dynamic water levels and rising temperatures***
- ***Microbial concerns***
- ***Amplified algal blooms***
- ***Dynamic oxygen levels***
- ***Increasing storm activities***
- ***Aging infrastructure***
- ***Escalating vulnerability to industrial exposures***

How can technology help?

We need a “Smart” Lake Erie Watershed



- *More data points to provide insights on contributing conditions and systemic impacts*
- *Accessible decision-support insights to enable faster and more dynamic response*

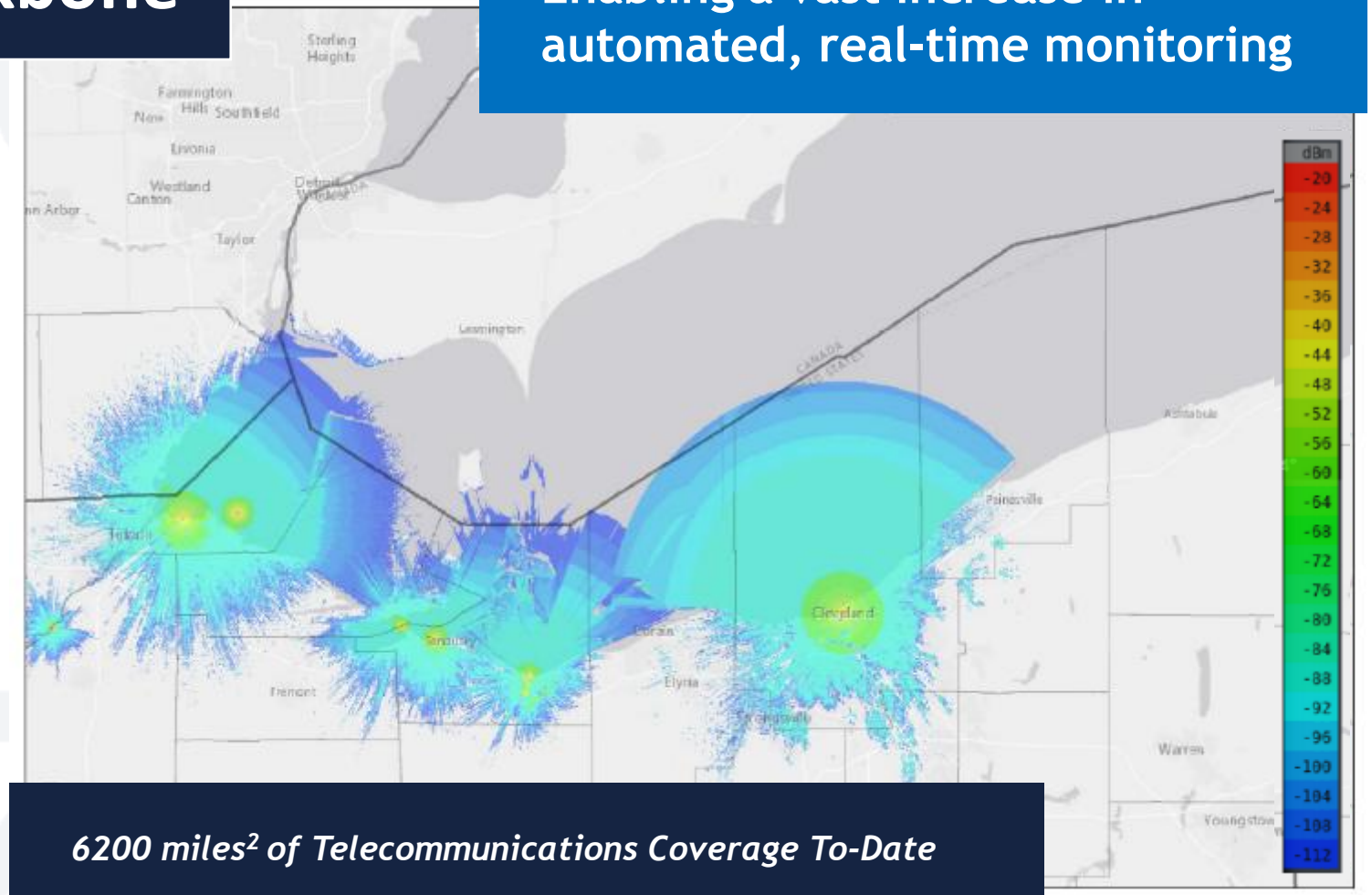
Smart Watershed Backbone

Enabling a vast increase in automated, real-time monitoring

Regional LoRaWAN Gateways

900mhz <-> “Internet”

- **100+ sensors per gateway**
- **1mi to 10mi range** *(~10ft=1 mi)*
- **All gateways can receive all sensor messages**



6200 miles² of Telecommunications Coverage To-Date

N W E S

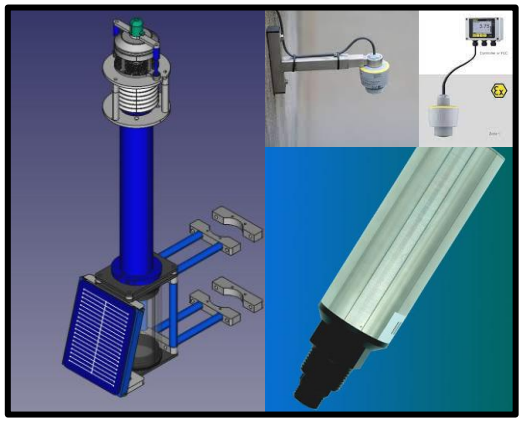
40 20 0 40 Miles

LimnoTech

Smart Watershed Building Blocks

Smart Buoys

Shoreline/Harbor Stations



Watershed Stations

Other Possibilities

Source: David Ruck

Nearshore Buoy (4)	Offshore Buoy (1)	Value Water Quality Buoy (4)
Temperature/Conductivity	Temperature/Conductivity	Turbidity
Turbidity	Turbidity	Chlorophyll
Chlorophyll	Dissolved Oxygen	
	Temperature profile	

LoRaWAN Sensor Kit (20)	Stormwater Kit (15)	Water Quality 3 Parameter Kit (15)
GPS	Rainfall	Dissolved oxygen
Water level	Soil moisture	Turbidity
Temperature	Soil temperature	Conductivity
Relative humidity	Air temperature	
	Relative humidity	
	Solar radiation	
	Water temperature	
	Conductivity	
	Water level	

LoRaWAN Outdoor Kit (20)	LoRaWAN Indoor Kit (20)	LoRaWAN Outdoor Soil Kit (10)
Water Level	Door Sensor	Soil moisture
Temperature	Temperature	Soil pH
Humidity		
Motion detection (PIR)		

aWAN Sensors (20)
Sensor (motion detection (PIR), on/off magnet switch, accelerometer, g-force
t, light detection, temperature, humidity)
ture
perature

CWA deploys 200+ IOT devices annually

clevelandwateralliance.org

Who could benefit from a Smart Watershed?

Utilities

- Real-time updates on source and effluent water quality
- Notify operators of backwash and CSO risk
- Identification of leaks and quality issues across distribution networks

Industry

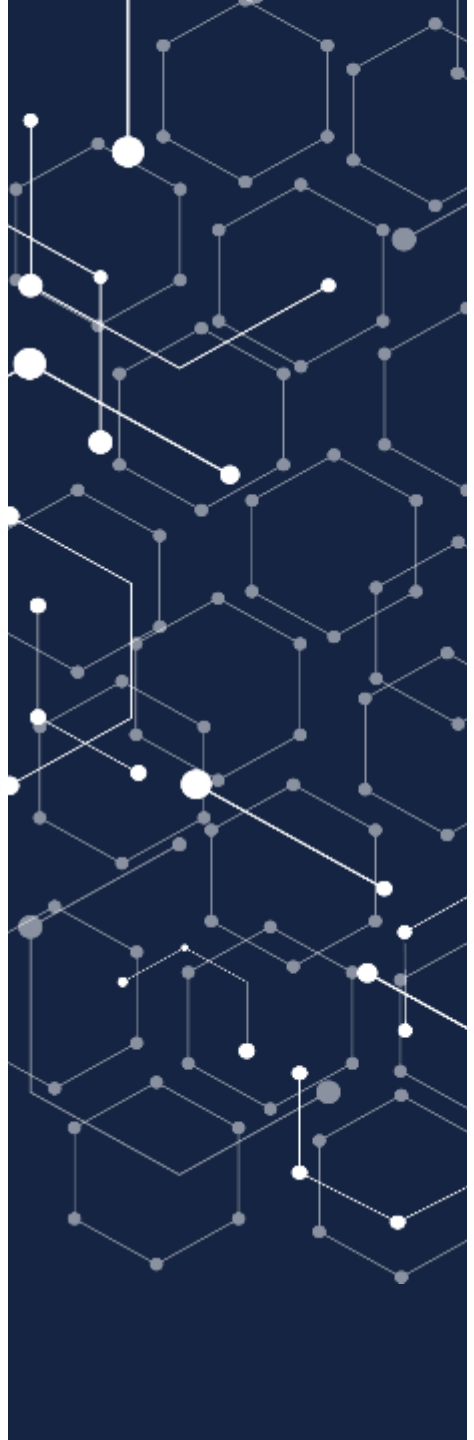
- Support maritime vessel navigation to facilitate trade
- Enable granular monitoring of industrial impacts
- Platform for accelerating new innovations to market

Resource Managers

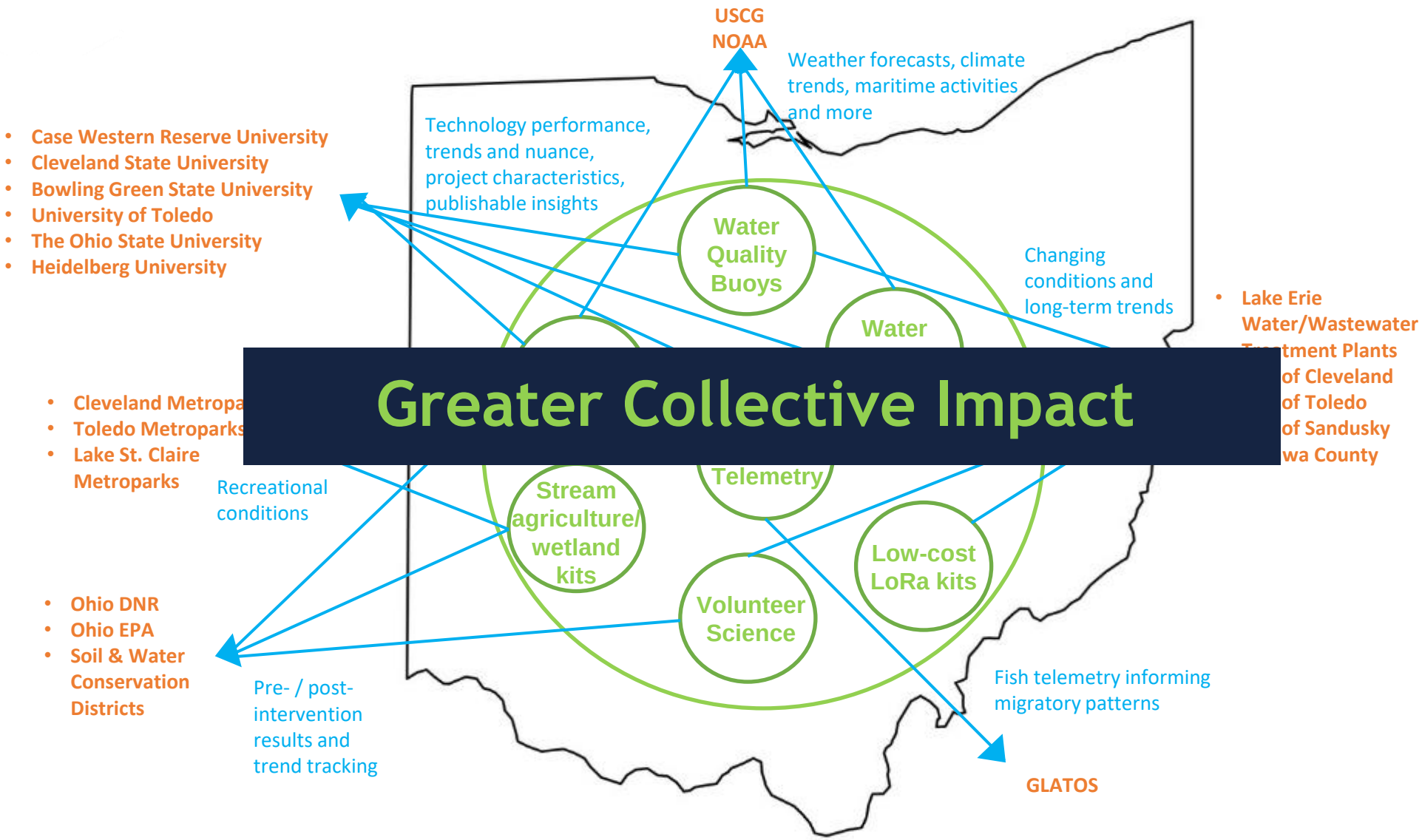
- Real-time updates on health and infrastructure risks
- Inform land use, restoration, and conservation strategies
- Assess returns on investments in water quality and stormwater

Community Members

- Help recreators plan for safe use of beaches, streams, and lakes
- Alert beachfront residents and businesses to flood conditions
- Empower communities with data driven stewardship



Data > Information > Action = Smart Lake Erie Watershed

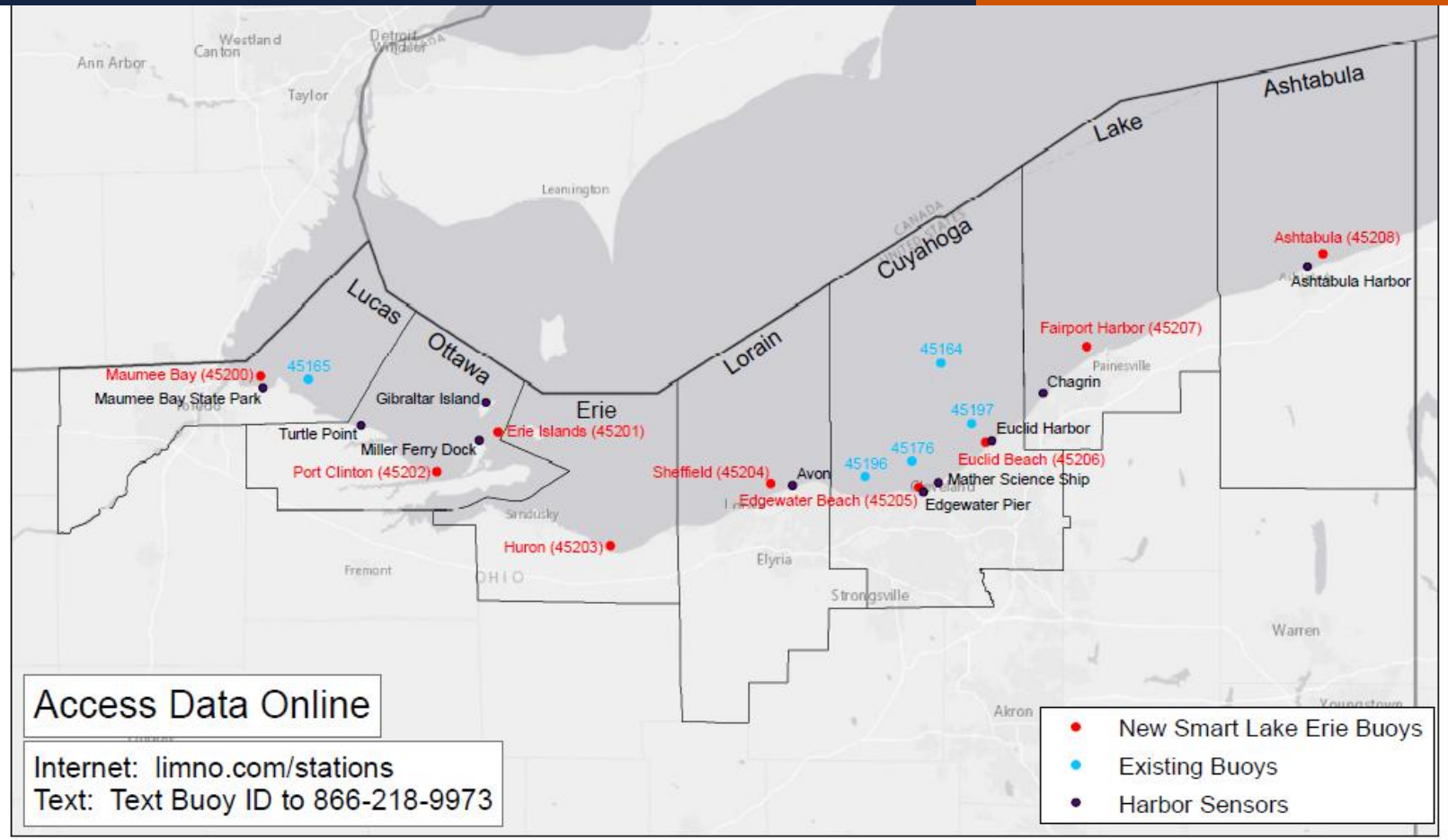


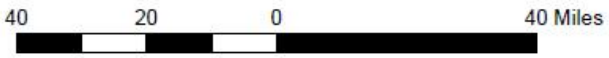
Greater Collective Impact

How is SLEW supporting water management today?

Local Operational Insights

DaaS for Source Water Monitoring





LimnoTech

CWA CLEVELAND WATER ALLIANCE

Monitoring Stations

45200

Little Cedar Point, OH

Last Update: 11:00 PM EDT, September 21, 2023 (>1 week ago)

45202

Port Clinton Buoy

Last Update: 11:40 PM EDT, September 21, 2023 (>1 week ago)

45201

Erie Islands Buoy

Last Update: 11:40 PM EDT, September 21, 2023 (>1 week ago)

45203

Huron Buoy

Last Update: 11:40 PM EDT, September 21, 2023 (>1 week ago)

45204

Sheffield Buoy

Last Update: 11:40 PM EDT, September 21, 2023 (>1 week ago)

45196

Rocky River Buoy

Last Update: 11:30 PM EDT, September 21, 2023 (>1 week ago)

45205

Edgewater Beach Buoy

Last Update: 11:40 PM EDT, September 21, 2023 (>1 week ago)

45176

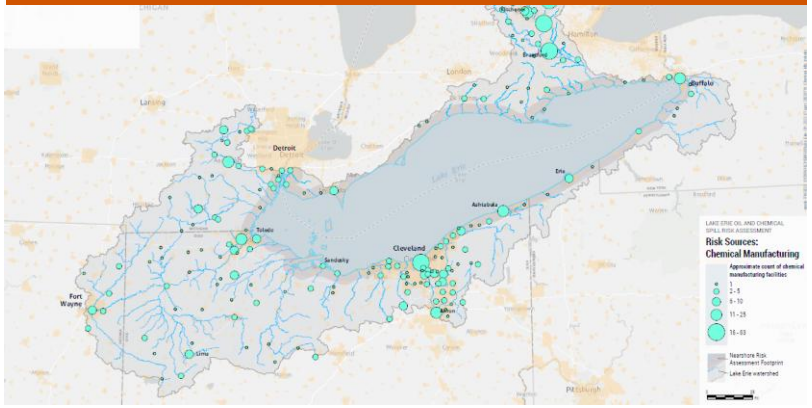
Cleveland Crib Buoy

Last Update: 11:40 PM EDT, September 21, 2023 (>1 week ago)

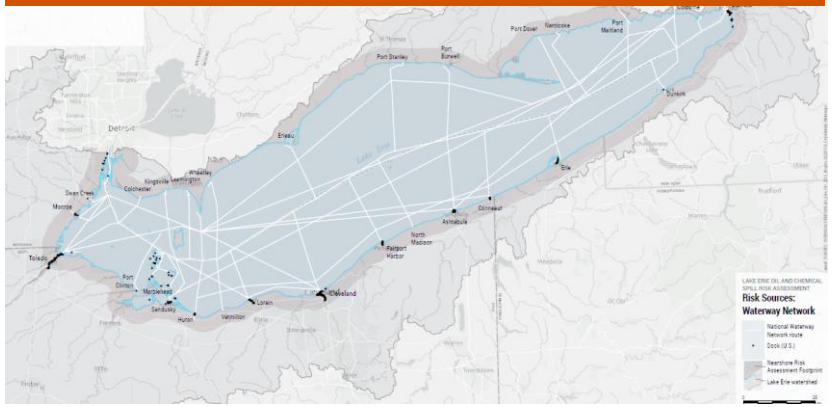
Regional Response Capacity

Oil & Chem Spill Risk & Warning

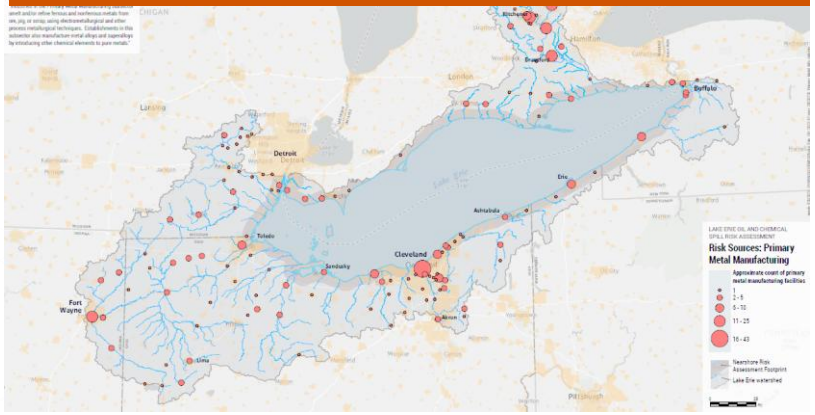
Chemical Manufacturing



Freeways, Railroads, Marine



Metals Manufacturing



Refineries, Pipelines, Storage

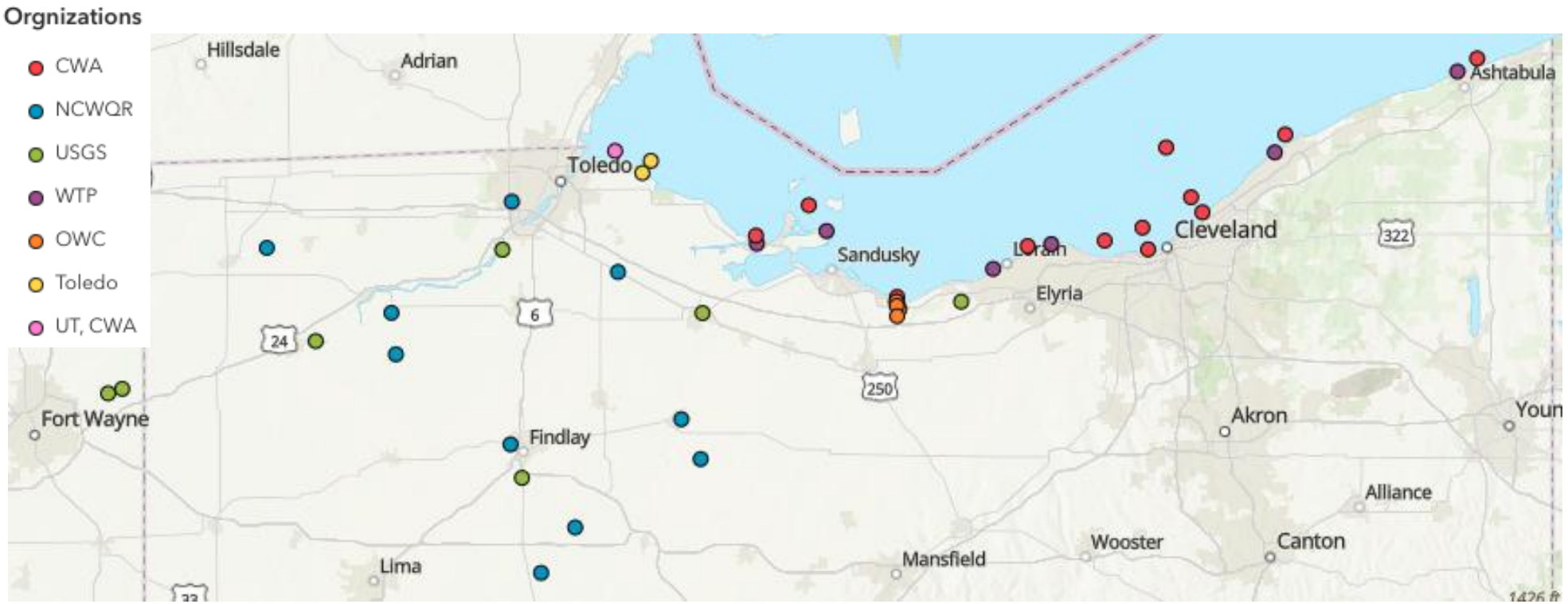
CLEVELAND WATER ALLIANCE

Research Collaborations

National Center for Water Quality Research
HEIDELBERG UNIVERSITY

Ohio Department of Higher Education

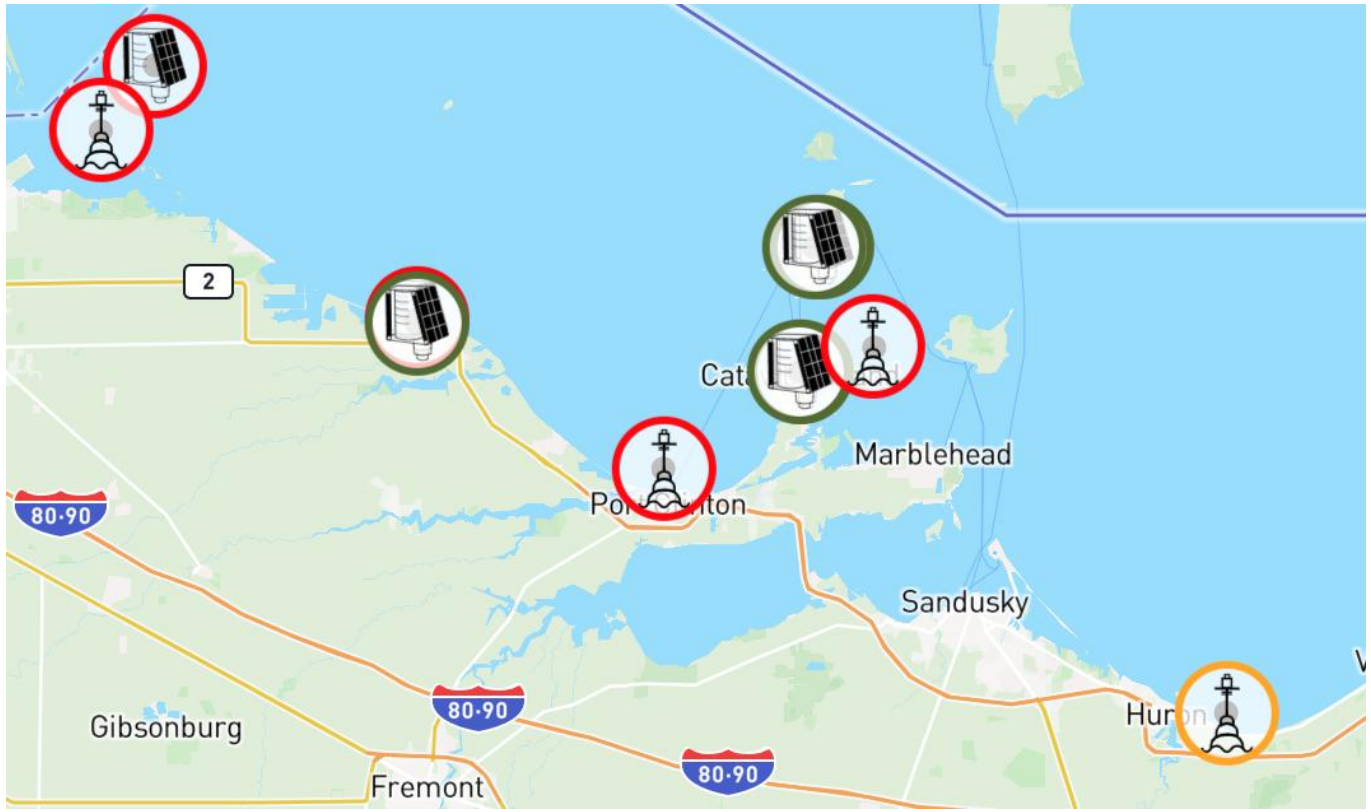
Western Basin WQ Trends



"Show Me The Data" – HABRI project visualizing laboratory and sensor data from WLEB together

Public Safety

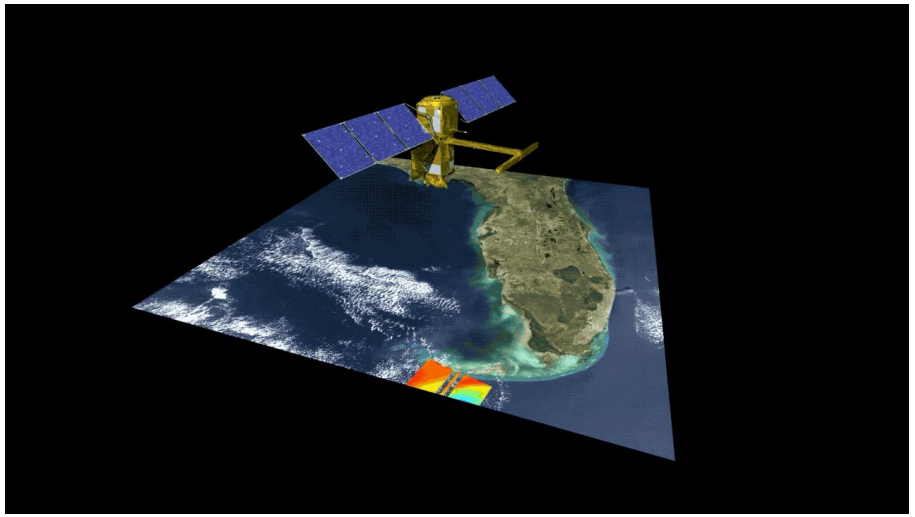
Data for Recreation Support

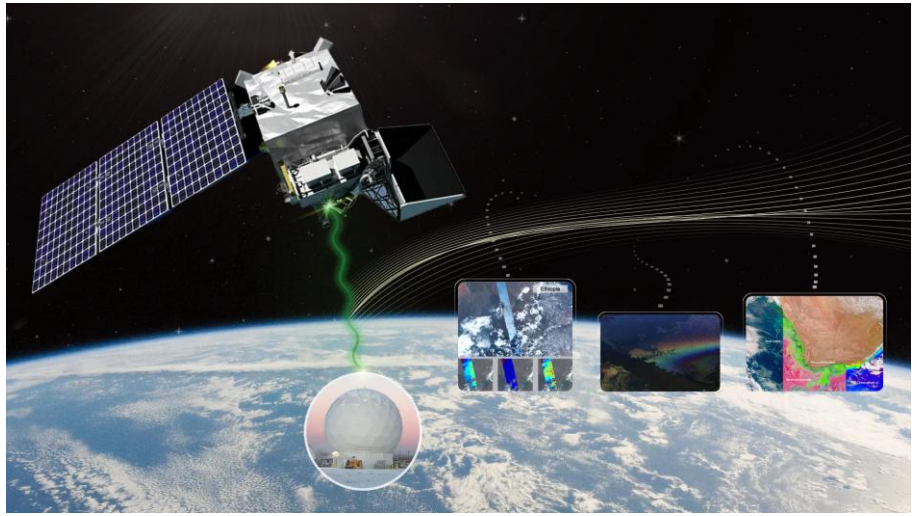


- Text-a-Buoy
- Online Data Portal
- Physical Signage
- Tourism Partnerships

Integration of Other Data

NASA Remote Sensing





Water Level Monitoring

NASA SWOT, Launched 2023

The first public satellite enables water level monitoring at 250 m globally

Water Quality Monitoring

NASA PACE, Launched 2024

Hyperspectral satellite for Global “Ocean” Color (i.e., phytoplankton distribution) Daily Observation

Community Engagement

Lake Erie Volunteer Science Network

CRWC
CLINTON RIVER WATERSHED COUNCIL

Huron River Watershed Council

TOLEDO ZOO & AQUARIUM

TMACOG

METROPARKS TOLEDO

Partners for Clean Streams

DEFIANCE Soil & Water CONSERVATION DISTRICT

ERIE Conservation DISTRICT

OLD WOMAN CREEK NATIONAL ESTUARINE RESEARCH RESERVE

WATER RANGERS

Tinker's Creek WATERSHED PARTNERS

DOAN BROOK Watershed Partnership

Ashland Soil & Water Conservation District

BUFFALO NIAGARA WATERKEEPER

McKINLEY HIGH SCHOOL

FREDONIA STATE UNIVERSITY OF NEW YORK

SUMMIT SOIL & WATER CONSERVATION DISTRICT

Scaling Technology Use

Lending and Hosting Sensors

AQUA Ohio

GLATOS Great Lakes Acoustic Telemetry Observation System

Ohio Department of Natural Resources

H2Ohio

clevelandwateralliance.org

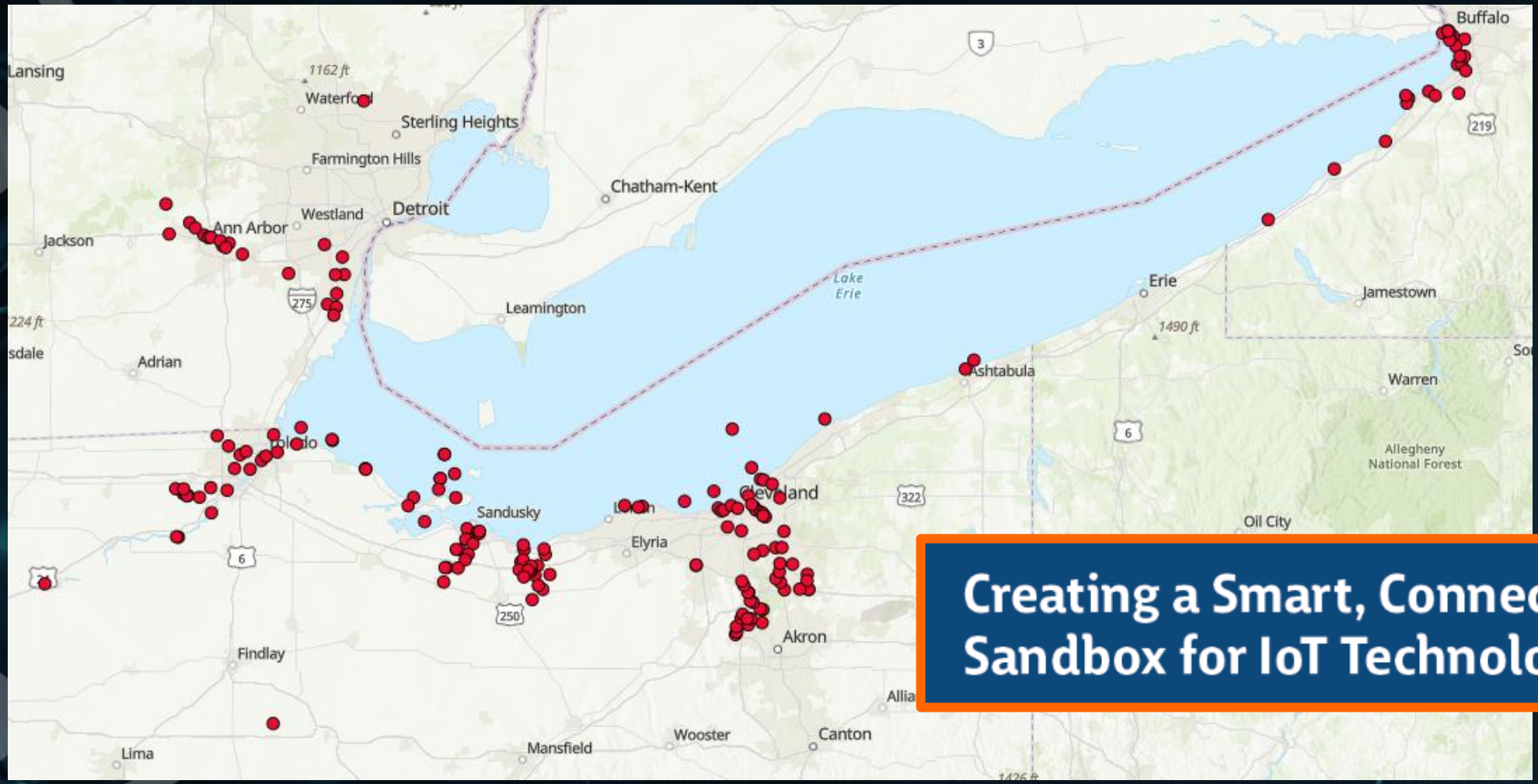
2025:
Expanding into the Ohio River and beyond…

Water Accelerator Testbeds

Leveraging a Smart Lake Erie Watershed to Drive Economic Impact

clevelandwateralliance.org

Smart Lake Erie Watershed Testbed



Creating a Smart, Connected Sandbox for IoT Technologies

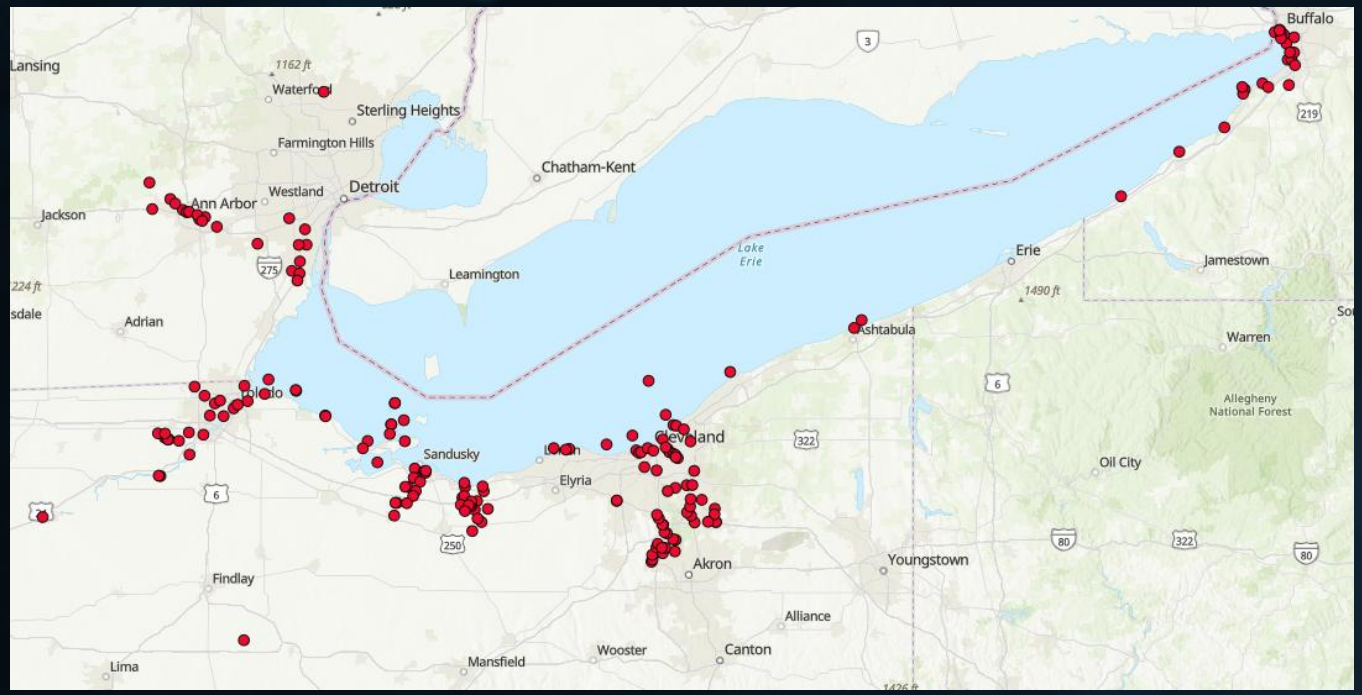
clevelandwateralliance.org

Driving Growth

- Market-focused: gaps & growth
- Wide range of profiles and benchmarking options
- De-risking trials with end users to accelerate commercialization
- Driving traffic and anchoring businesses to create economic impact

Accelerating the Next Generation of Water Data

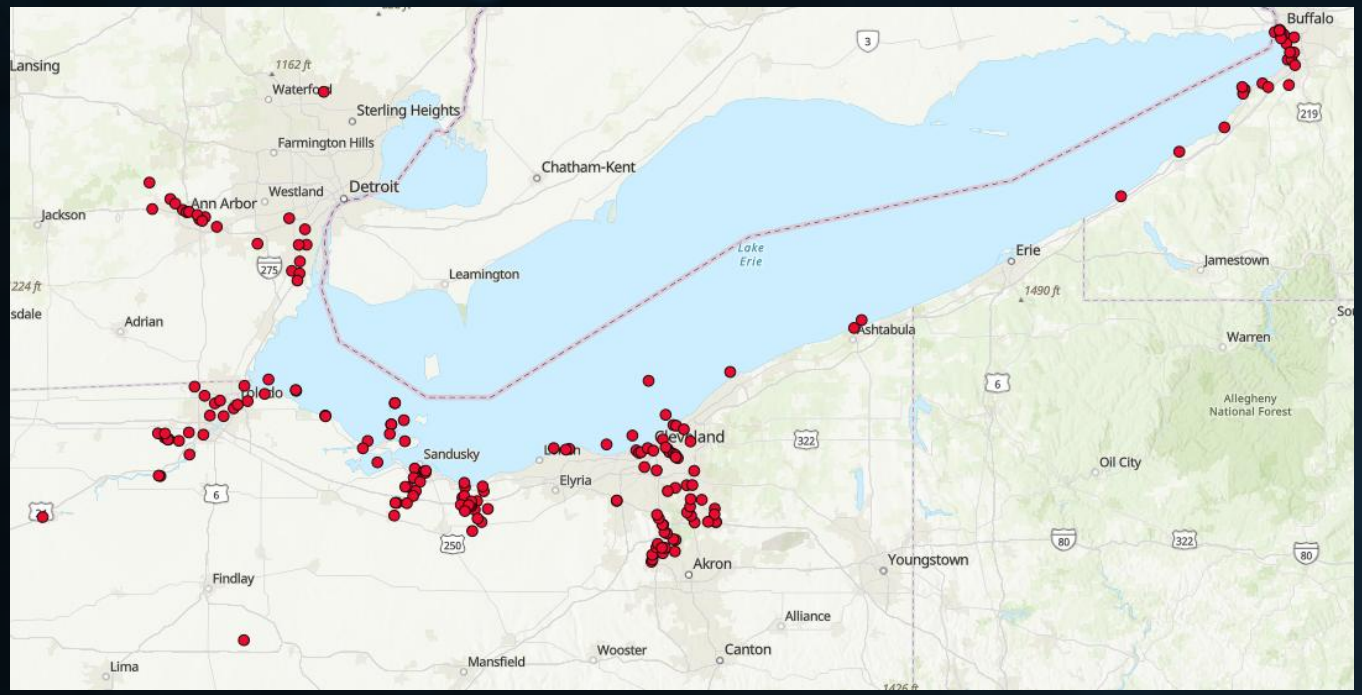
- **Water Properties**
  - **Oxygen, pH, conductivity, levels, flow, turbidity**
- **Biological & Nutrient**
  - **HABs, nitrates, phosphates, E. coli, invasive species**
- **Other Contaminants**
  - **Metals, pesticides, PFAS, microplastics, PPCPs**



clevelandwateralliance.org

Trialing Tech Across the IoT Lifecycle

- Sensors
- Automation
- Telemetry
- Data Hosting
- Data Management
- Cloud Platforms
- AI & Predictive Analytics
- Cybersecurity



clevelandwateralliance.org

De-risking Demonstration

- A single “Intake” matches to dozens of potential deployment sites and partners
- Legal infrastructure

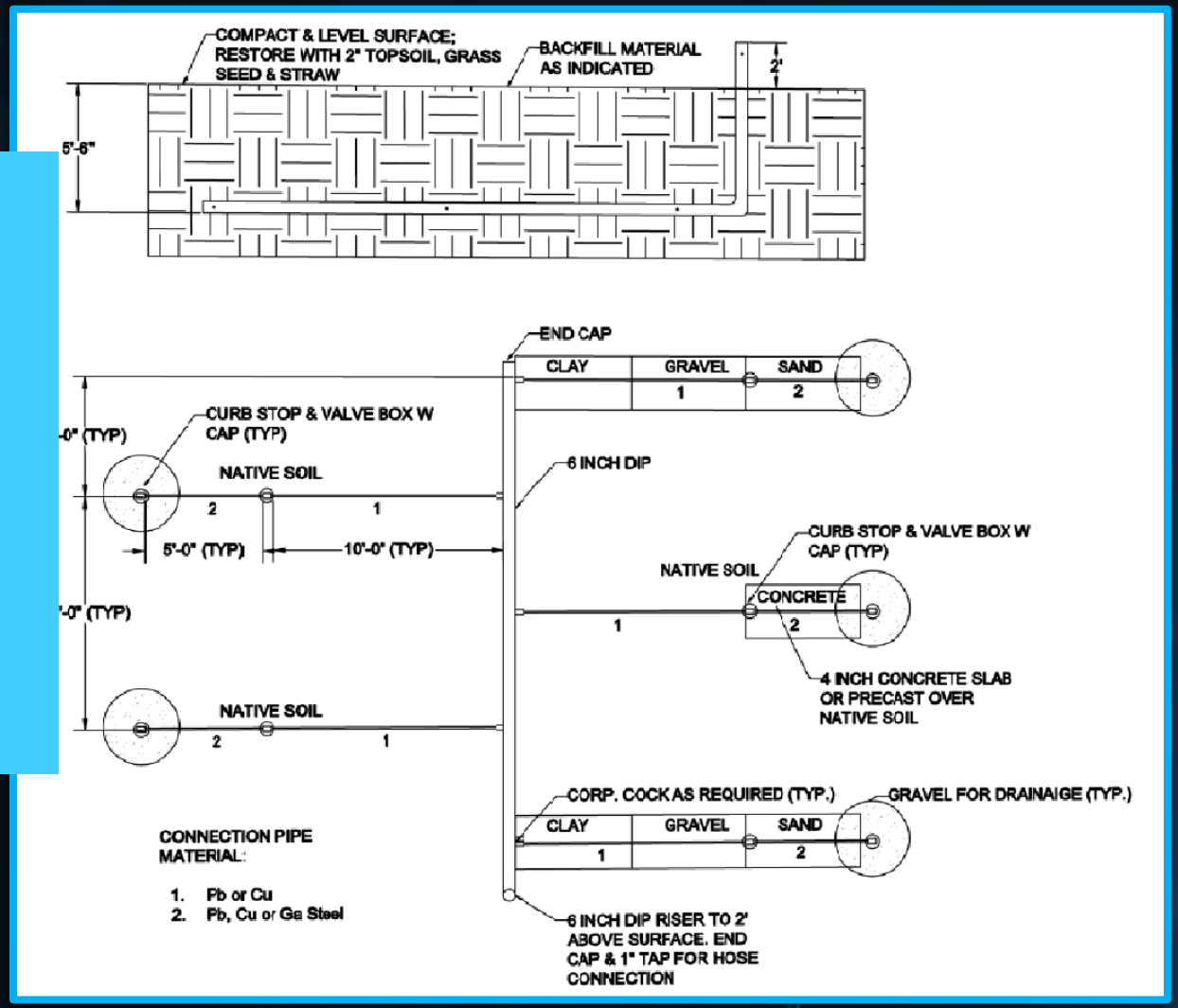
- Insurance to help mitigate risk concerns

Soft Infrastructure - A Soft Landing in Ohio

- Pilot Partner Circular & Tech Lending Library
- Service Referrals – Prototyping, Marketing, etc.
- Office Space, Relocation Support, Site Selection
- Proposal Support and Collaborative Submission
- Manufacturing Support
- Partnership Matchmaking
- Coming This Spring – Tech Showcase
  (Save the Date - March 25-26)

Building Capacity Through Open Innovation

- Surface Water
- Residential Water
- Agricultural Runoff
- Drinking Water
- Next Up: Industrial, PFAS, Microplastics, and Beyond



clevelandwateralliance.org

The Upshot

- ✓ New operational and research insights
- ✓ De-risked trials → faster commercialization
- ✓ End user validation → faster adoption
- ✓ 300+ innovators and 60+ deployments to date
- ✓ $10M raised and Seed Fund underway
- ✓ Framework for development wins in Ohio

Get Engaged with CWA

- ✓ Sign up for our Pilot Partner Circular for first look at new tech
- ✓ Share your innovation needs so we can scout for solutions
- ✓ Leverage our support for data and commercialization in projects
- ✓ Save the date for our first ever Tech Showcase (March 25-26)
- ✓ Help us expand SLEW model across Ohio!

clevelandwateralliance.org


CLEVELAND
WATER
ALLIANCE
What problems do you want to solve?
Plug in today!