One Water

Ohio AWWA-WEA 2018 Technical Conference & Expo

UV-AOP as an Additional Cyanotoxin and Microbial Barrier

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Outline

Celina Background

The Water Source: Grand Lake

Existing Water Treatment Process

Drivers for Selecting UV-AOP

Implementation

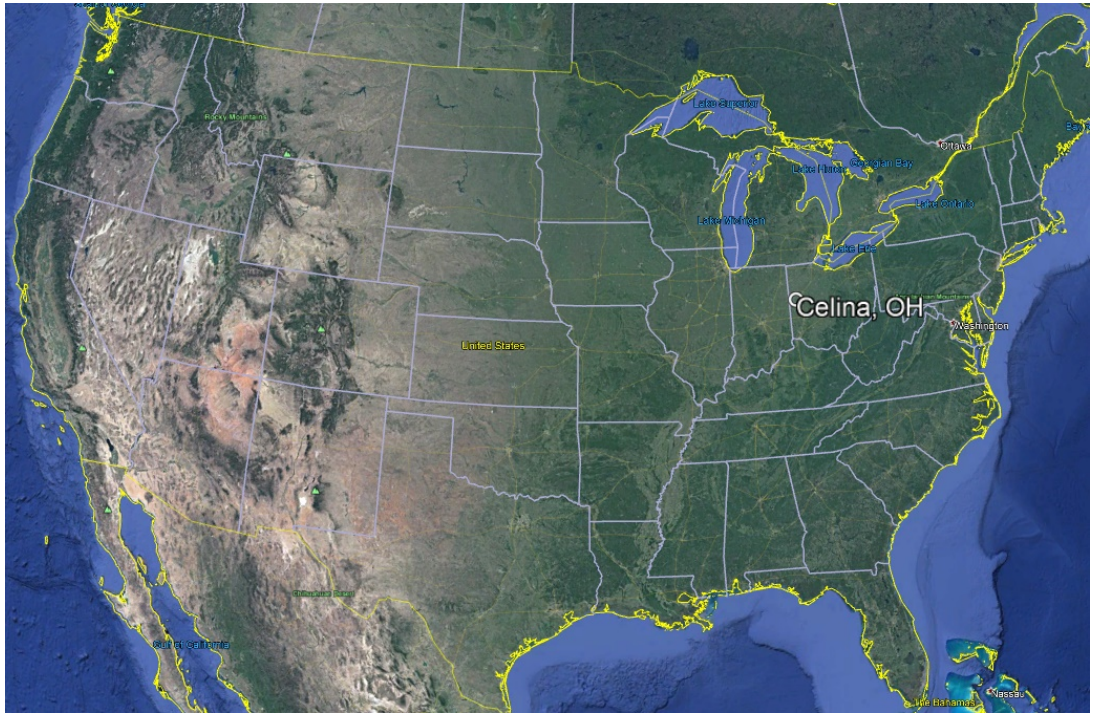
Background: Celina, OH

~10,500 People

Water source: Grand Lake

Local economy: Agriculture, light industry, tourism

Cyanotoxins have caused significant economic harm



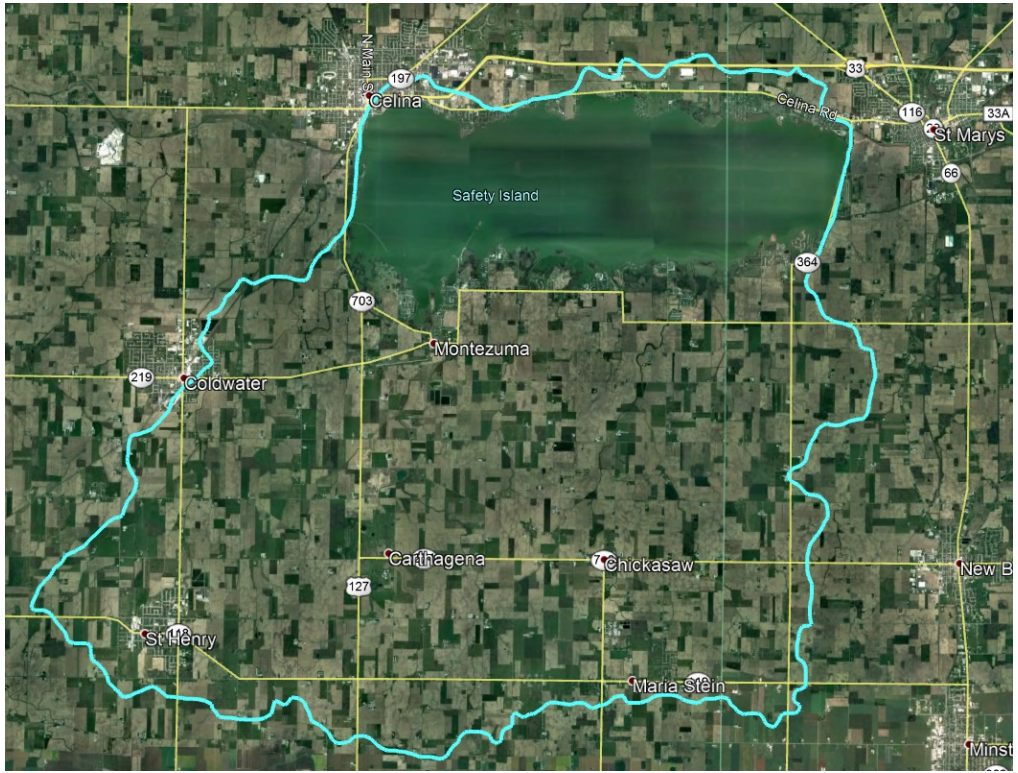
Water Source: Grand Lake

Originally constructed as a canal feeder

Currently water supply/recreational

Near-ideal cyanobacteria incubator

- Nutrients
- Sunlight/Mixing
- Tenacious strain of *Planktothrix*



Tell Me More About Cyanotoxins!

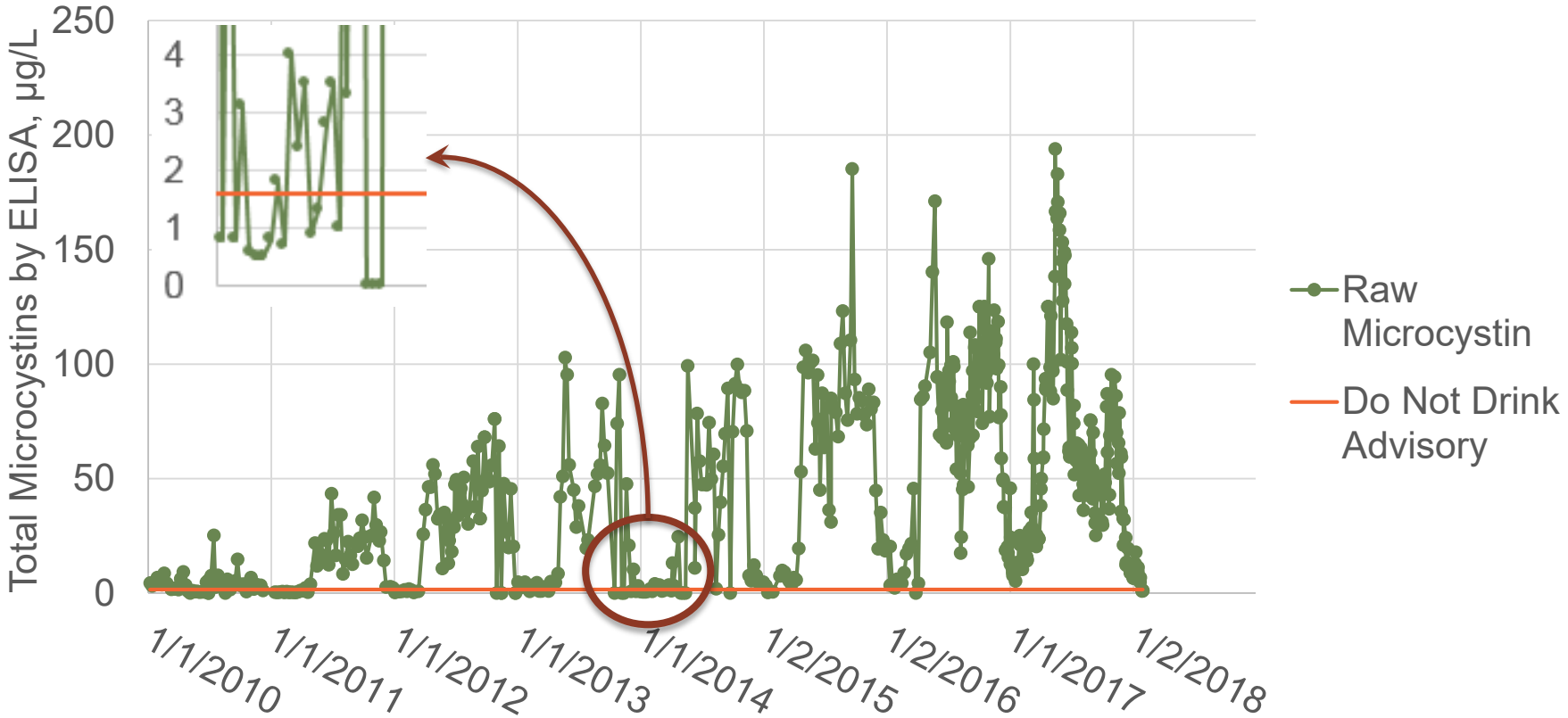
Cyanotoxins are released into environment by both living and dead cyanobacteria

Extremely stable and decompose slowly

Toxic; can cause illness or death in people, animals

Common types: **Microcystins**, cylindrospermopsin, anatoxin-a, Saxitoxin. Other poorly-characterized ones also exist.

Grand Lake Microcystin Levels, 2010-2018



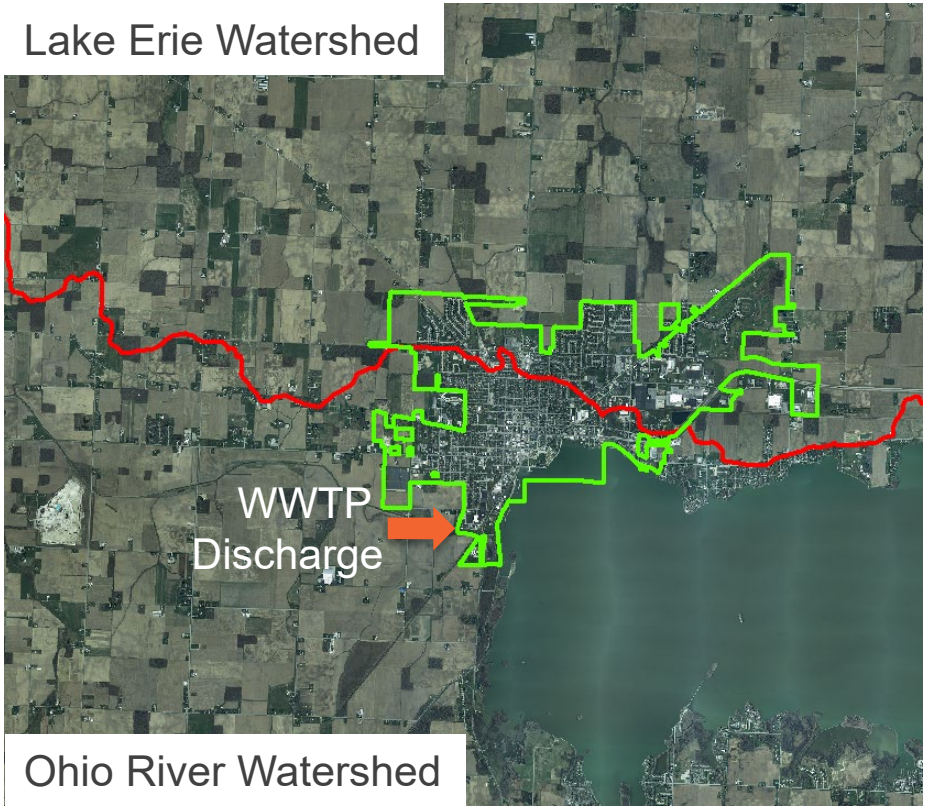
Source: Ohio Environmental Protection Agency

Why Are They Even Using This Source?

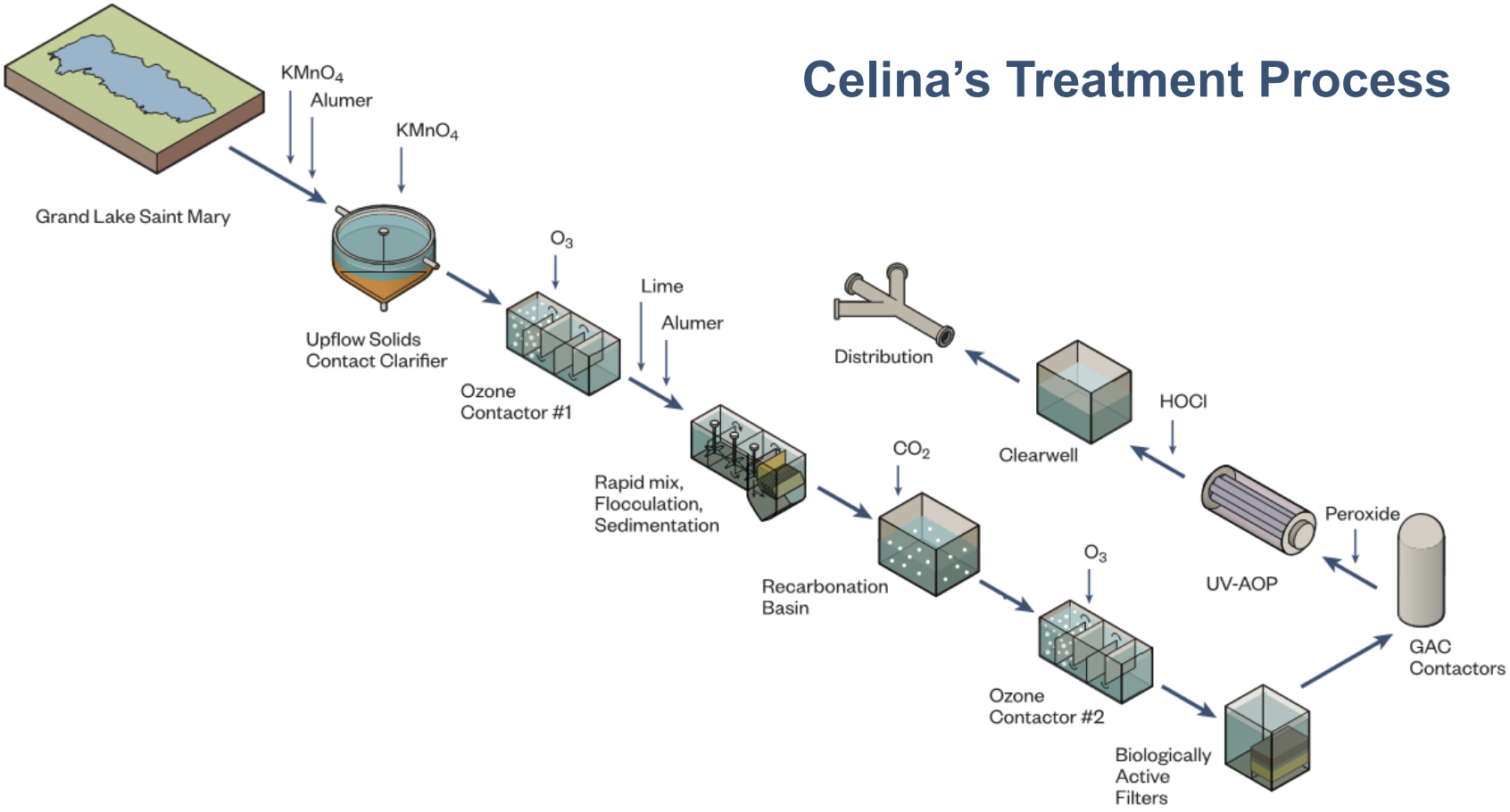
Water source must be on same side of continental divide as WWTP discharge

South of divide: insufficient groundwater quantity and quality

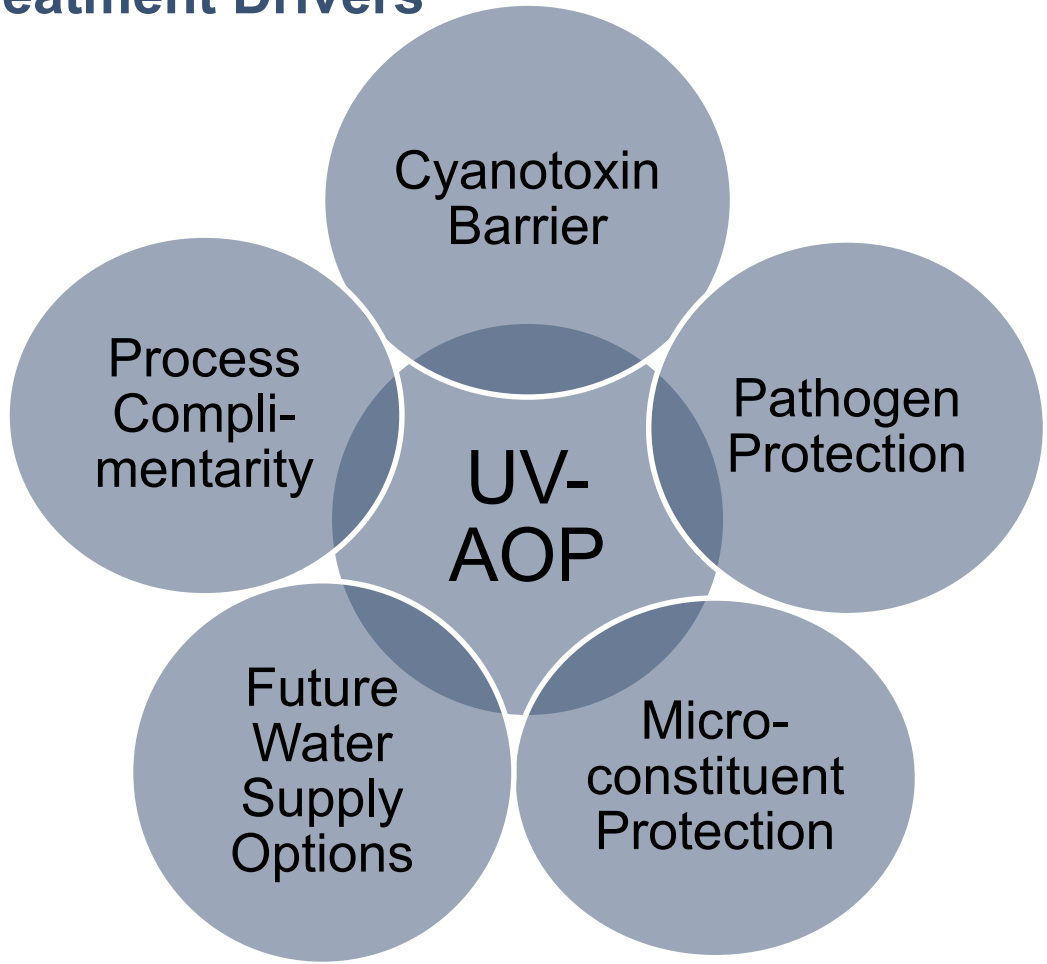
North of divide: moderate to poor quality, required WW outfall relocation



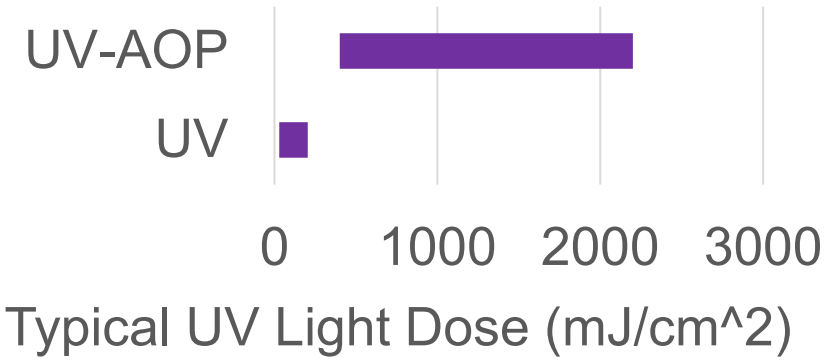
Celina's Treatment Process

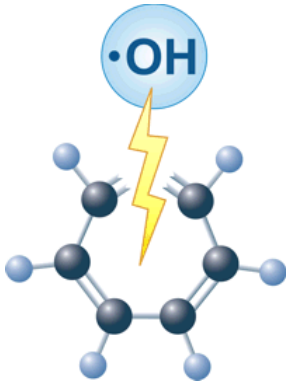


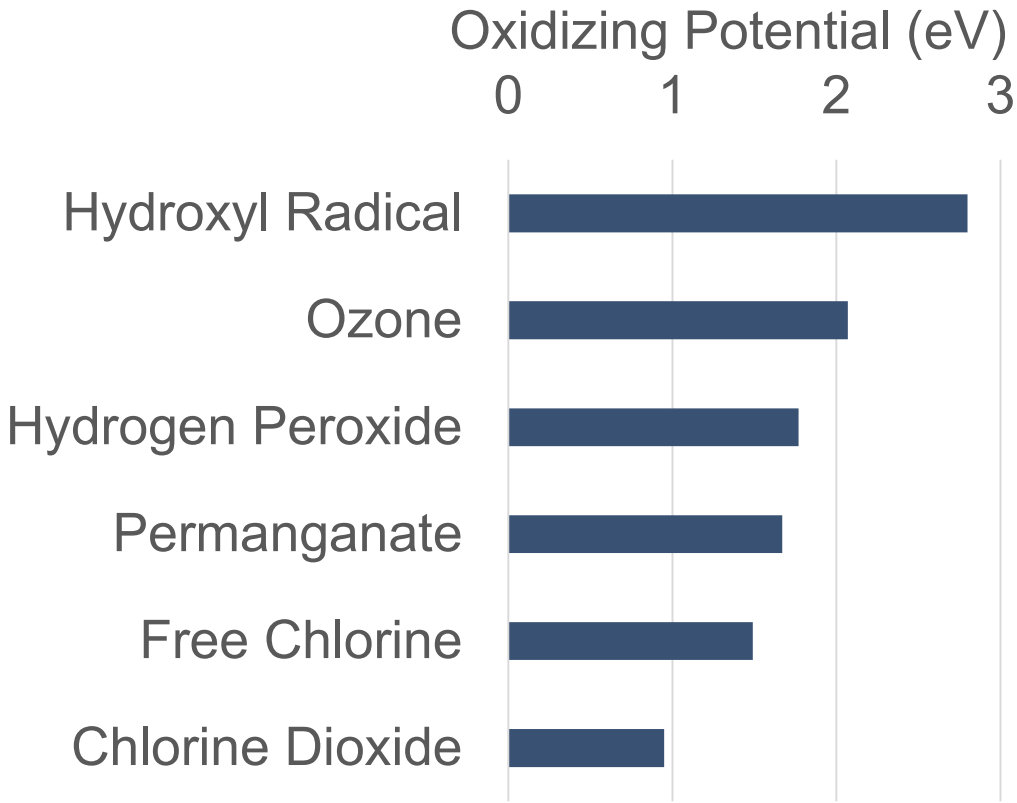
Advanced Treatment Drivers



UV Advanced Oxidation Process (UV-AOP)







Key Challenges – Space and Time!

Space allotted in previous design and hydraulic profile

Accelerated installation timeframe

City to self-install equipment

UV AOP Design Alternatives

- Option 1
  - 0.5-log 1,4-Dioxane Destruction and 0.5-log NDMA Destruction (>2 log MC-LR)
  - Design Flow = 3.0 MGD
    - 24” Reactors
- Option 2
  - 4-log Virus Inactivation
  - 0.5-log Destruction of MIB / 1.0-log Destruction of MC-LR
  - Design Flow = 2.0 MGD
    - 12” Reactors

Design Parameters

	2 trains of 2 reactors in series each (4 reactors) in operation
Maximum Total Flow Rate Per Train (MGD)	1.5
Design Total Flow Rate Per Train (MGD)	1.0
Maximum Allowable Headloss per Train (inches w.c.)	3
Virus Inactivation	4-log
Degradation of MIB / Degradation of MC-LR	0.5-log / 1.0-log
Maximum Hydrogen Peroxide Dose (mg/L)	12.0

Water Quality Parameter	Value
Influent Water Temperature (°C)	2 - 28
UV Transmittance (UVT) at 254 nm (%), Range	97.0 – 99.3
Total Hardness (mg/L as $CaCO_3$)	94.3 – 190.3
pH (standard units) Range (Avg)	8.91 – 10.0 (9.35)
Total Organic Carbon (mg/L)	1.30 – 4.35 (2.06)
Alkalinity (mg/L as $CaCO_3$)	50.1 – 88.1

Bid and Accelerated Schedule

Engaged vendors early during system design

Vendors sized systems based on design criteria

Bids evaluated based on life cycle cost

City acted as the prime contractor

OEPA permitting – focused on equipment approval

Schedule Item	Days from Award
Notice of Award	0
UV-AOP Equipment Delivery	70
Other equipment, panels, programming	84

Installation

Moral of the Story

1. UV-AOP complements the existing treatment process
2. Allows greater flexibility for future water supply changes
3. Procurement approach and self-install saved time and cost
4. UV is a good option for smaller systems too!

Questions