Evaluation of Potable Reuse in Wichita Falls – DPR and IPR

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Wichita Falls
TEXAS
Blue Skies. Golden Opportunities.

Who is this Guy?

- 2021 – Class A Wastewater Treatment Operator - TCEQ
- 2019 - Class A Water Operator - TCEQ
- 2018 – Certified Water Professional - TEEX
- 2013 - MS in Biology – Midwestern State University
- 2008 - BS in Biology – Midwestern State University

- 85+ Conference Presentations & Webinars
- 175+ Articles & Chapters Published
- 9 Standard Methods
  - 9 in Progress

Who is this Guy?

- Standard Methods Part 6000 Coordinator – Organics
- WateReuse Texas Board Trustee
- APHL Environmental Laboratory Science Committee
- AWWA Water Quality Technology Division Trustee
- AWWA Aesthetic Quality and Perception Committee
- AWWA Water Quality Laboratory Committee
- AWWA Organisms in Water Committee
- AWWA Joint Section Research Committee
- TAWWA Laboratory Committee
- WEF Laboratory Practices Committee
- WEAT Laboratory Committee
- TNI Microbiology Expert Committee
- ASTM Microbiology Committee
- Environmental Monitoring Coalition
- *Opflow* Editorial Advisory Board

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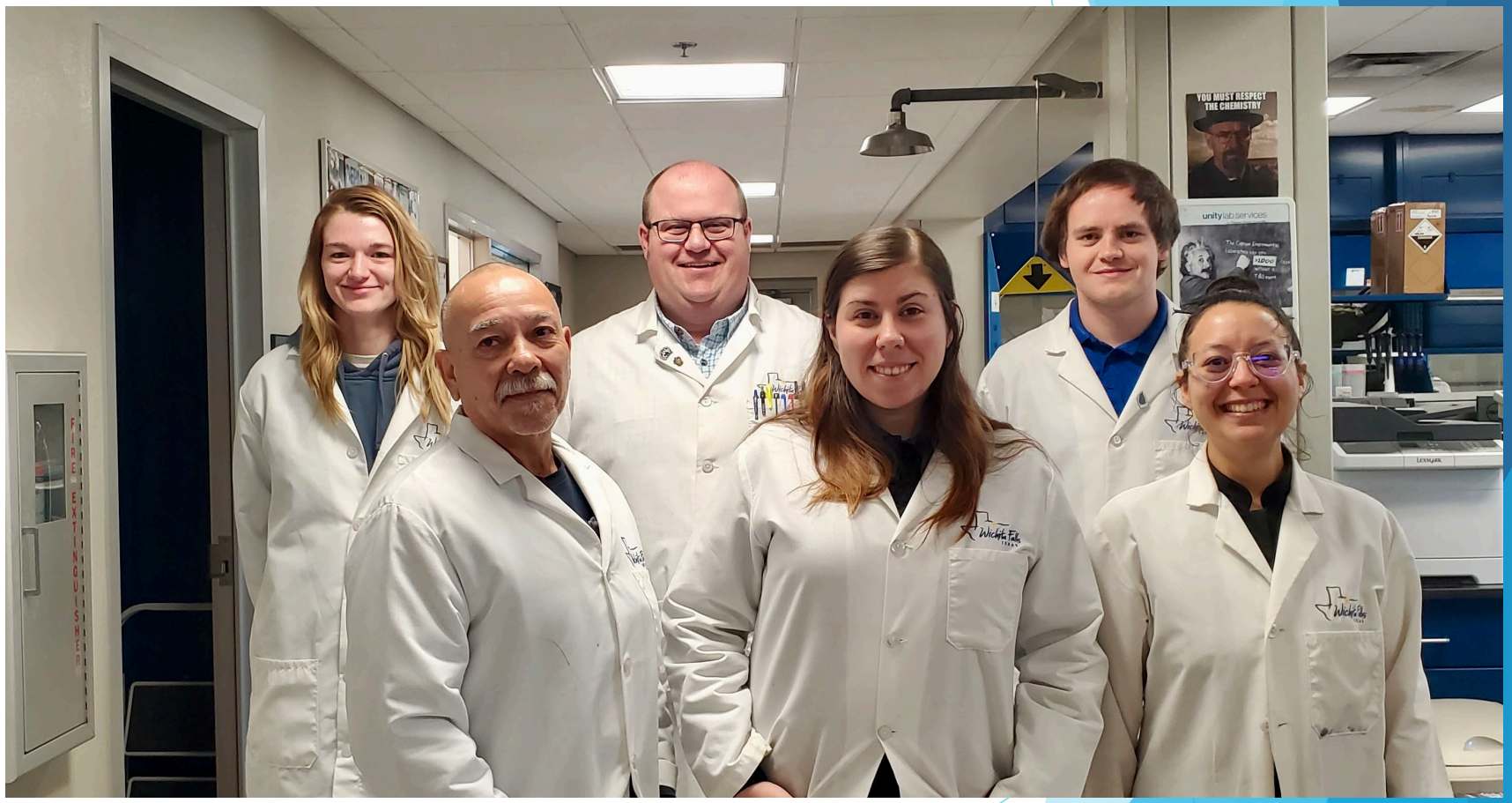
Cypress Environmental Laboratory

Cypress Environmental Laboratory

Superintendent – Hunter Adams
Lab Supervisor – Sam Reeder
Senior Lab Tech – Emily Appleton
Lab Tech I – Ben Colvin
Operator/Lab Tech I – Joe Alaniz
Operator/Lab Tech I – Mary Migliozzi

- 5,400 Analyses per Month
- > 65,000 Analyses per Year
- Excellence on a Daily Basis



DPR vs. IPR

Direct Potable Reuse

- Involves the treatment and distribution of water without an environmental buffer.
- 5 cities in US approved for DPR
  - CRMWD, Big Spring, TX – 2 MGD
  - ~~Wichita Falls, TX – 10 MGD~~
  - ~~El Paso, TX – under construction~~
  - ~~Cloudcroft, NM - approved~~
  - ~~Brownwood, TX - approved~~

Indirect Potable Reuse

- Uses an environmental buffer, such as a lake, river, or a groundwater aquifer, before the water is treated at a drinking water treatment plant.
- ~15-20 water systems
- Only one water system has done both
  - Wichita Falls, TX

Potable Reuse Projects in the United States

2017 Potable Reuse Compendium (EPA 2017)

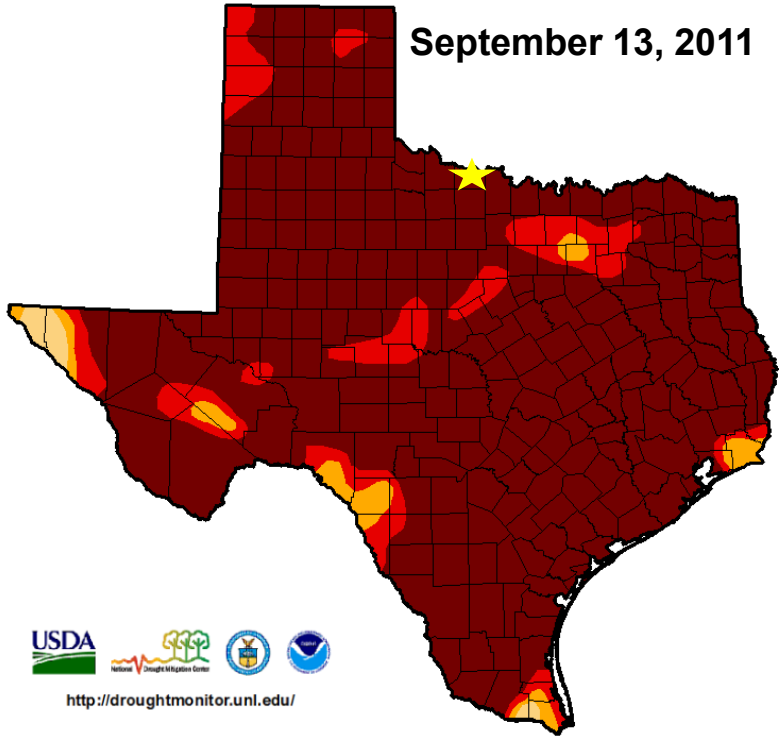
Why Potable Reuse?

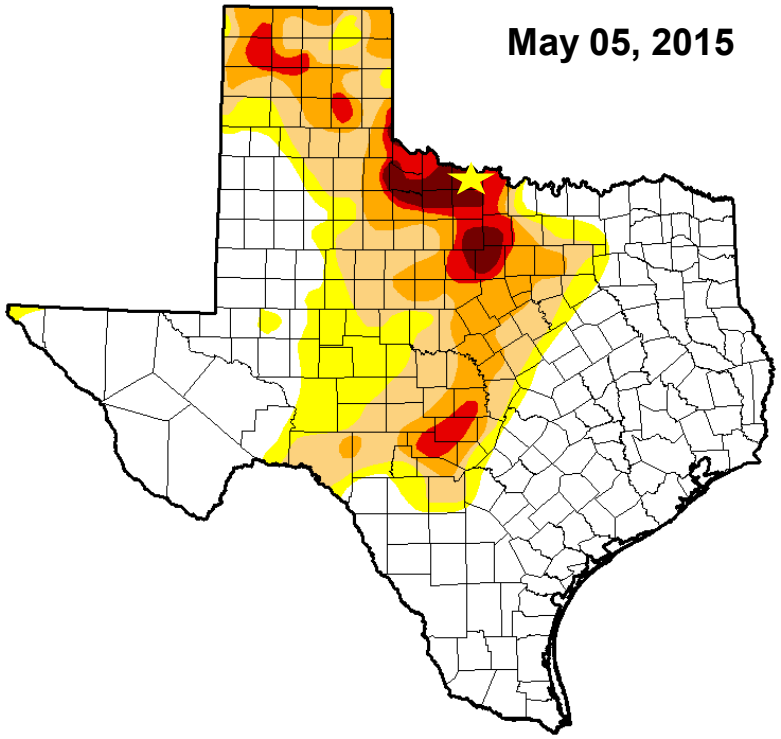
What happens when your source water reservoir looks like this?

Photo by Stephen Neslage/The Weather Channel - https://weather.com/science/environment/news/wichita-falls-texas-cracked-20140423

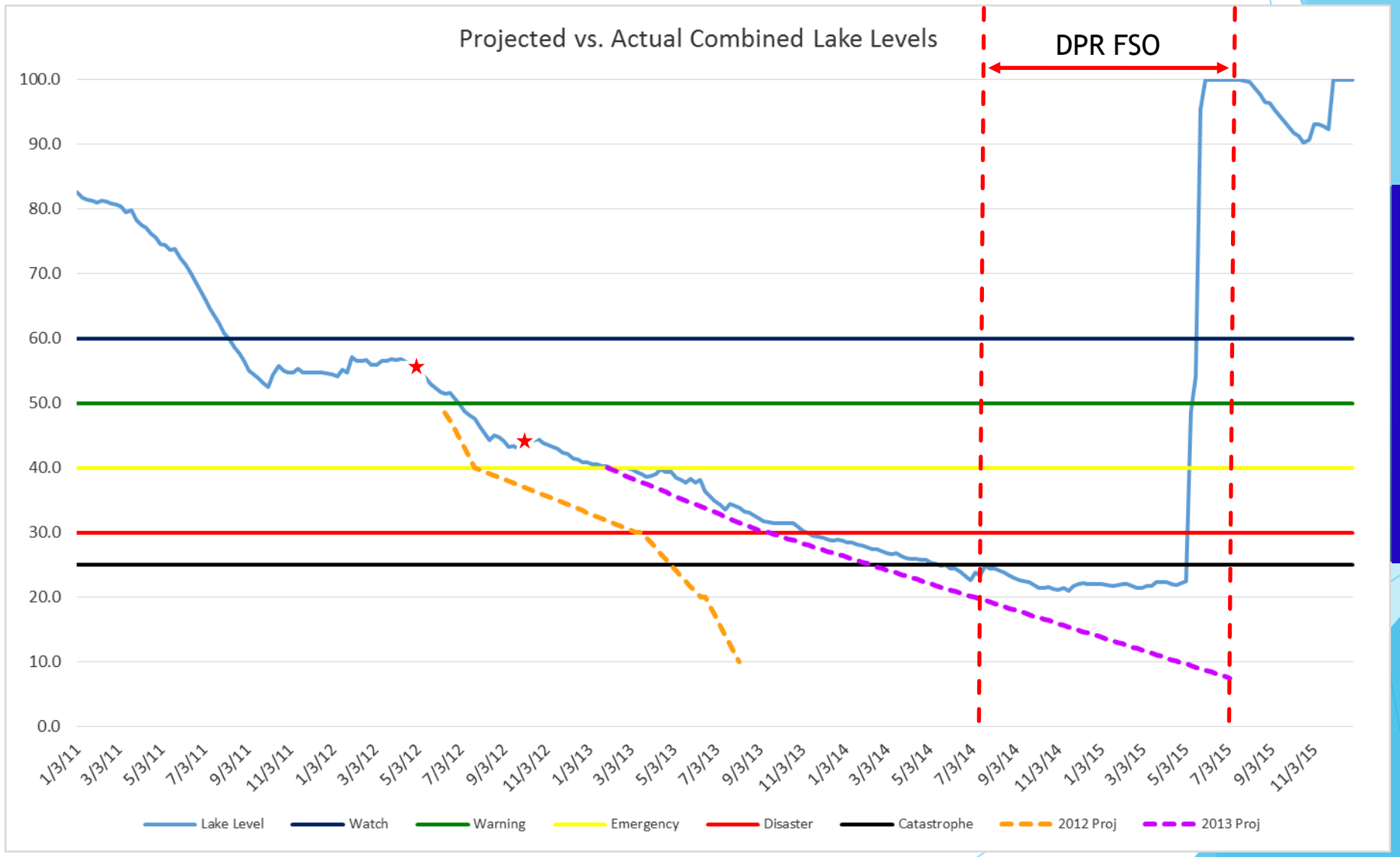
2011-2015 Drought

- 2011 – 100 days over 100˚F
- Lakes 83% to 55% in 6 months



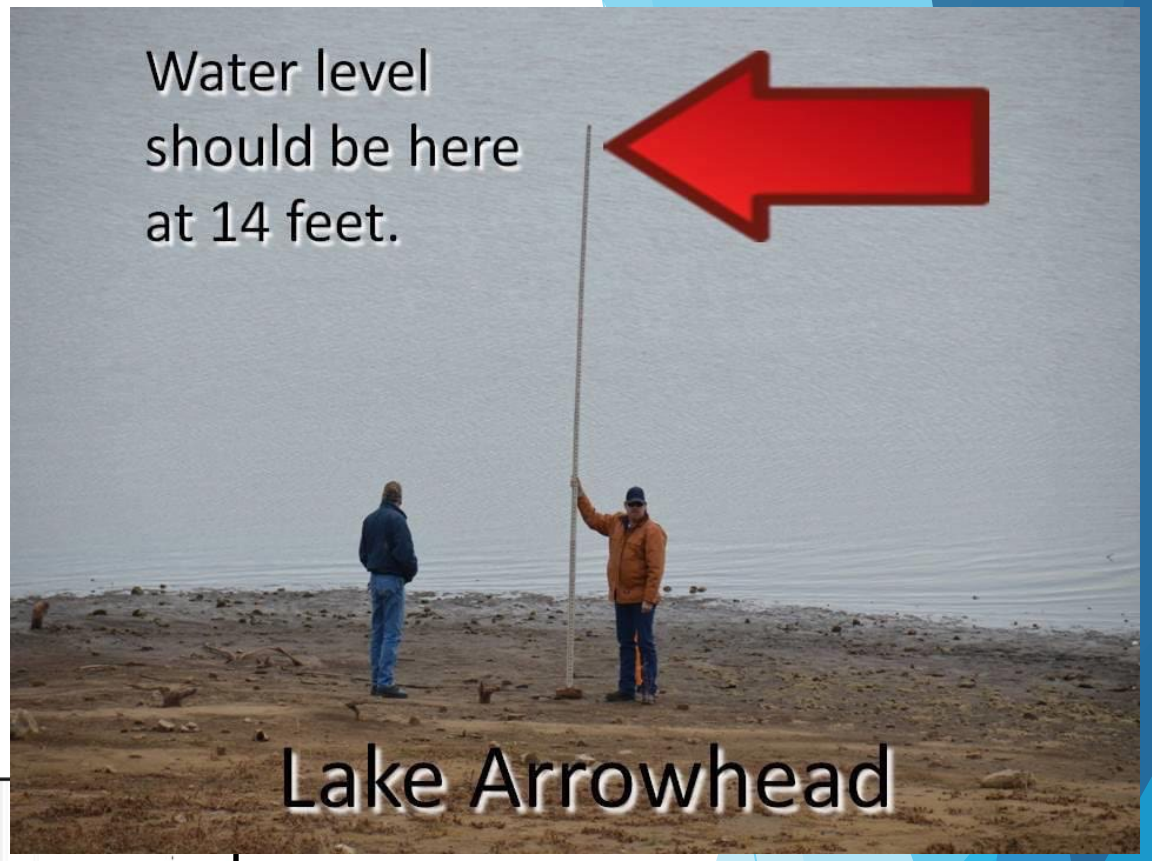


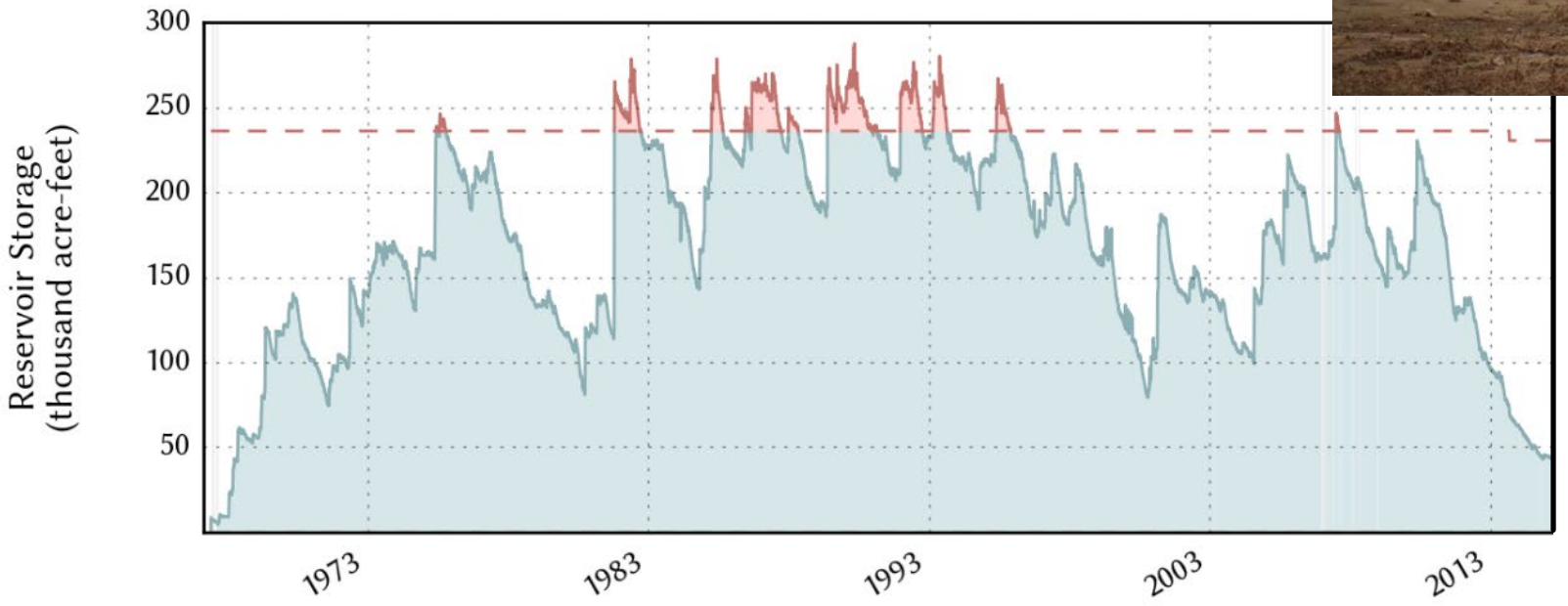
Lake Level Decline



Why Direct Potable Reuse?

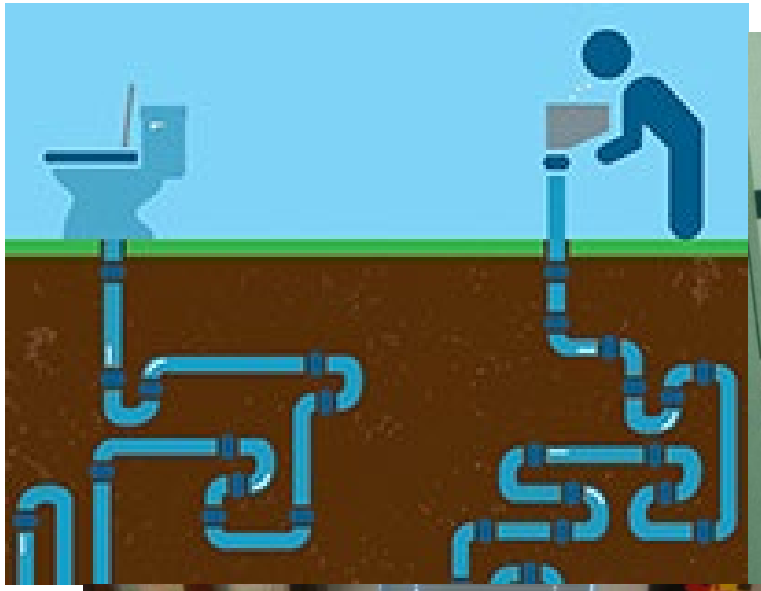
- Extended Drought - Emergency
  - 2011 – May 2015
- Lake Arrowhead – 19.0%
- Lake Kickapoo – 26.4%
- Combined Lake Levels – 21.0%

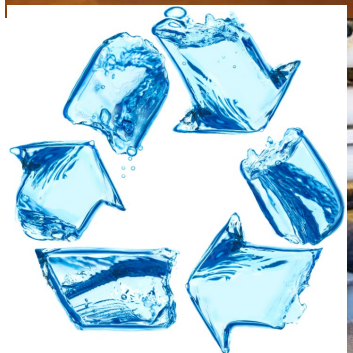


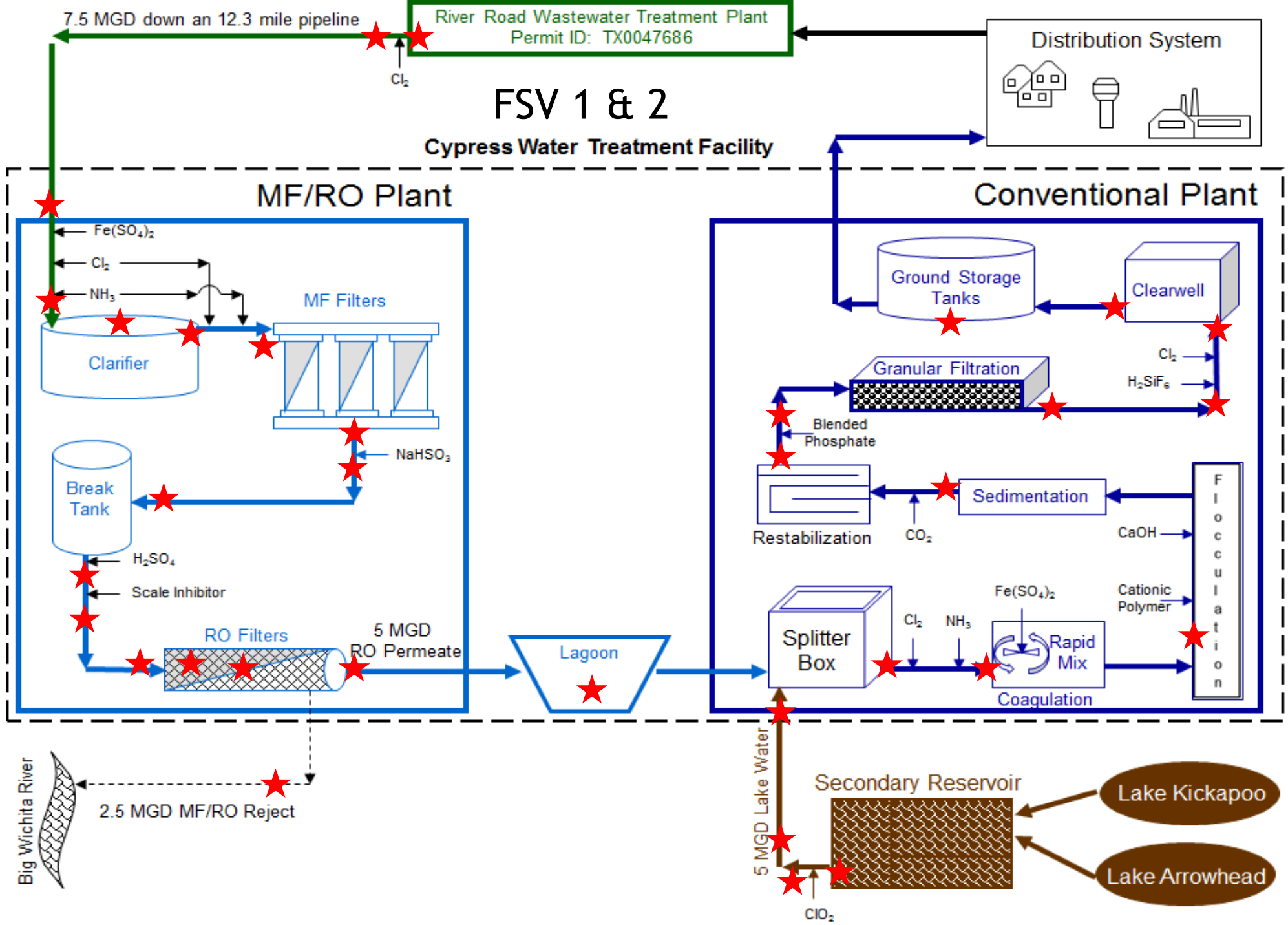


The Plan

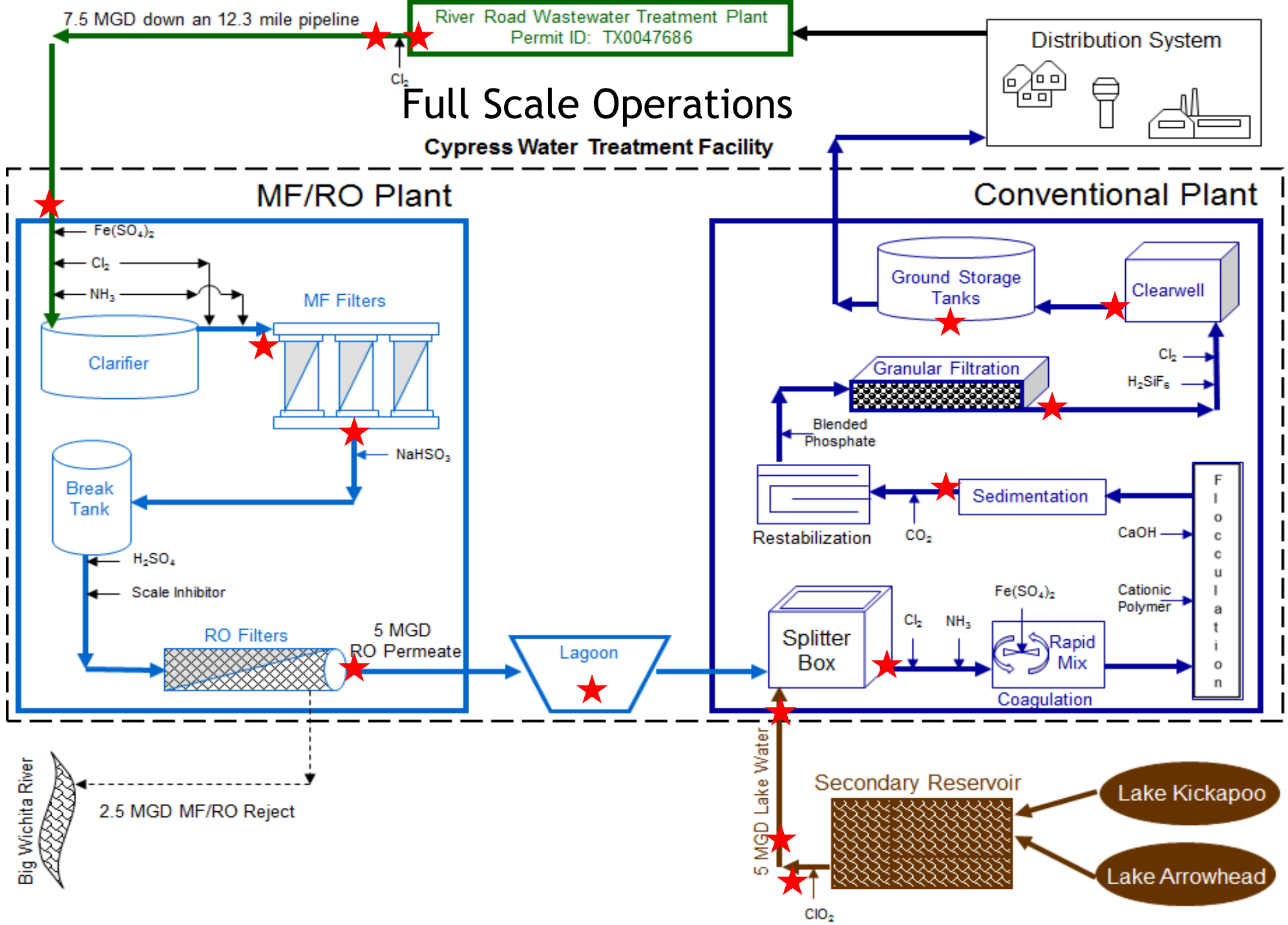
- TCEQ expedited permitting
  - Approved exemptions to treatment rules
- FSO began July 9, 2014
- 7.5 MGD effluent from River Rd WWTP
- MFRO Cypress WTP - Blend 1:1
  - 5 MGD RO permeate
  - 5 MGD raw lake water
- Treat blend in a conventional treatment plant
- Develop long-term strategy - IPR






7.5 MGD down an 12.3 mile pipeline
River Road Wastewater Treatment Plant
Permit ID: TX0047686
Cl_2
Distribution System
FSV 1 & 2
Cypress Water Treatment Facility
MF/RO Plant
Conventional Plant
$Fe(SO_4)_2$
Cl_2
NH_3
MF Filters
Clarifier
$NaHSO_3$
Break Tank
H_2SO_4
Scale Inhibitor
RO Filters
5 MGD RO Permeate
Lagoon
Ground Storage Tanks
Clearwell
Cl_2
H_2SiF_6
Granular Filtration
Blended Phosphate
Restabilization
CO_2
Sedimentation
CaOH
Flocculation
Splitter Box
Cl_2
NH_3
$Fe(SO_4)_2$
Rapid Mix
Cationic Polymer
Coagulation
Big Wichita River
2.5 MGD MF/RO Reject
5 MGD Lake Water
ClO_2
Secondary Reservoir
Lake Kickapoo
Lake Arrowhead

Full Scale Operations



The Goals

- Meet all Primary Drinking Water Standards
- Meet all Secondary Drinking Water Standards
- Zero *E. coli*
- Log removals
  - Virus – 9 log
  - *Giardia* – 6 log
  - *Cryptosporidium* – 5.5 log
- Rigorous testing – 1.8 million discrete data points
- Protect the public health and extend the available water supply

> *A town in Texas just announced a controversial plan to recycle toilet water and use it for drinking water. Dog said, 'how are you only thinking of this now?'*

Temporary Water Reuse Project Running Smoothly After 6 Months

January 9, 2015 at 10:48 PM CST - Updated July 2 at 12:25 PM

Friday, January 9th, 2015 marked the six month anniversary of the temporary water reuse project going online.

Daniel Nix, the Operations Manager at the Cypress Water Treatment Plant said, "The project has been an overwhelming success.

He said the temporary water reuse project is saving Texoma five-million gallons of water a day.

DPR Results

Microbial Detections

	Wastewater Effluent	Microfilters	RO	POE	Standards Compliance
Virus	0	0	0	0	✓
Giardia	62.65	0	0	0	✓
Cryptosporidium	4.35	0	0	0	✓
E coli	100,000+	0	0	0	✓

Primary and Secondary Standards

	MCL (mg/L)	FSV Average	FSO Average	FSO Max	Standards Compliance
Nitrate	10.0	0.66	0.85	3.26	✓
TTHM	0.080	0.0142	0.0289	0.0344	✓

DPR Results

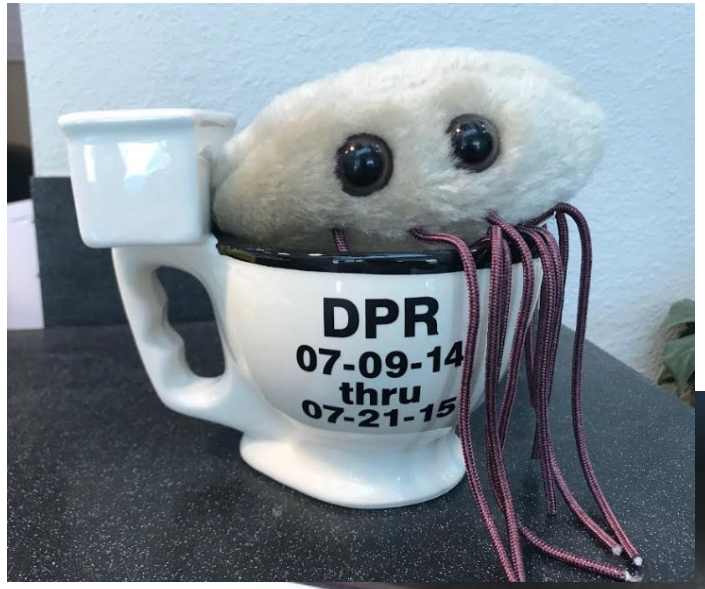
Primary and Secondary Standards

	MCL (mg/L)	FSV Max	FSO Max	Standards Compliance
Aluminum	0.05	0.0260	0.0190	✓
Antimony	0.006	ND	0.0003	✓
Arsenic	0.010	0.0013	0.0008	✓
Barium	2.0	0.0210	0.0459	✓
Chloride	250	120	88	✓
Chlorite	1.0	0.32	0.46	✓
Chromium	0.1	ND	0.0007	✓
Copper	1.3	1.3	0.1470	✓
Cyanide	0.2	ND	0.147	✓
Fluoride	4.0	0.7	0.568	✓
Iron	0.3	0.02	0.134	✓

	MCL (mg/L)	FSV Max	FSO Max	Standards Compliance
Manganese	0.05	ND	0.003	✓
Nitrate	10.0	2.08	3.26	✓
Nitrite	1.0	0.02	0.09	✓
Sulfate	250	30	33	✓
TDS	500	462	271	✓
Zinc	5.0	ND	0.025	✓
Gross Alpha/Beta	15.0	10.1	9.2	✓
Uranium	0.03	0.0007	0.0013	✓
Turbidity	0.3	0.267	0.27	✓
TTHM	0.080	0.0167	0.0344	✓
HAA5	0.060	0.0093	0.0152	✓
LSI	+	0.17	0.39	✓

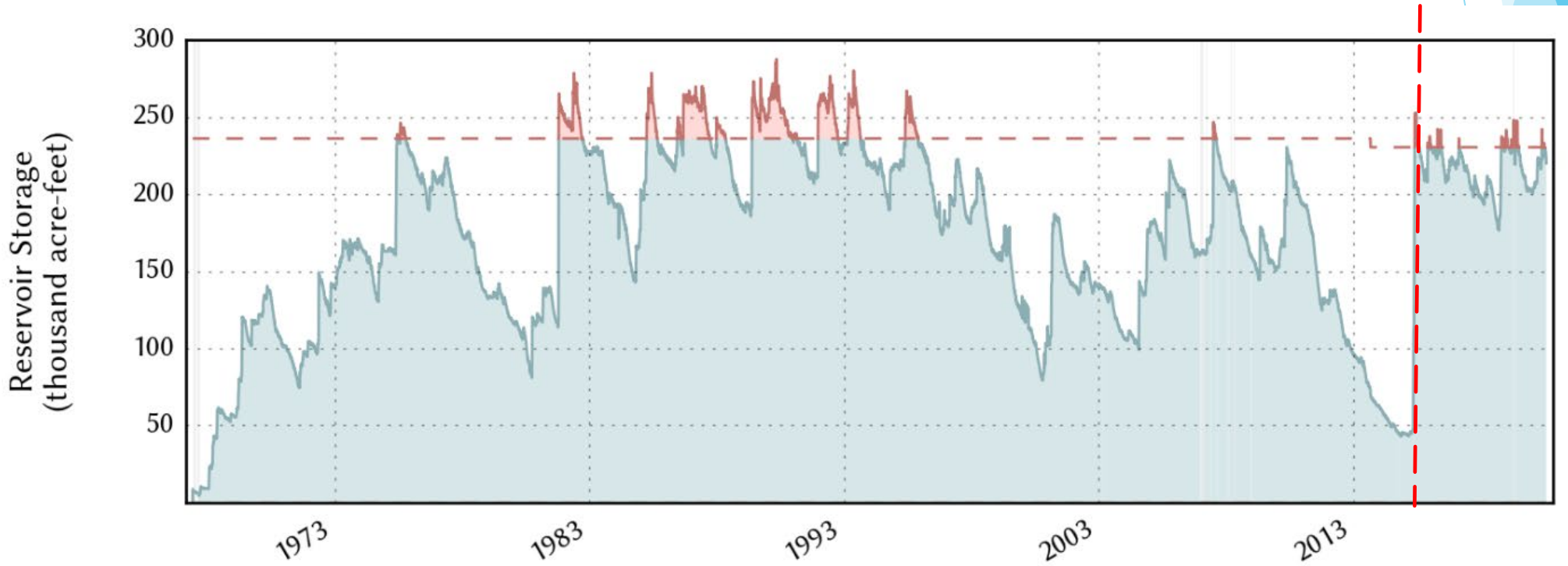
DPR Success

- 100% compliance with Primary and Secondary Drinking Water Standards
- 100% compliance with microbial log removals
- Viable and reliable supply
- Public acceptance
- Zero customer complaints
- > 2 billion gallons reclaimed in 12 months
- Public health was protected



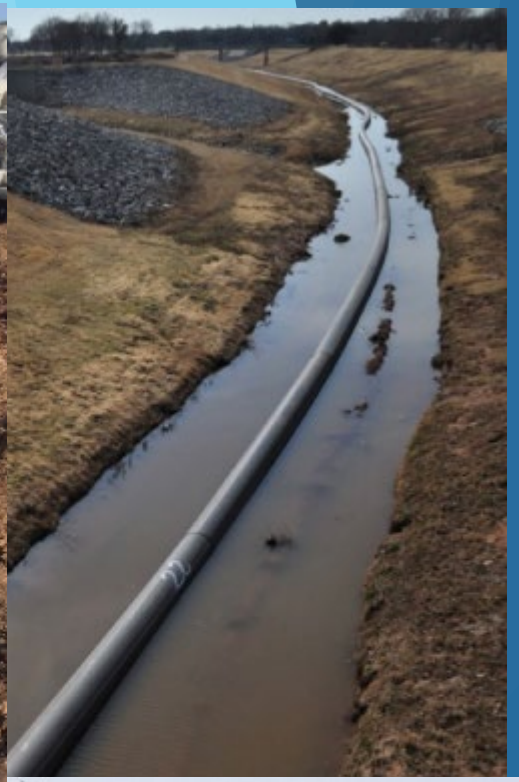
The Transition

- May 2015 – record rainfall
- Flood Disaster Declaration
- 3 weeks = 3 reservoirs to 100%
- Decommissioned July 21, 2015
- August 2015 – December 2017 transition to IPR
  - Begin Lake Arrowhead baseline January 2017
  - Begin FSO lab testing December 2017
- Begin IPR FSO January 2018



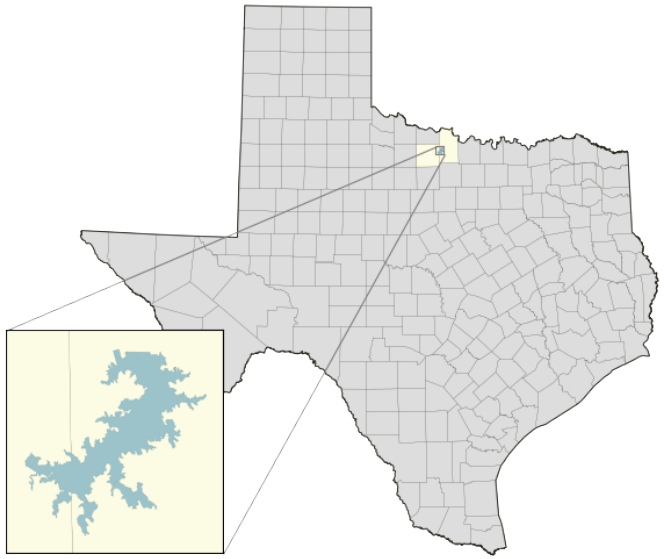
The Transition

- Entire approval process required
  - Design, modeling, application, permitting, approval
- $6 million of an 12.3 mile 32” HDPE DPR pipe repurposed for IPR
- 5.5 miles of additional 36” ductile iron pipeline added
- Outfall 3,000 ft into Lake Arrowhead
- Baseline testing for Lake Arrowhead and wastewater effluent



IPR – Permanent Reuse

- Plant improvements/additions
  - New SCADA system
  - Lime
    - Phosphorus removal
    - Additional alkalinity
  - Ferric chloride
    - Phosphorus removal
  - Disc filter
    - Phosphorus polishing
    - Protozoan barrier
  - Liquid oxygen
- FSO began January 2018
- ~ 8 MGD RRWWTP effluent returned to watershed
  - Lake Arrowhead instead of Lake Texoma



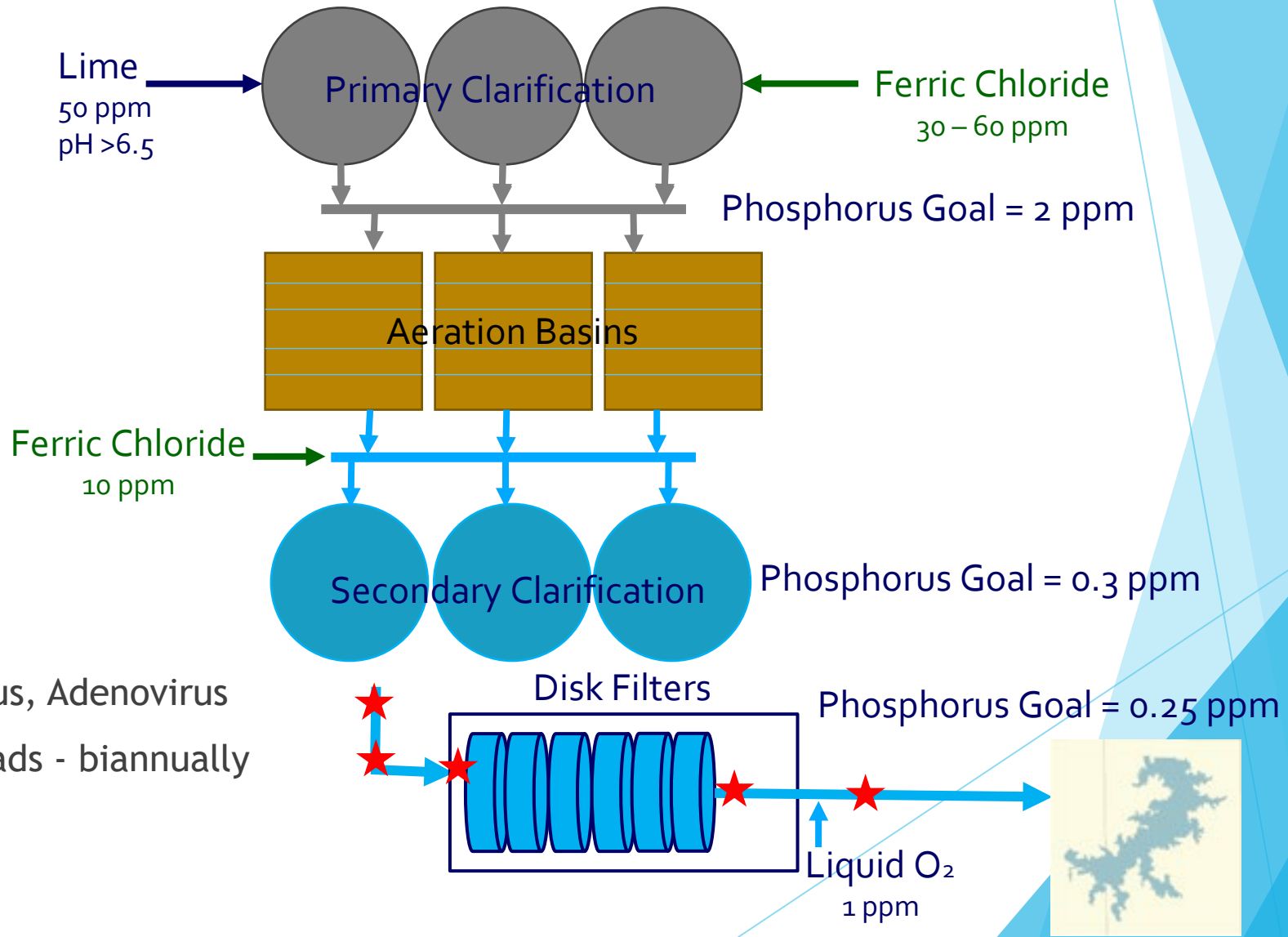
Indirect potable water reuse system goes online; plant renamed

The city of Wichita Falls' indirect potable water reuse system is up and running, hopefully making the city a bit more drought-resistant.

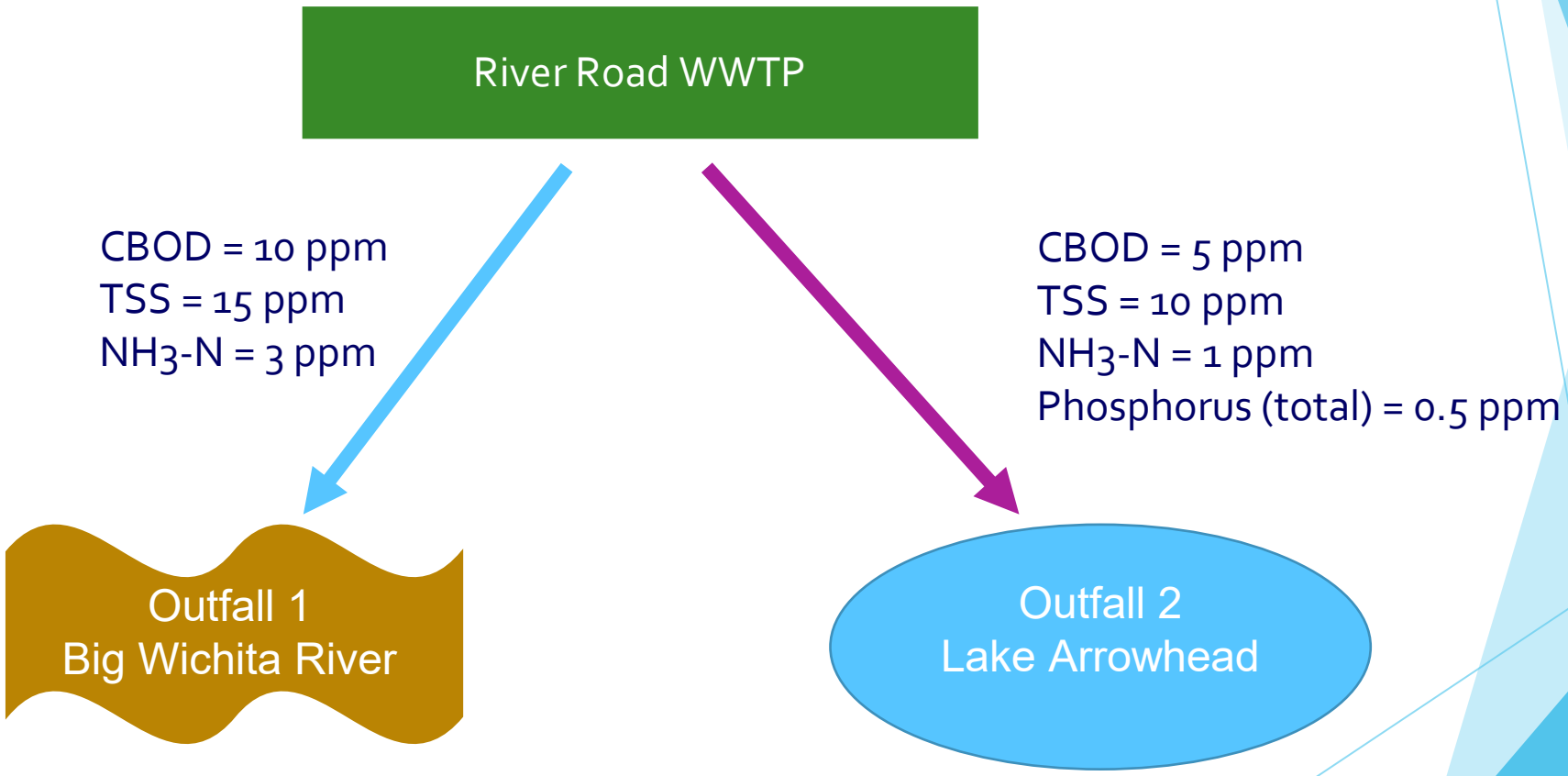
LOCAL Claire Kowalick Feb. 28, 2018

Wastewater Effluent Monitoring

- Wet chemistry
- Anions/Cations
- Metals
- TTHMs
- HAA_5
- *E. coli*
- *Crypto/Giardia*
- Coliphage
- Enterovirus, Norovirus, Adenovirus
- SOCs, VOCs, IOCs, Rads - biannually

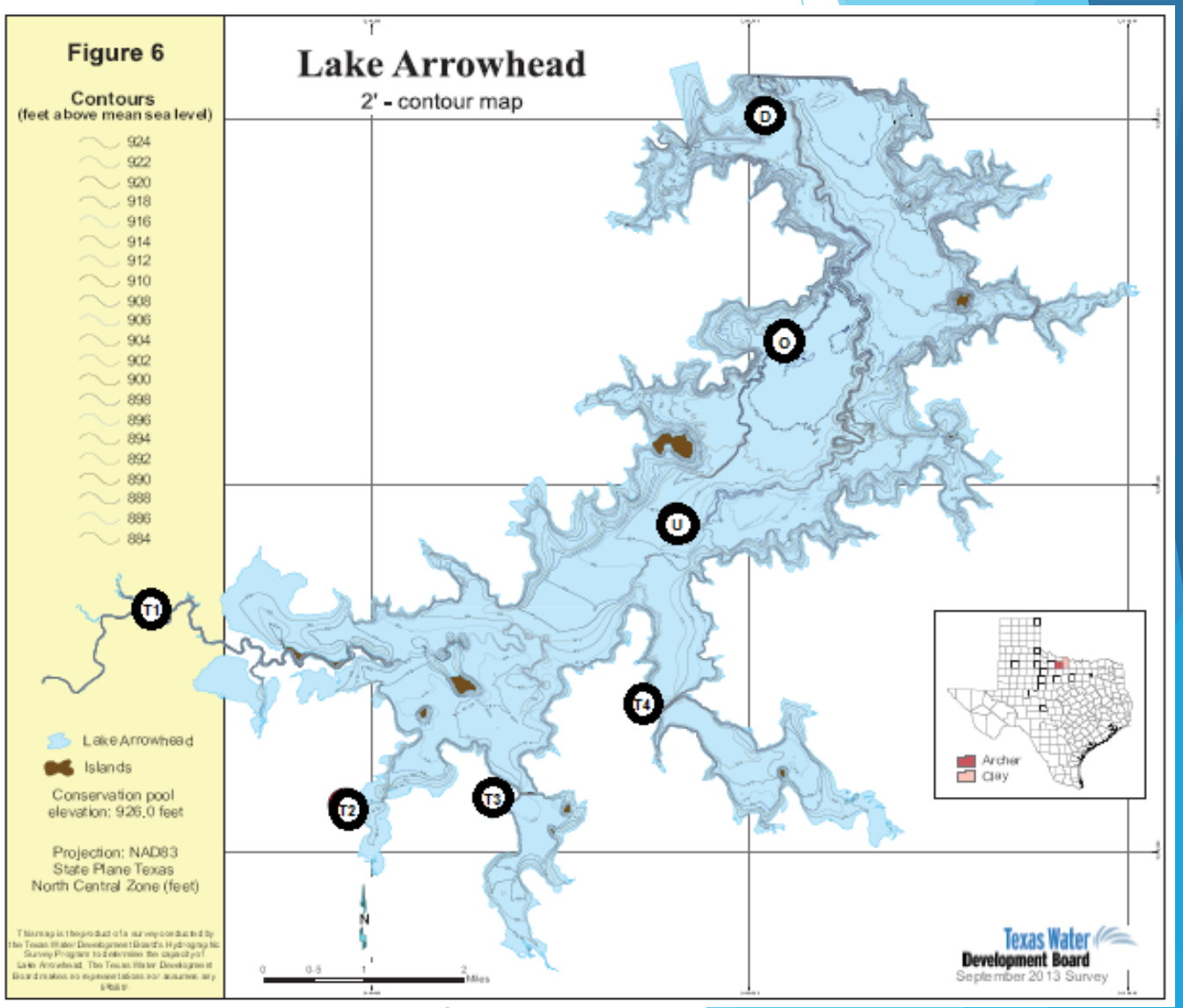


Environmental Buffer – Lake Arrowhead

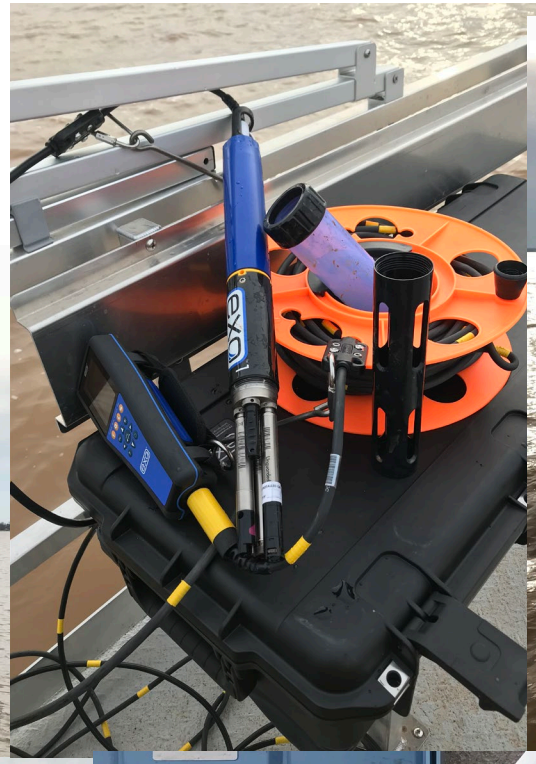


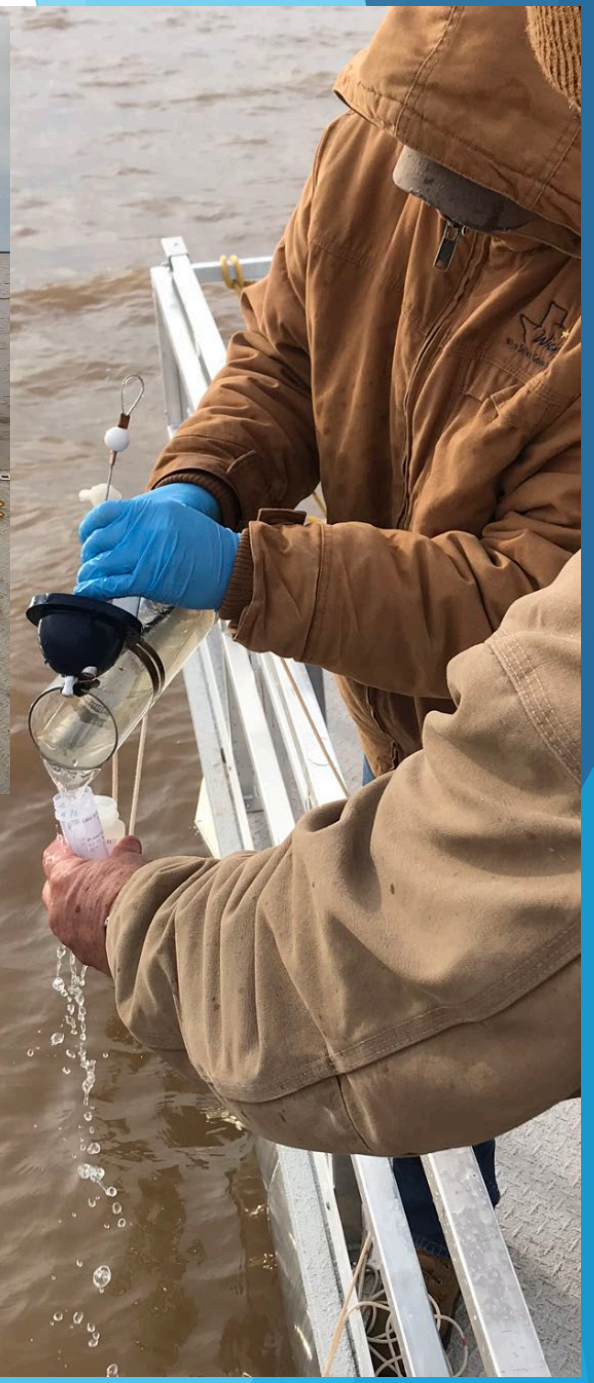
Reservoir Monitoring

- Wet chemistry
- Anions/Cations
- Metals
- TTHMs
- HAA_5
- *E. coli*
- *Crypto/Giardia*
- Enterovirus, Norovirus, Adenovirus
- Coliphage
- SOCs, VOCs, IOCs, Rads - biannually
- Benthic sediment - annually

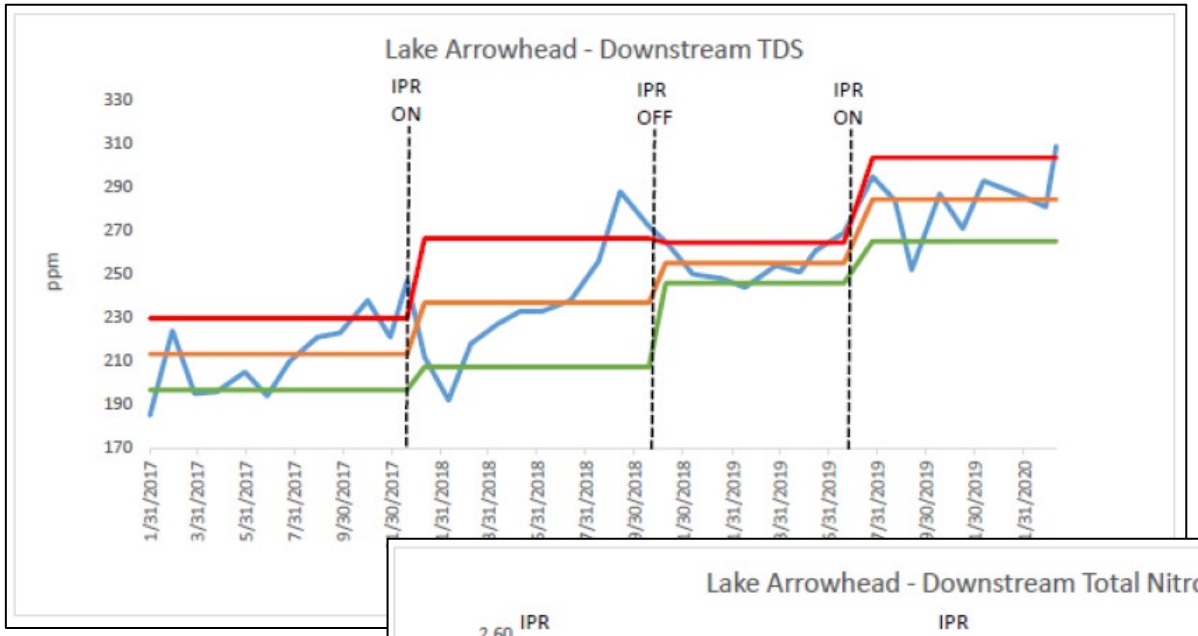


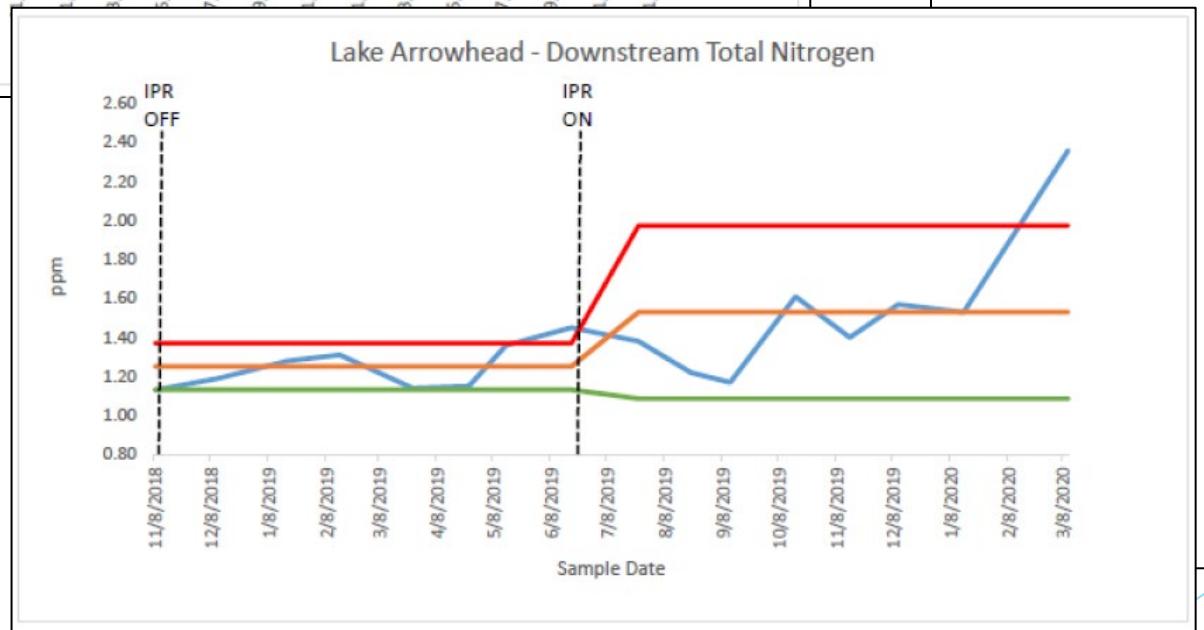
Field Samples





Reservoir Monitoring





2018 ANNUAL REPORT

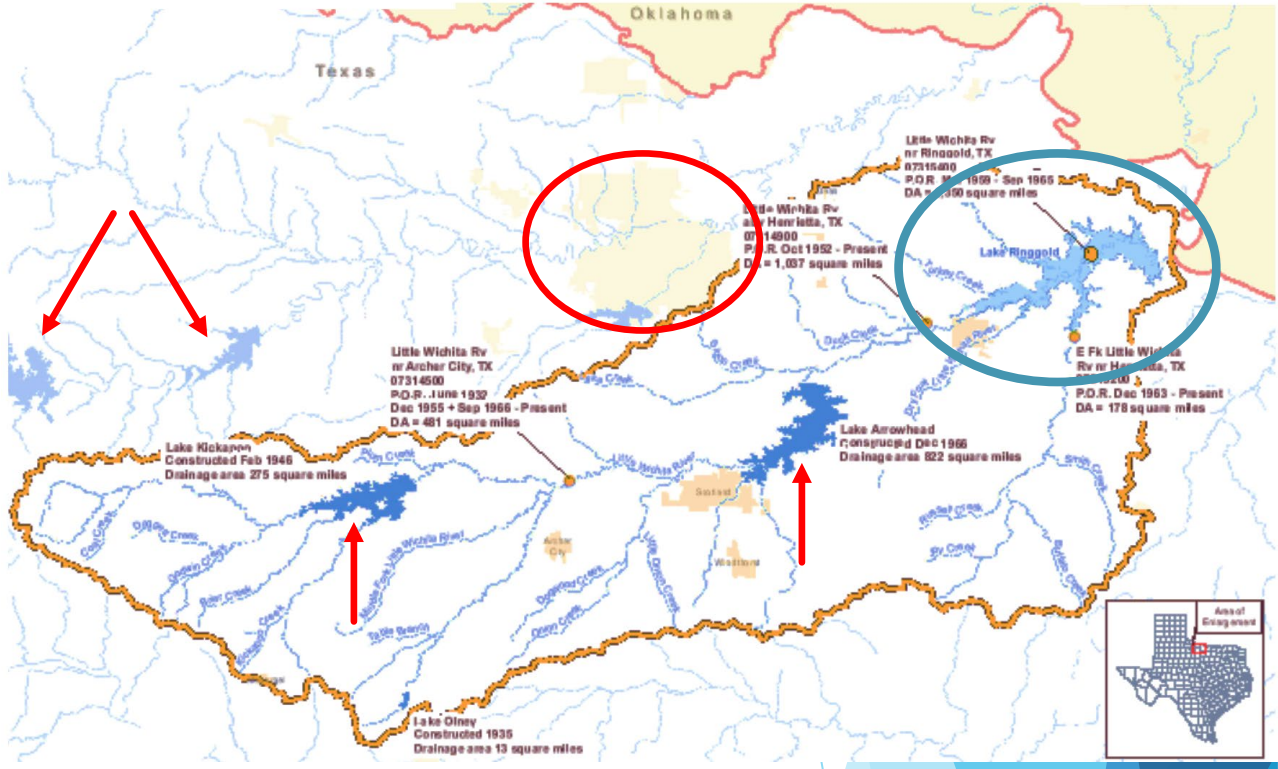
A LIMNOLOGICAL ANALYSIS OF THE LAKE ARROWHEAD/IPR SYSTEM

Submitted to:
The City of Wichita Falls, TX

Wichita Falls
TEXAS
Blue Skies. Golden Opportunities.

Prepared by:
Cypress Water Purification Lab
Resource Recovery Laboratory
City of Wichita Falls, TX
March 29, 2019

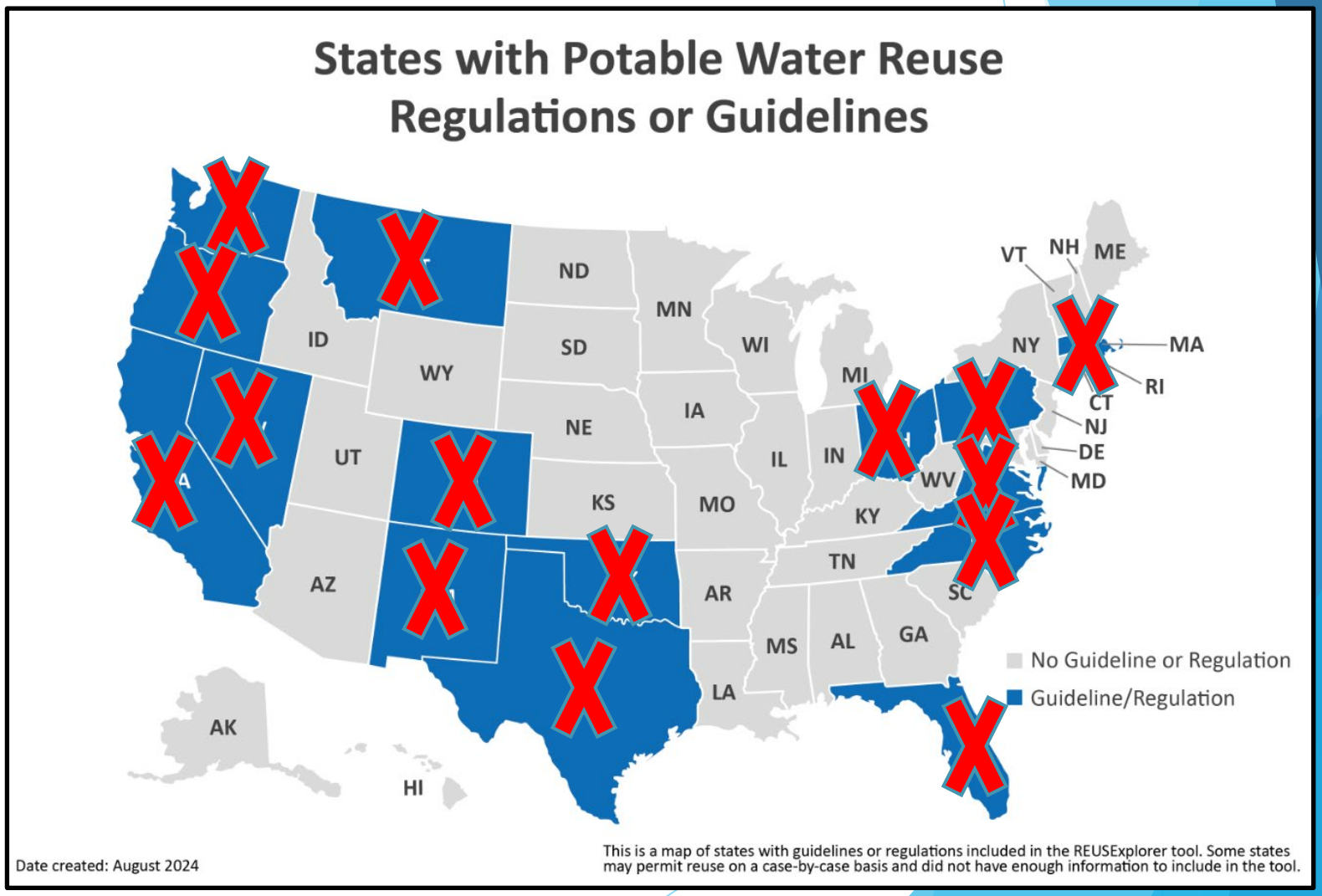
What Next?



- Continue expanding water supply
  - Lake Ringgold
- TAWWA Advanced Treatment Courses
  - Reuse Certification
- EPA 2016 Potable Reuse Supplement
- AWWA G485 DPR Standard
- WateReuse Assocation Projects

Current Regulatory Outlook

This map looked very different in 2012 when the City of Wichita Falls began DPR planning.



Questions?

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