GROUNDWATER SUPPLY & WATER TREATMENT SYSTEM

TWIN CITY WATER & SEWER DISTRICT

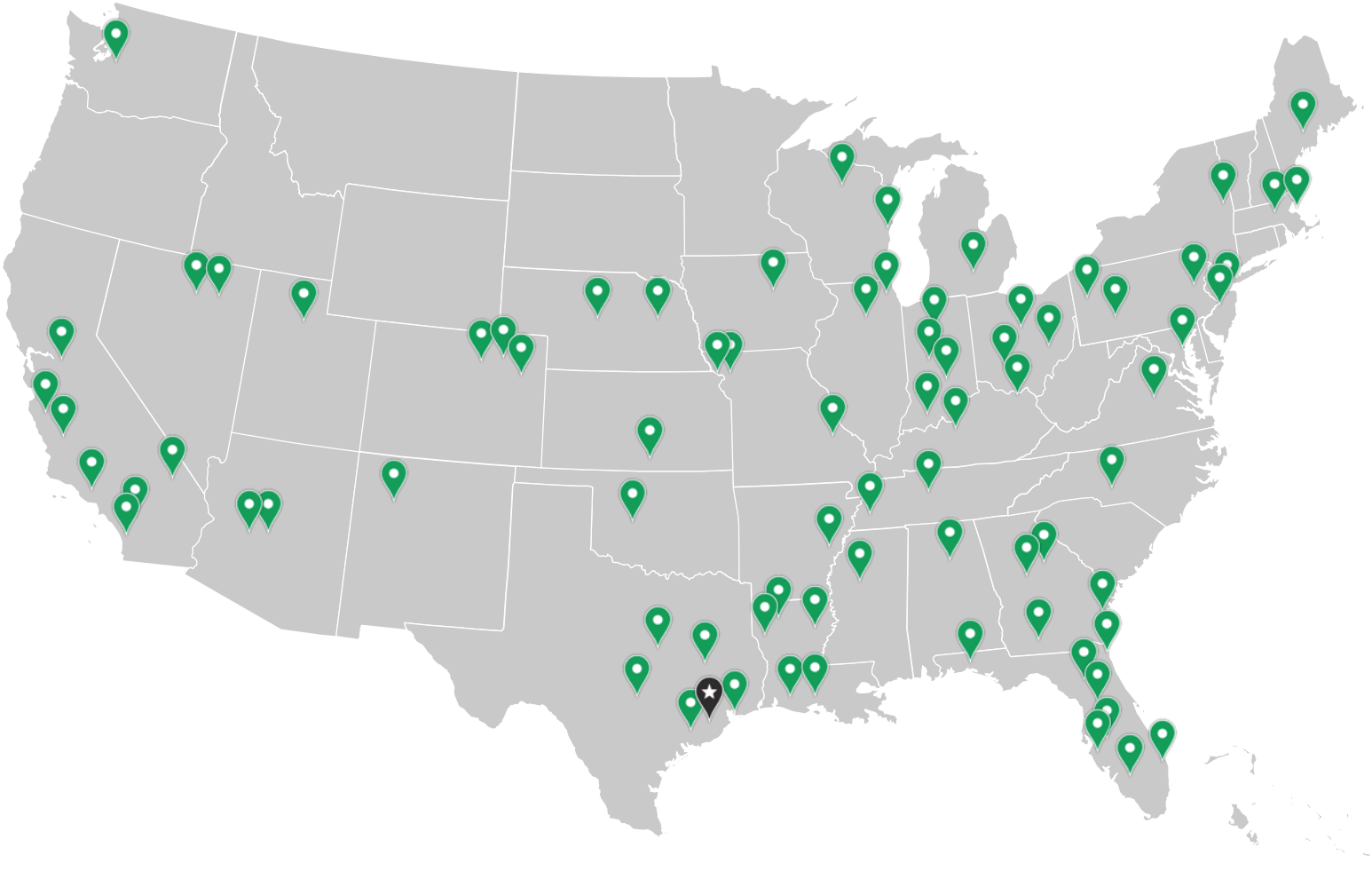
Prepared for OTCO - November 13, 2018

Bob Curley and Terry Breckenridge

Services Offered

- Well Drilling & Pump Design
- Well & Pump Maintenance
- Water Treatment Equipment
- Professional Services
- Assistance to Consultants

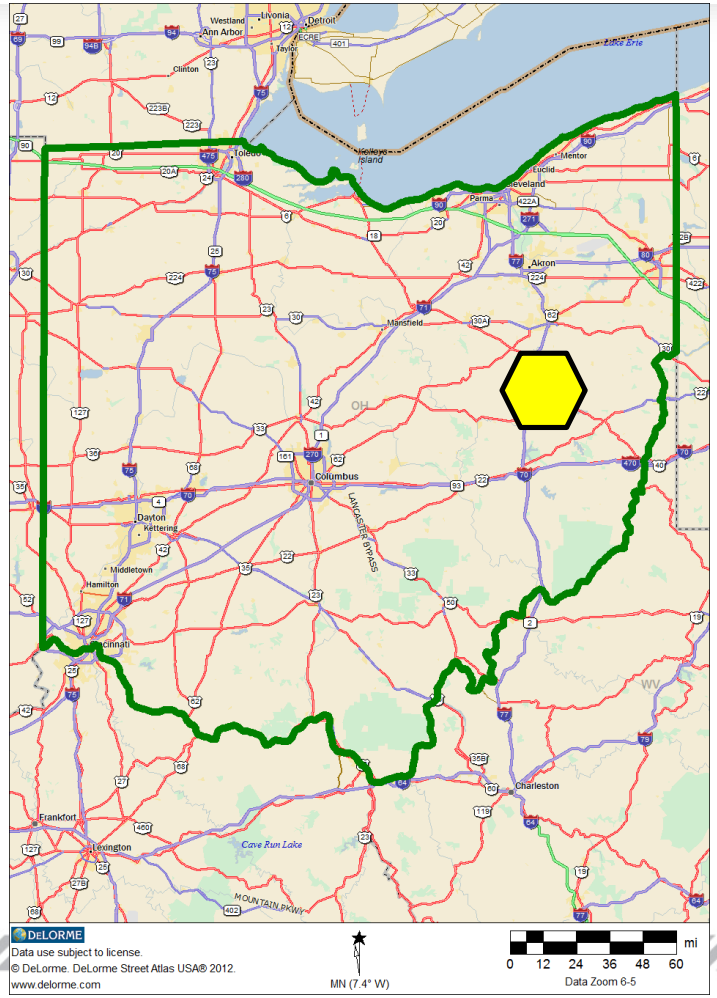
UNITED STATES LOCATIONS



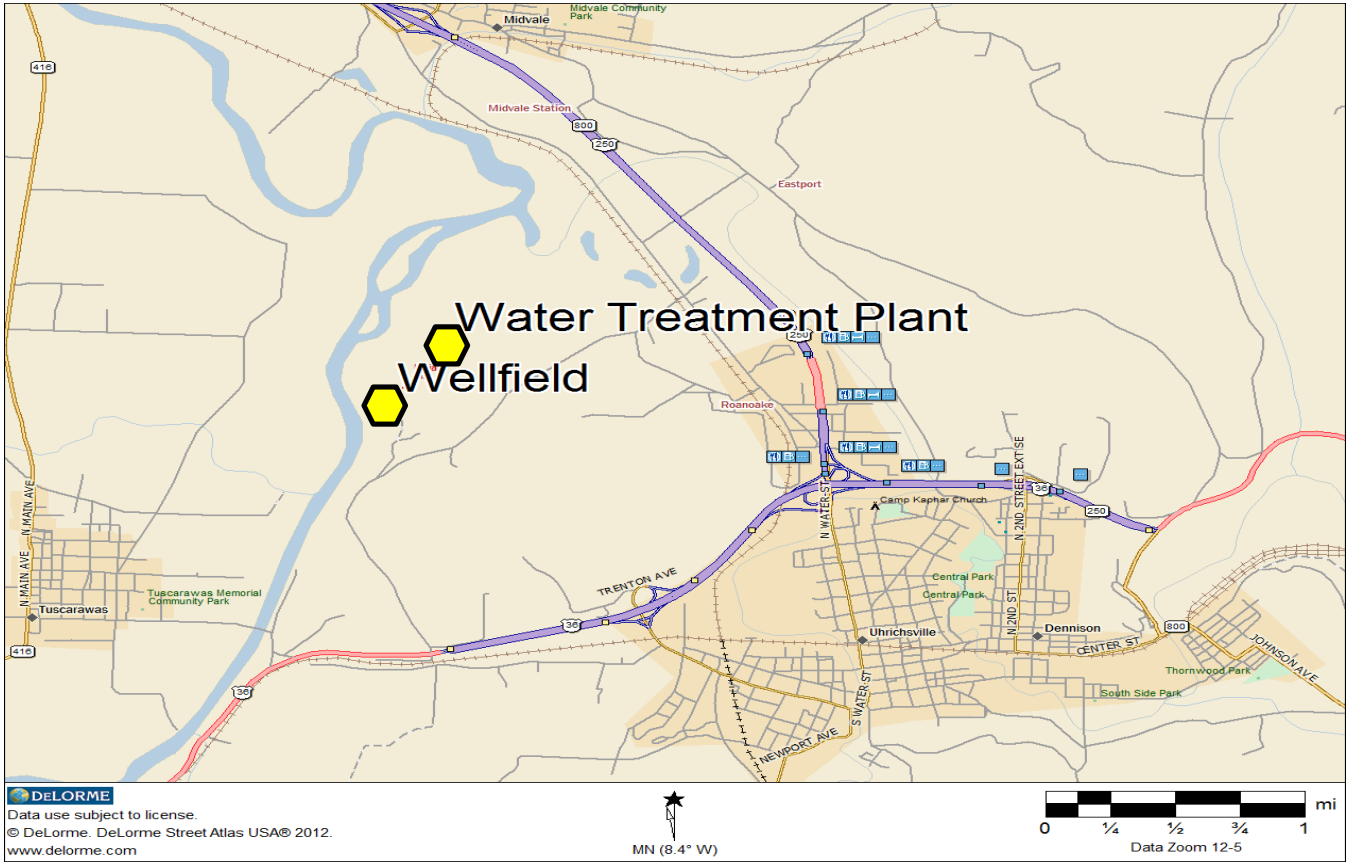
Unique Project Elements

- Owner / Contractor driven
- Collaboration and coordination
- Change of water source
- Accelerated schedule
- Use of high LLR LayneOx™ media

Project Location



Project Location



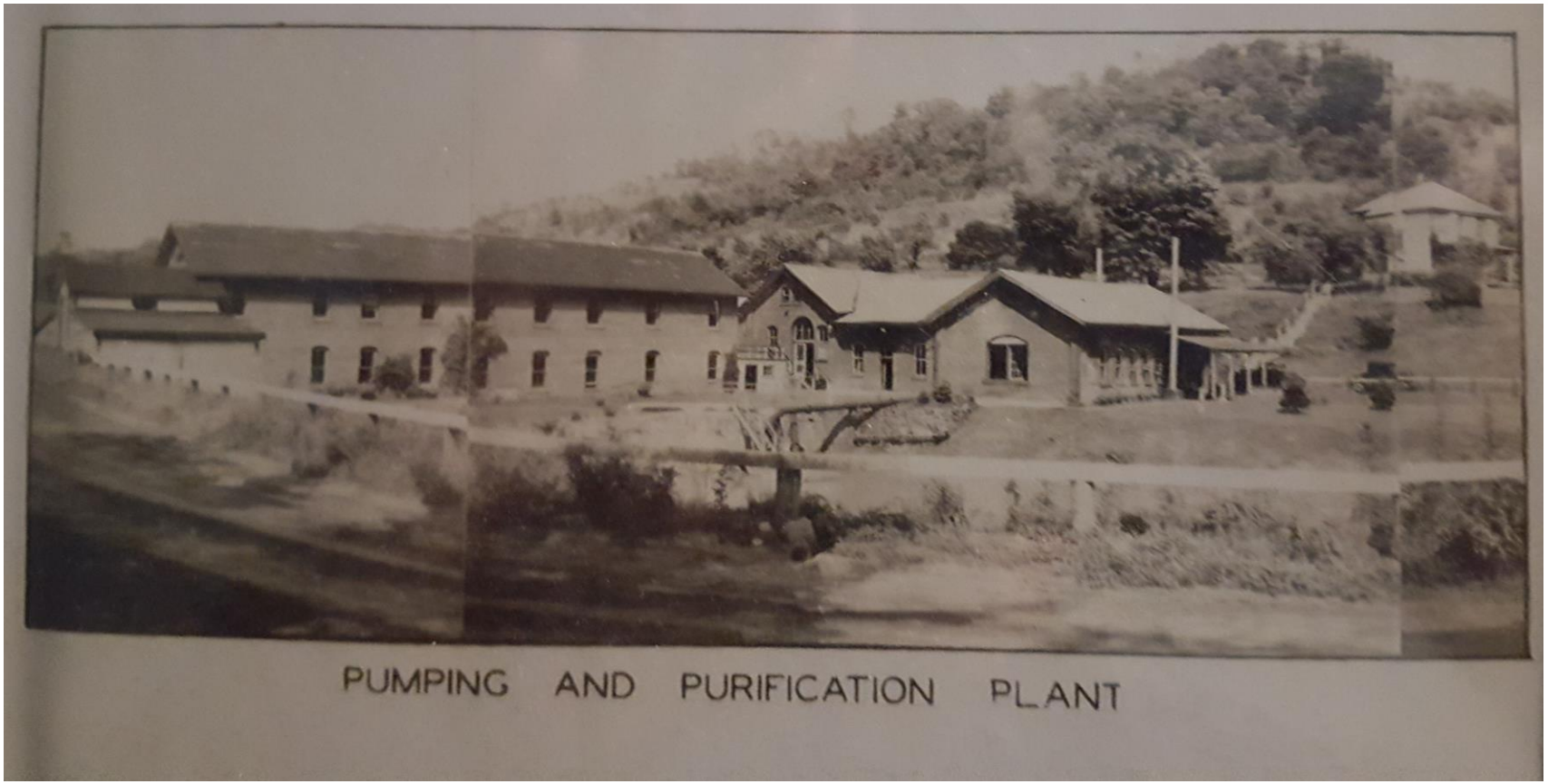
REGIONAL GEOLOGY

- Unglaciated region
- Outwash in buried valleys
- Tuscarawas Buried Valley Aquifer
- Yields up to 1,500 gpm

Historical Background

- Dennison Water Co. in Early 1900's
- Stillwater Creek River Intake
- Water for Steam Train Engines
- WTP Rebuilt in 1964
- TCWSD formed in 1979
- Population / Service Taps

Old Water Plant



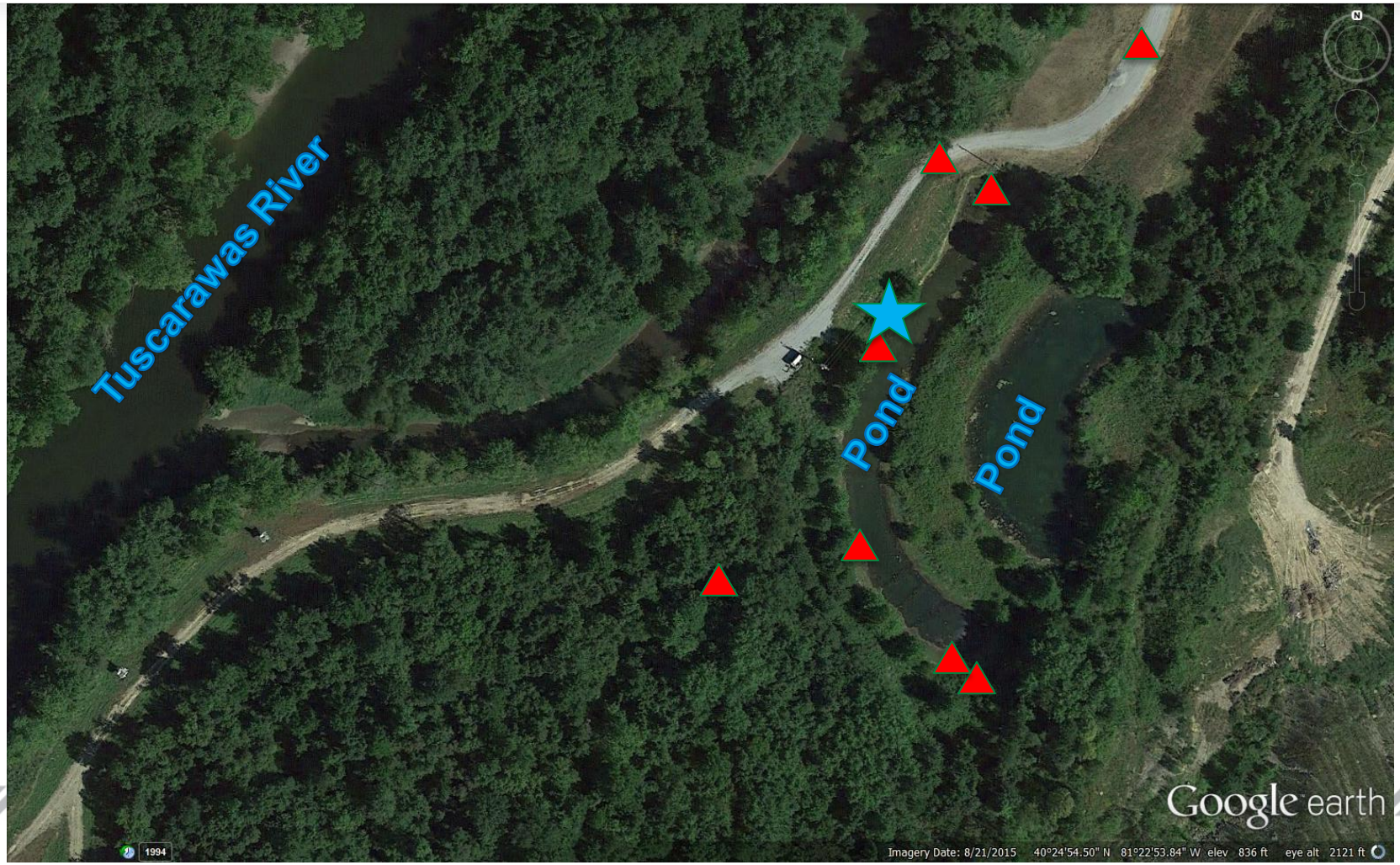
Water Plant circa 2000

Old River Intake

Project Scope

- Issues Facing TCWSD
- Objectives
- Funding
- Project Team

Phase 1 Site Map



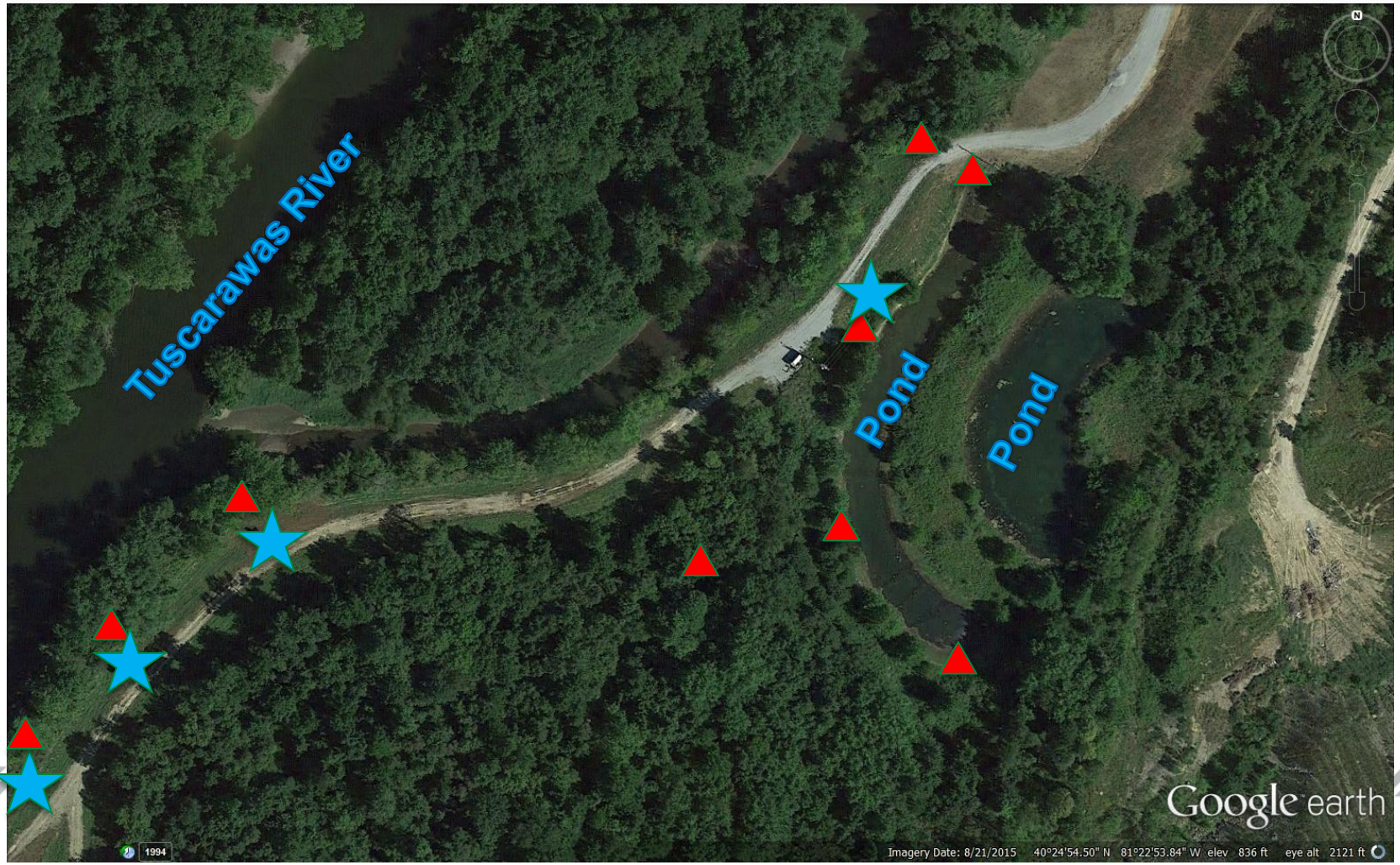
Phase 1 Summary

- Identify 3 Water Well Sites
- 500 gpm Potential Cap. / Well
- Poor Water Quality
- Did not develop

Phase 2

- Obtain OEPA Site Acceptance
- Obtain Approval from FMA
- Heavily Wooded in Floodway
- Drill 3 Test Holes
- Install 2” Piezometers

Phase 2 Site Map



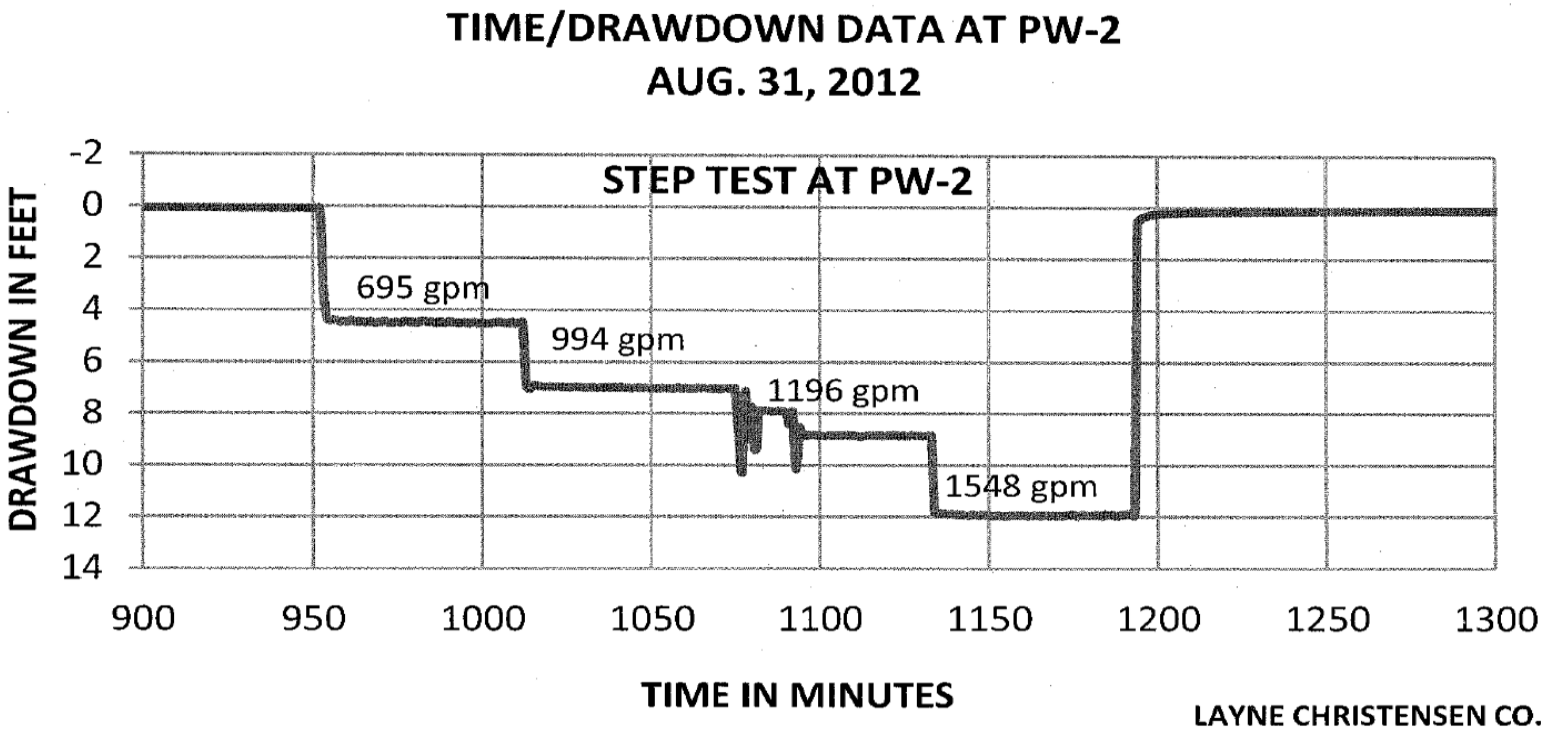
Phase 2 Groundwater Quality

PARAMETER	SMCL (mg/l)	TW-9 (mg/l)	TW-10 (mg/l	TW-11 (mg/l
Sulfates	*250*	377	360	616
Iron	*0.3*	1.44	0.960	2.6
Manganese	*0.05*	0.61	0.67	0.58
pH	*7.0-10.5*	7.60	7.61	7.48

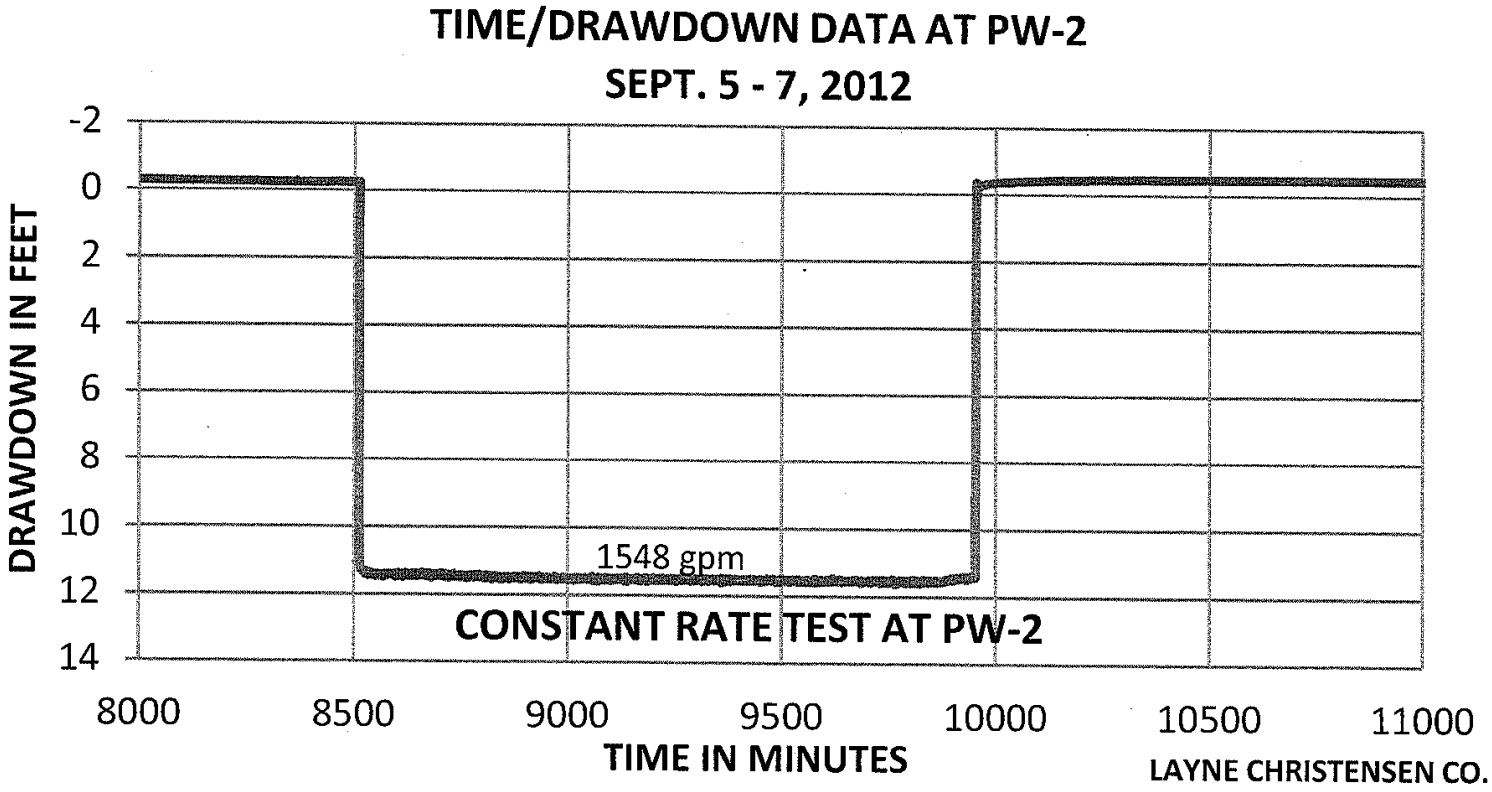
Phase 2 Pumping Well

- Cable Tool Rig
- Well Design
  - Gravel Packed Well
  - Screened Interval
- SWL / Available Drawdown

Phase 2 Step Test



Phase 2 Constant Rate Test



Phase 2 Groundwater Quality

PARAMETER	SMCL (mg/l)	PW-2 (mg/l)
Sulfates	250	467
Iron	0.3	2.07
Manganese	0.05	0.67

Phase 2 Summary

- Identify 3 Water Well Sites
- Potential Yield
- Water Quality
- Develop Wells


What Next?

High LLR Media Features

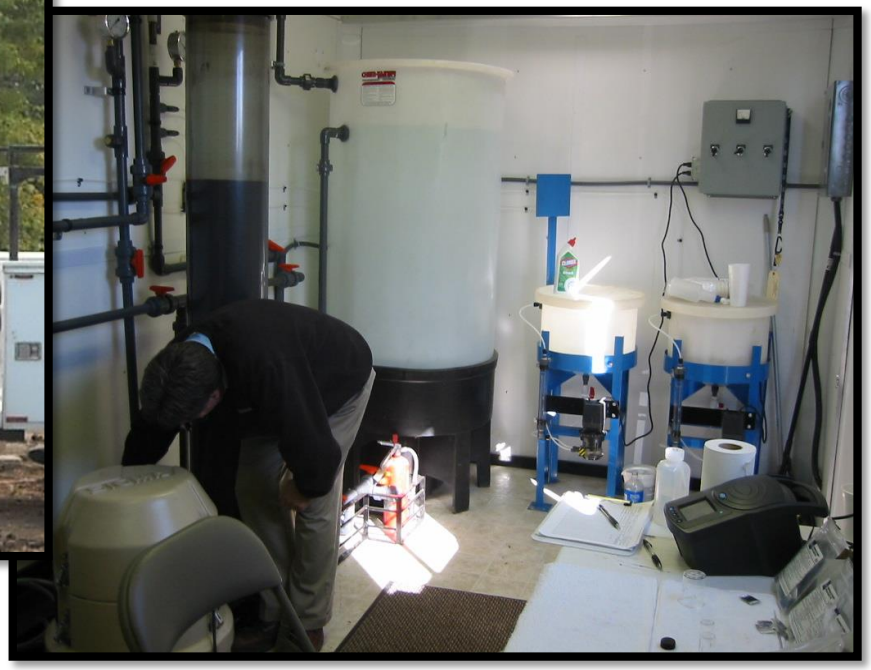
- Manganese dioxide: 70% to 80%
- Naturally occurring mined media
- Rapid catalytic oxidation
- High affinity for Fe & Mn
- Arsenic, radium & H_2S
- Effective size - 0.3 to 0.5 mm
- Proven Technology

High LLR Media Advantages

- High LLR (6 to 12 gpm/sq ft)
- Life cycle savings
  - Fewer & smaller tanks
  - Smaller plant footprint
  - 10+ year life
  - Lower chemical costs
- Modular design
- NSF-61 rated, ASME code vesels


And Then What?

Pilot Testing



Pilot Runs

Run #	LLR (gpm/sf)	Filter Run (hours)	Avg Fe Influent (mg/L)	Avg Fe Effluent (mg/L)	Avg Mn Influent (mg/L)	Avg Mn Effluent (mg/L)
1	9.7	8.5	2.3	0.10	0.605	0.014
2	9.7	9	1.9	0.10	0.61	0.010
3	8.8	9.5-10.0	2.3	0.06	0.64	0.016
4	**6.5**	**19.5**	**1.7**	**0.14**	**0.62**	**0.019**
5	**6.5**	**19.5**	**1.9**	**0.12**	**0.64**	**0.016**
6	**6.5**	**20**	**2.2**	**0.10**	**0.65**	**0.015**
7	9.5	8	2.7	0.10	0.66	0.011
8	9.5	8.0-9.0	2.7	0.09	0.66	0.011
9	9.5	8.5-9.0	2.6	0.10	0.66	0.012
10	8.8	9	2.7	0.07	0.66	0.015

Pilot Summary

- Ohio EPA Approved
- LLR of 8.2 gpm/sf Accepted
- LLR Selected was 6 gpm/sf
- *PILOT TEST WAS A SUCCESS*

WTP Design Criteria

- 1,500 gpm Design Flow Rate
- Filters – 4 at 108” x 64”
- Filter Rate – 400 gpm Each
- Chlorine Gas Pre-oxidant
- Project Team Expanded

TWIN CITY WATER & SEWER DISTRICT


MINNEAPOLIS
Kansas !!!

Final Project Construction

- Wellfield
- Raw & Finish Water Lines
- WTP with LayneOx Filters
- Booster & System Water Lines

Water Supply Wells

Filter Delivery

Water Treatment Plant

Unique Project Elements

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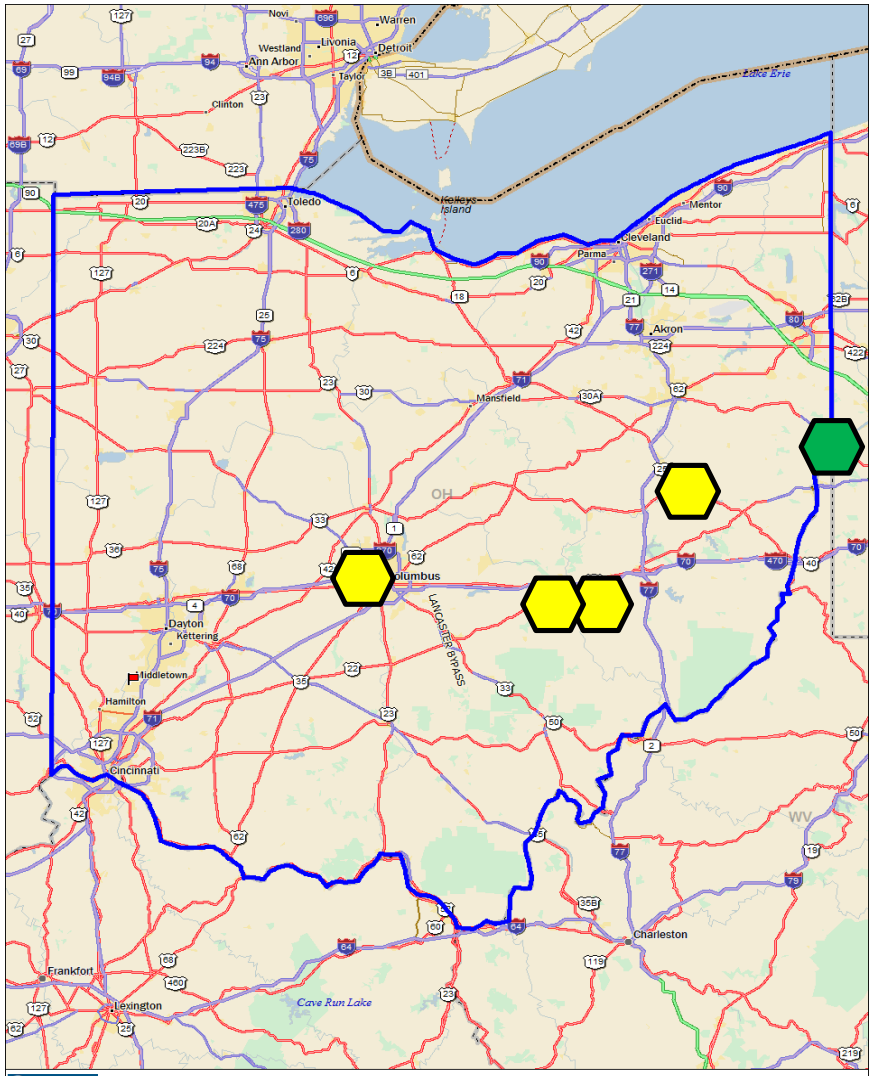
Beyond Twin City

TWIN CITY WATER & SEWER DISTRICT

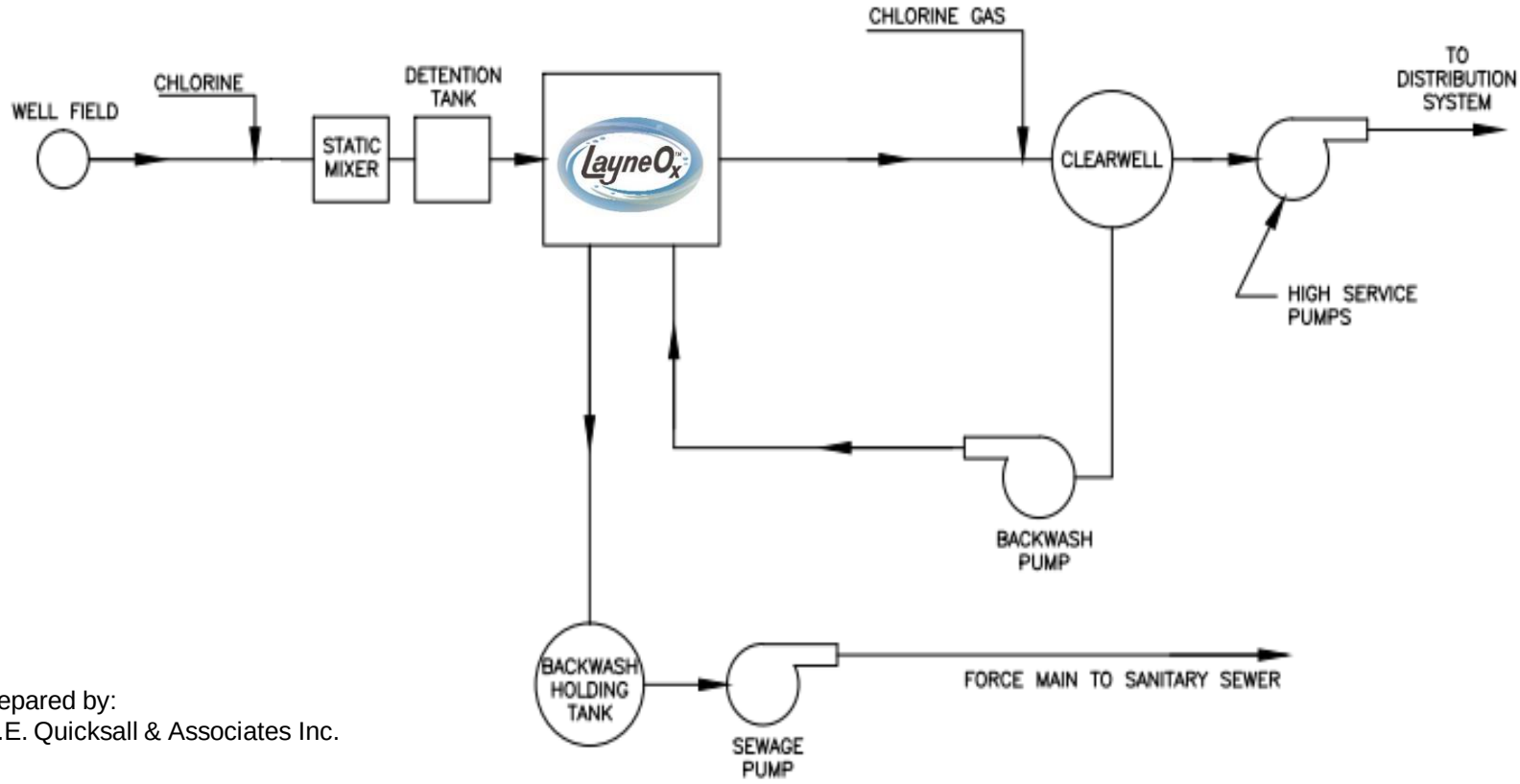


Special Thanks To

- Erin Moore & the Operator Training Committee of Ohio (OTCO)

Questions?

WTP Flow Diagram



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