2022 Region 8 Pretreatment Confrence

Salem City,

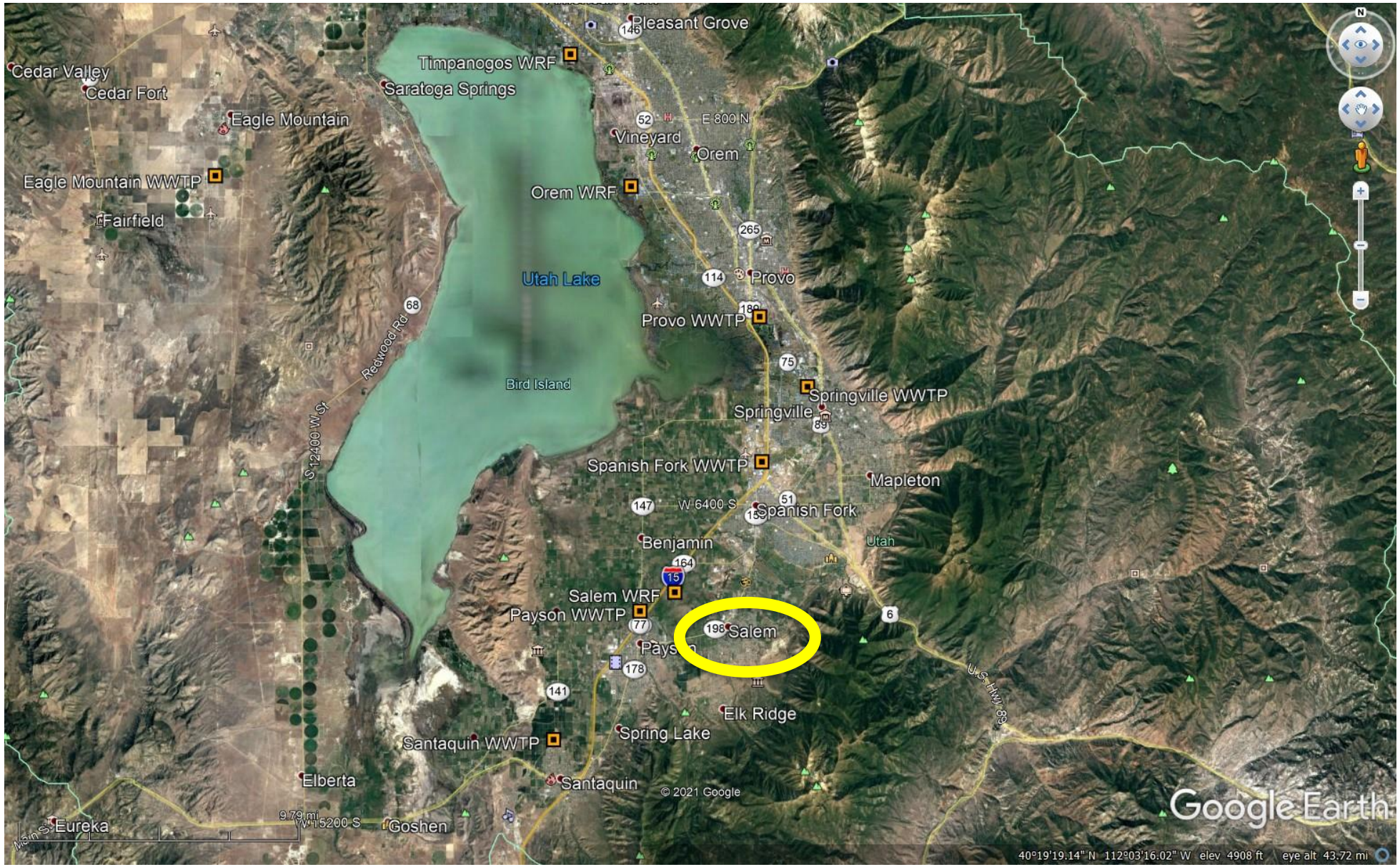
The Story Of The Obsolete Lagoon

April 3, 2022

Overview of Presentation

- Provide background of Salem
- Provide an overview of the selected process
- Review startup procedures
- Present data for first year of operation
- Industrial Pretreatment Plans

Where is Salem?



Background

- Using lagoon system built in late 1980's
- Discharges to Beer Creek, leads to Utah Lake
- Received new lower ammonia limits in mid-2010's
  - Old limit: 23 mg/L daily max
  - New limit: 1.5 mg/L monthly avg, 5 mg/L daily max
- Also required to meet statewide phosphorus limits
  - Would exceed lagoon pound loading cap in 5 years
- Possible future total nitrogen limits
- Potential future reuse
- Expecting significant population growth in next few decades

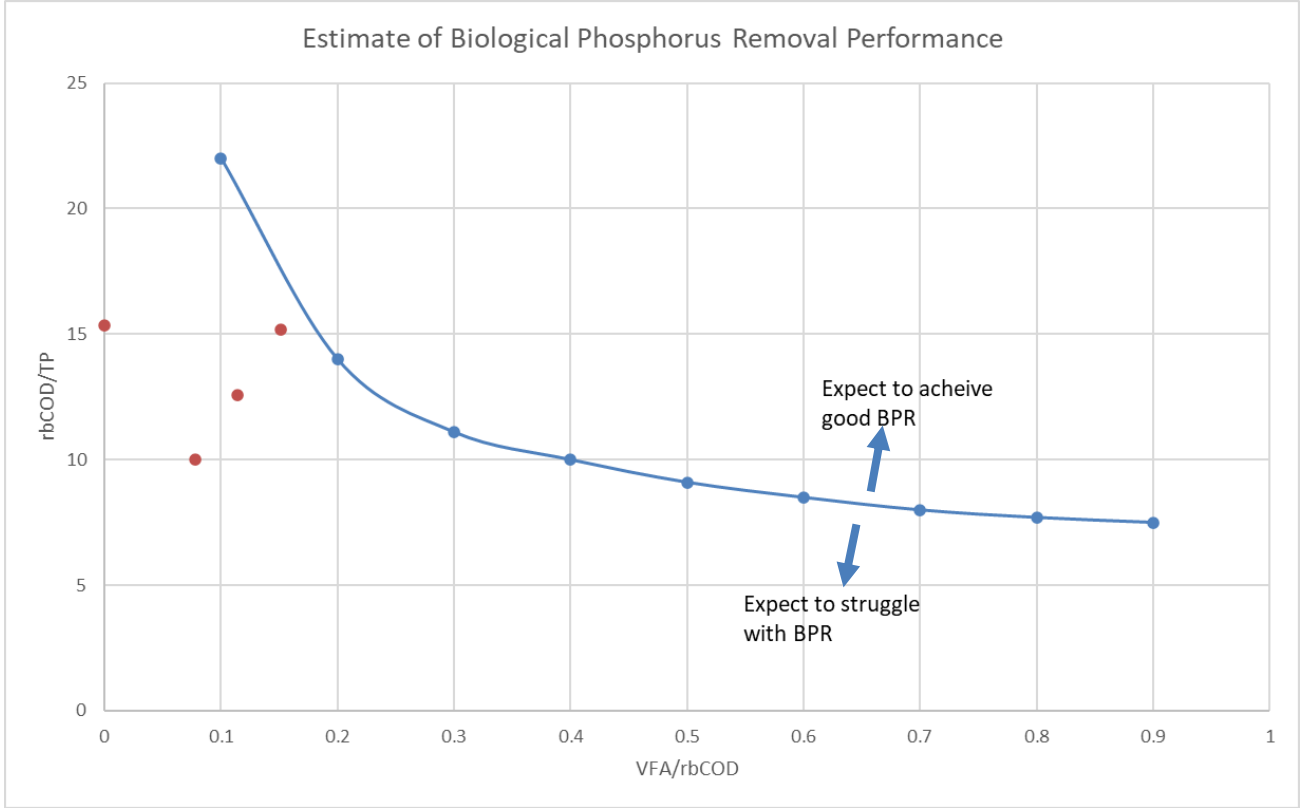
Parameter	Effluent Limitations *a				
	Maximum Monthly Avg	Maximum Weekly Avg	Yearly Average	Daily Minimum	Daily Maximum
Total Flow, MGD *b	1.5	--	--	--	3.0
BOD_5, mg/L	25	35	--	--	--
BOD_5 Min. % Removal	85	NA	--	--	--
TSS, mg/L	25	35	--	--	--
TSS Min. % Removal	85	NA	--	--	--
Dissolved Oxygen, mg/L	--	--	--	5.0	--
pH, Standard Units	--	--	--	6.5	9
E. coli, No./100mL	126	157	--	--	--
TRC, mg/L	.022	--	--	--	0.025
Ammonia (as N), mg/L					
Summer (Jul-Sep)	2.5	--	--	--	5.0
Fall (Oct-Dec)	3.0	--	--	--	6.0
Winter (Jan-Mar)	3.0	--	--	--	7.0
Spring (Apr-Jun)	3.0	--	--	--	6.0
Phosphorus, Total mg/L Effluent	--	--	1.0	--	--
WET, Chronic Biomonitoring	--	--	--	--	IC_{25}> 51% effluent (from WLA)
Oil & Grease, mg/L	--	--	--	--	10.0

Approach to New Treatment Plant

- Process options
  - Upgrade lagoons (nitrification) with chemical phosphorus removal
  - Oxidation ditches
  - Activated sludge
  - Membrane bio-reactors
  - Sequencing batch reactors
- Key priorities
  - Use BNR
  - Reliable process with lower O&M requirements
  - Easy to expand
  - Low potential for odors
  - Capital and life cycle costs (largest single invest in City's history)
- Selected: BNR oxidation ditches (1.5 MGD)

Early Testing for BNR

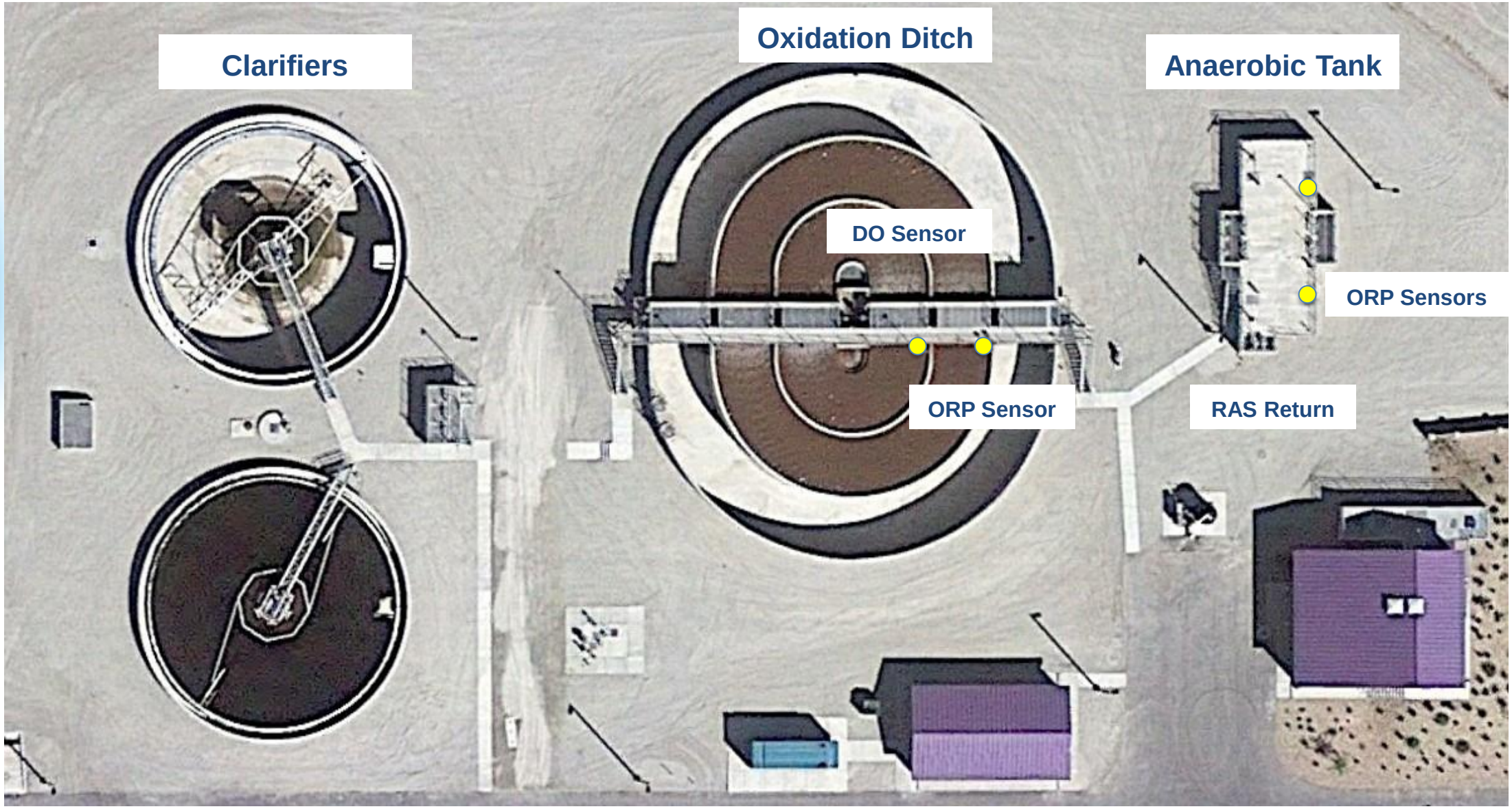
- Tested lagoon influent in 2017
- Early indications were that BPR conditions may not be ideal
- Planned to trim TP level with chemical removal



Treatment Plant Overview

- Influent pumping
- Screening
- Grit removal
- Anaerobic tank
- Oxidation ditch
- Clarifiers
- UV disinfection
- Sludge holding tank
- Screw press
- Chemical removal

BNR System Overview



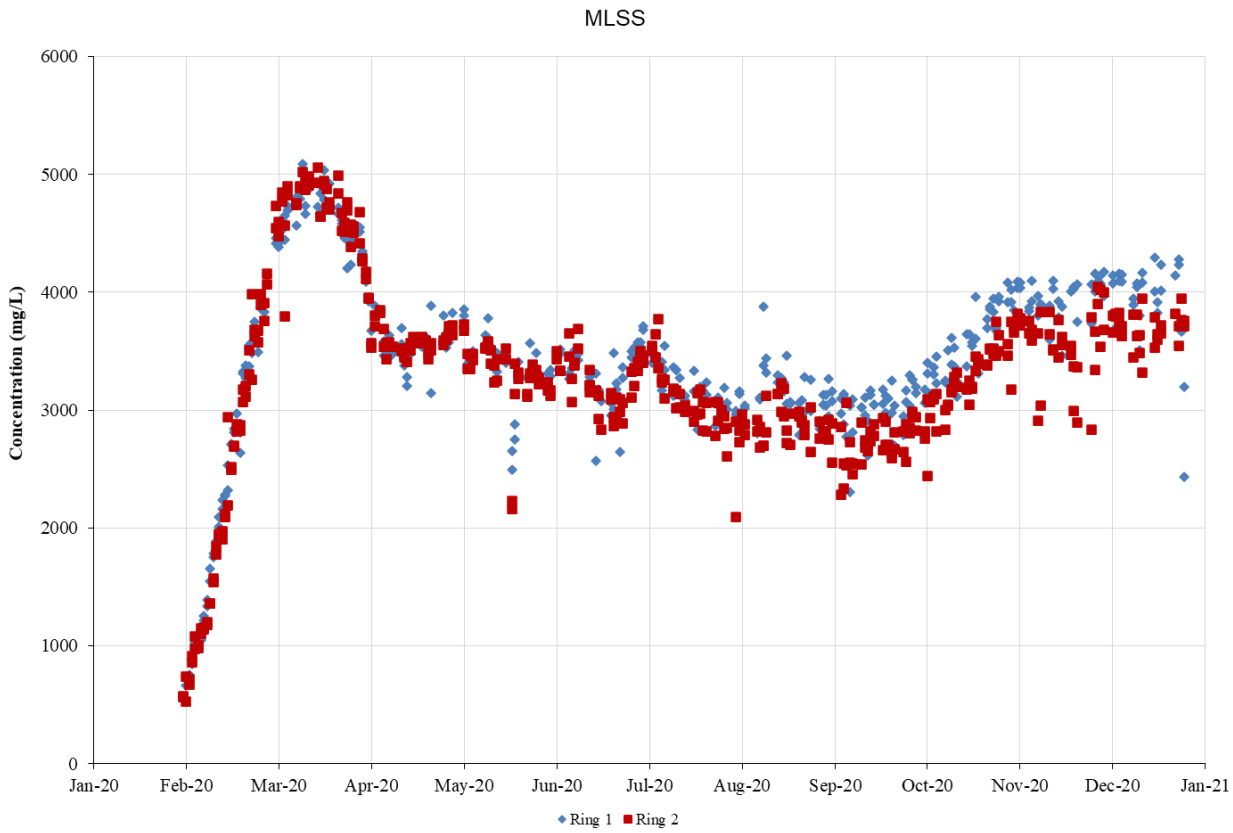
Oxidation Ditch

- Orbal system by Evoqua
- Discs provide aeration and mixing
- Not an RBC
- Uses simultaneous nitrification-denitrification

Oxidation Ditch

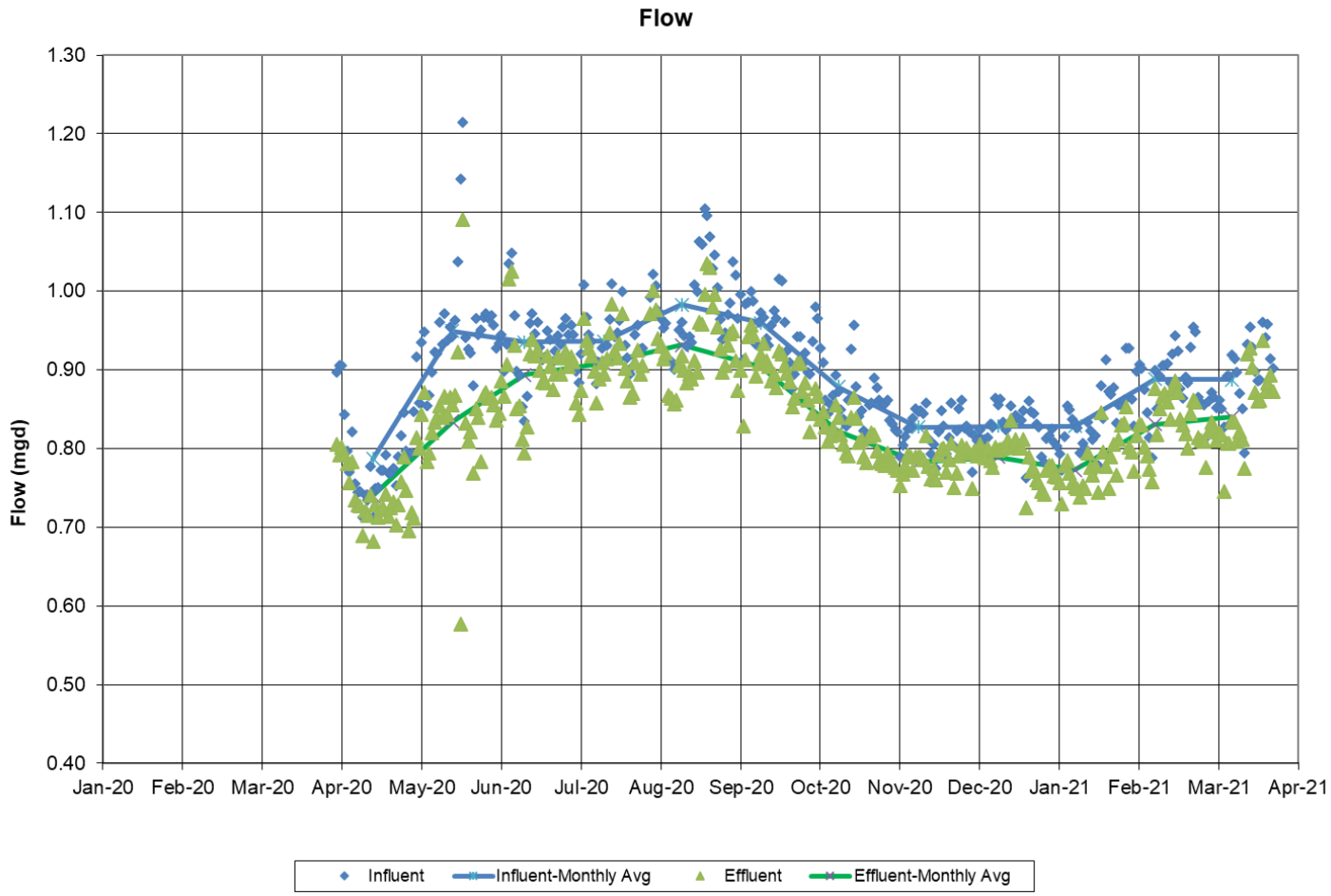
Start Up Procedures

- Began operation in February
- Cold air temps, cold wastewater
- Seed sludge from Santaquin – 20,000 gallons (200 mg/L MLSS)
- Planned to step feed after ditch filled up, but didn't
- Contingency plan to get additional seed sludge from Eagle Mountain



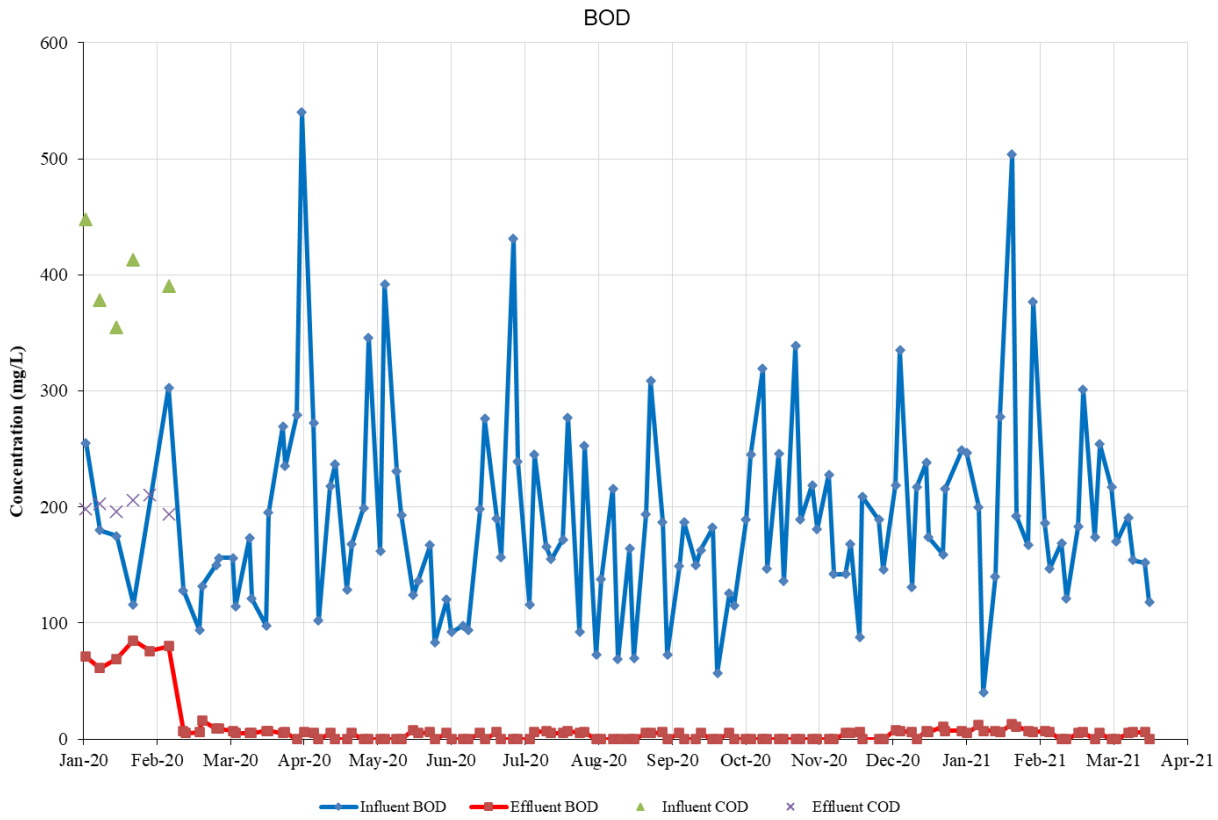
First Year Data – Flow

- Influent average: 0.89 MGD



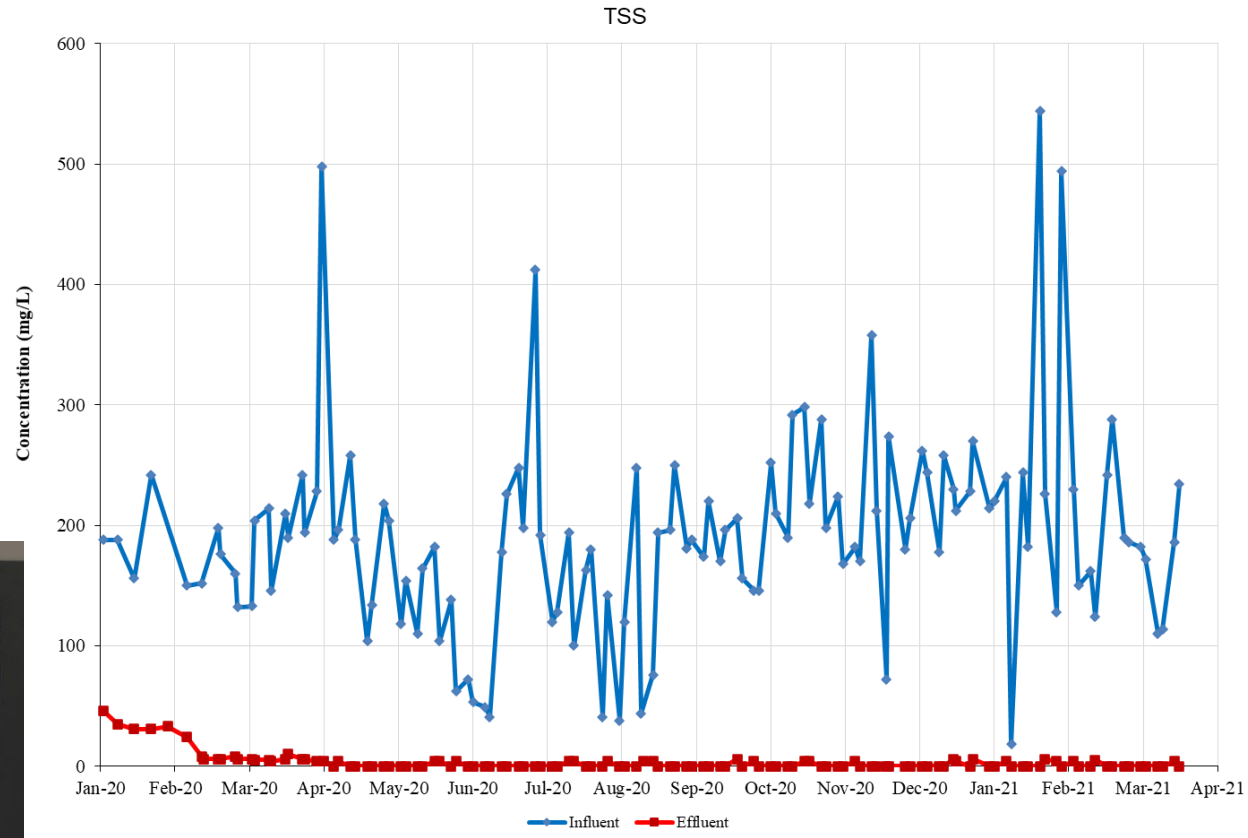
First Year Data – BOD

- Influent average: 189 mg/L
- Effluent: generally non-detect or at detection limit



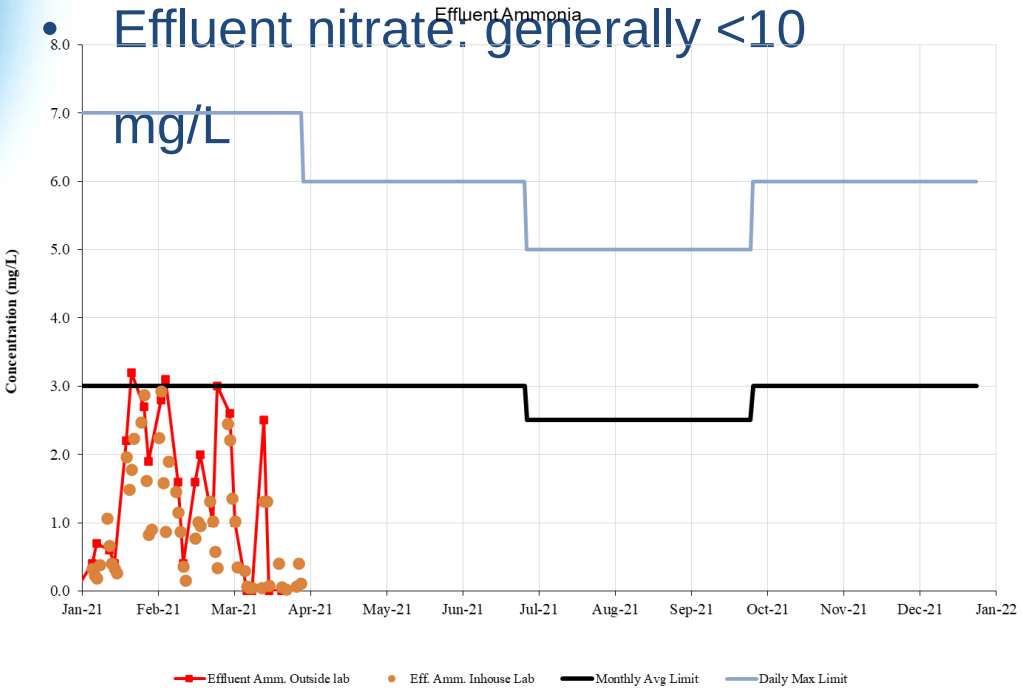
First Year Data – TSS

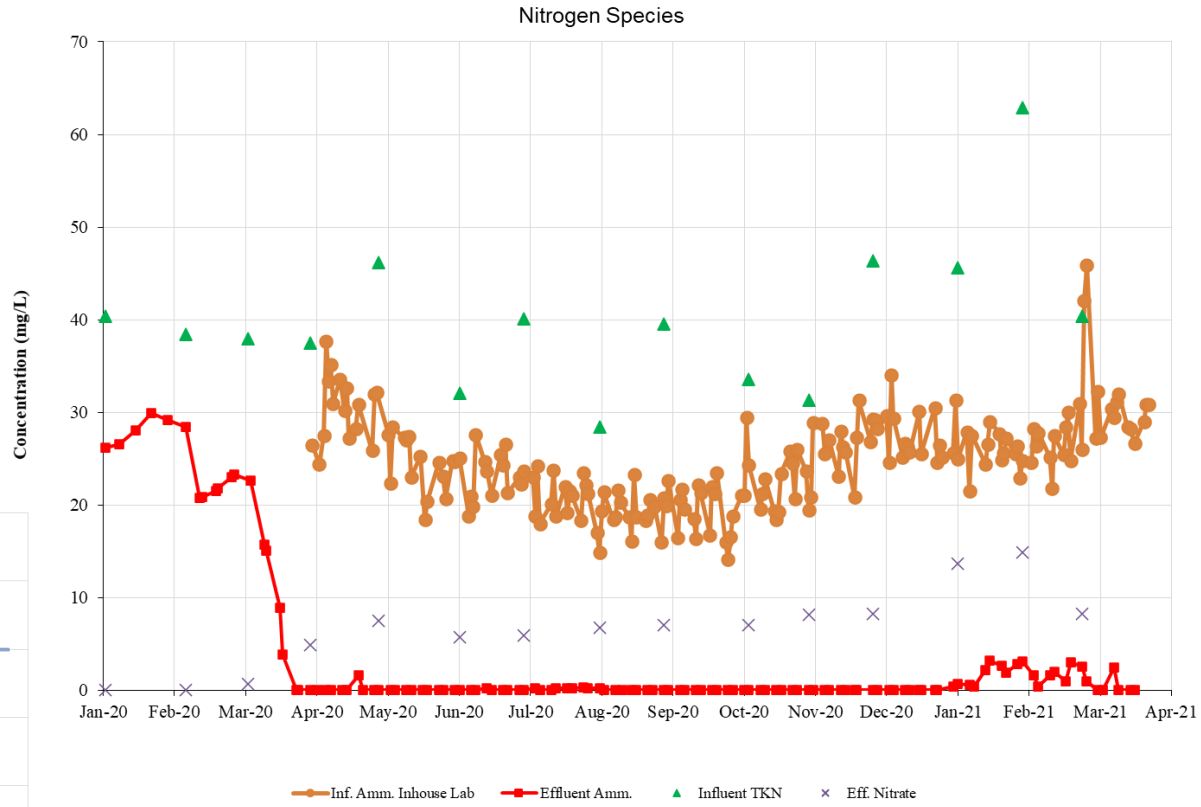
- Influent average: 189 mg/L
- Effluent: generally non-detect or at detection limit
- UV transmittance: low 80% range



First Year Data – Nitrogen

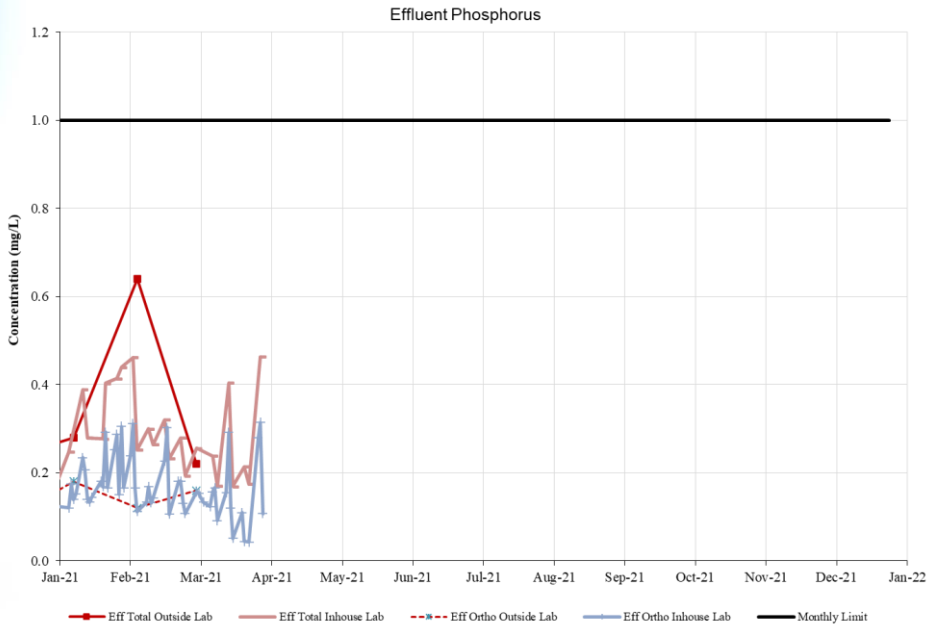
- Influent TKN average: 40 mg/L
- Influent ammonia average: 25 mg/L
- Effluent ammonia: non-detect
- Effluent nitrate: generally <10 mg/L

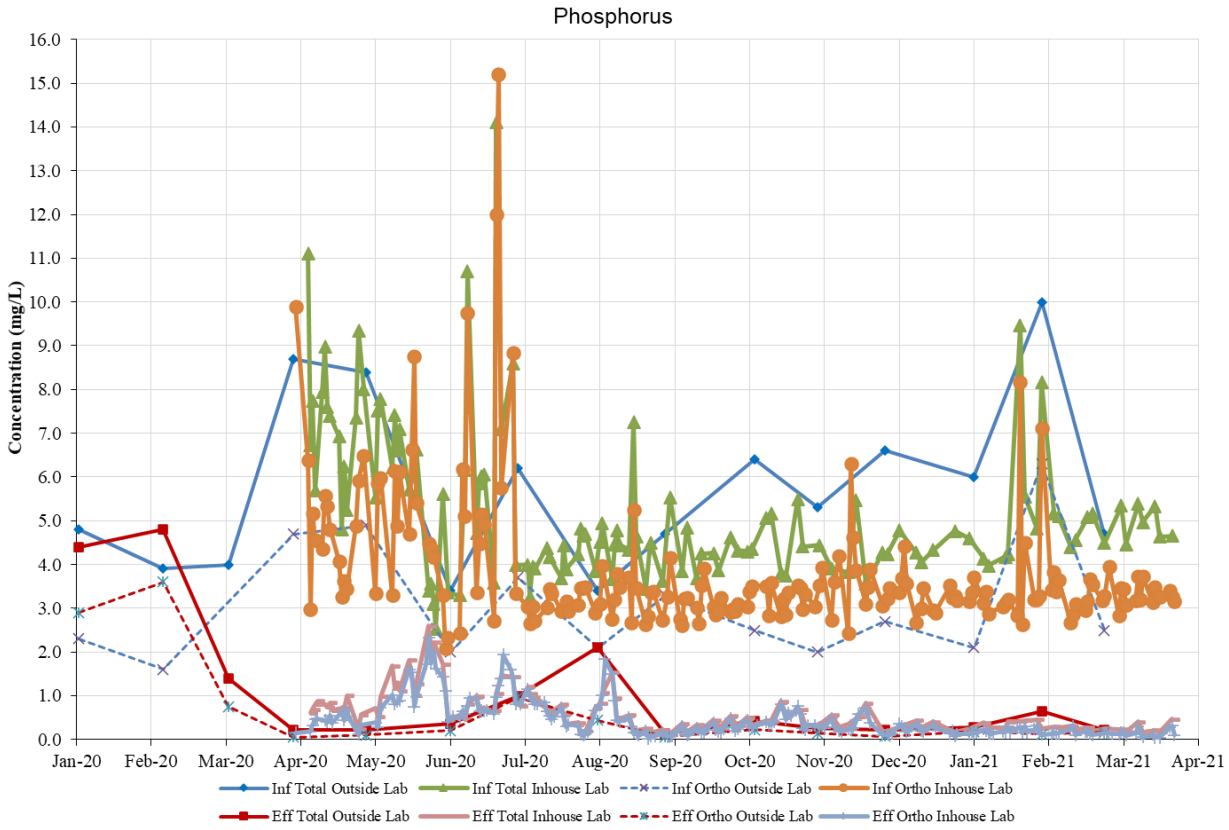




First Year Data – Phosphorus

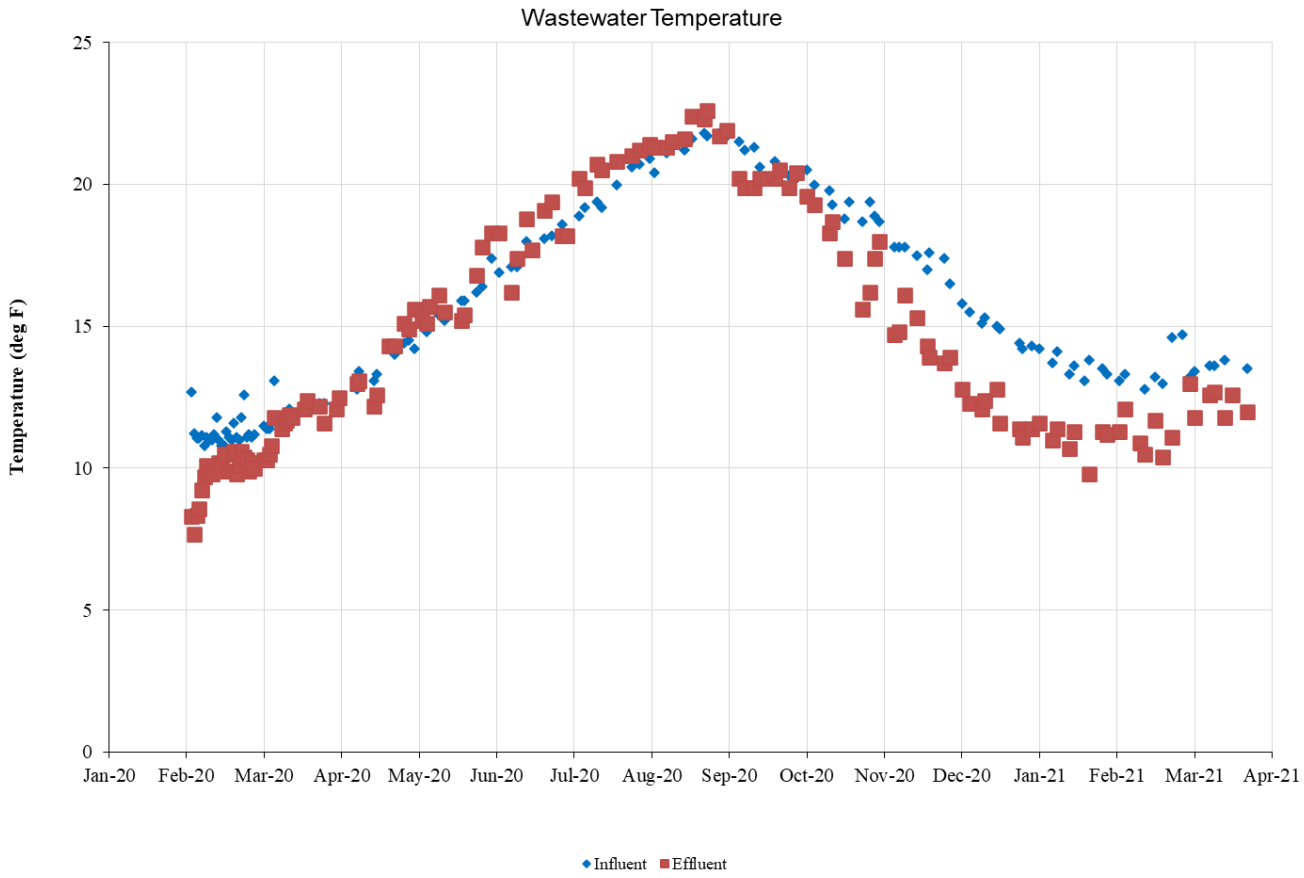
- Influent TP average: 5.3 mg/L
- Effluent TP average: 0.3 mg (since 9/1)





First Year Data – Temps

- Range: 10 – 22 deg C



Exciting Trends

- Rapid development of biology
  - MLSS at 4,500 mg/L within 30 days
  - Full nitrification within 60 days
  - Phosphorus removal dialed in within 6 months
- BNR is working well, no chemicals required
- Varied microbiology – DNA testing
  - PAOs: 9 species present; Accumulibacter dominant; also Acinetobacter and Tetrasphera
  - Ammonia oxidizers: 3 species present, primarily Nitrosomonas
  - Nitrite oxidizers: 3 species present, including Nitrobacter; Nitrospira dominant
  - Nitrate reducers: 30 species present, including Pseudomonas
  - Nitrospira: COMAMMOX (complete ammonia oxidation) – ammonia and nitrite oxidation in one organism

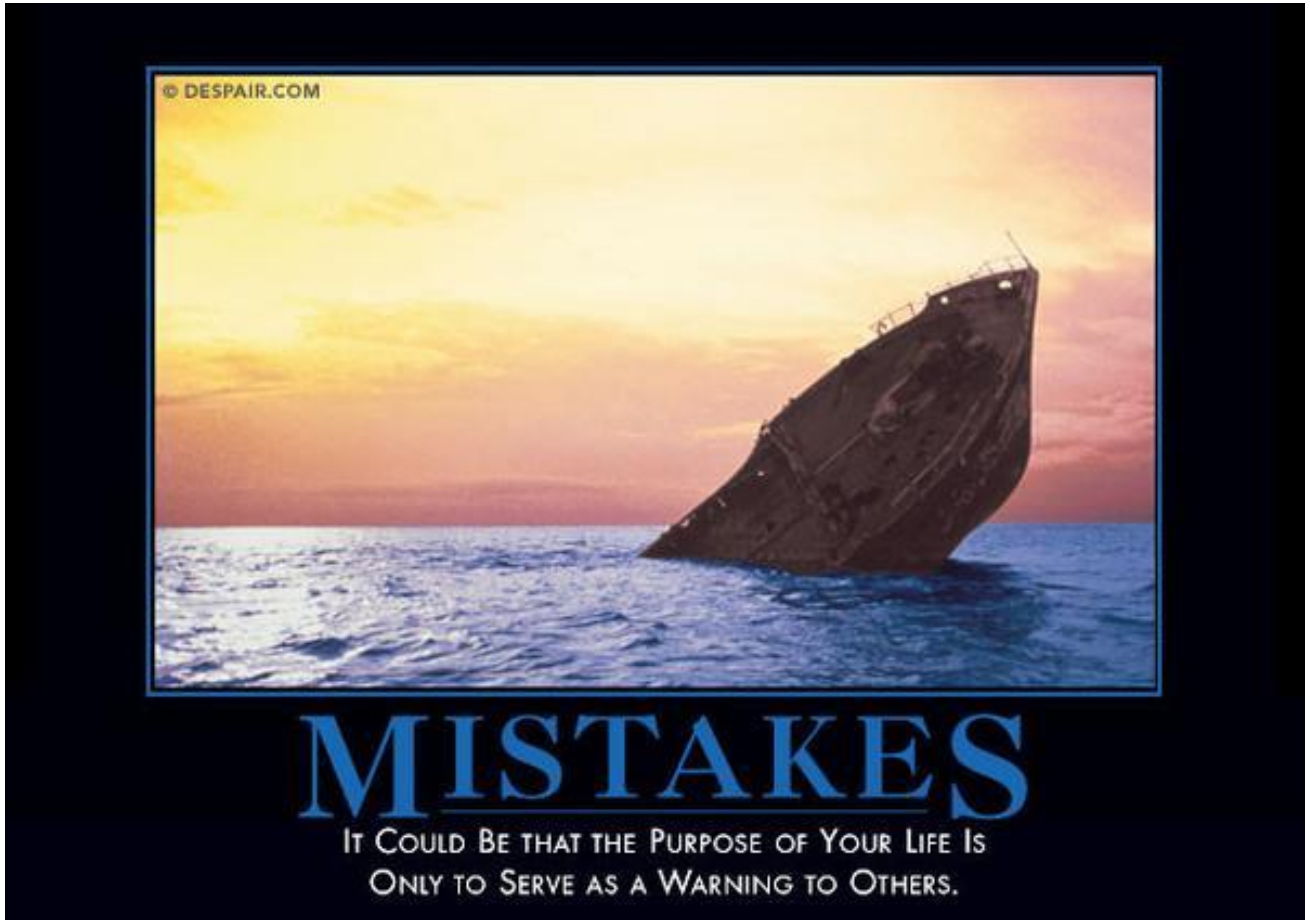
Industrial Pretreatment – Plans?

- Pretreatment Program?
- Local Limits ?
  - Sampling Plan
    - Locations
      - SIU’s vs Residential
    - Pollutants of concerns
    - Sampling
      - Frequency
      - Dates
      - Procedures

Recognition of the Team

- Salem WRF Staff: Mike Pritchett, Loren Willes, Allison Taylor
- Statepoint: Paul Krauth
- Forsgren Engineering: Jason Broom
- City: Mayor, council, and staff

Questions?



- Email: lorenw@salemcity.org