Springfield Water and Sewer Commission

Disinfection Byproducts Update

November 2020

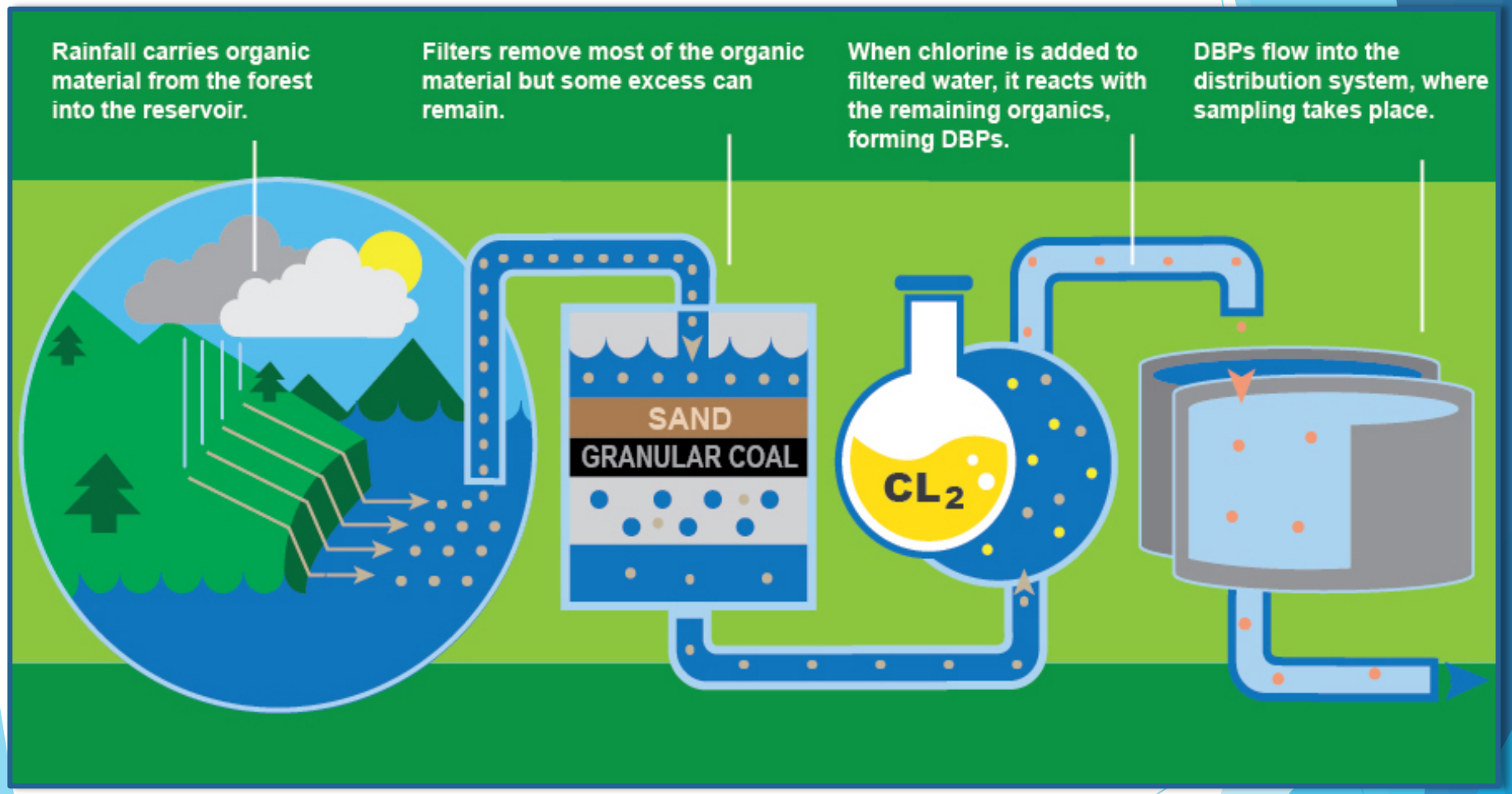
Agenda

- Disinfection Byproducts
  - Formation
  - Compliance Rules
- Current situation
  - Organics
  - Chlorine Dose
  - DBP Compliance
- Pilot Plant results
  - Half-plant trial
- The future
  - Short-term and Long-term Strategies

Cobble Mountain Reservoir 9/29/20

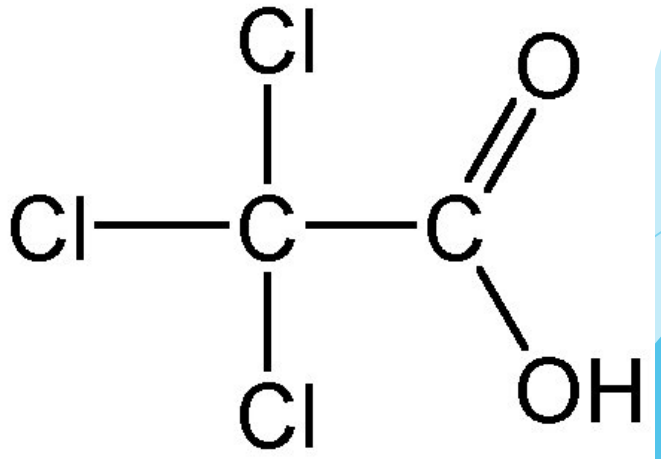
Disinfection Byproducts

How They Form



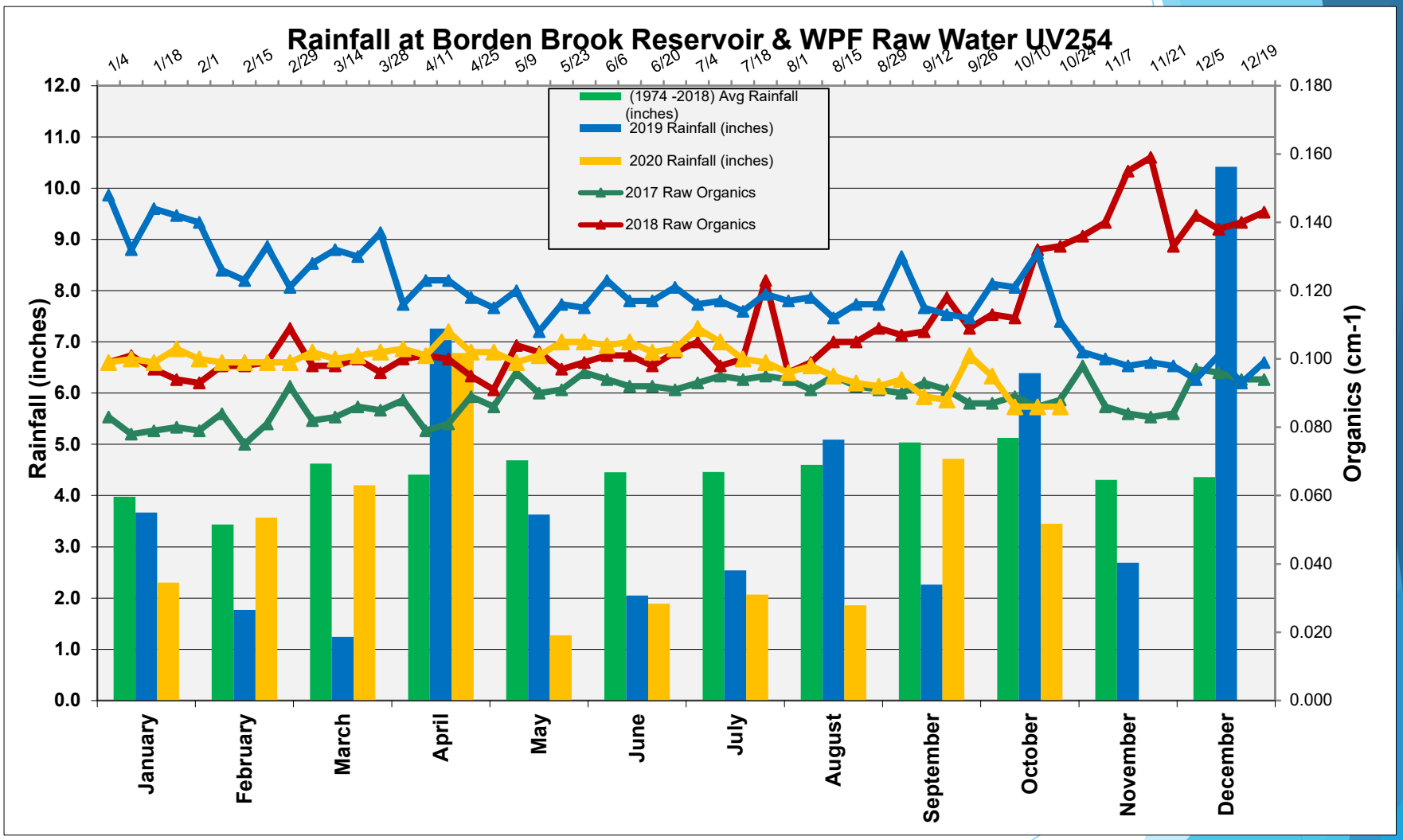
Disinfection Byproducts Rule

- Stage 1 DBPR – February 1999
  - Running Annual Average of **ALL** samples
  - High DBP results averaged out by low results
- Stage 2 DBPR began April 2012
  - **Locational** Running Annual Average
  - Much more sensitive
  - Operational Evaluation Level (OEL)
    - Evaluate treatment practices

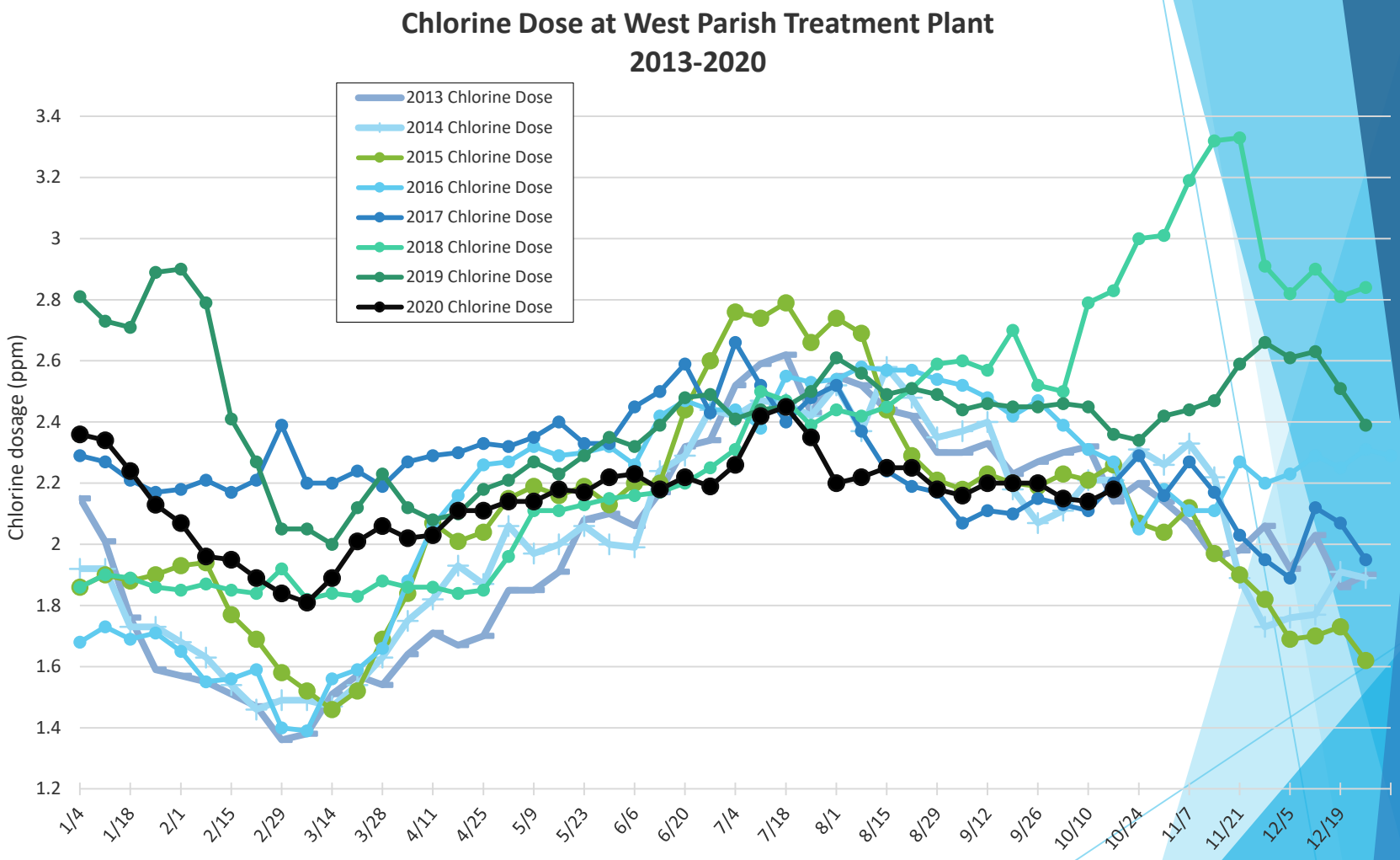


Trichloracetic Acid (TCAA)

Current Conditions: Organics



Current Conditions: Chlorine Dose



Current DBP Regulatory Situation

September 1, 2020 Sampling – Quarter 3

TTHM

- Maximum Contaminant Level (MCL) is Location Running Annual Average (LRAA) of 80 ppb
- Current range for 8 locations: 51.0 - 63.5 ppb
- Continued Compliance

HAA5

- MCL of LRAA of 60 ppb
- Two sample locations currently exceed MCL at 60.5 and 63.8 ppb
- Six other sample locations in compliance

Current Conditions: DBP Compliance

HAA5	2019								2020							
	QTR1		QTR2		QTR3		QTR4		QTR1		QTR2		QTR3		QTR4	
	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA
Chapin St Pump Ludlow	64.9	59.6	58.2	62.3	50.8	58.9	52.4	52.6	51.1	50.5	64.6	57.9	57.5	58.6		
1400 State St (Vibra)	67.0	65.7	72.5	71.0	72.4	75.2	72.5	69.1	60.3	66.7	65.1	67.3	56.8	60.4		
833 Page Blvd	65.0	63.6	70.1	68.1	65.2	70.3	69.2	65.5	55.8	62.2	59.5	60.9	52.3	56.8		
322 Main St	67.6	62.9	67.5	66.6	64.8	69.0	66.4	65.3	55.2	59.7	64.9	63.1	56.9	60.3		
North Main St Fire	71.6	65.8	75.7	72.6	74.7	77.4	58.5	65.2	51.5	58.9	51.3	55.9	52.5	49.5		
Center St Fire Ludlow	64.3	58.5	68.6	63.8	72.6	70.6	72.1	71.6	59.1	65.1	69.2	68.1	60.4	63.8		
1043 Sumner Ave	67.6	63.2	73.7	69.4	71.3	73.3	75.9	72.9	58.6	66.7	62.8	64.5	54.8	60.5		
Catalina Pump	63.3	59.0	67.3	63.3	69.4	68.4	73.6	70.9	60.4	65.7	59.5	63.2	49.0	56.9		

TTHMS	2019								2020							
	QTR1		QTR2		QTR3		QTR4		QTR1		QTR2		QTR3		QTR4	
	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA	OEL	LRAA
Chapin St Pump Ludlow	62.6	64.2	60.2	64.1	62.4	62.9	70.3	64.3	59.9	62.8	64.9	65.2	59.9	63.5		
1400 State St (Vibra)	48.8	49.4	51.0	51.4	53.1	51.8	58.5	54.1	49.1	52.9	52.2	53.0	50.0	51.9		
833 Page Blvd	47.4	48.0	49.1	49.3	51.2	50.0	57.5	53.0	48.1	51.4	51.6	51.9	49.0	51.4		
322 Main St	48.4	49.1	50.8	50.9	51.6	51.2	55.6	52.1	47.0	50.9	51.5	51.3	50.2	51.0		
North Main St Fire	47.4	48.1	48.3	49.6	51.7	49.7	57.5	52.8	48.1	51.5	2.5	52.7	49.8	51.8		
Center St Fire Ludlow	57.0	57.6	57.3	59.1	60.1	59.5	65.5	60.6	55.8	59.3	59.5	60.5	55.8	58.4		
1043 Sumner Ave	53.1	53.7	55.3	55.6	57.2	56.8	62.0	57.6	52.8	56.5	55.8	56.9	51.1	54.2		
Catalina Pump	56.6	58.2	57.4	59.0	56.8	58.3	63.6	58.5	53.6	57.3	62.2	60.2	56.6	59.3		

Pilot Water Treatment Plant

Underway – Evaluates Process Performance

Pilot Water Treatment Plant

Underway – Evaluates Process Performance

Schedule

- Season 1: Oct 7, 2019 – Dec 18, 2019
- Season 2: May 4, 2020- June 12, 2020
- Season 3: Phase 1 Aug 17, 2020 – Sept 4, 2020

  Phase 2 Oct 5, 2020 – Nov 13, 2020
  (2 weeks in parallel with SUEZ DAF trailer)

Season 1 and 2 complete

- Pre-oxidation process ruled out / ineffective
- Dissolved air flotation (DAF) – most effective process
- Study effectiveness of coagulants in season 2 and 3 for DAF and Direct Filtration

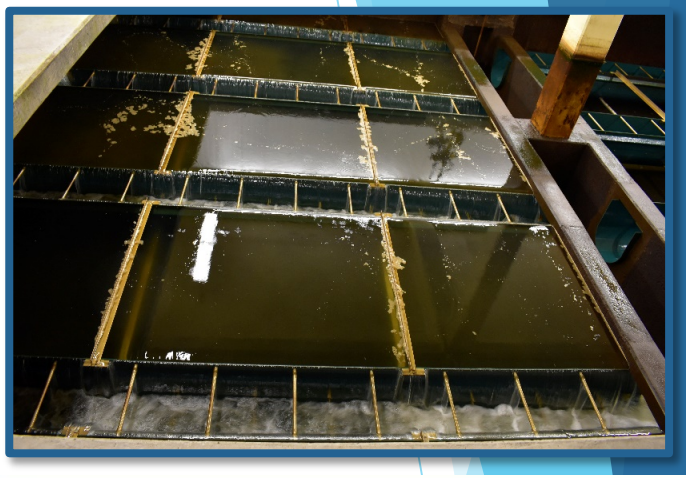
Possible Short-Term Process Improvements

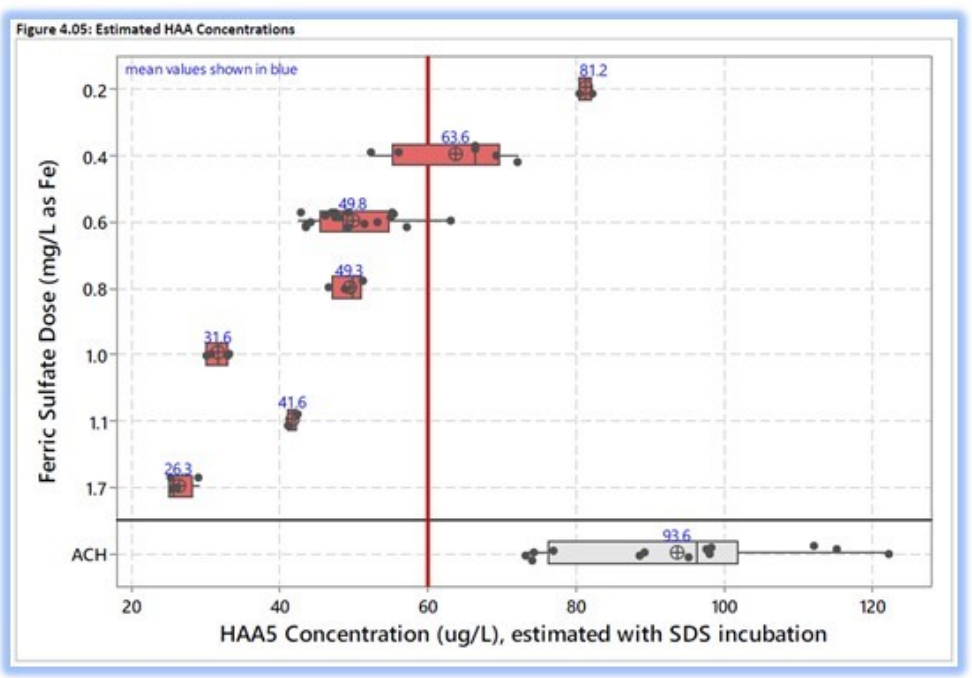
- Use of ferric sulfate as a new coagulant in existing Direct Filtration process
- Promising significant DBP reduction
- Winter trial at full scale (1/2 plant flow) – pending DEP approval

Pilot Plant: Ferric Sulfate

Direct Filtration Half-plant Trial

- Organic removal improved with ferric sulfate
- Ferric sulfate commonly used in other plants
- Optimal dose of >0.20 mg/L- 0.6mg/L
- UFRV remain similar to current plant
- Fall 2020- Half Plant Trial using Ferric Sulfate
  - 3 filters remain as control
  - Simulated Distribution System testing





Short Term Strategies - Ongoing

Optimize System Performance

Optimized chlorine dosing

- Reviewed daily

Coagulant optimization trials

- Pilot Plant evaluation through Oct 2020- early November
- Winter 2020 – half-plant trial planned (pending MASS DEP approval)

Reduce water storage time (age)

- Reducing water storage in winter months
- Added storage tank mixing

Maximize NOM removal

- Slow Sand Filter vs. Rapid Sand Filtration

Distribution System Flushing

- Aids in reducing chlorine dosage

Long Term Solutions- Capital Planning

New West Parish Filters Treatment Process

New Treatment Plant – Preliminary Based on Pilot Plant

- 60 MGD Dissolved Air Flotation (DAF) Clarification Process
- Rapid Sand Filter Upgrades
- New Electrical System
- New Chemical Storage and Feed Building

New Treatment Plant - Design

- Design schedules for FY22-FY23
- $1.944 million

New Treatment Plant - Construction

- FY24 - FY27
- $86.04 million

Looking Ahead

Treatment – Next Steps

- Completion of the Pilot Treatment Plant
- Commence Winter 2020 Coagulant Trial (1/2 plant – full scale)- after MASS DEP approval
- If Ferric Trial is Effective, Permit Full-Time Use in Winter/Spring 2021
- Begin Design of New Process Upgrades