

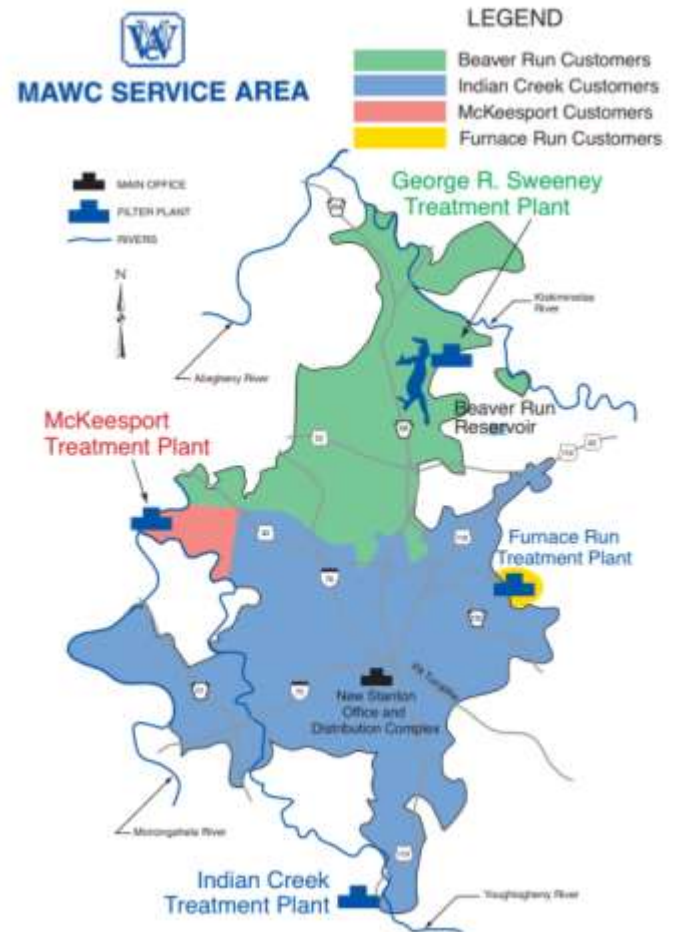


Peracetic Acid as a Pre-oxidant for DBP Reduction

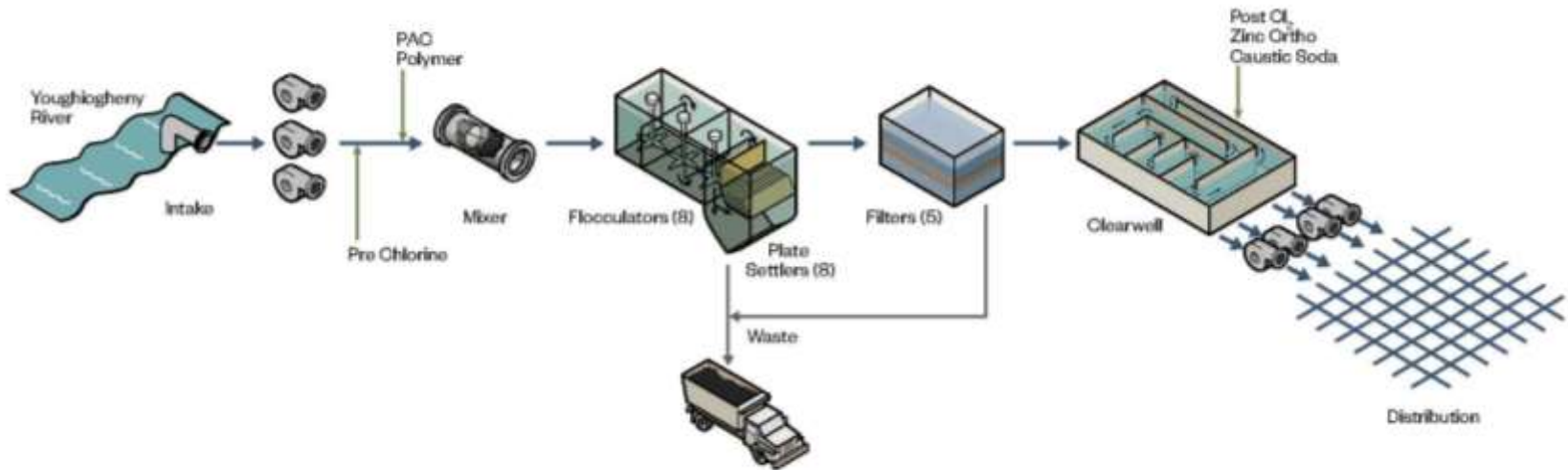
Aron Griffin & Jim DeWolfe – Hazen
Sarah Kocak & Mark Stoner - MAWC

Municipal Authority of Westmoreland County (MAWC)

- **McKeesport WTP**
 - 10 MGD
- George R Sweeny WTP
 - 24 MGD
- Indian Creek WTP
 - 40 MGD
- Johnstown Interconnect
 - 3 MGD

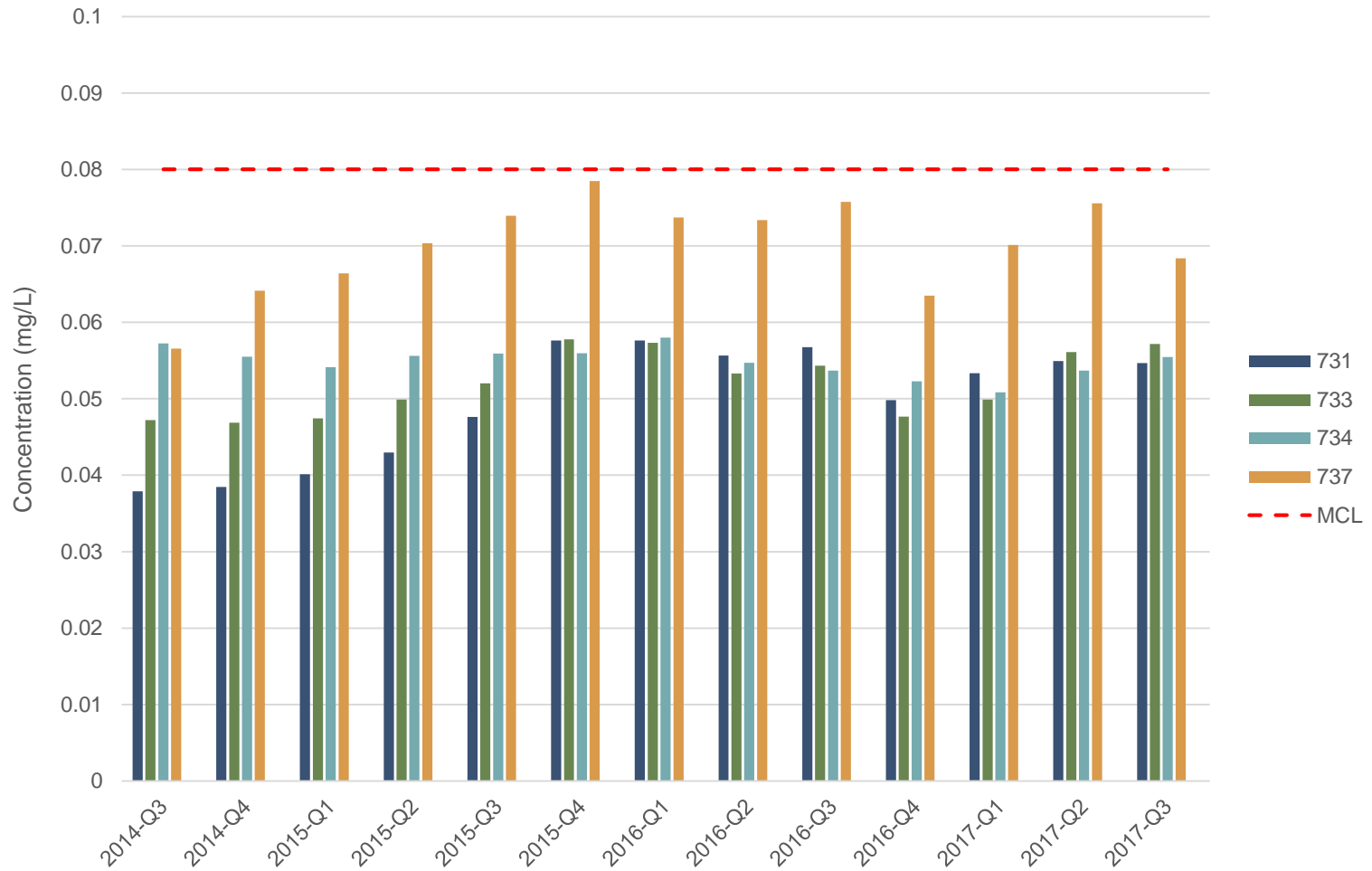


McKeesport WTP

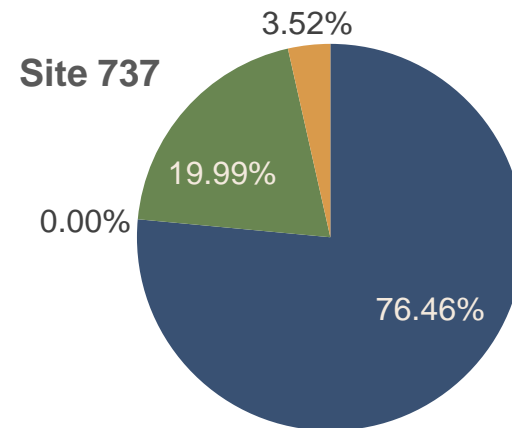
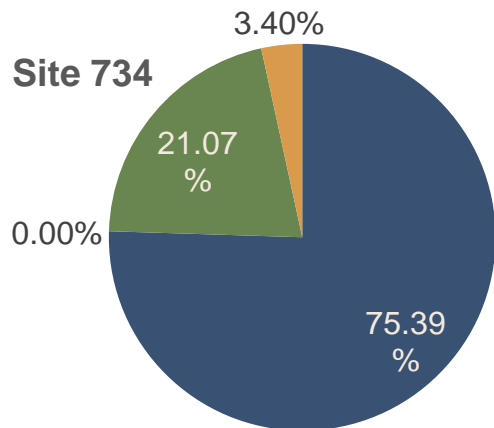
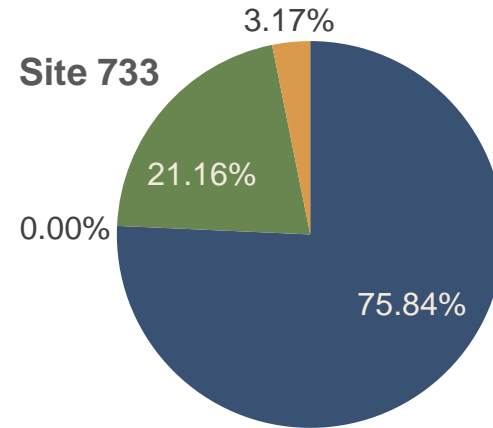
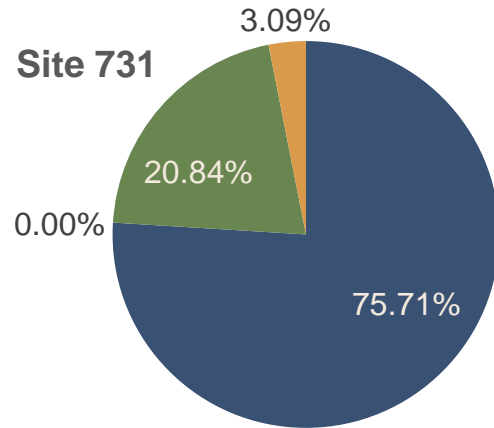


- Elevated surface water temperatures
- **Elevated DBP concentrations – no exceedances!**

THM LRAA

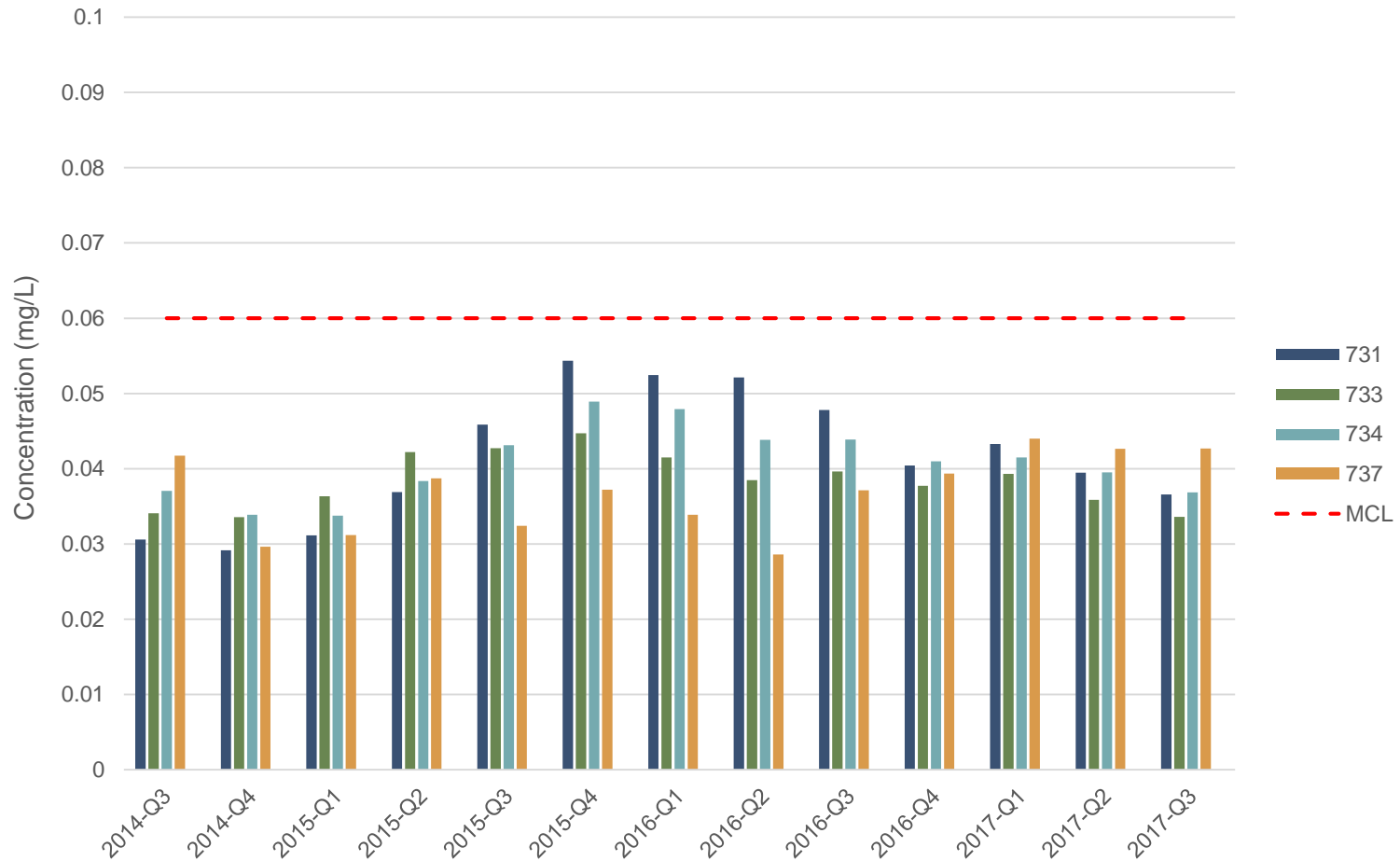


Average THM Speciation (Q1 2015 - Q2 2017)



■ CHLOROFORM ■ BROMOFORM
■ BROMODICHLOROMETHANE ■ CHLORODIBROMOMETHANE

HAA5 LRAA



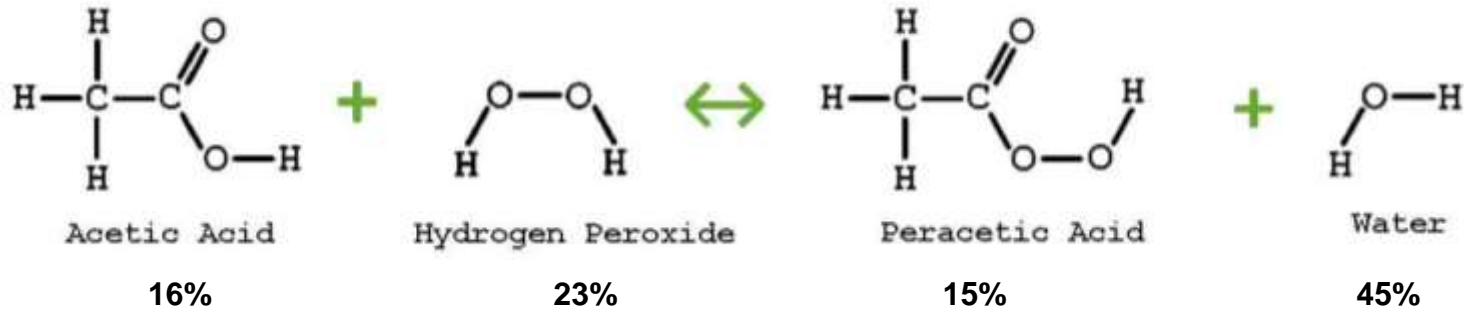
- Primarily di- & tri- chloroacetic acid

DBP Reduction Strategies

- Cover clarifiers
- Tank aeration
- Alternative pre-oxidant
 - Permanganate
 - Chlorine Dioxide
 - Ozone
 - **Peracetic Acid**



Peracetic Acid (PAA) – NSF 60 Approved



Oxidant	Standard Potential (V)
Hydroxyl Radical	2.80
Ozone	2.07
Peracetic Acid	1.81
Hydrogen Peroxide	1.78
Potassium Permanganate	1.68
Chlorine Dioxide	1.57
Chlorine	1.36

Jar Testing Methods

- Assess polymer/coagulant sequence
- Determine optimum pre-oxidant dose
 - NaMnO_4 and PAA
- Evaluate treatment efficacy
- Assess DBP formation



Coagulant / Polymer Sequence

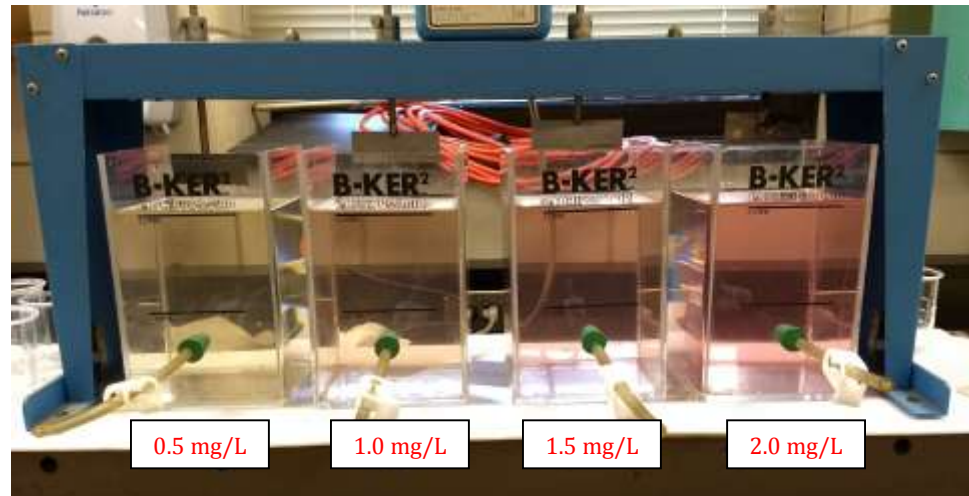
- Inconclusive
- Warrants further investigation

Sequence	5 Min Settled NTU	10 Min Settled NTU
No Polymer	1.1	0.52
No Polymer	1.0	0.44
Polymer before Coagulant	1.0	0.45
Polymer after Coagulant	1.3	0.50



Optimum Pre-oxidant Dose

- PAA - HACH DPD w/ correlation factor
 - 0.105 mg/l PAA or 0.7 mg/l PAA product
- Permanganate – visual test
 - 0.7 mg/L NaMnO_4



Pre-oxidant Treatment Efficacy

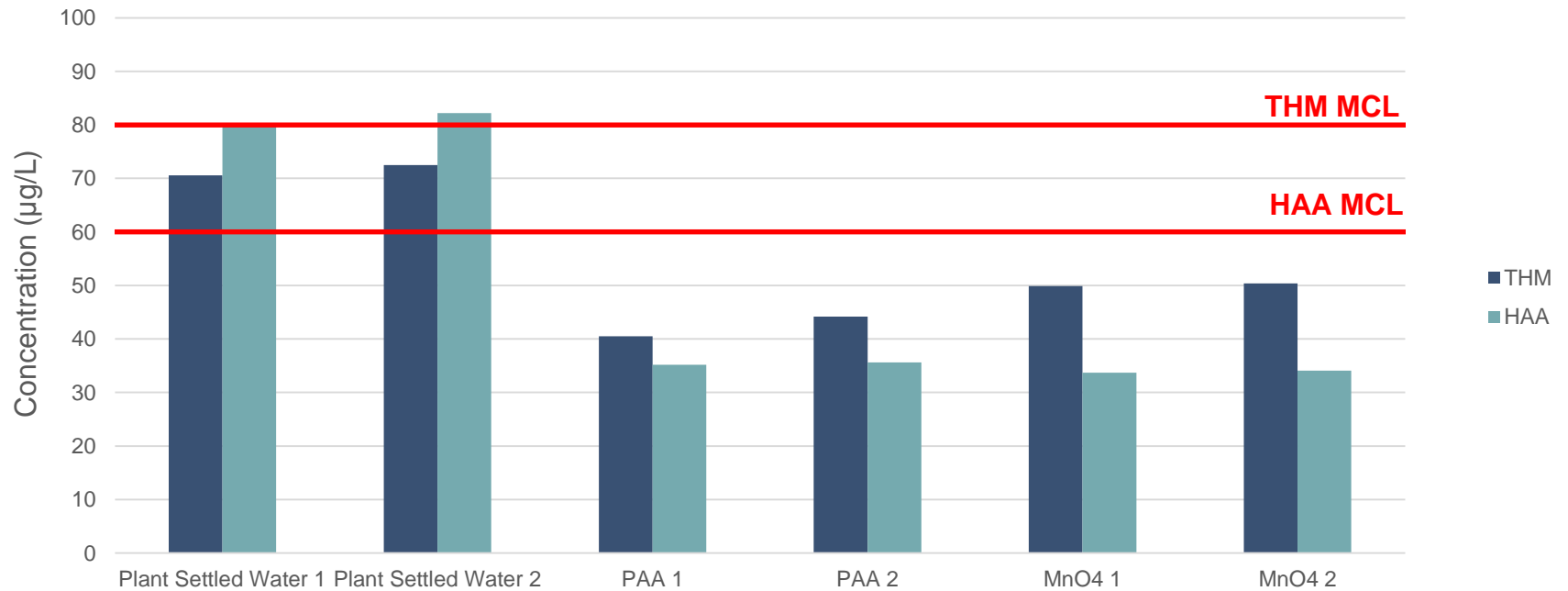
Parameter	Pre-oxidant	Raw	Settled	Reduction
Turbidity (NTU)	Plant Settled Water (Cl ₂)	4.00	1.14	72%
	PAA		1.10	73%
	NaMnO ₄		1.18	71%
TOC (mg/L)	Plant Settled Water (Cl ₂)	2.57	2.03	21%
	PAA		1.88	27%
	NaMnO ₄		1.82	29%
UV-254 (UVA)	Plant Settled Water (Cl ₂)	0.080	0.053	34%
	PAA		0.049	39%
	NaMnO ₄		0.049	39%

- Increased TOC removal and UV-254 absorbance

	Plant Settled Water 1	Plant Settled Water 2	PAA 1	PAA 2	MnO ₄ 1	MnO ₄ 2
MPN	5.9	6.5	15.6	5.6	5.3	2.8

- Similar heterotrophic plate count MPN

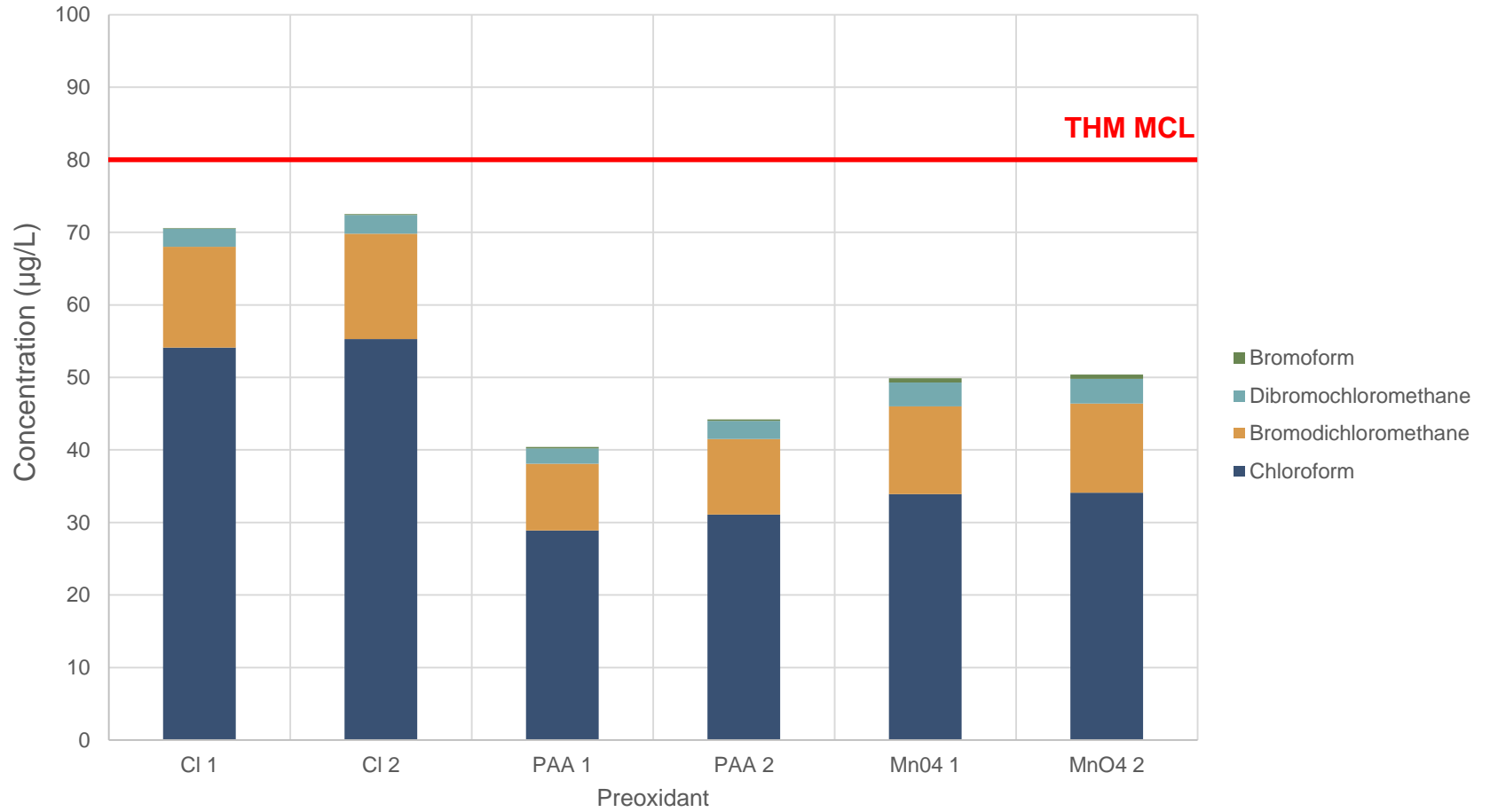
Simulated Distribution System Test



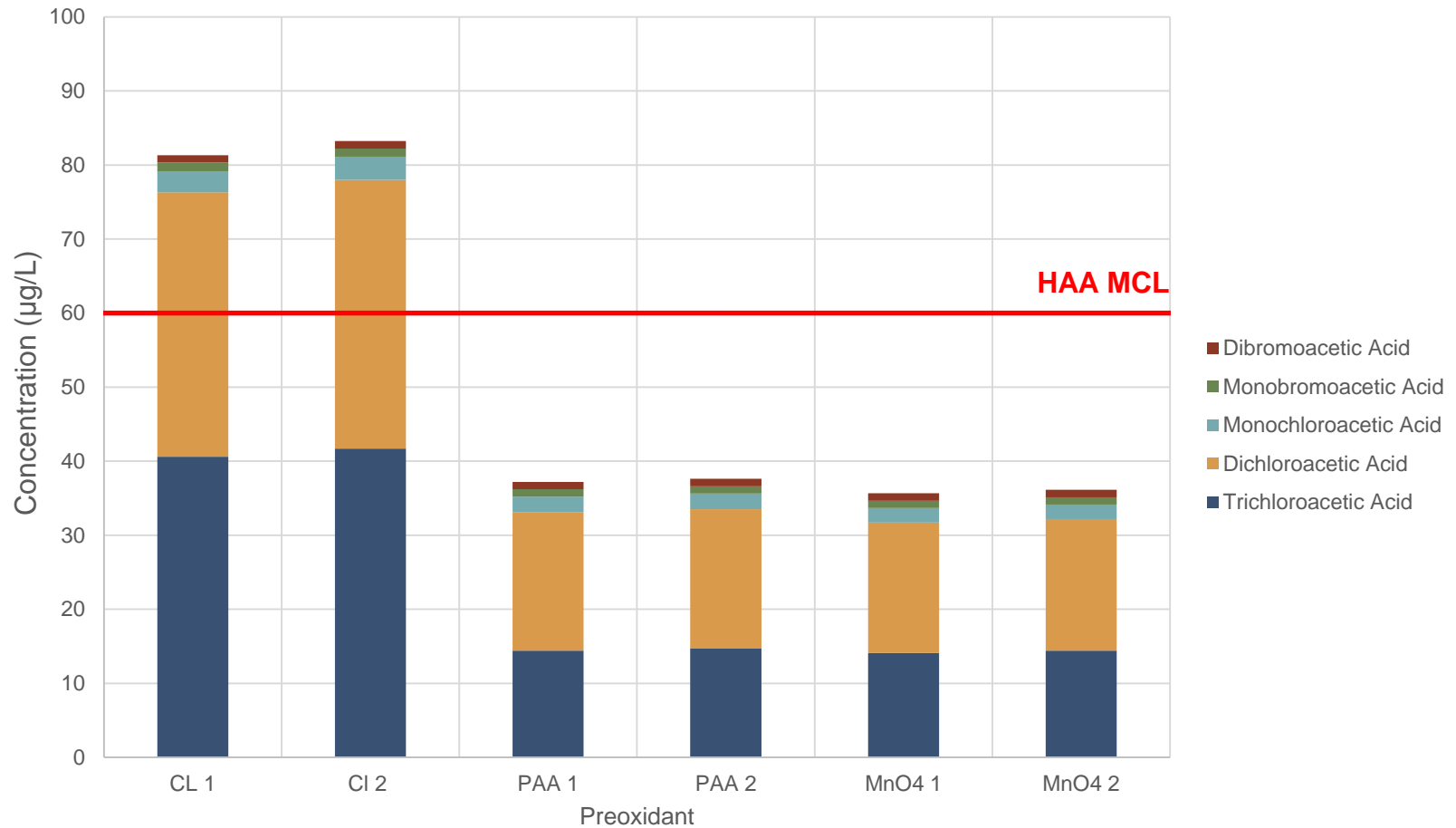
**41% THM & 56%
HAA REDUCTION**

**30% THM & 58%
HAA REDUCTION**

THM Speciation

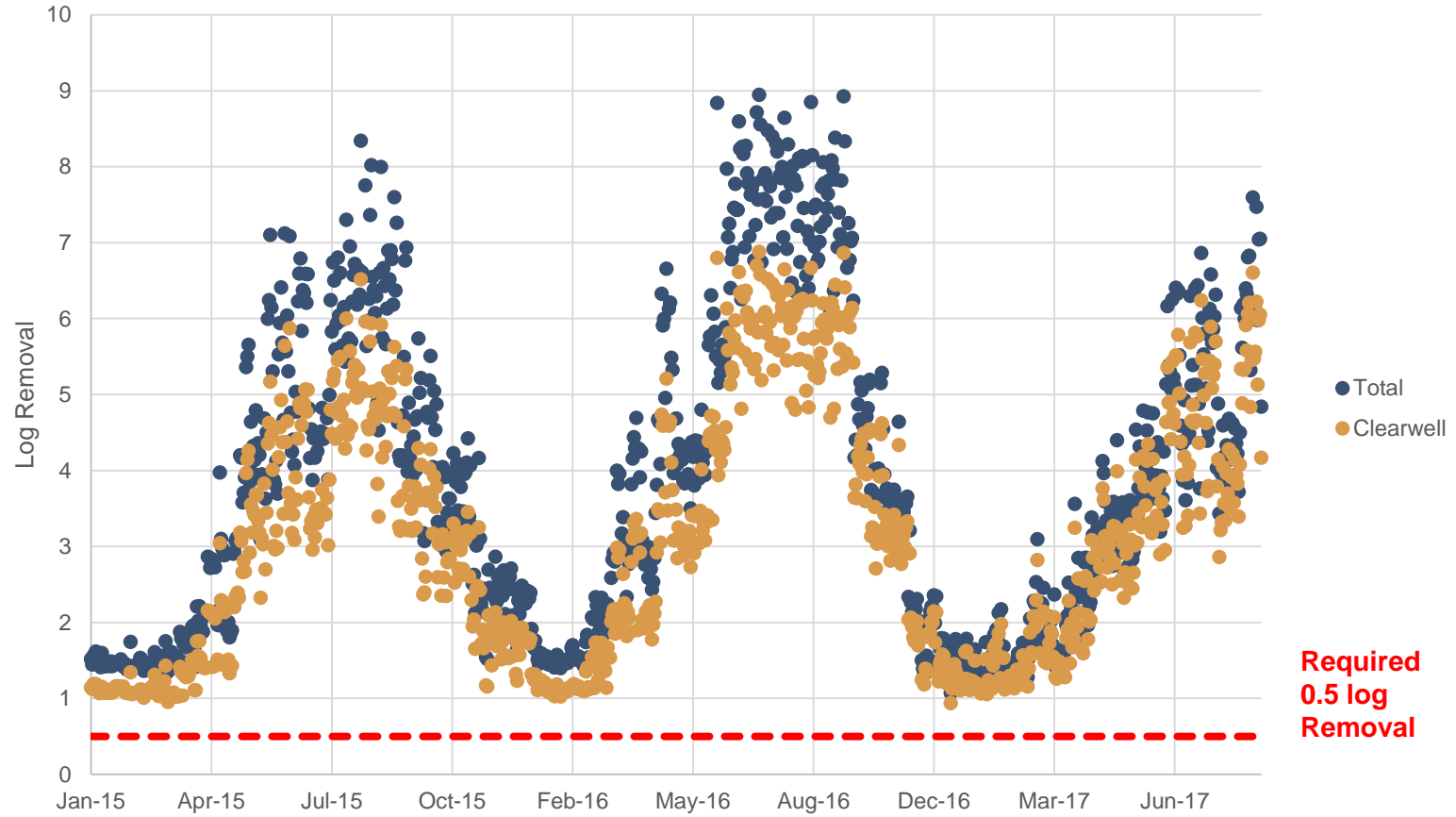


HAA5 Speciation



Ensure Maintenance of CT

Giardia Log Removal



PRELIMINARY!! – Cost Comparison

	Dose	Capacity	Usage	Unit Price	Total Price	
	mg/L	MGD	lb/Day	\$/lb	\$/month	\$/year
PAA	1*	10	83.4	\$0.75*	\$1,900	\$22,800
NaMnO4	1	10	83.4	\$4.15**	\$10,400	\$126,300

- Only chemical costs
- Only one source water condition
- **PRELIMINARY!!**

Next steps

- Change chlorine feed location
- Optimize coagulation
- Further evaluate alternative pre-oxidant
 - **Coordinate pilot testing with DEP**
- Continue installation of tank aeration

Questions?

