Pilot Testing Project Report:

A study to reduce disinfection by-products in Red Rock Indian Band's drinking water supply

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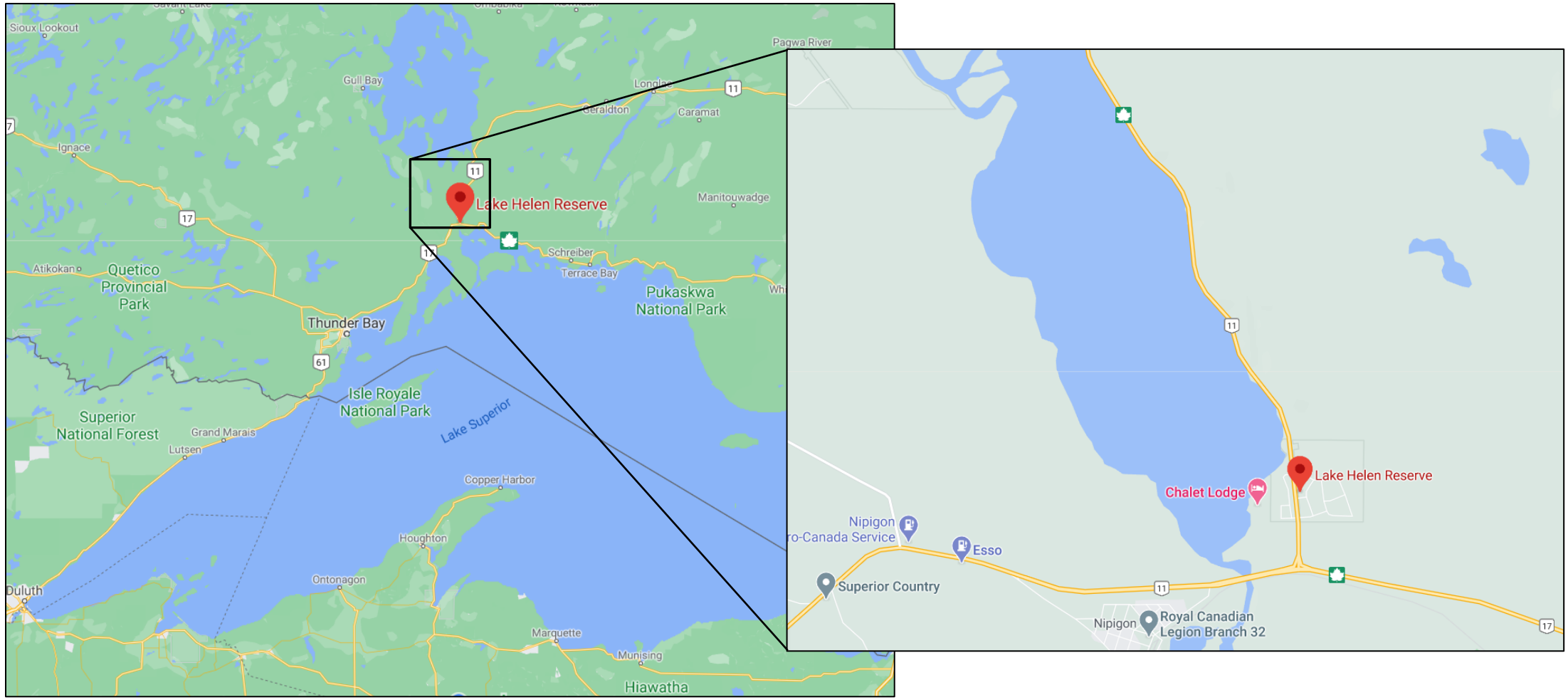
Introduction



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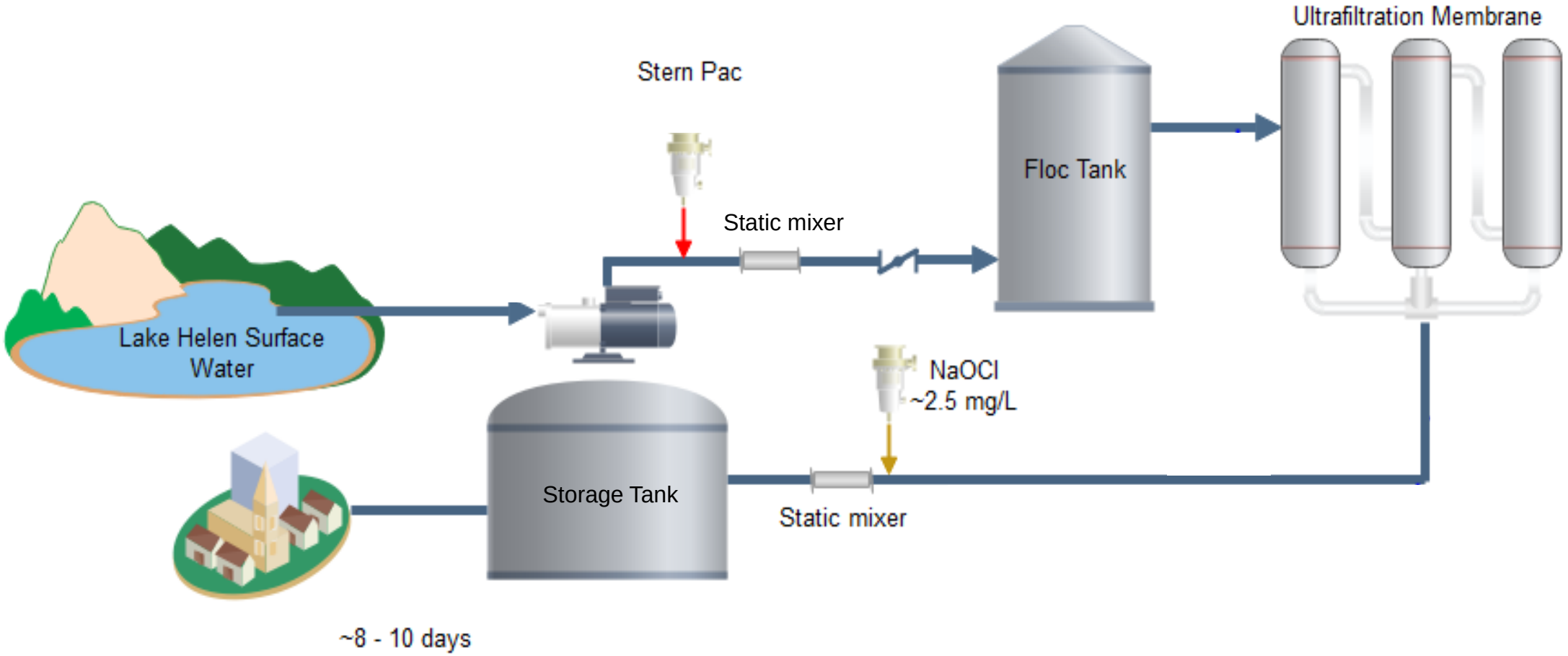
Introduction



Challenges

Disinfection by-products (DBPs) were above the Maximum acceptable concentration (MAC) since 2015

- Trihalomethanes (THMs) > 100 µg/L
- Haloacetic acids (HAAs) > 80 µg/L

Project Outline

Jar Test

- Optimum coagulant and dose
- Detention time in storage tank/ distribution system

Pilot

- GAC filtration (Bituminous and Coconut)
- Implement effective real-time organic monitoring

Project Limitations

Water Quality	Operational (UF)
Low alkalinity (~ 45 mg/L) (30-500 mg/L OG)	Coagulant dose range (2-10 mg/L)
Cold water (~ 1 - 8 ºC)	
Raw DOC (5.8 mg/L)	Long detention time in distribution for fire protection
Treated DOC (3.4 mg/L)	

OG: operational guideline;
Raw pH = 7.0 - 8.2

Bench Scale Expectations

Specific Ultraviolet Absorbance (SUVA)

$$SUVA = [UVa\ (cm^{-1}) / DOC\ (mg/L)]\ X\ 100\ cm/m$$

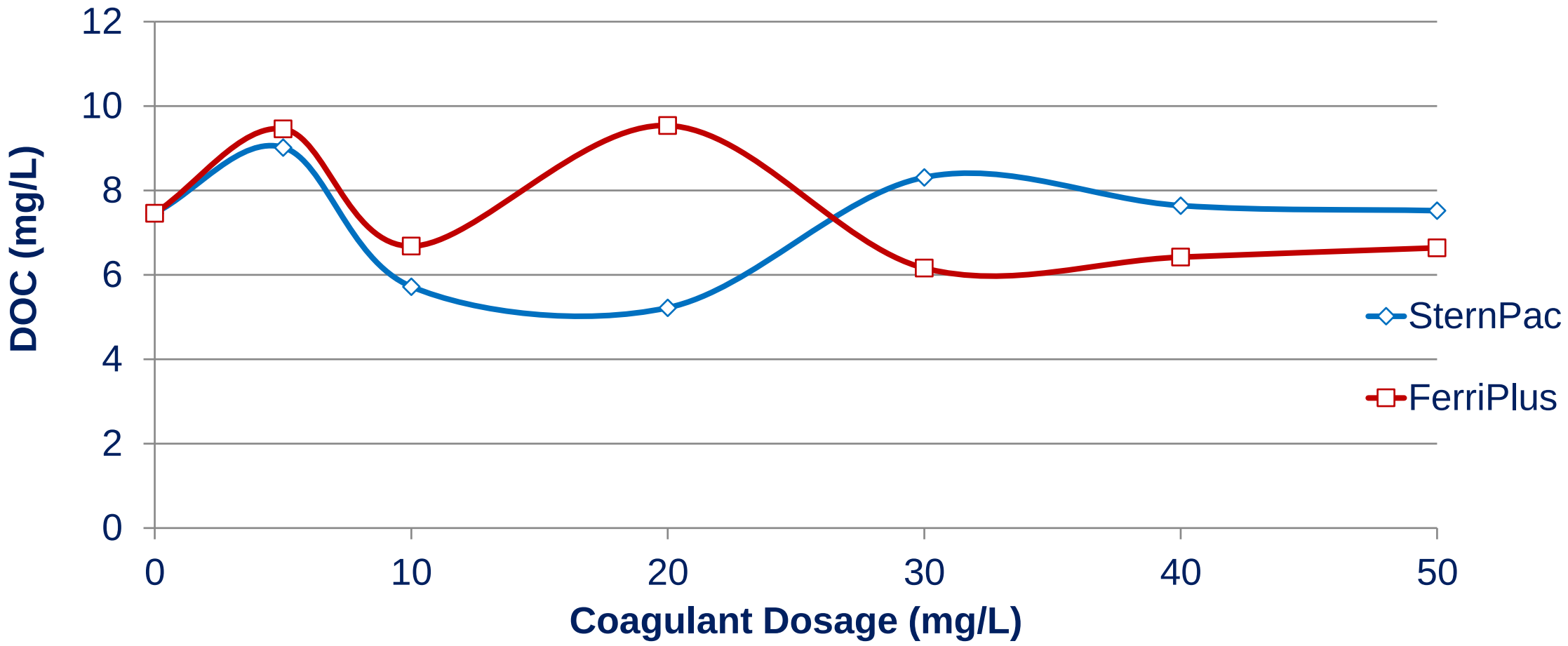
SUVA	Composition	Expected Removal Using (Alum)	DOC Removal
≥ 4	Mostly aquatic humic Hydrophobic, high MW	Good	≥ 50%
2 – 4	Mixture of humics and non- humics	Fair – Good	25 – 50%
≤ 2	Mostly non-humics, hydrophilic, low MW	Poor	≤ 25%

(Edzwald and Tobiason 1999).

Full Scale Operation

Full Scale Water Quality Characteristics					
Date (2019)	Raw			Treated	
	UVa (cm-1)	DOC (mg/L)	SUVA	DOC (mg/L)	Removal (%)
March 14th	0.152	7.46	2.0	3.02	60
October 8th	0.134	5.74	2.3	3.22	44
November 26th	0.151	5.92	2.6	3.54	40
December 10th	0.142	5.82	2.4	3.52	40

Jar Test DOC Removal and Coagulant Dose



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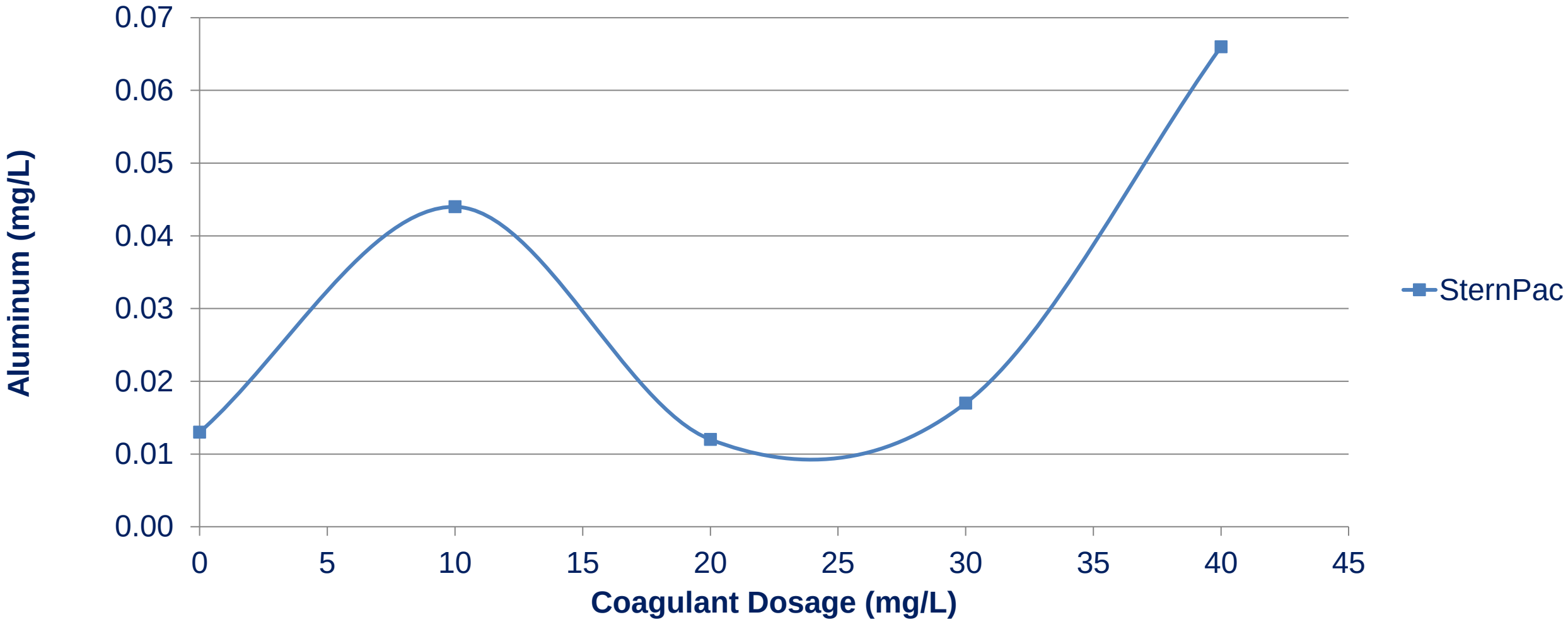
Jar Test Aluminum Residual and Coagulant Dose



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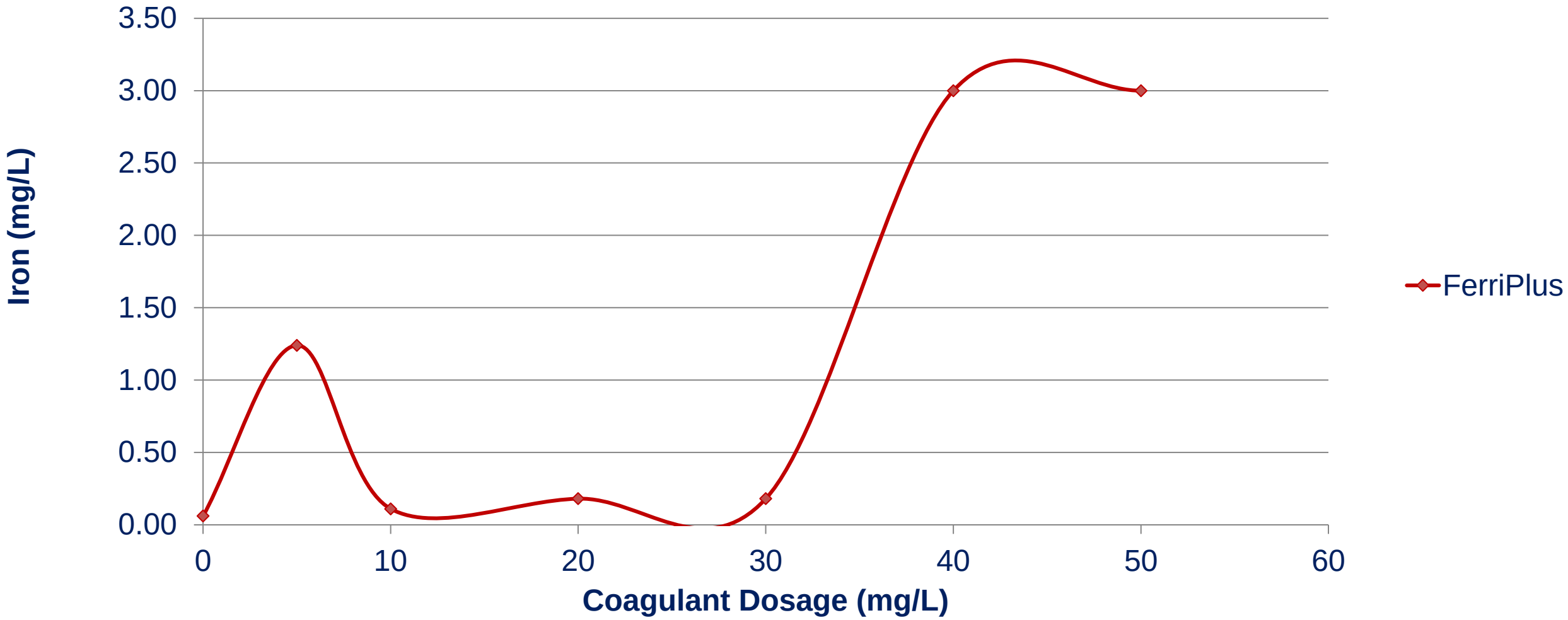
Jar Test Iron Residual and Coagulant Dose



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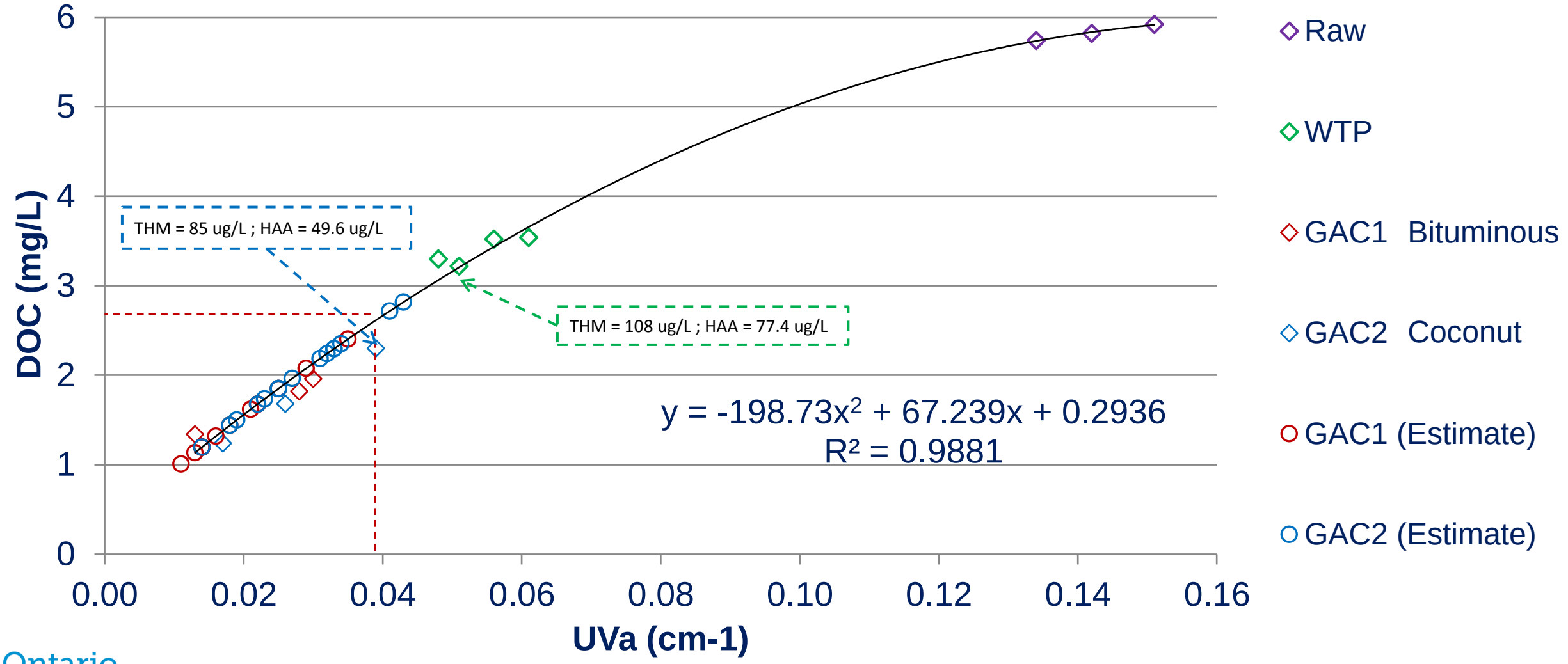
Simulated Distribution System (SDS) Disinfection By-Product (DBP) Test (March)

Sources	Coagulant Dose	Detention Time (days)	HAA (µg/L)	THM (µg/L)
Full Scale (SternPac)	14 mg/L	6	49	94
		8	53	106
		10	48	113
Jar Test (SternPac)	10 mg/L	6	63	125
		8	59	135
		10	67	131
	20 mg/L	6	42	75
		8	44	95
		10	40	97
Jar Test (FerriPlus)	10 mg/L	6	49	81
		8	50	95
		10	50	105
	30 mg/L	6	33	42
		8	35	52
		10	35	52

Pilot: GAC Filter Performance and Real-Time Monitoring



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Key Findings

SternPac apparent optimum was higher than operationally feasible;

FerriPlus could be a good coagulant option for other Northern Ontario waters;

A shorter detention time reduced DBPs;

GAC filtration reduced DBPs below the MAC;

UVa monitoring appeared to be an effective operational indicator

Questions/ Comments?

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