

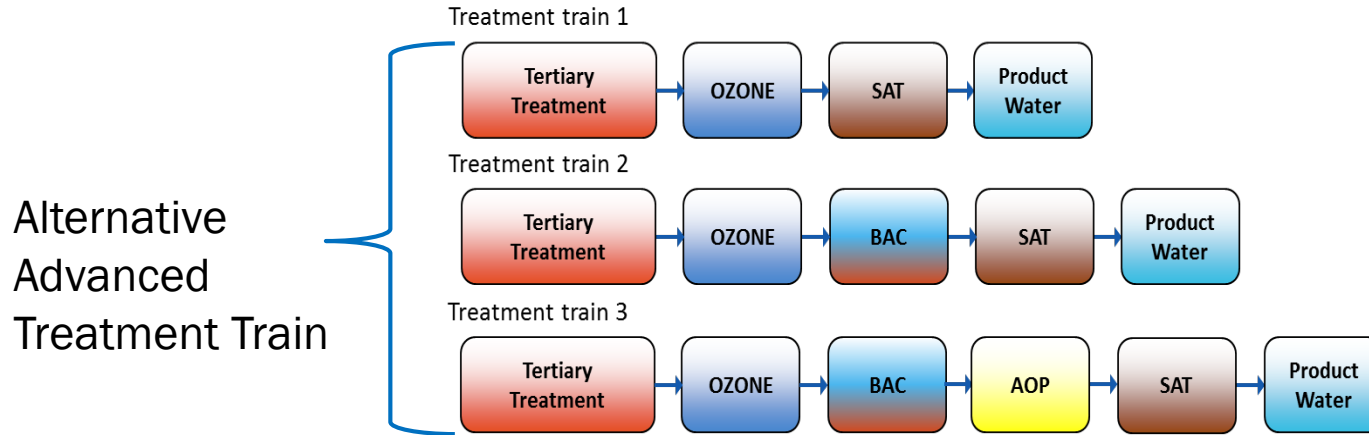
DC Tillman AWWPF Pilot Project

Los Angeles Chapter WaterReuse Meeting

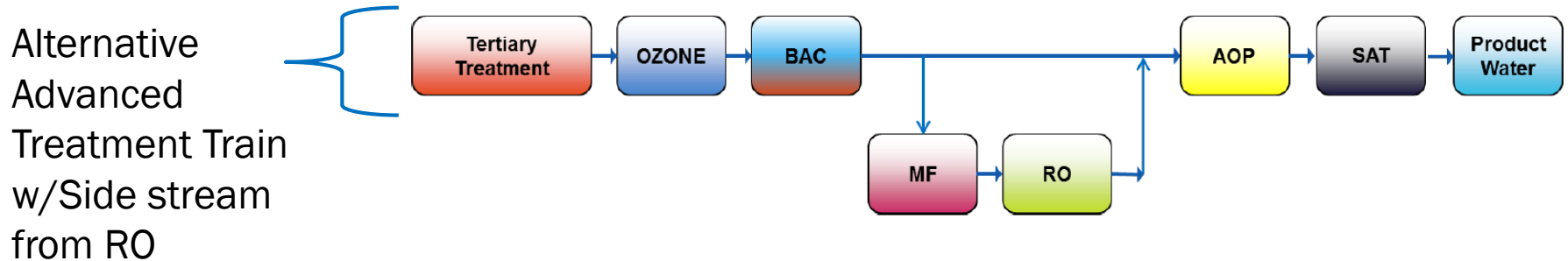
October 10, 2017



Alternative Advanced Treatment Trains for Pilot Evaluation



Limited side stream treatment from RO evaluated for the scenario where it is deemed necessary for meeting TDS or chloride limits:



DCTWRP AWPf Pilot System

Multiple treatment trains tested to identify optimal approach for full-scale system

Full Advanced Treatment

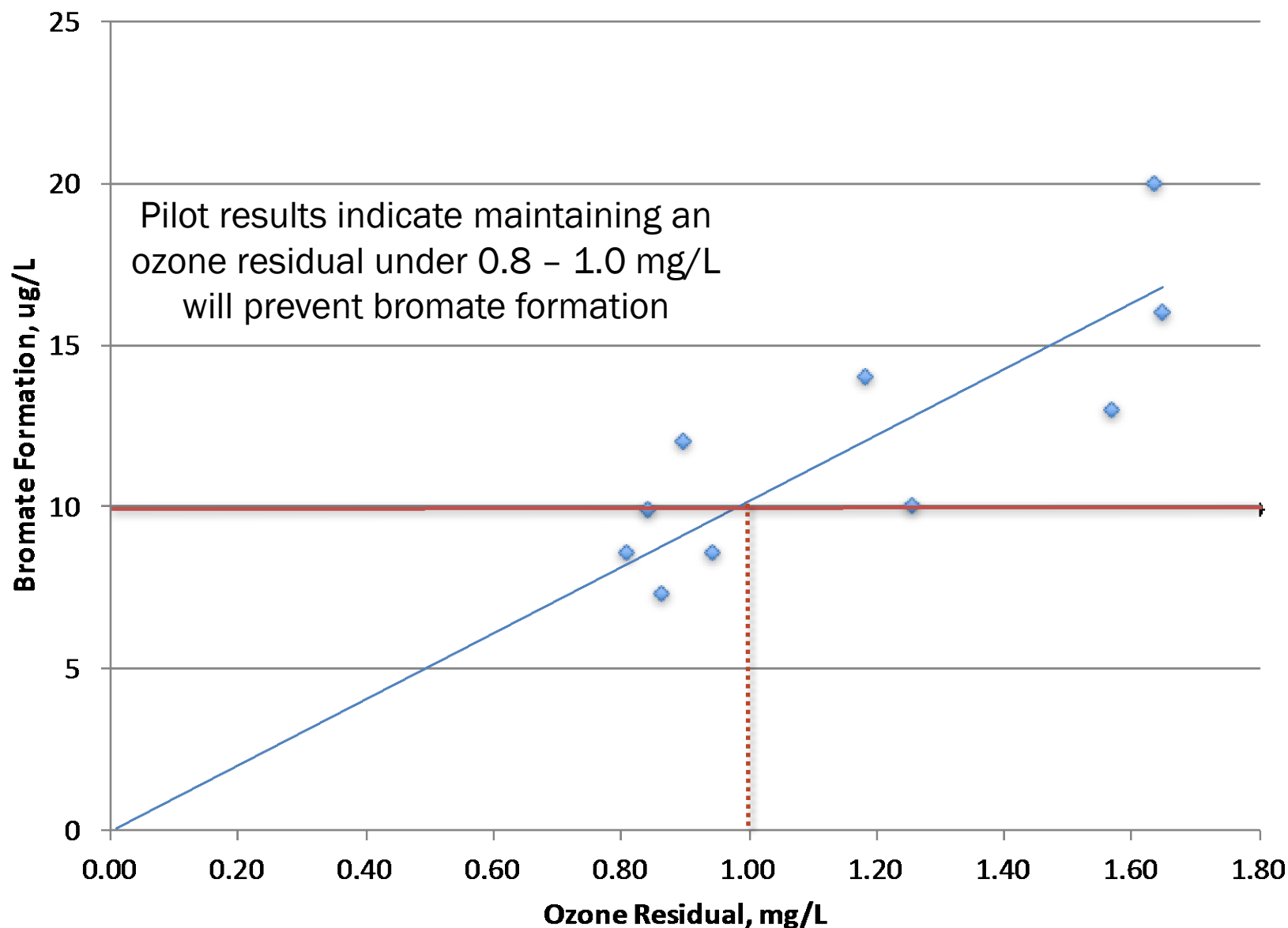
- Membrane Filtration (MF)
- Two-Stage Reverse Osmosis (RO)
- Closed Circuit Desalination (CCD)
- Advanced Oxidation Process (AOP)

Alternative Advanced Treatment

- Ozone
- Biologically Activated Carbon (BAC)
- Advanced Oxidation Process (AOP)
- Soil Columns (Soil Aquifer Treatment)

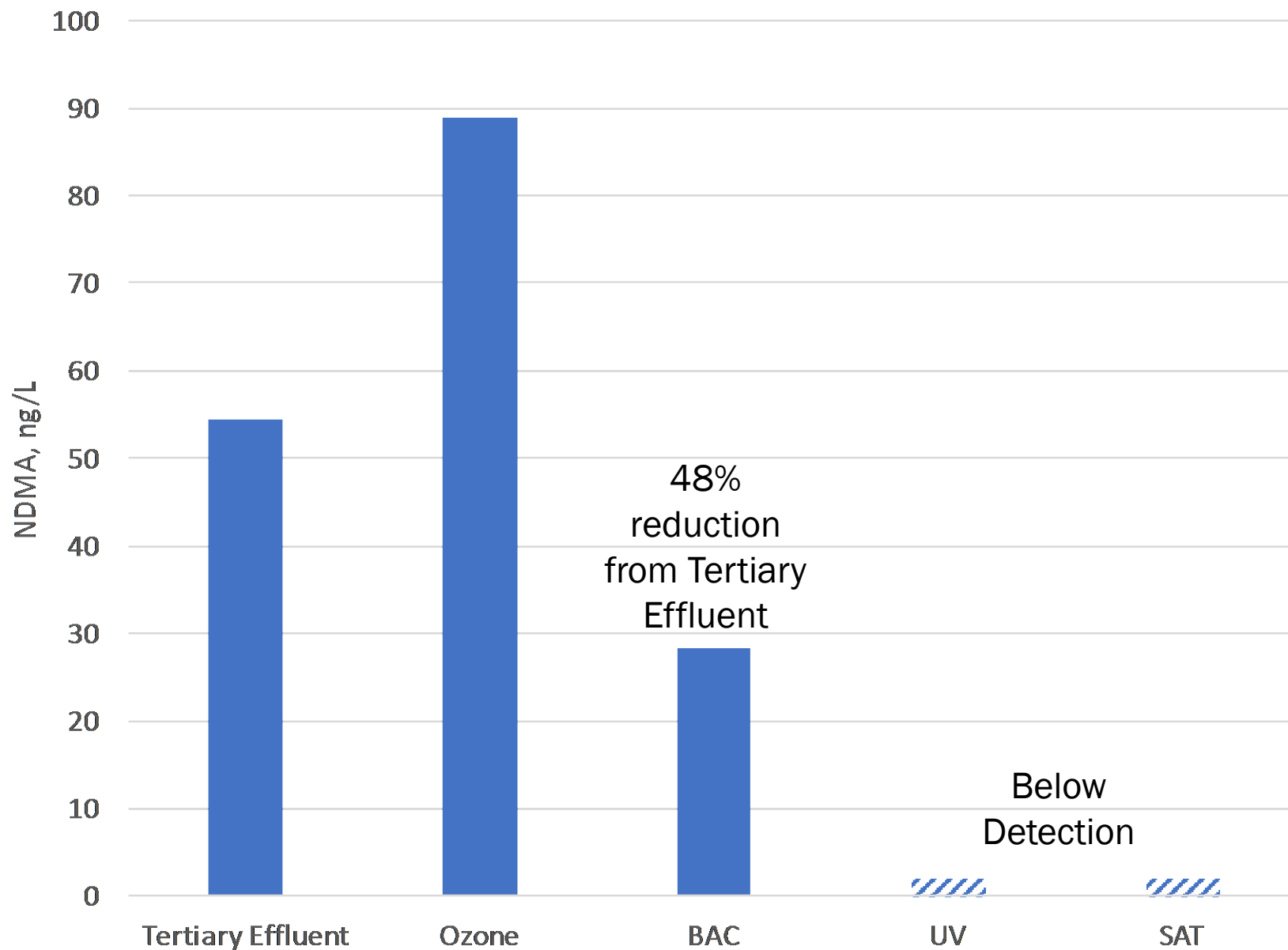


Alternative Treatment Results - Bromate



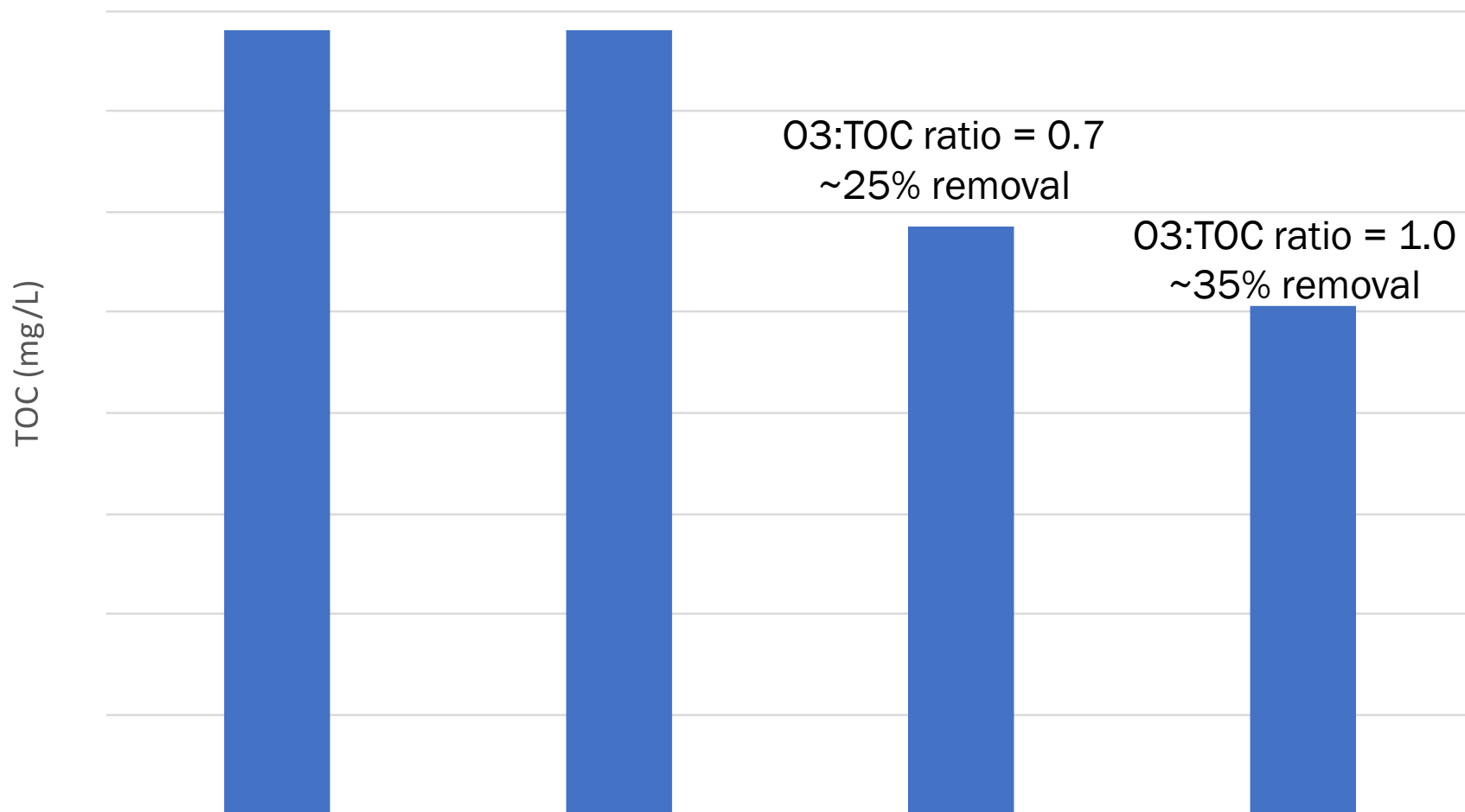


Alternative Treatment Results - NDMA





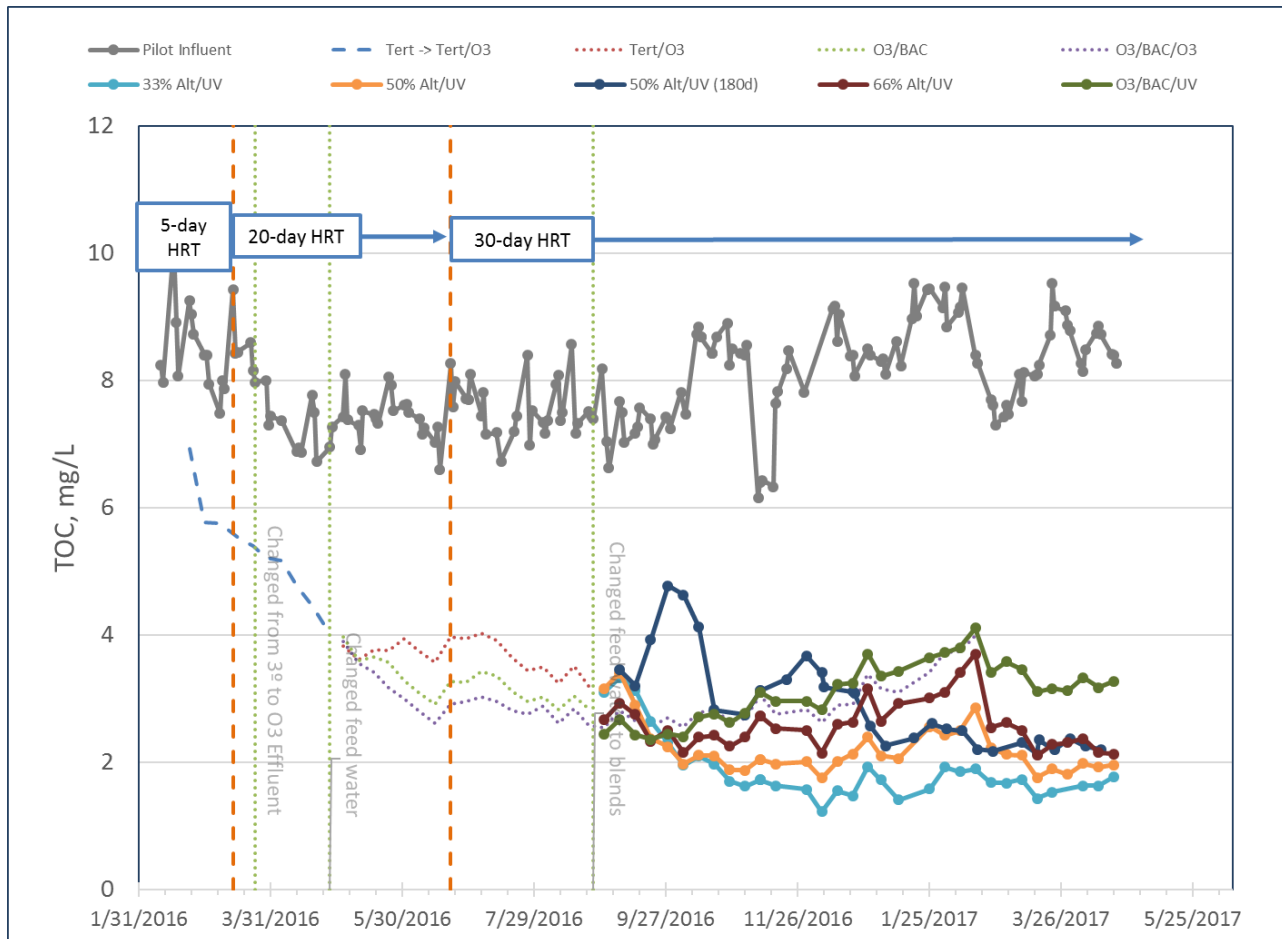
Alternative Treatment Results – Bulk TOC



C = 1.0)

Alternative Treatment Results – Bulk TOC

- Soil Aquifer Treatment via soil columns
- Lowers TOC an additional 50-60% (65-75% overall)



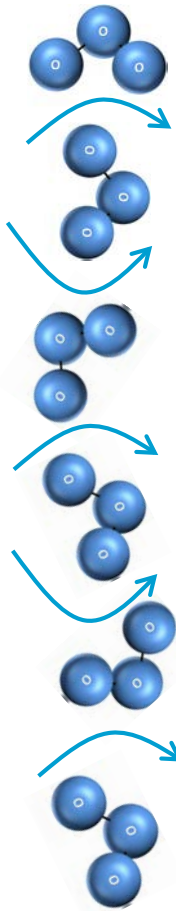
Alternative Treatment Results – CECs

28 CECs
detected in
tertiary effluent

Carbamazepin
Benzotriazole
SUCRALOSE
ACESULFAME K
Diphenhydramine
Aztithromycin
Sulfamethoxazole
Bisphenol A
Fluoxetine
Atenolol
DEET
TCPP
1,4-dioxane
TCEP
Dilantin
Gemfibrozil
Ibuprofen
Triclosan
Cotinine
PFOA
PFOS
Primidone
Meprobamate
Trimethoprim
apimodol

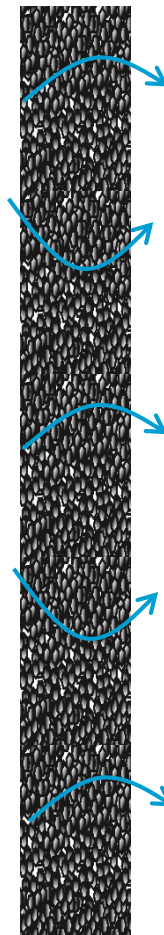
14 CECs
detected after
ozonation

Ozone



Atenolol
DEET
ACESULFAME K
Benzotriazole
Meprobamate
PFOA
Ibuprofen
TCEP
Primidone
Cotinine
PFOS
1,4-dioxane

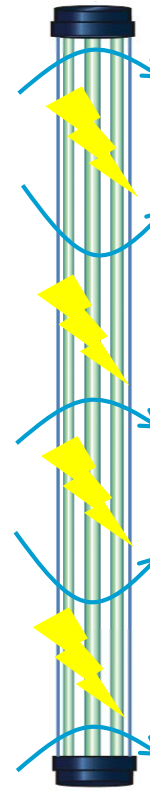
BAC



12 CECs
detected
after BAC

DEET
TCEP
PFOA
PFOS
Cotinine
ACESULFAME K
Sulfamethoxazole
Primidone
Meprobamate
1,4-dioxane
TCPP

UV



10 CECs
detected
after UV

1,4-dioxane
Cotinine
TCEP
TCPP
PFOA
PFOS
DEET
Primidone
Meprobamate
SUCRALOSE

SAT



8 CECs
detected
after SAT

TCPP
TCEP
1,4-dioxane
PFOA
PFOS
Primidone
Meprobamate
SUCRALOSE

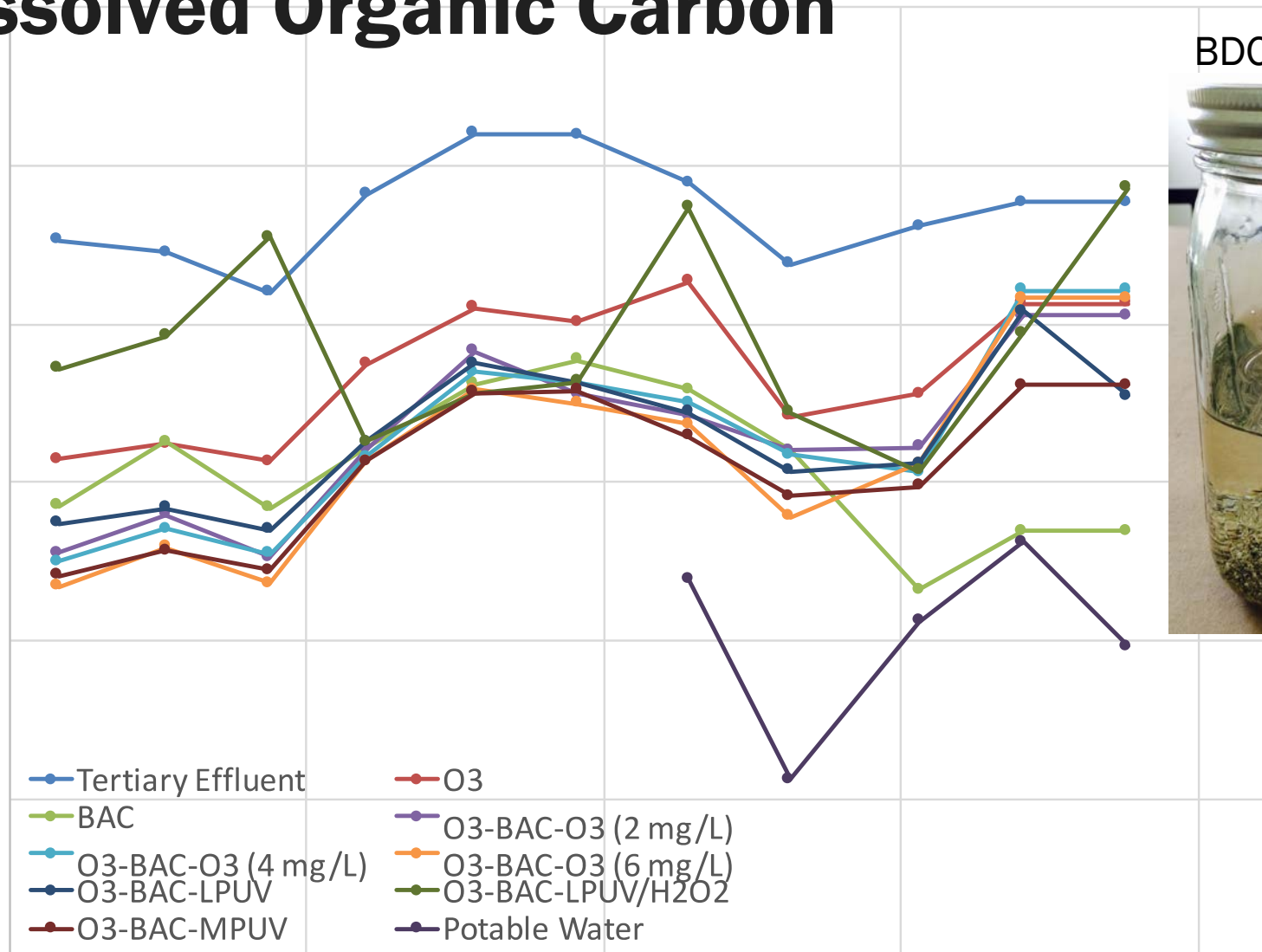
The Remaining CECs

CEC	O3-BAC-UV-SAT	NWRI Advisory Levels ^a	Health Advisory	Colorado River ^d Range (median)	State Water Project ^d Range (median)	Raw Surface Water ^e (95 th %)
1,4-Dioxane	260	-	1,000 ^b			
Meprobamate	67	200,000	-	-	-	37
PFOA	27	400,000	70 ^c	-	-	-
PFOS	3.1	200	70 ^c	-	-	-
Primidone	11	10,000	-	ND-25	ND-4	53
Sucralose	12,000	150,000	-	-	-	9,910
TCEP	66	5,000	-	ND-71	ND-17	96
TCPP	330	-	-	-	-	-

All units in ng/L. Median value from 3 rounds of testing.

^a NWRI 2012, ^b California notification level, ^c EPA Advisory Level is 70 ng/L for the sum of both PFOA and PFOS, ^d NWRI 2010, ^e Eaton and Haghani 2016

Biodegradable Organic Carbon: Ultimate Dissolved Organic Carbon

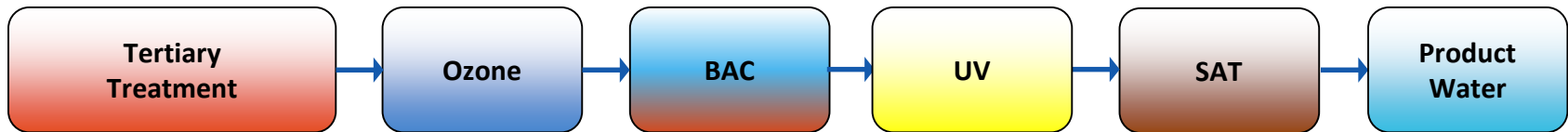


BDOC Bioreactor



Recommended Treatment Approach

Alternative Advanced Treatment



- DCTWRP Phase 2 Pilot
 - Alternative advanced treatment (O₃-BAC-UV) provides effective TOC removal and attenuation of CECs
- DCTWRP Full Scale Project
 - Implement O₃-BAC-UV for full scale use by 2023

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- LA Sanitation
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- Trussell Technologies
 - Shane Trussell
 - Teresa Venezia

And Many More!



Thank you.

Questions?

