Oneida County, NY

Chasing Wet Weather and Cost Savings All the Way to Compliance

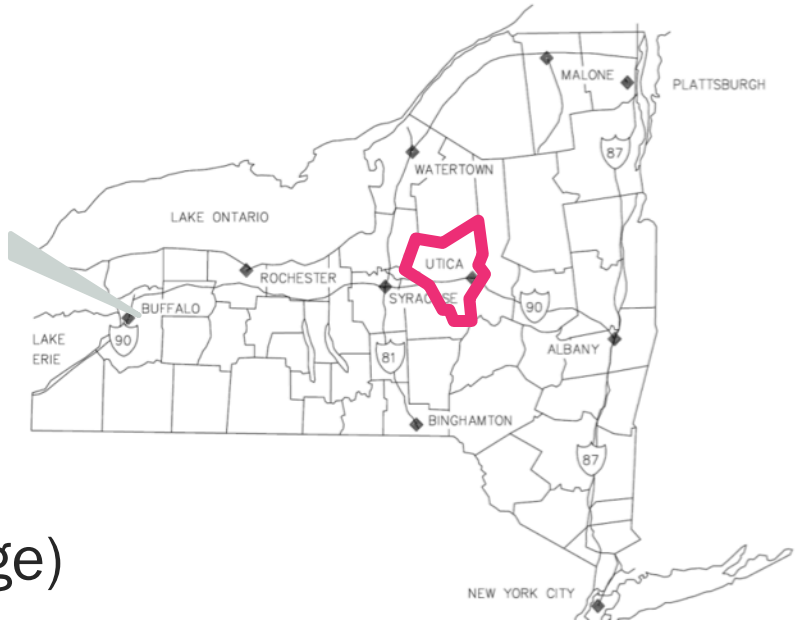
Dan Davis and Diane Nascimento

January 27 | 2015

Outline

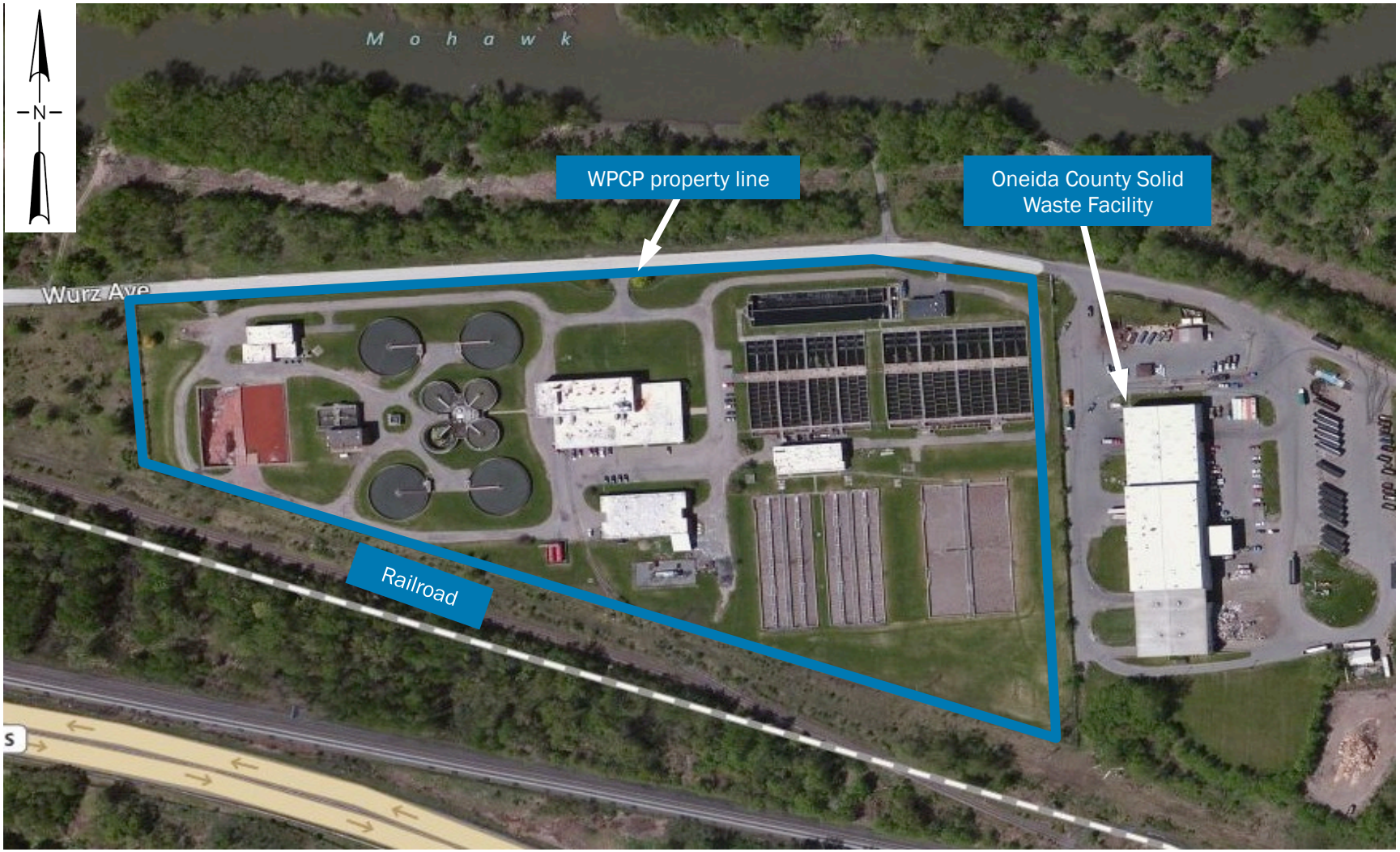
- Background
- Site Constraints
- Alternatives Considered
- What is Chemically Enhanced Primary Treatment (CEPT)
- What is High Rate Disinfection (HRD)
- Bench Testing Results
- Schedule

Project Background



- Oneida Regional WPCP:
  - 14 Towns/Villages (Sanitary Sewage)
  - City of Utica (Combined Sewage)
- Consent Order - SSO at Sauquoit Creek Pump Station (SCPS)
  - Consent Order in 2007 ; Compliance by 2021
- City of Utica - LTCP to mitigate CSO
  - Will result in increased wet weather flows to WPCP
- Industrial development

Oneida WPCP - Existing



Existing Flows

- SPDES permit requires:
  - Minimum capacity of 53 mgd during winter (November – May)
  - Minimum capacity of 48 mgd during summer (June – October)
- Current operating procedure is to limit peak flow to 53 mgd due to hydraulic restrictions

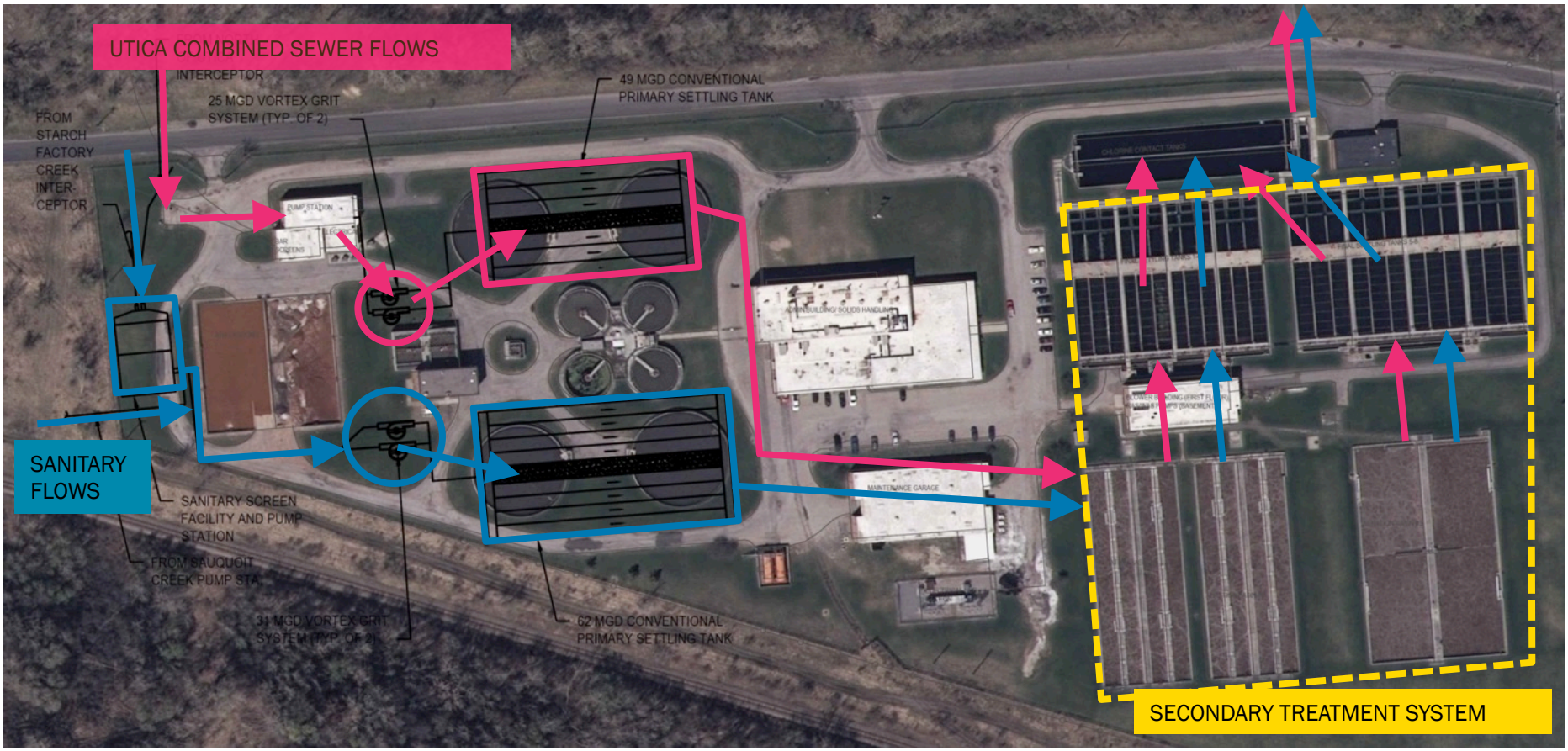
Projected Peak Flows

Flow source	Existing conditions (mgd)	Future conditions (mgd)
SCPS Basin	15	35
City of Utica	28	49
Other Basins	12	18
Microchip Plant and Spin-Offs	0	9
Total at WPCP	**55**	**111**

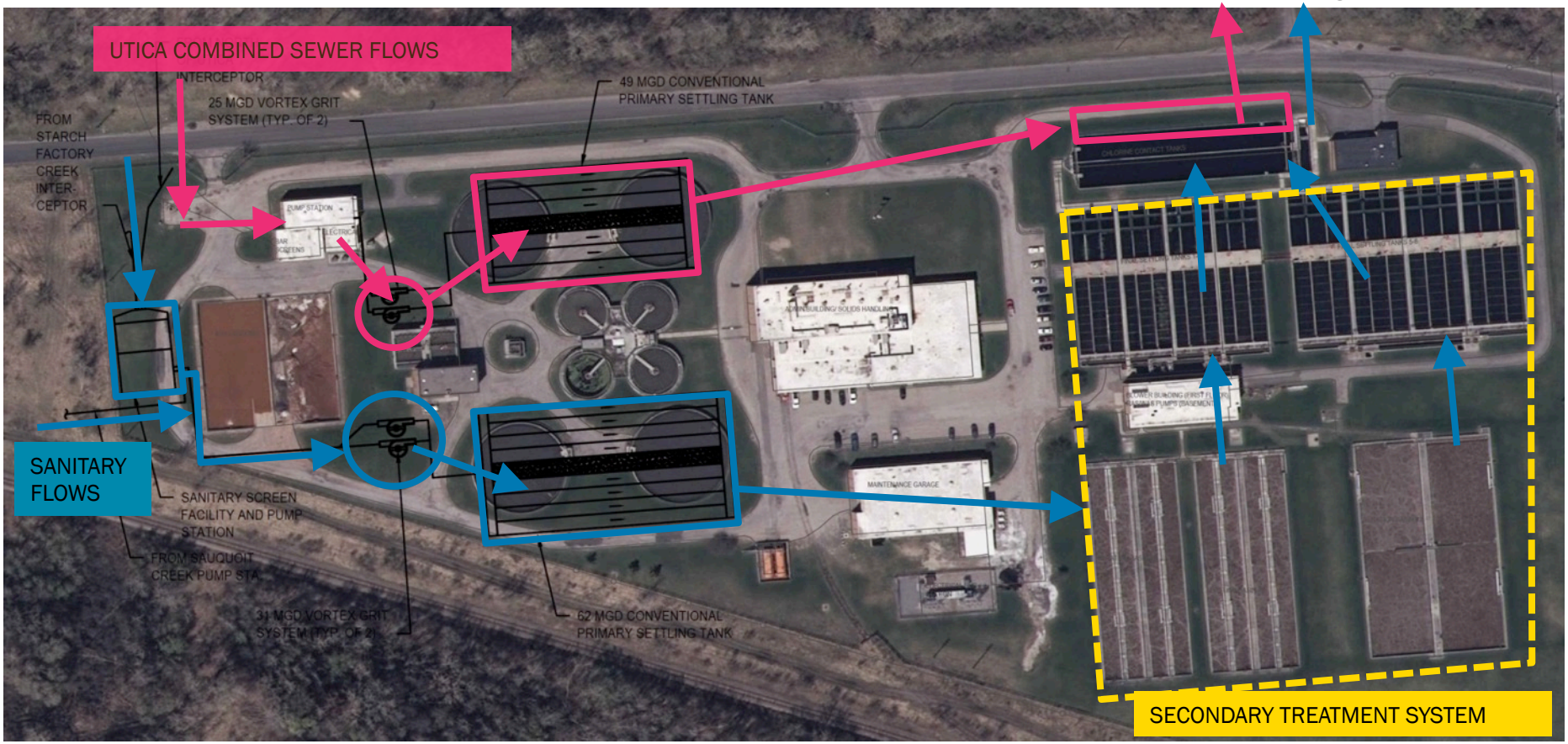
WPCP Expansion – Split Flow Concept

- Easy to separate combined and sanitary flows at the head of the plant (yard piping modifications)
- During wet weather, combined flows through one train; sanitary flows through another train
- Combined flows receive primary settling and disinfection to comply with EPA CSO regulations
- Sanitary flows receive secondary treatment
- Capacity of secondary treatment system always maximized (65 mgd)

Split Flow Concept – Dry Weather



Split Flow Concept – Wet Weather



Split Flow Concept

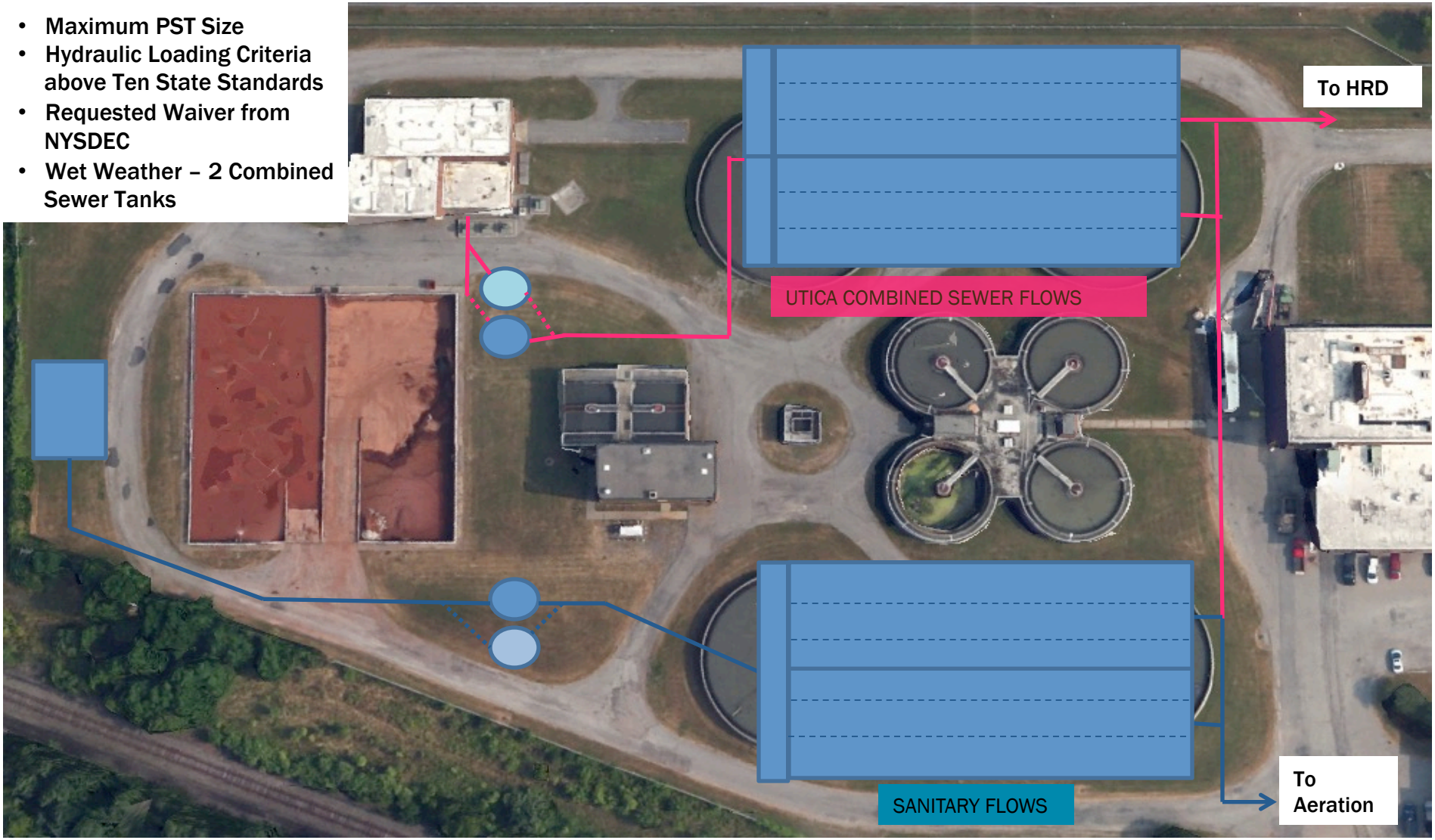
- Advantages:
  - Screening and grit removal for 100% of flows reaching the WPCP
  - Primary settling for all flows
  - Primary settling and disinfection for all CSO flow
  - Secondary treatment for all sanitary flow
  - Maximize capacity of secondary treatment system
  - Minimize amount of new tanks and equipment required
  - Lower cost than conventional plant expansion or other wet weather technologies
  - City of Utica and County in compliance with regulations and Consent Order

Split Flow Concept - Constraint

- PST Area Site Constraint
  - SOR with largest tanks > Ten State Standards SOR Criteria
  - CSO: Average SOR 1,052 gal/sf-d > 1,000 gal/sf-d
  - Sanitary: Peak SOR 2,296 gal/sf-d > 2,000 gal/sf-d
- PST Options
  - Conventional with Waiver from NYSDEC on SORs
  - Chemically Enhanced Primary Treatment for CSO flows

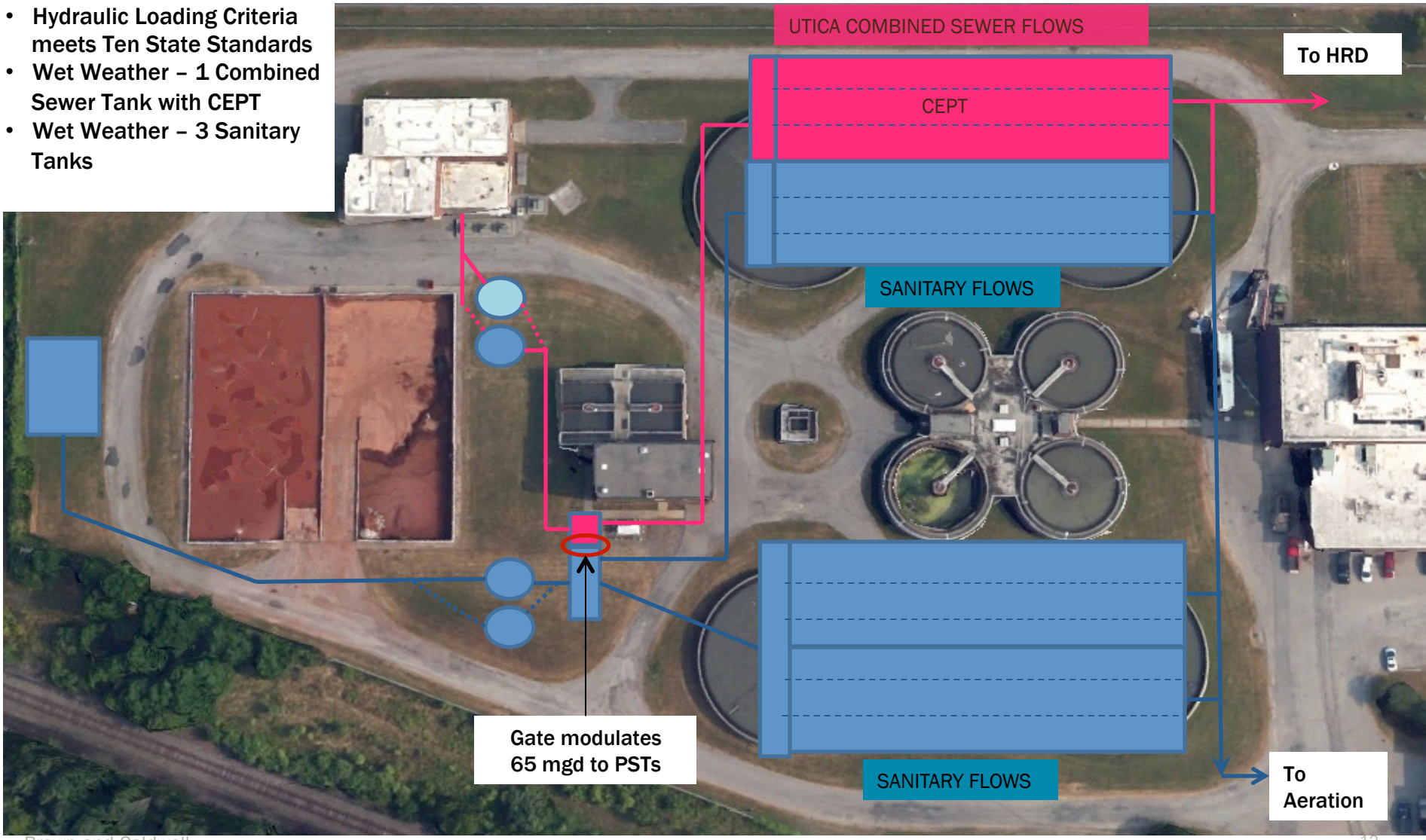
PST Layout Alt 1 - Conventional

- Maximum PST Size
- Hydraulic Loading Criteria above Ten State Standards
- Requested Waiver from NYSDEC
- Wet Weather – 2 Combined Sewer Tanks



PST Layout Alt 2 - CEPT

- Hydraulic Loading Criteria meets Ten State Standards
- Wet Weather – 1 Combined Sewer Tank with CEPT
- Wet Weather – 3 Sanitary Tanks

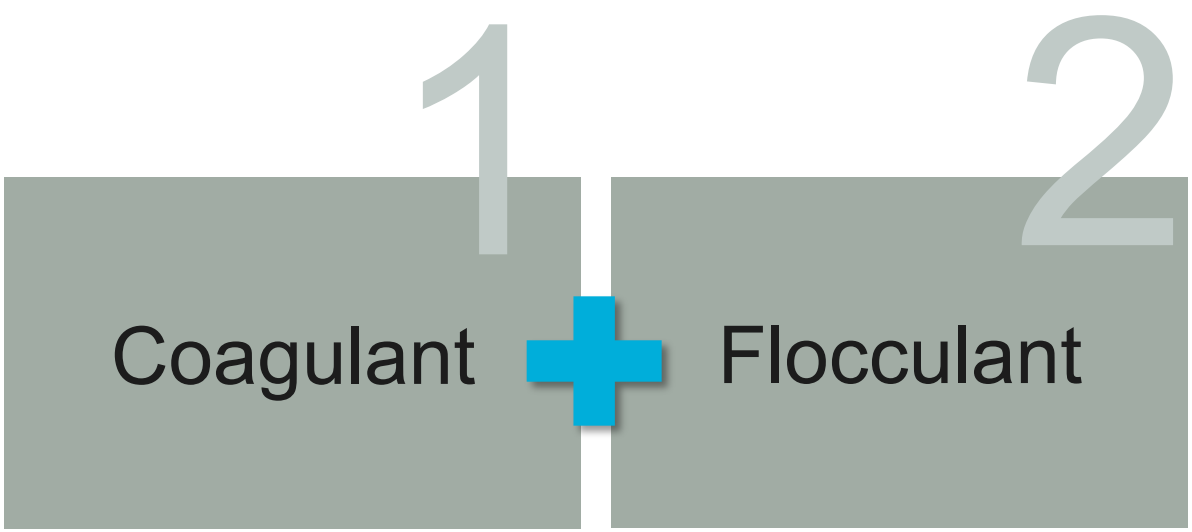


Chemically Enhanced Primary Treatment (CEPT)

Brown AND Caldwell

Chemically Enhanced Primary Treatment (CEPT)

- Enhanced performance through chemical addition
  - Convert slow settling and colloidal solids into rapidly settleable solids
  - Allows for much higher loading than traditional primary treatment
- Two-step chemical addition process
  - Metal coagulant – neutralizes particle charge
  - Polymer flocculant – aggregates coagulated particles



Objective is to create a floc like…

This:

Flocculated primary influent

Not this:

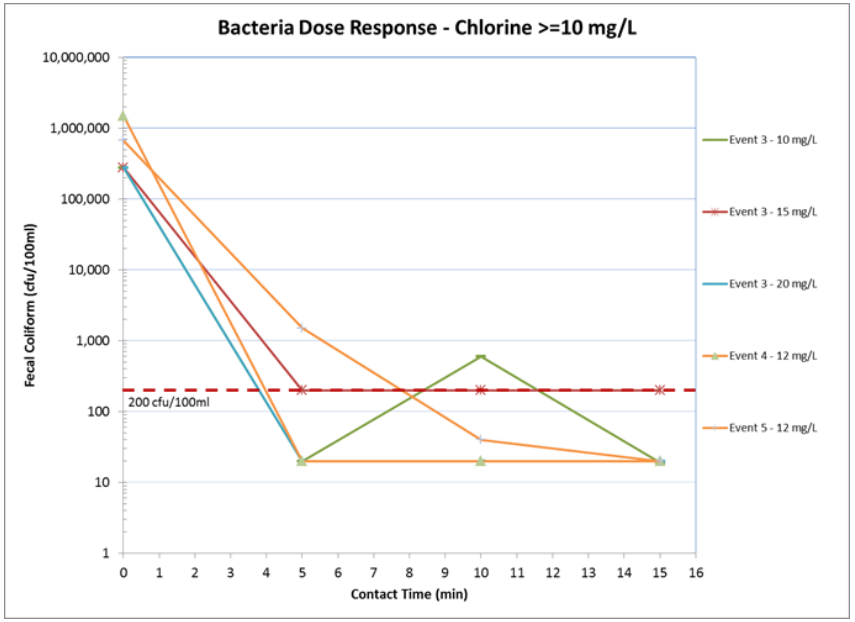
Normal primary influent

High-Rate Disinfection (HRD)

Brown AND Caldwell

High-Rate Disinfection (HRD)

- Bacteria reductions achieved at detention times less than conventional 15-30 minutes
- HRD detention time can be as low as ~ 5 minutes
- High intensity, rapid mix for instantaneous chlorine dispersion
- Typically higher doses of disinfectant
- Develop dose-kill relationship

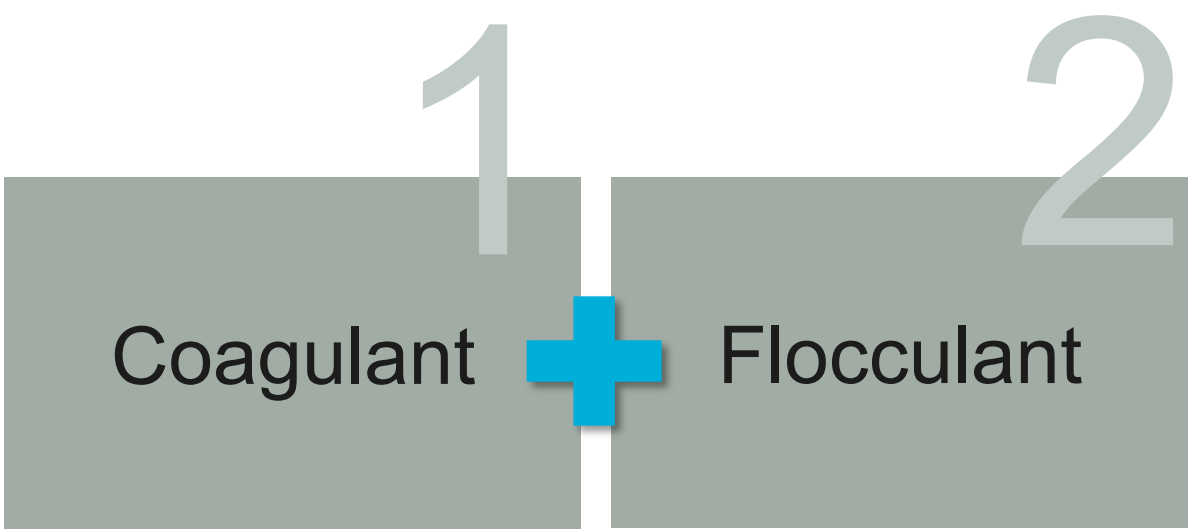


CEPT and HRD Projects

Brown AND Caldwell

Chemically Enhanced Primary Treatment (CEPT)

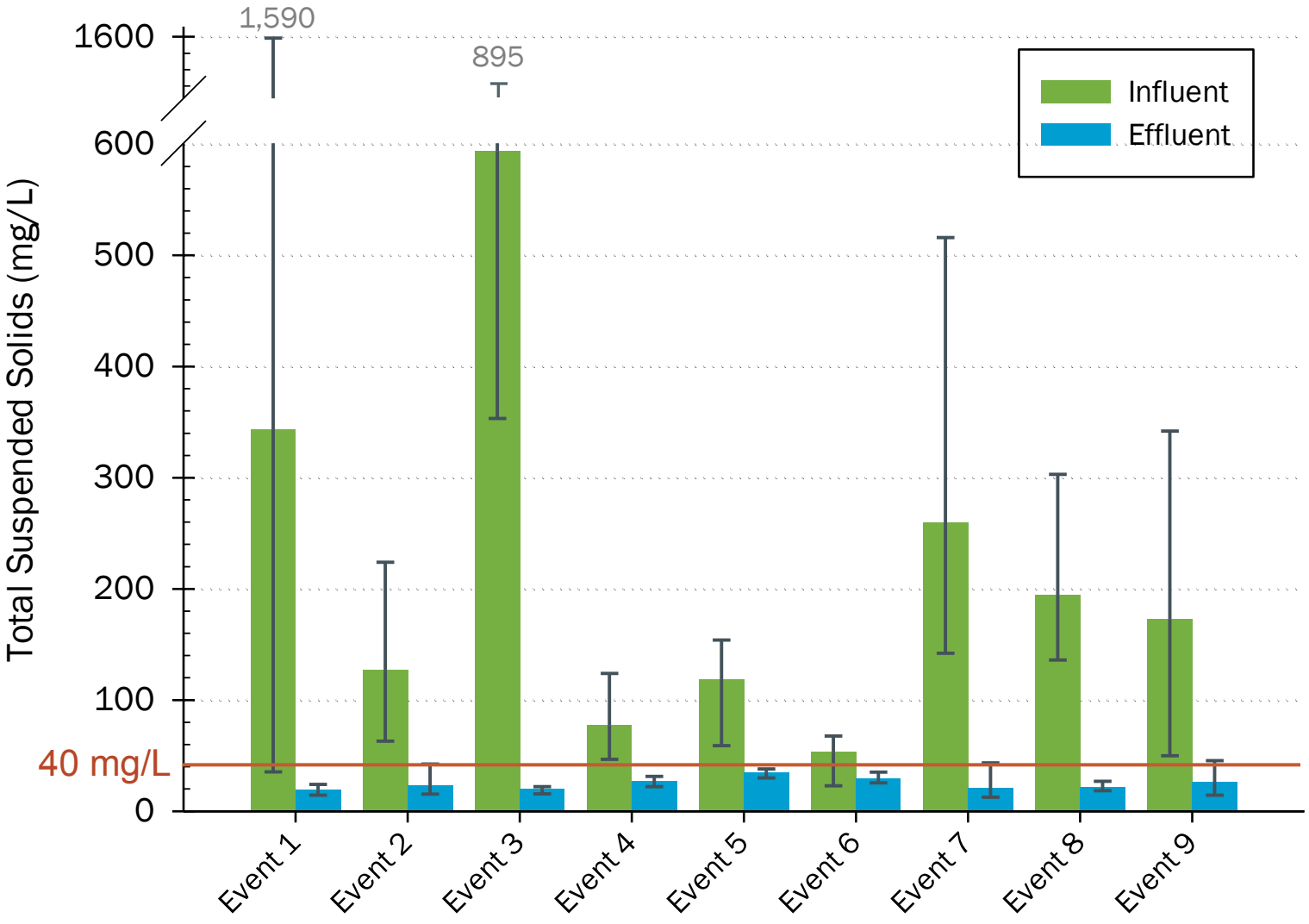
- Where else is CEPT applied
  - ***Cleveland, OH (+HRD)***
  - *Hartford, CT (+HRD)*
  - *Portand, OR*
  - *Seattle, WA*



NEORSD CEPT
Facility Size Comparison

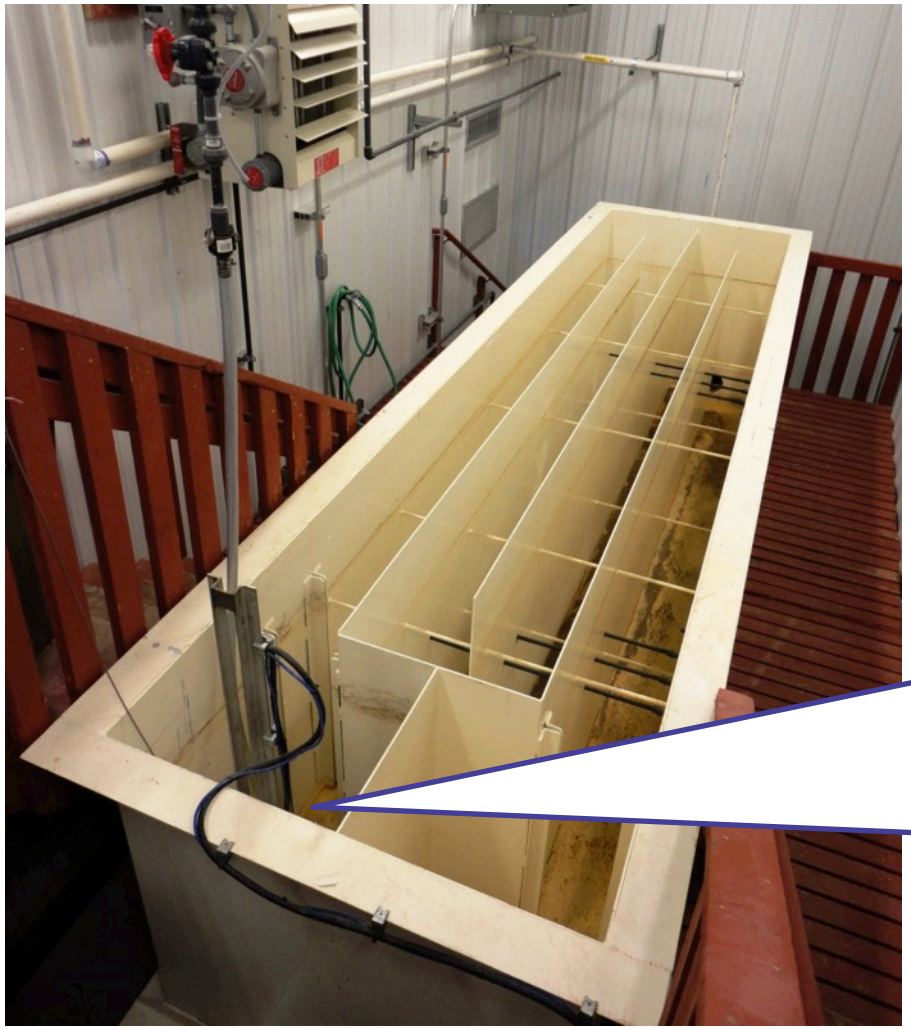
- Southerly PST No. 18 Demo
  70 mgd
- Westerly CSTOF Tank A Demo
  18 mgd
- Easterly Pilot
  100 gpm

Southerly – Average TSS



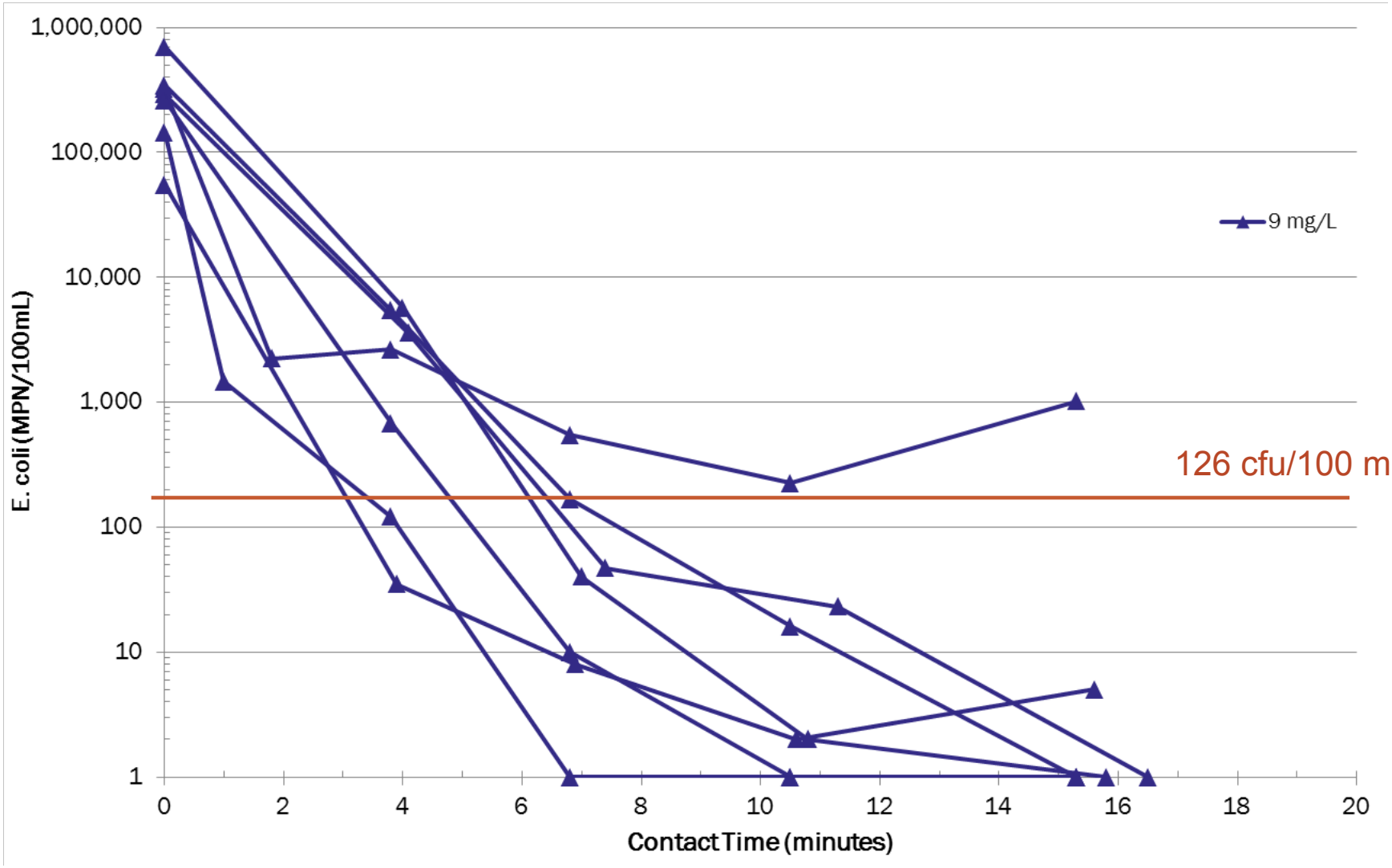
Southerly – Pushing the limits, but not really

Pilot HRD Tank

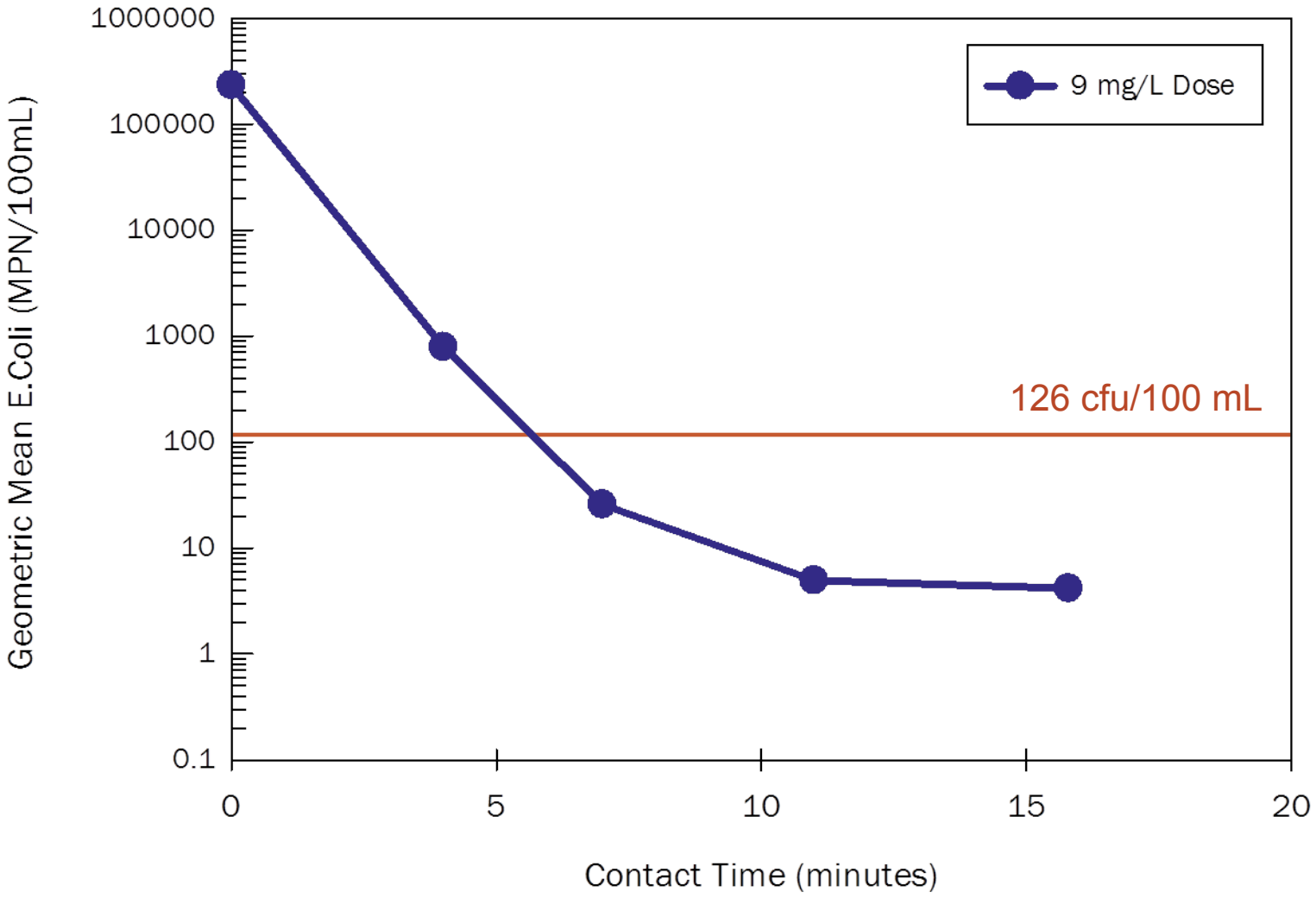


Sodium Hypochlorite Induction Mixer

Southerly – Disinfection Performance



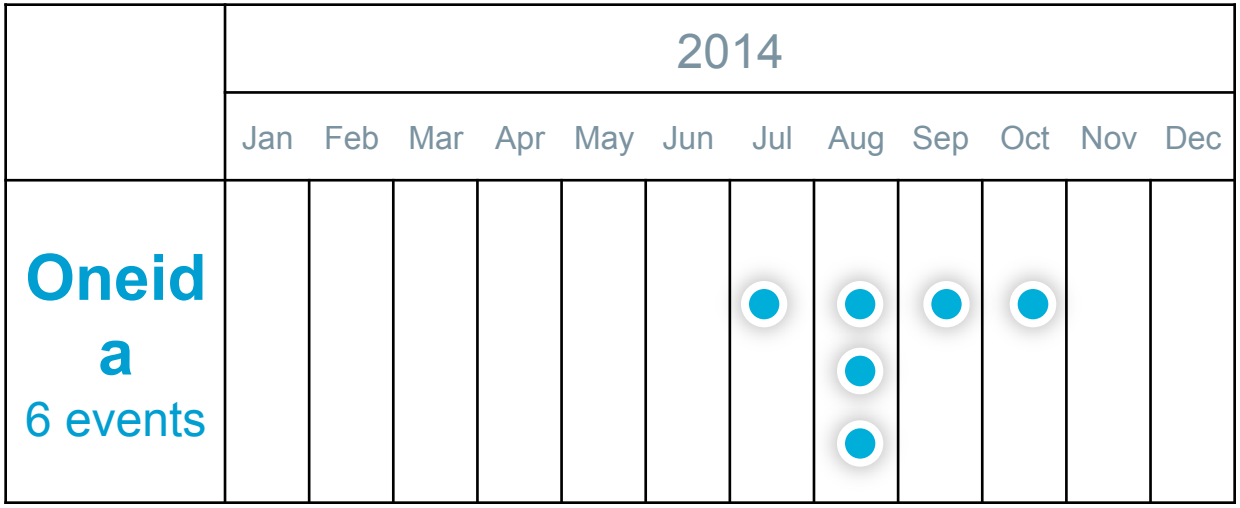
Southerly – Disinfection Performance



Oneida Bench Testing

Brown AND Caldwell

Calendar of Events Captured



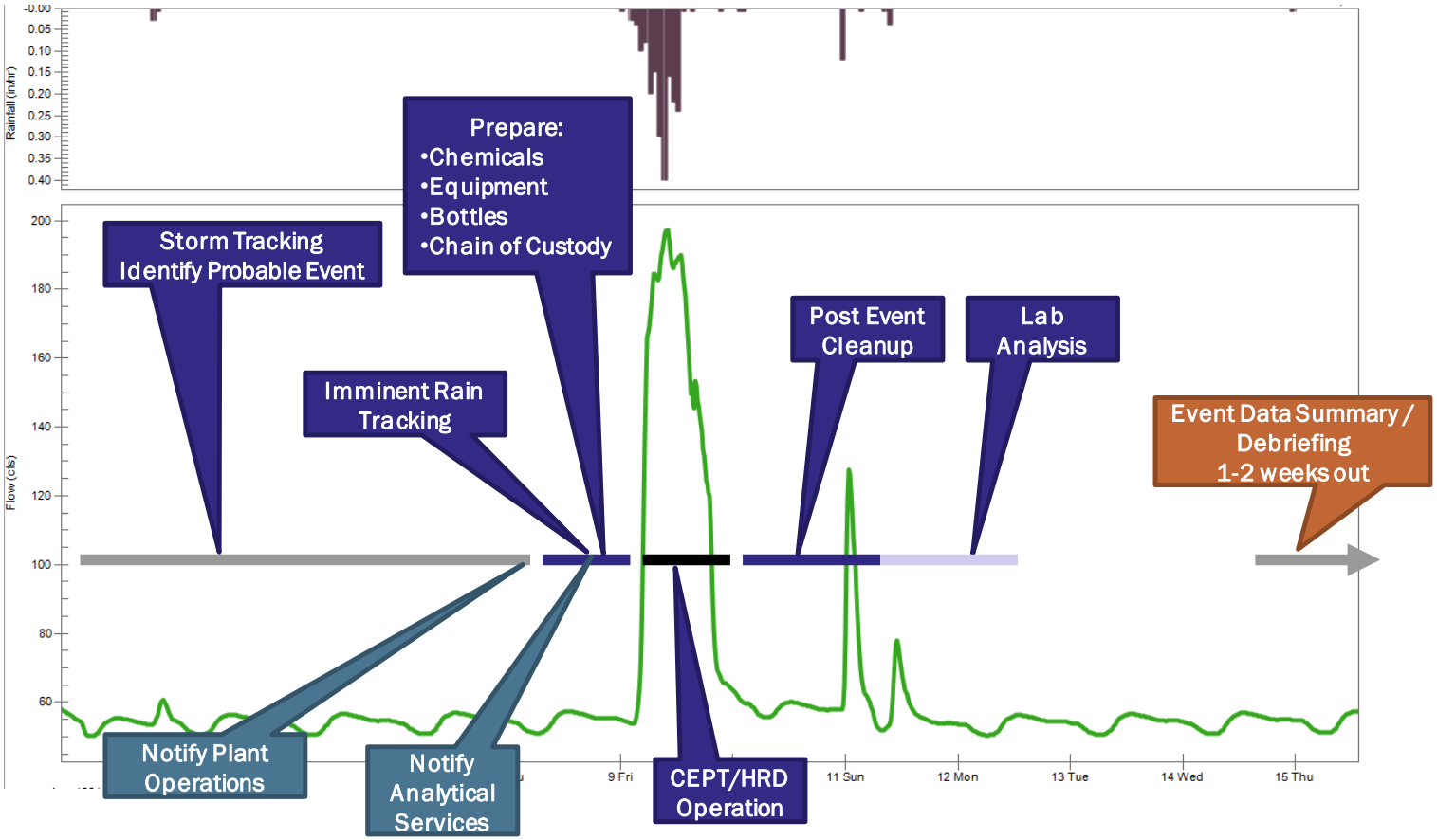
- Bench scale - Jar testing
- Storm variations
  - Range in storm types and influent conditions

Storms Sampled

- variability

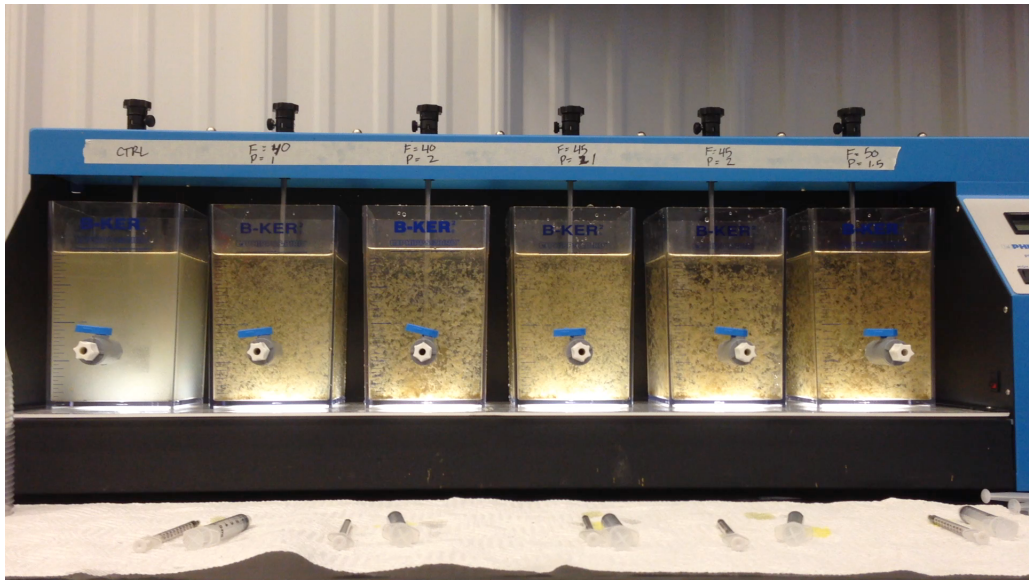
Event	Date	Peak Intensity	Duration of Peak Intensity	Cumulative Rain Volume during Event
		[in./hr]	[min]	[in.]
Event 1	7/29/14	0.00	60	0
Event 2	8/3/14 - 8/4/14	0.45	60	1.03
Event 3	8/12/14-8/13/14	0.38	60	1.29
Event 4	8/21/14	0.05	60	0.18
Event 5	9/2/14	0.71	60	1.60
Event 6	10/15/14 - 10/16/14	0.86	60	3.25

Example storm chasing hydrograph



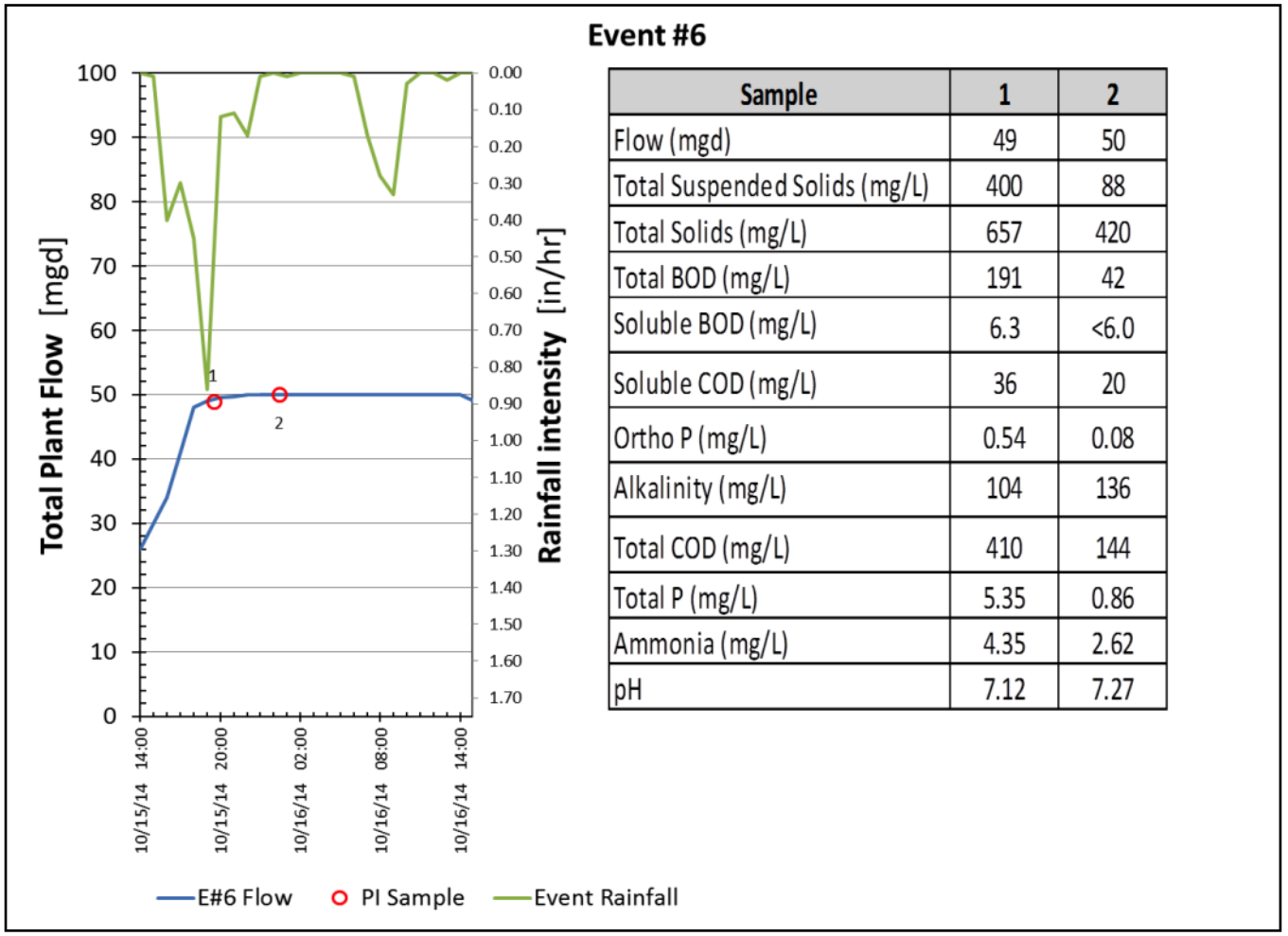
Why jar testing?

- Simulates coagulation & flocculation very well
- Used to find most effective coagulant and flocculant
- Diagnose performance issues … on the fly



Jar Testing

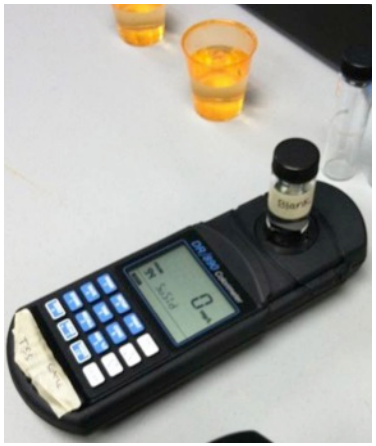
- Influent wet weather characterization

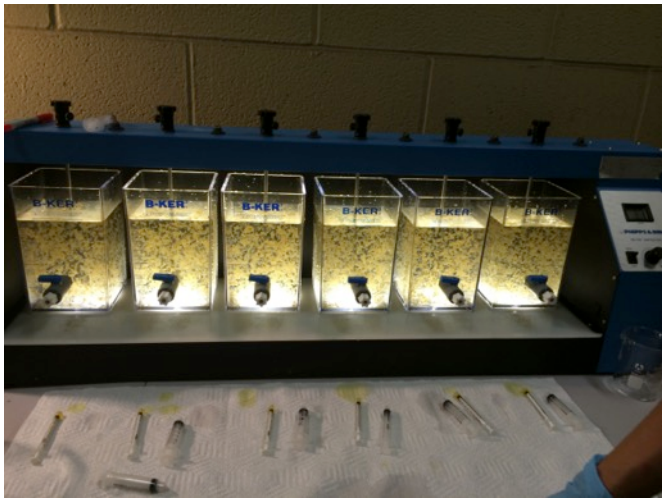


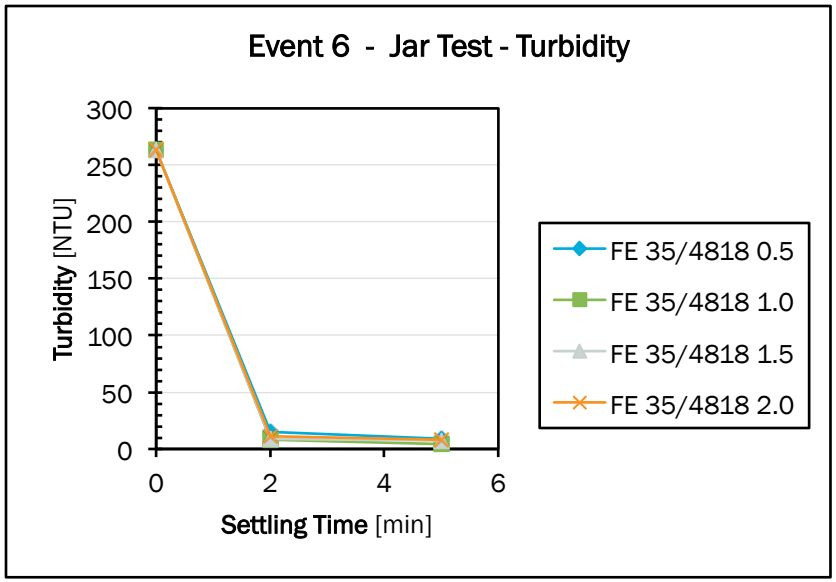
Sample	1	2
Flow (mgd)	49	50
Total Suspended Solids (mg/L)	400	88
Total Solids (mg/L)	657	420
Total BOD (mg/L)	191	42
Soluble BOD (mg/L)	6.3	<6.0
Soluble COD (mg/L)	36	20
Ortho P (mg/L)	0.54	0.08
Alkalinity (mg/L)	104	136
Total COD (mg/L)	410	144
Total P (mg/L)	5.35	0.86
Ammonia (mg/L)	4.35	2.62
pH	7.12	7.27

Jar Testing – CEPT

Coagulant/Flocculent Dosage						
		Background	Jar 1	Jar 2	Jar 3	Jar 4
Jar Name:			FE 35/4818 0.5	FE 35/4818 1.0	FE 35/4818 1.5	FE 35/4818 2.0
$FeCl_3$ [mg/L $FeCl_3$]:			35.00	35.00	35.00	35.00
$Al_2(SO_4)_3$ [mg/L $Al_2(SO_4)_3$]:						
Kemira 4818(-) [mg/L Neat]:			0.50	1.00	1.50	2.00
Post-Flocculation Settling		**Turbidity [NTU]**				
Mode	**Time [min]**	**Background**	**Jar 1**	**Jar 2**	**Jar 3**	**Jar 4**
Raw Sample:	0.0	263	263	263	263	263
Settling Time 1:	2.0		15	8	9	11
Settling Time 2:	5.0		9	4	7	8
Post-Rip Settling Time 1:	2.0		19	5	7	12
Post-Rip Settling Time 2:						







Jar Testing – CEPT

- Optimal coagulants and flocculants

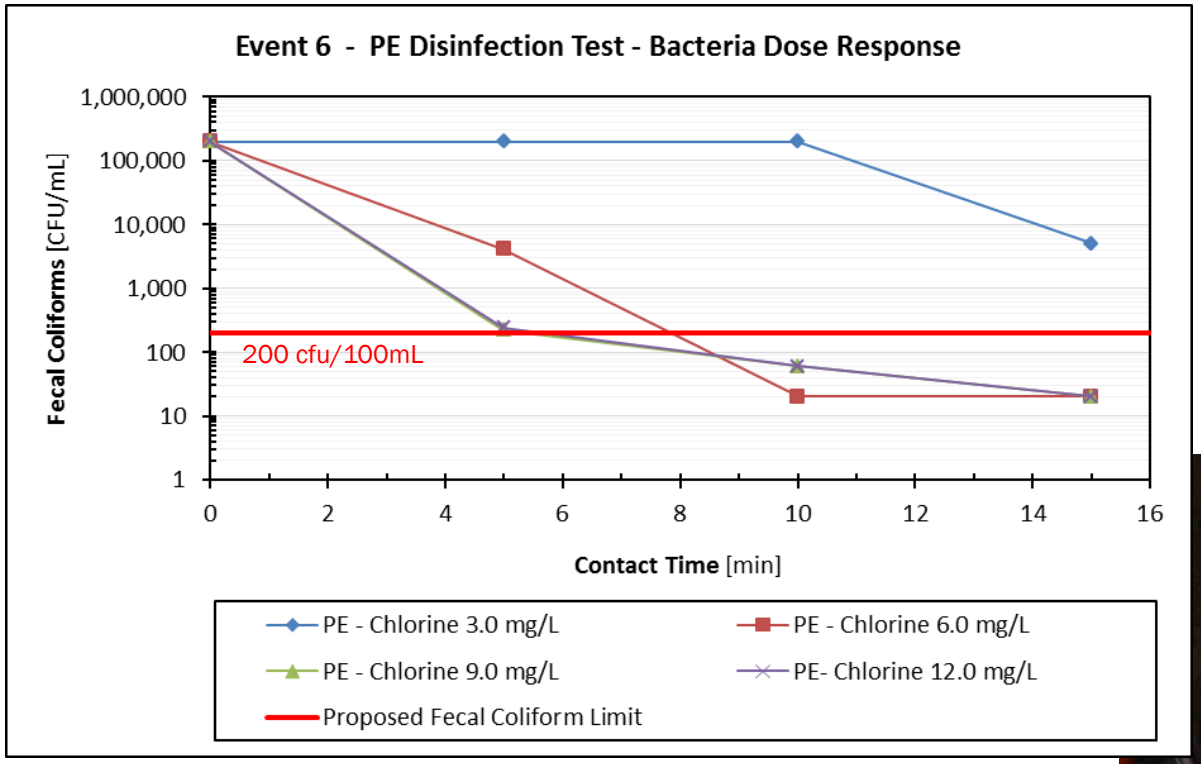
Coagulant	Optimal Dose
Ferric Chloride, mg $FeCl_3$/L	35 – 40
Alum, mg Al2S04/L	20 – 30
PAX XL 1900, ug PAX/L	10 – 12
DelPAC 2020, ug/ DelPac/L	12 – 15

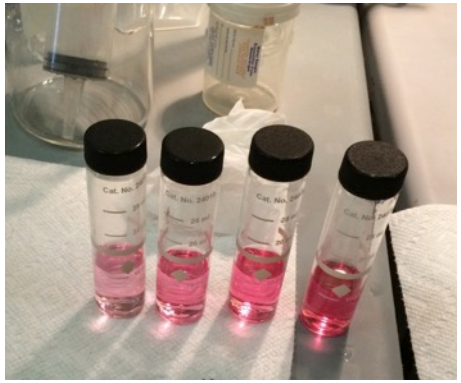
Flocculant	Optimal Dose , mg/L active
Nalco 7766/7768	2
Ashland 3040	1.5 – 2
Kemira 4818/4518	1 – 1.5

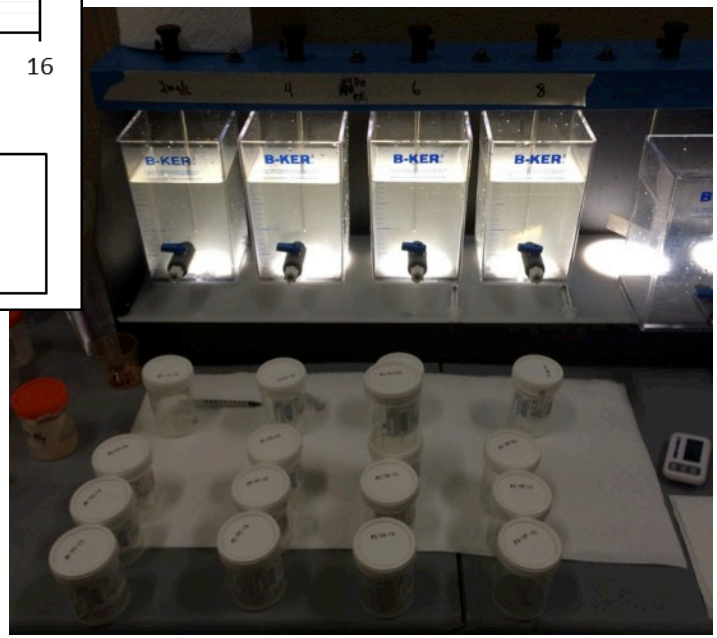
  - No issues with Alkalinity or pH

Disinfection – Jar test

- Results for Primary Effluent

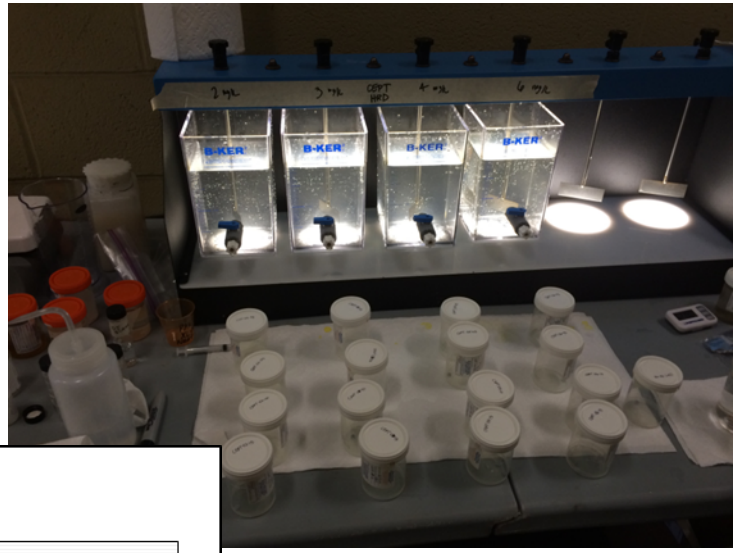


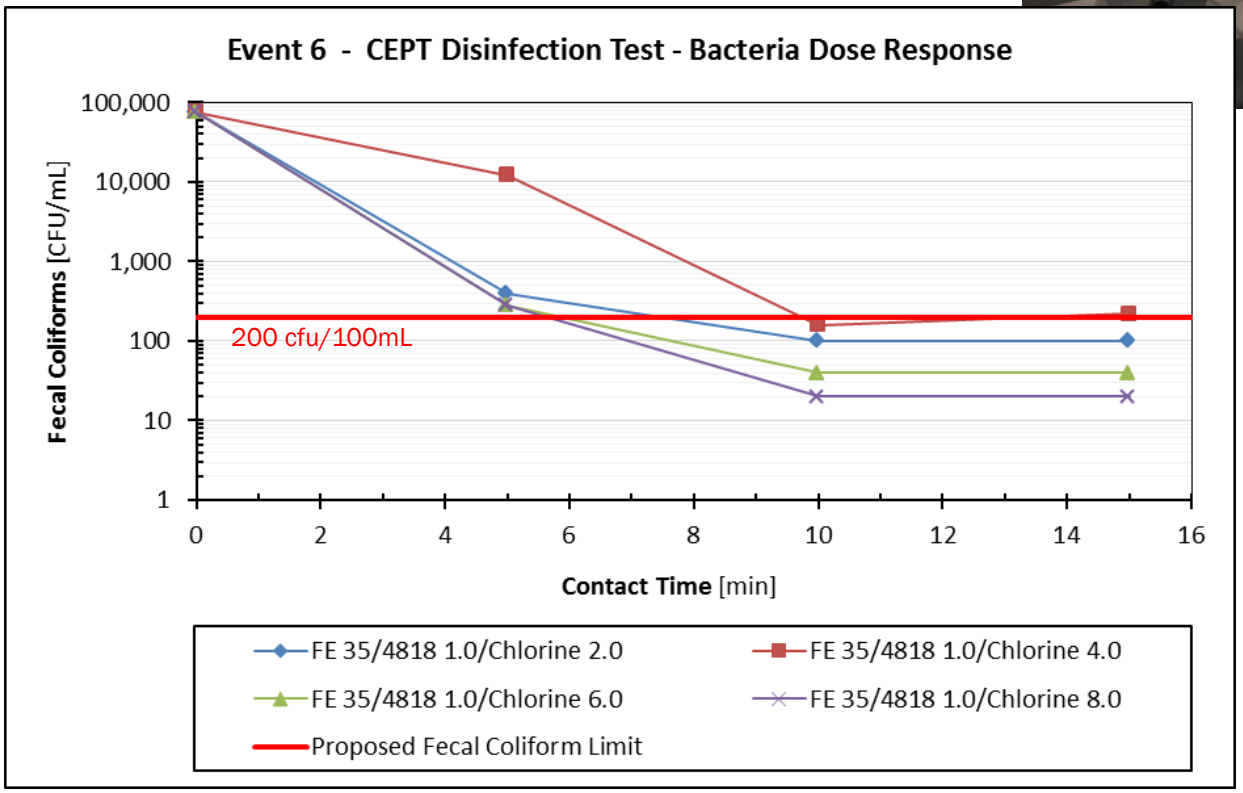




Disinfection – Jar test

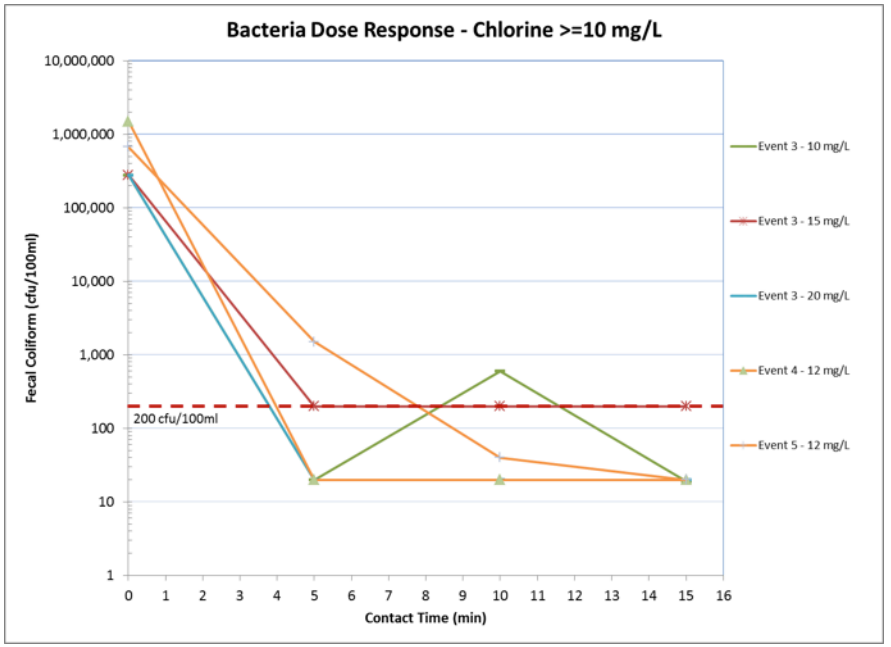
- Results for CEPT





Disinfection – Jar test

- Conclusions
  - CEPT – target dose 6 mg/L achieves 200 instantaneous
  - PE – target dose 10 mg/L achieves 200 instantaneous
  - Target 10 min contact time
  - Work with the regulatory agency on ultimate requirements



Schedule

Brown AND Caldwell

Schedule

- WPCP Expansion Design – complete by 2016
- WPCP Construction – complete by 2021 per Consent Order

Acknowledgements

Steven Devan, P.E.
Commissioner
Oneida County, New York
Department of Water Quality and Water Pollution Control

Amy Mowers

Lauren Pepe, Colin O'Brien

Questions?

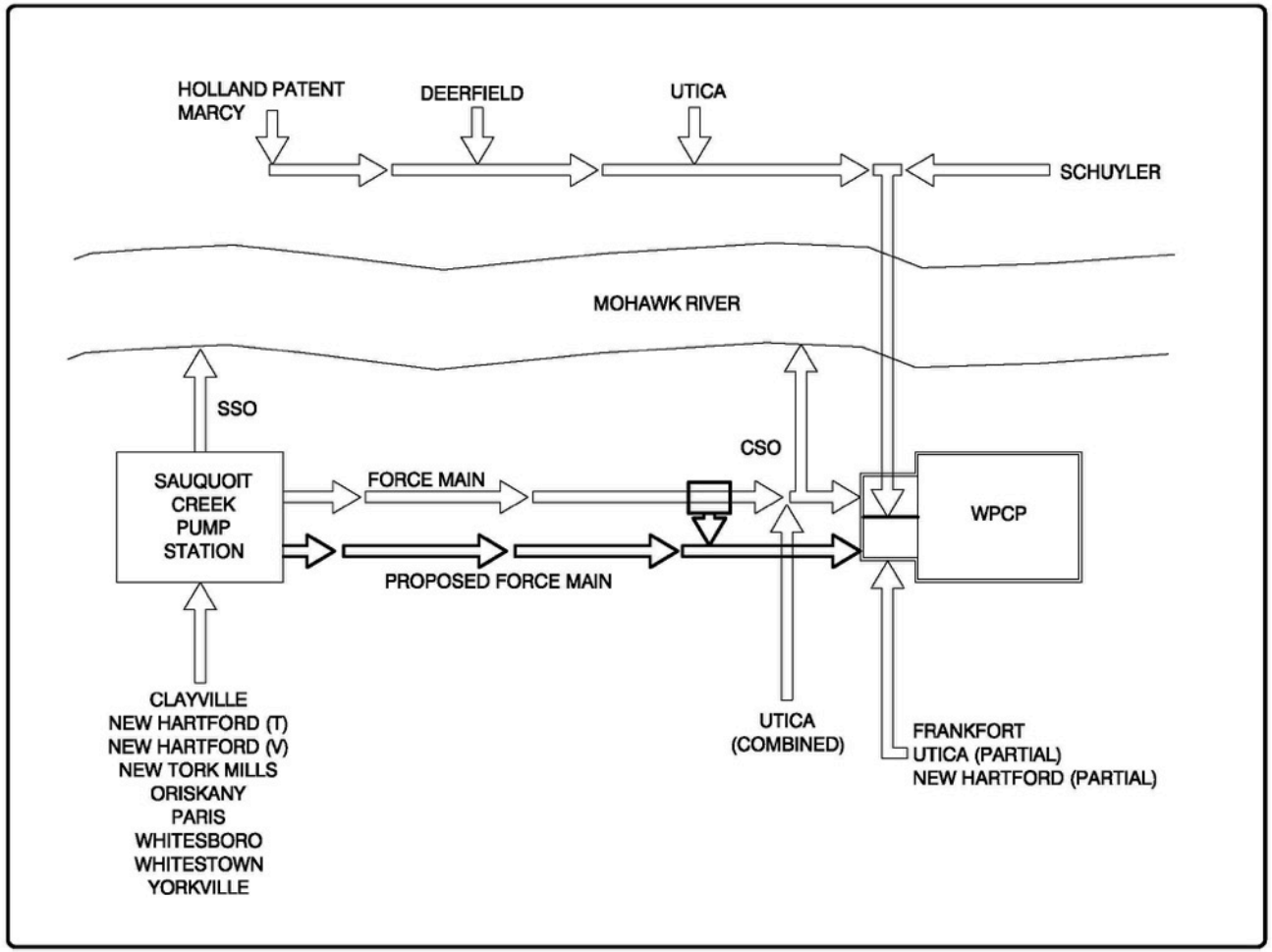
Brown AND Caldwell

Bullpen

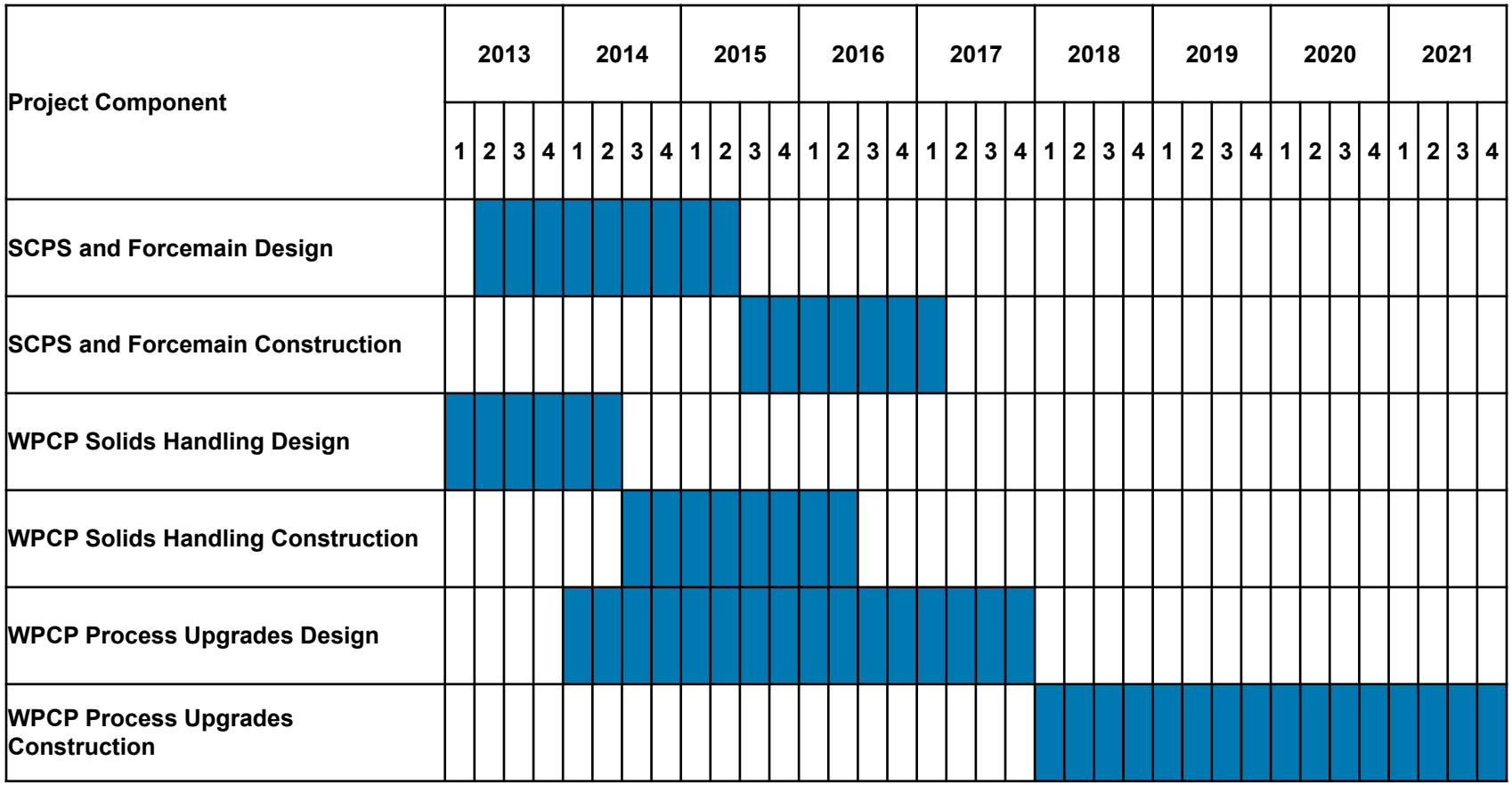
O'BRIEN & GERE

Brown AND Caldwell

Split Flow Concept



Schedule


Project Component
2013
2014
2015
2016
2017
2018
2019
2020
2021
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
SCPS and Forcemain Design
SCPS and Forcemain Construction
WPCP Solids Handling Design
WPCP Solids Handling Construction
WPCP Process Upgrades Design
WPCP Process Upgrades Construction