

MEETING COLUMBUS'S TREATMENT LIMITS

EVEN WHEN WET WEATHER
CHANGES THEM



AGENDA

- CEPT Background
- CEPT Preliminary Testing
- CEPT Project Update
- CEPT NPDES Permit Modification

CEPT BACKGROUND



BACKGROUND: WHAT IS CEPT?

CHEMICALLY

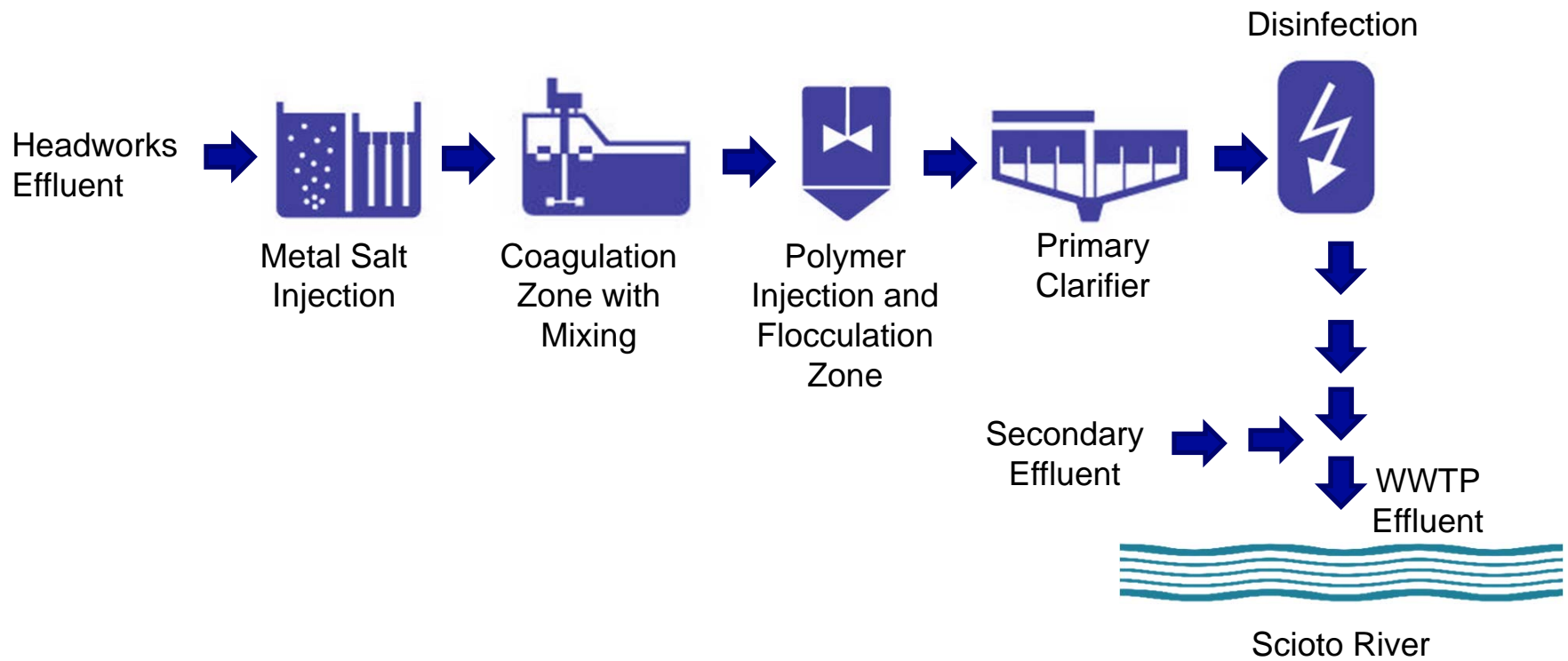
ENHANCED

PRIMARY

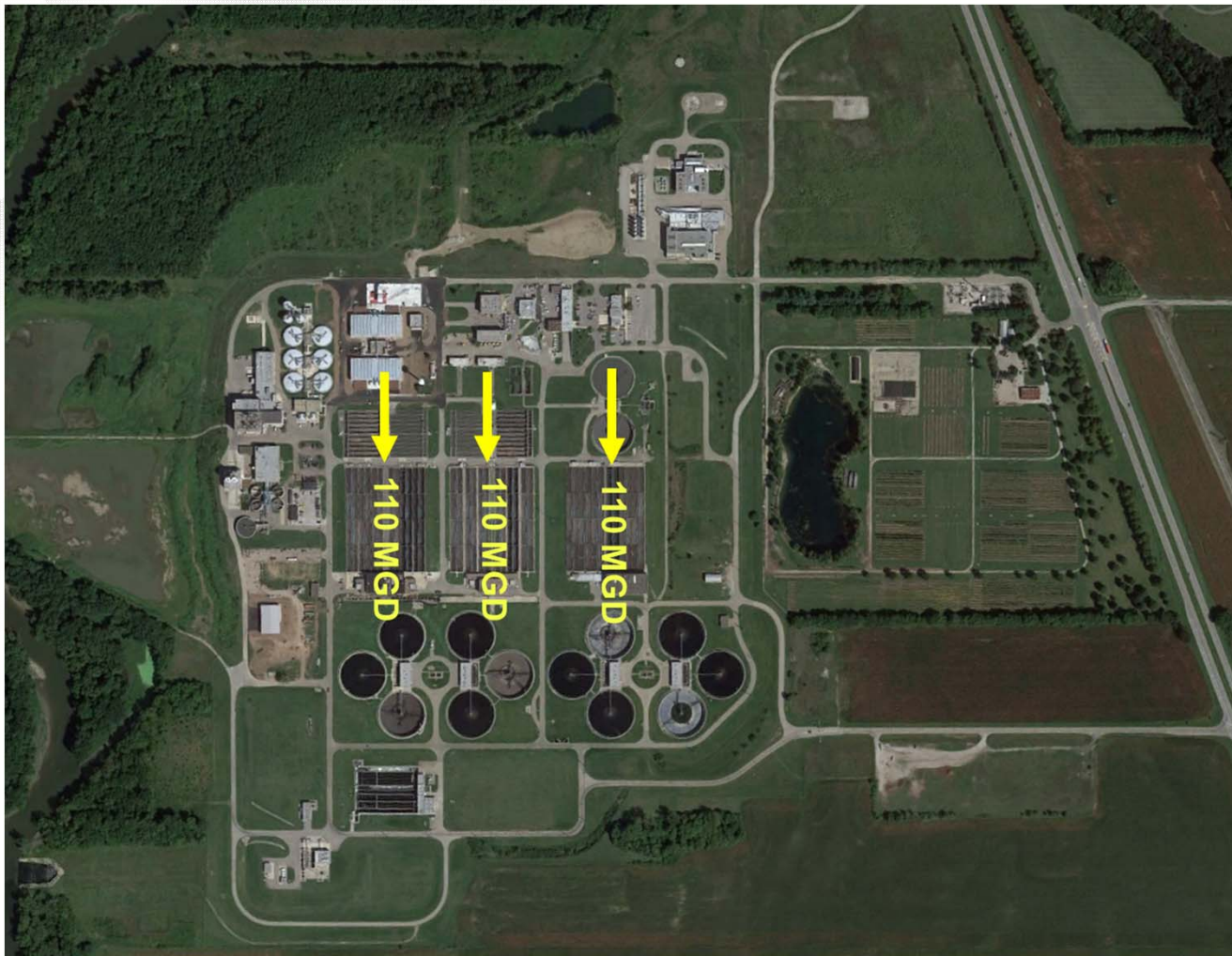
TREATMENT

- Adds 110 MGD of partial side stream treatment of wet weather flow
- Used after WWTP capacity is exceeded
- Goal is to remove TSS, BOD and disinfect
- Blended with WWTP effluent near outfall

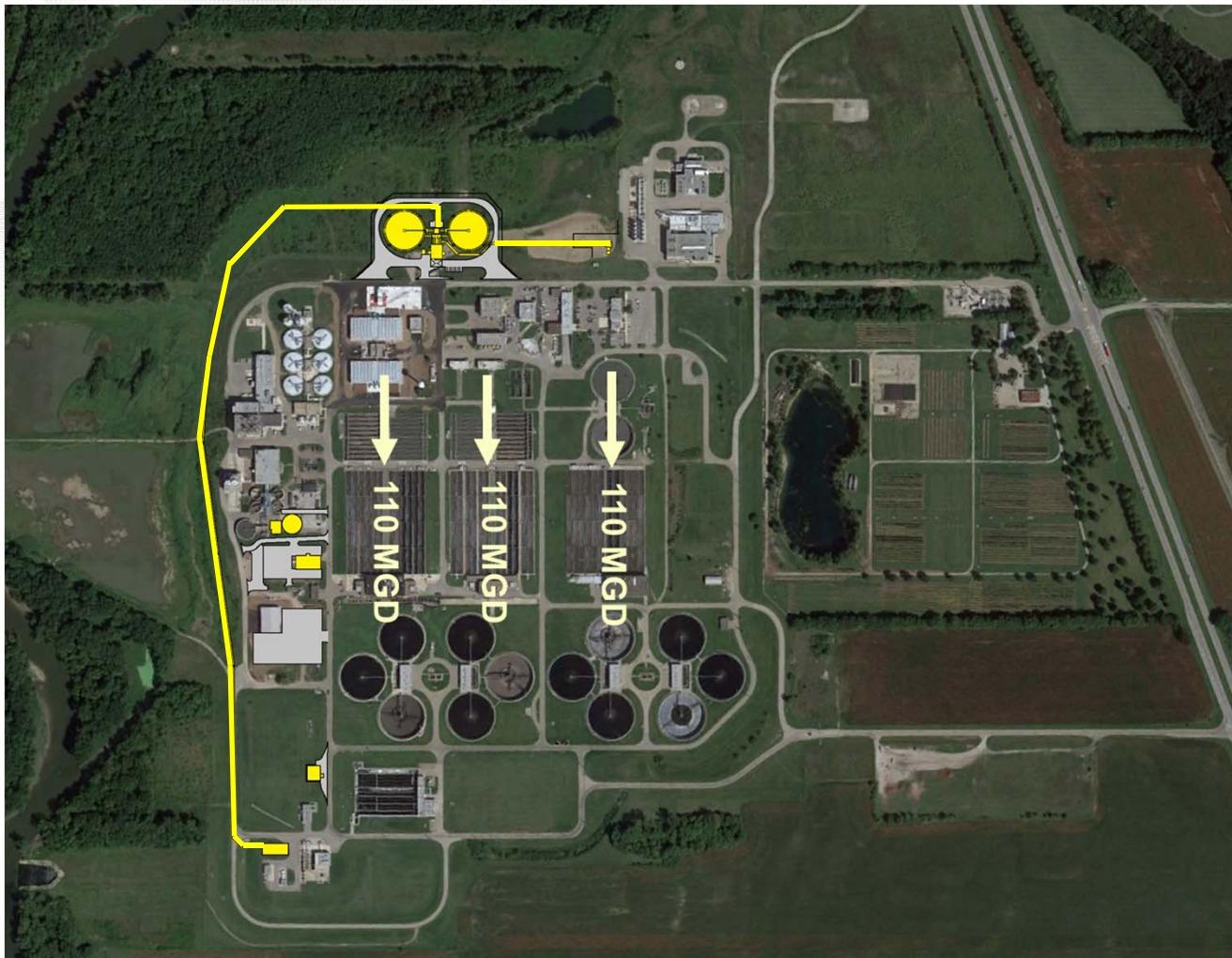
BACKGROUND: WHAT IS CEPT?



BACKGROUND: SOUTHERLY WWTP



BACKGROUND: CEPT AT SOUTHERLY WWTP

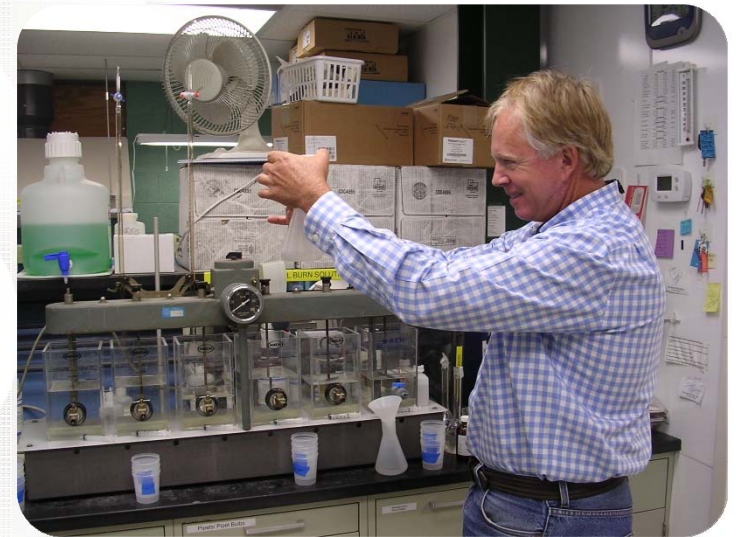


CEPT PRELIMINARY TESTING



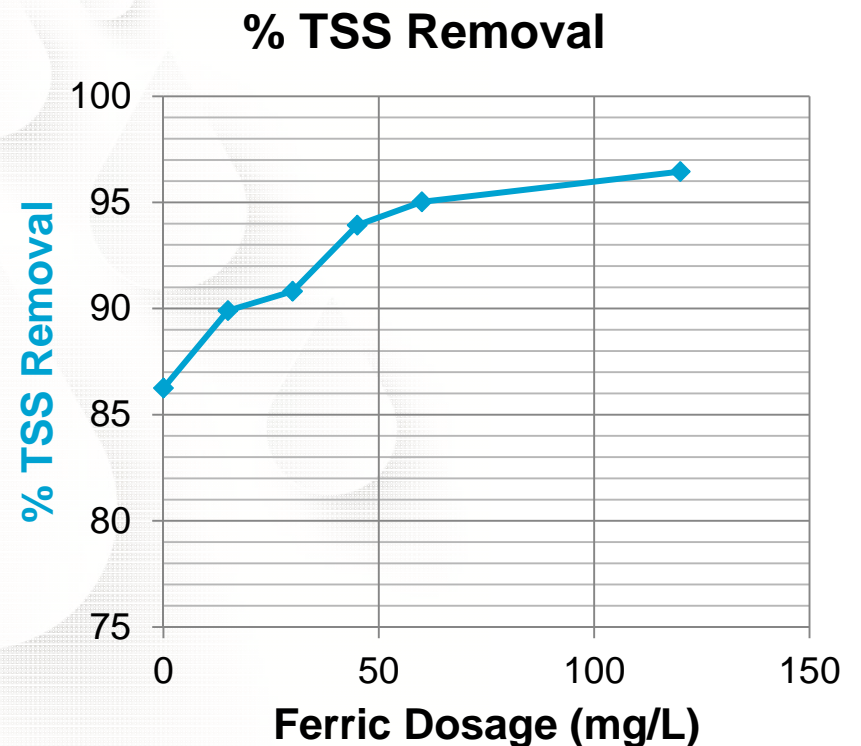
PRELIMINARY TESTING

- Jar testing and full scale pilot testing
- Verify feasibility and effectiveness of CEPT
- Estimate dosages of coagulant and flocculant
- Coagulants
 - Ferric chloride (FeCl)
 - Polyaluminum chloride (PACl)
 - Aluminum sulfate (Alum)
- Flocculants
 - Polyacrylamide flocculant



PRELIMINARY TESTING: JAR TESTING

- Removal at recommended chemical doses:
 - TSS: 85-94%
 - CBOD: 70-82%
 - Total P: 75-88%
- Treating to TSS of 30 mg/L is achievable
 - Initial TSS ranged from 156 mg/L to 406 mg/L
 - Final TSS ranged from 12 mg/L to 30 mg/L



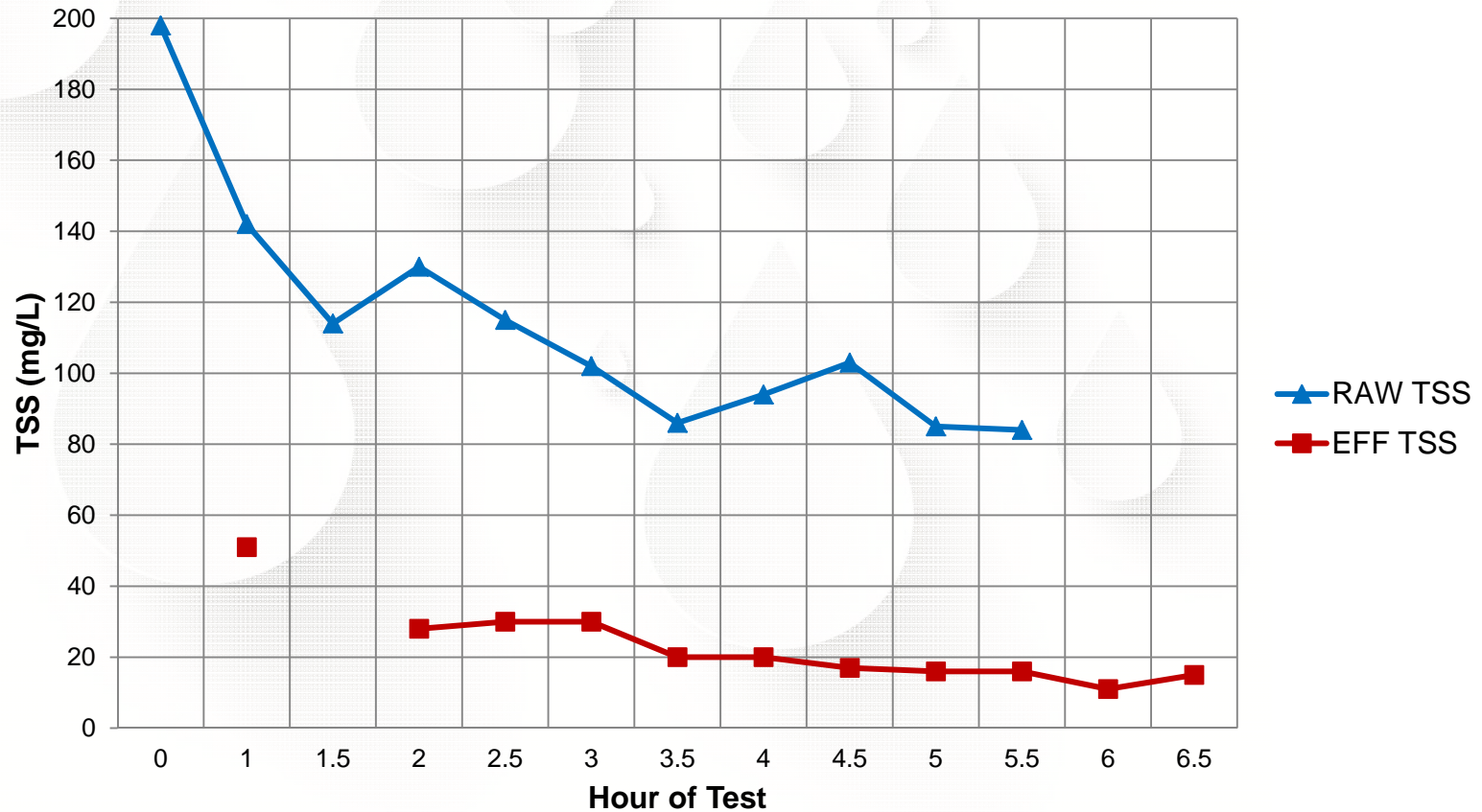
PRELIMINARY TESTING: FULL SCALE PILOT TESTING

- June 2014
- Total Plant Flow of 240 MGD
- East Train at 90 MGD
- Ferric Chloride – 40 mg/L
- Flocculant Polymer – 0.5 mg/L
- Surface Overflow Rate of 1,800 – 1,900 gpd/sf



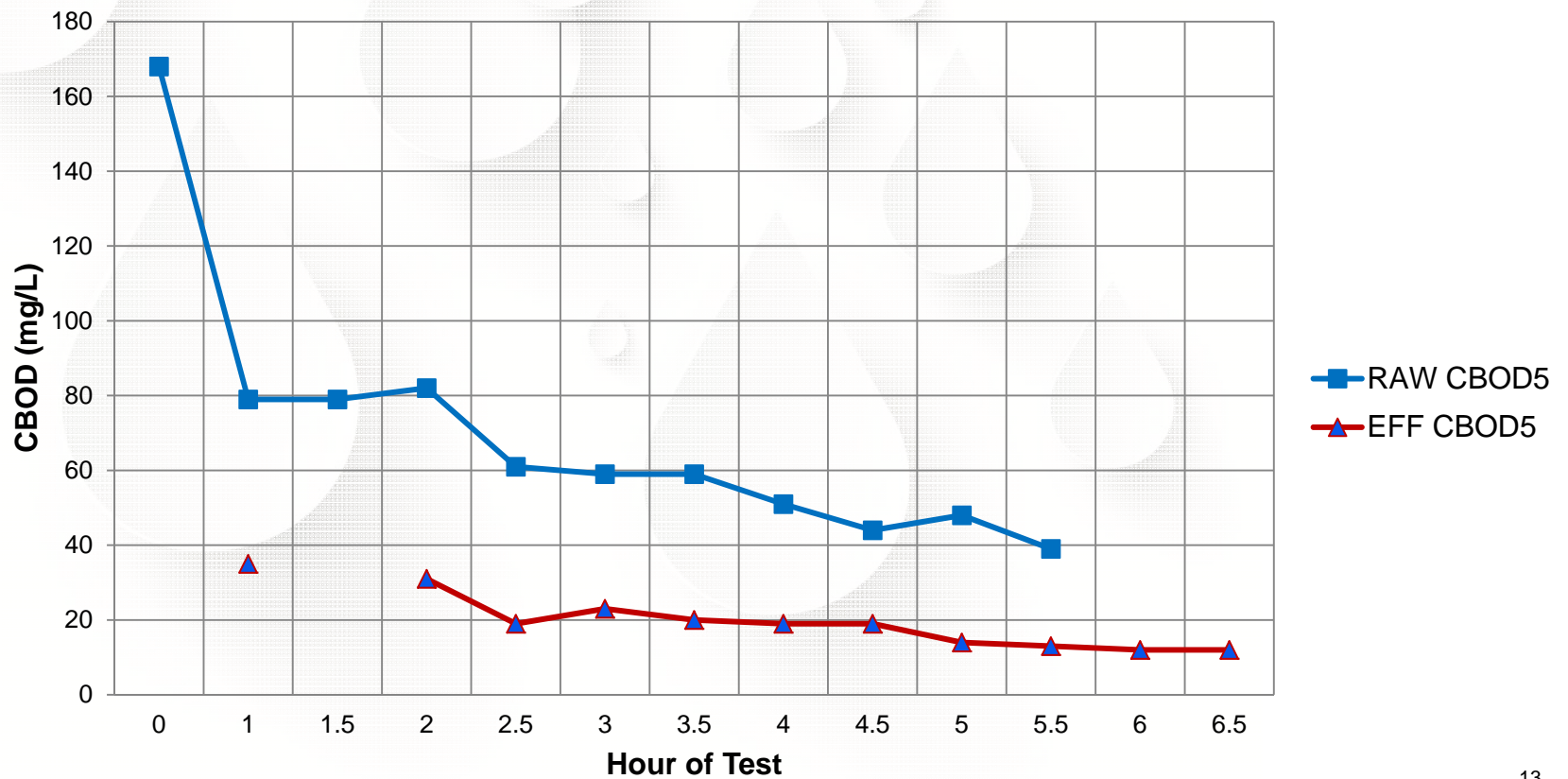
PRELIMINARY TESTING: FULL SCALE PILOT TESTING

**TSS (Test #1)
Influent vs. Effluent**



PRELIMINARY TESTING: FULL SCALE PILOT TESTING

**CBOD (Test #1)
Influent vs. Effluent**



CEPT PROJECT UPDATE



PROJECT UPDATE: CONTRACT SUMMARY



SITE PREP

- Clearing
- CMT and Contractor Facilities
- Preloading of Pipe Route
- Site Utilities



PRELIMINARY TREATMENT

- Increase raw sewage pumps capacity
- Increase fine screen capacity
- New gravity thickener



CLARIFICATION

- Flow diversion
- Flow metering
- Chemical systems
- Clarification
- Sludge pumping



DISINFECTION

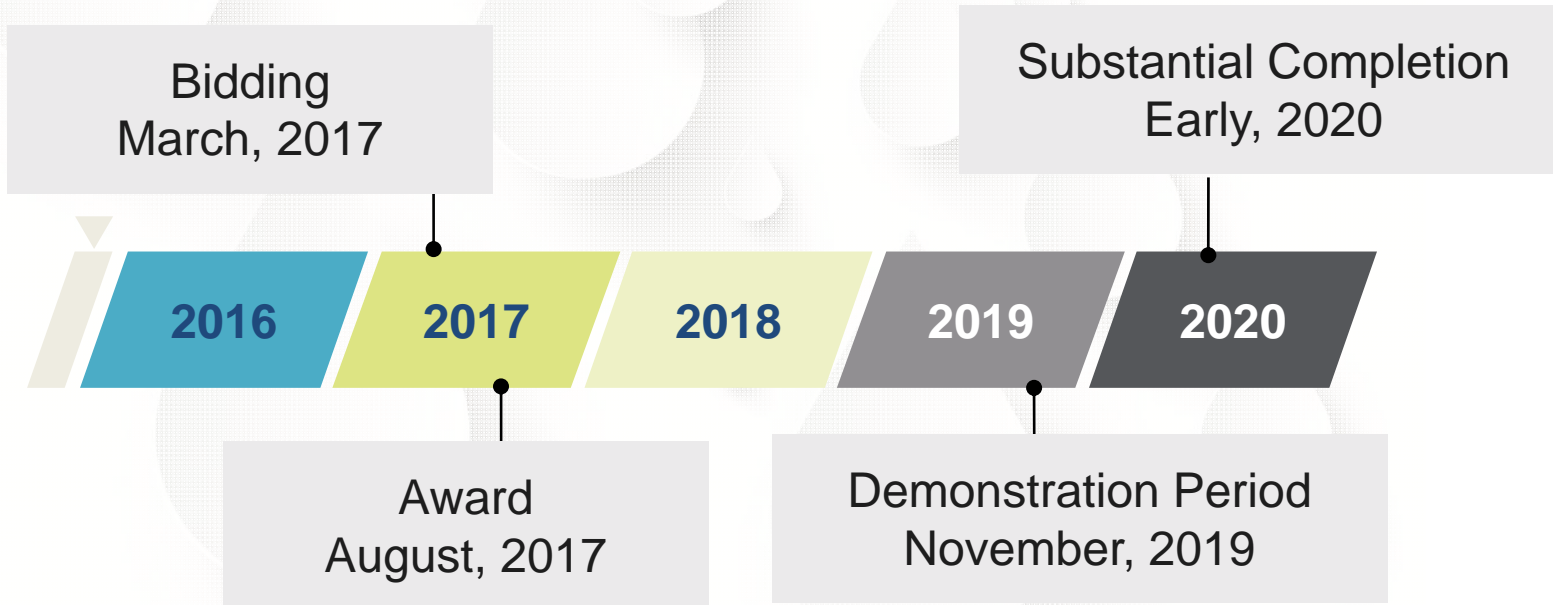
- Disinfection
- 3,900 LF effluent pipe
- Dechlorination
- Tie-in to existing outfall

PROJECT UPDATE: CONSTRUCTION COST

- Site Prep - \$5M
- Preliminary Treatment - \$26M
- Clarification - \$27M
- Disinfection - \$18M
- Total Bid Construction Cost: \$76M



PROJECT UPDATE: TIMELINE



CEPT NPDES PERMIT MODIFICATION



NPDES PERMIT MODIFICATION

- Per letter from OEPA dated December 12, 2012, TSS limited to 30 mg/l averaged across 7 activations with disinfection
- No other CEPT performance requirements in approval letter
- Existing permit limits of concern:
 - Ammonia
 - pH
 - DO

NPDES PERMIT MODIFICATION: AMMONIA

- CEPT does NOT treat for ammonia
- Initial evaluation showed that the current load limits could be exceeded in blended effluent
- During CEPT event:
 - High river flow rates (river estimated ~9,600 MGD)
 - Dilution will occur (CEPT + WWTP = 440 MGD)
 - Represents < 4.6% of total flow in river
- Performed primary effluent ammonia sampling
- Evaluated expected ammonia loading to the Scioto during CEPT operation

NPDES PERMIT MODIFICATION: AMMONIA

Ammonia sampling performed on east train primary clarifiers

- 230 samples taken > 220 MGD
- 78 hours of flow >330 MGD
- For flows >330 MGD
 - Average 5.6 mg/L
 - Maximum 10.8 mg/l
 - Minimum 2.1 mg/l
- Permit limits 1.5 - 5.1 mg/L weekly
- Permit limits 1.0 - 3.4 mg/L monthly



NPDES PERMIT MODIFICATION: AMMONIA

- Correlated stream flow to plant flow to estimate Scioto River flow while CEPT operational
 - 9,600 MGD vs 440 MGD
- Correlated stream ammonia to plant ammonia to estimate Scioto River ammonia concentration while CEPT operational
 - River Ammonia (from upstream gauge) = 0.38 mg/L (95% perc)
 - CEPT Ammonia (from sampling) = 8.3 mg/L (95th perc)
 - WWTP Ammonia (assumed seasonal permit limits) = 1.5 – 5.1 mg/L
- Determined that during all CEPT scenarios, instream ammonia concentration would stay below 1.0 mg/L
- Scioto is designated a Warmwater Habitat (WWH) and Outside Mixing Zone Maximum criteria (OMZM) is 5.9 - 7.3 mg/L depending on season
- **Conclusion: no reasonable potential for CEPT discharge to cause exceedance of ammonia WQ criteria; therefore no ammonia limit needed during CEPT operation**

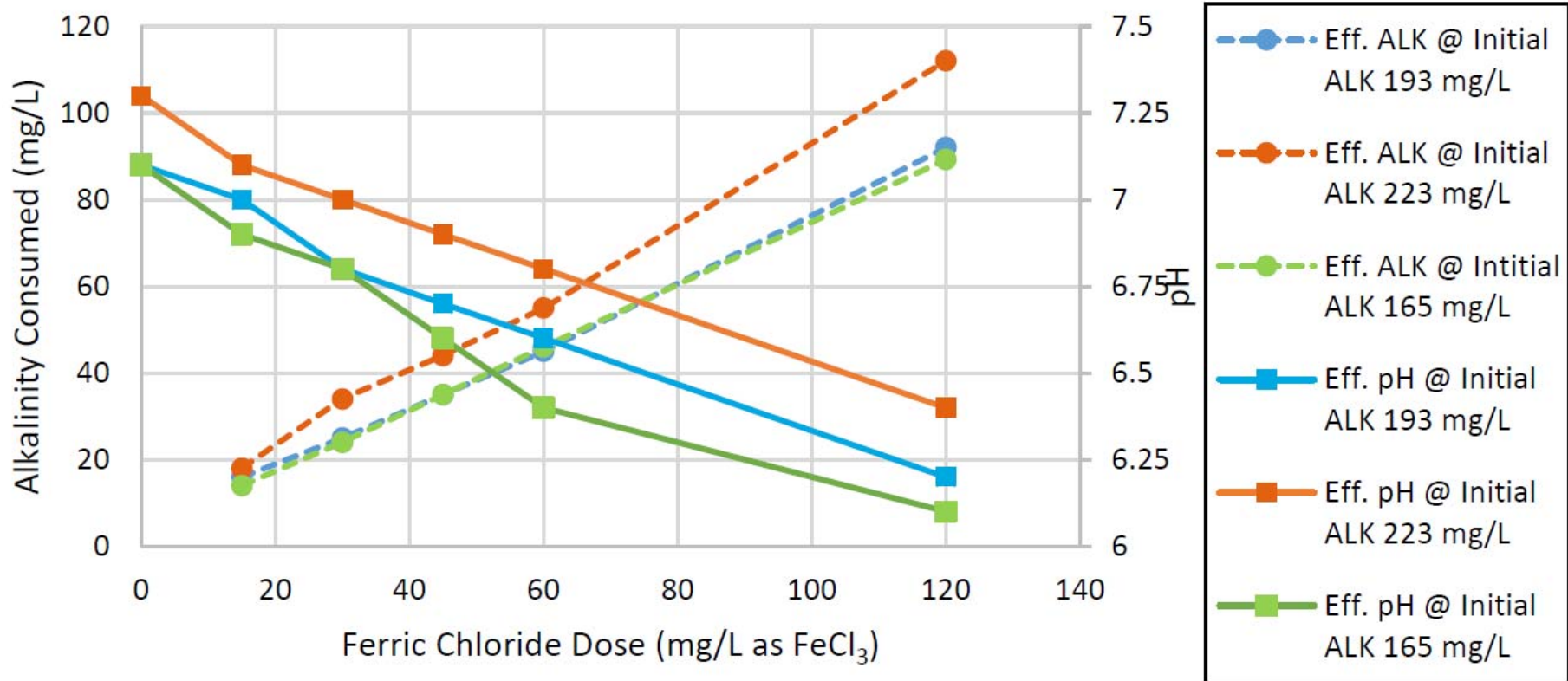
NPDES PERMIT MODIFICATION: pH

- Current permit limit = 6.5
- WWH criteria limit = 6.5
- Disinfection
 - Slightly raises pH
- Coagulation
 - Consumes alkalinity
 - May significantly lower pH
- Jar test pH data utilized



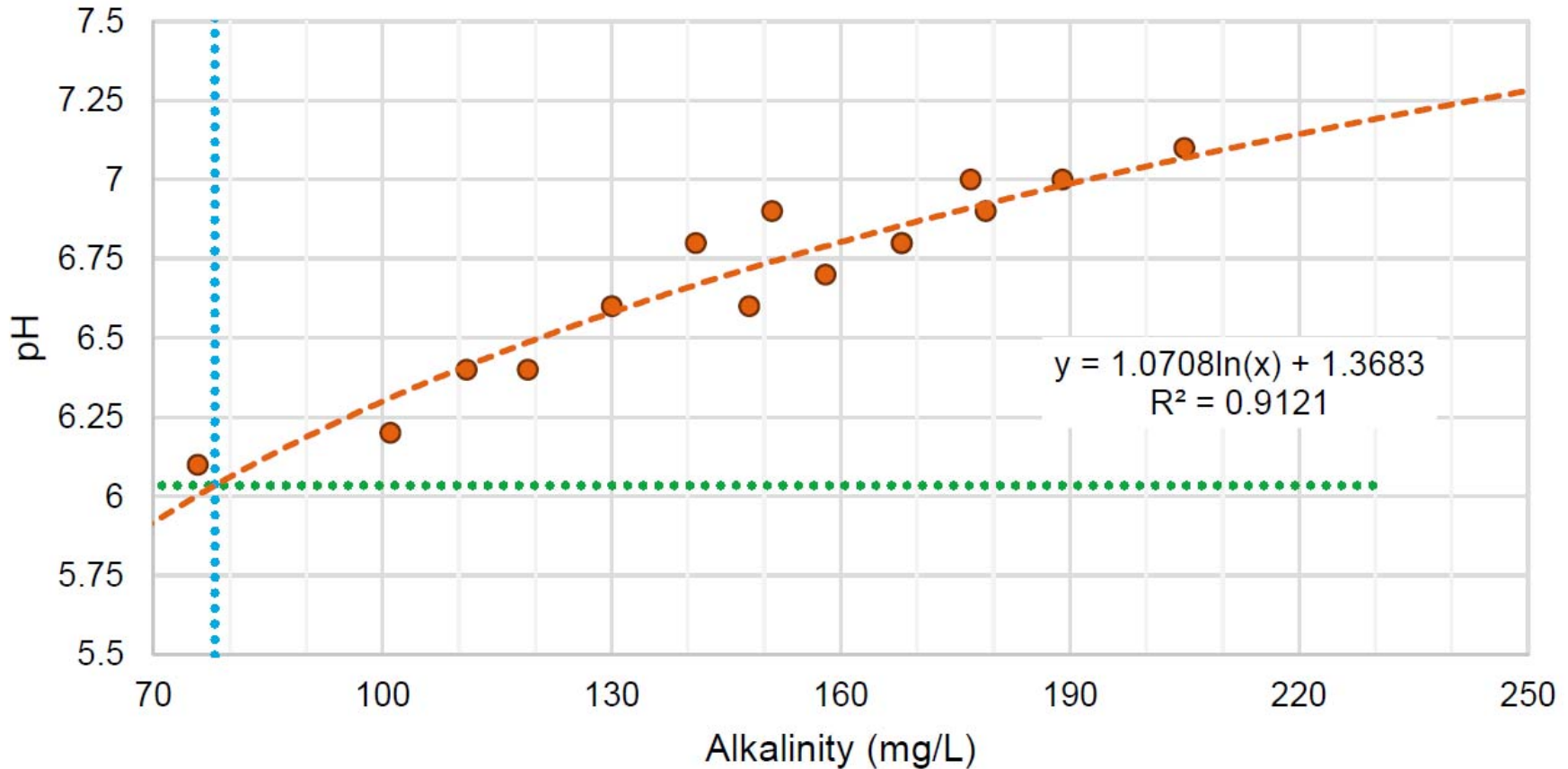
NPDES PERMIT MODIFICATION: pH

Jar Test Effluent Alkalinity Consumed and pH Levels



NPDES PERMIT MODIFICATION: pH

CEPT Effluent pH vs. Alkalinity (Treated)

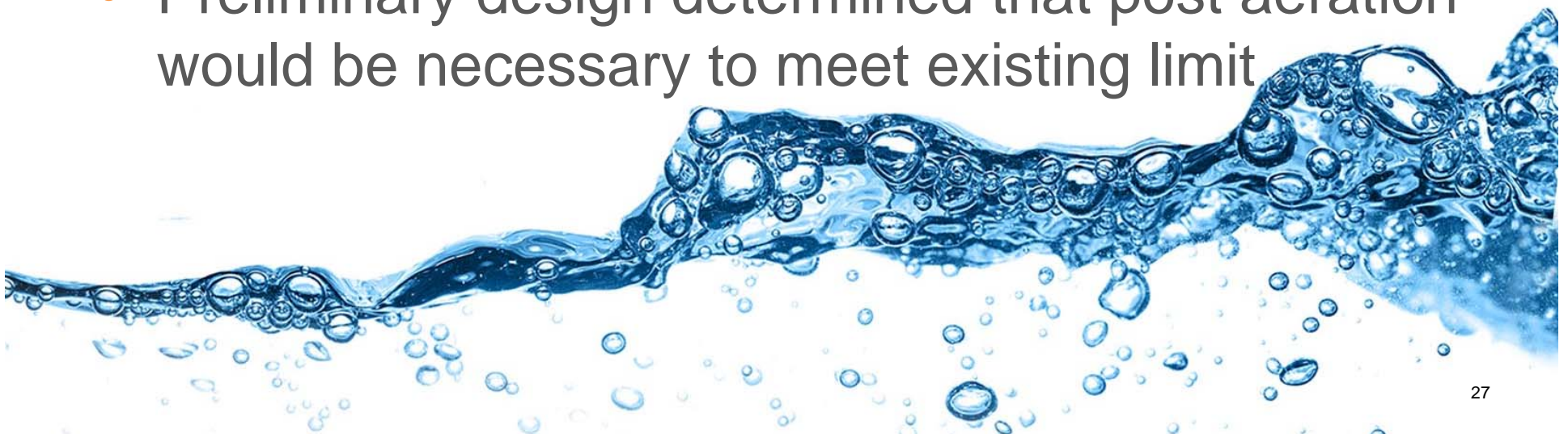


NPDES PERMIT MODIFICATION: pH

- Typically minimal risk of violating NPDES pH limit through full secondary treatment (without CEPT)
- FeCl dosing presents low-moderate risk of violation in lowest 5th percentile of influent pH (once in 11 years)
- Mitigation options:
 - Limit FeCl dose during low turbidity conditions
 - Switch to aluminum-based coagulant
 - Add pH adjustment process
 - Develop high flow permit exception with OEPA
- **Conclusion: Due to the minimal impact of CEPT+WWTP flows on Scioto (> 4.6%) and chance of violation infrequent, a lower pH of 6.0 would likely have no adverse impacts**

NPDES PERMIT MODIFICATION: DO

- CEPT effluent expected DO will be 2 - 3 mg/L
- This may reduce combined plant effluent below permit of 7.0 mg/L
- Is DO increase necessary for CEPT flow?
- Preliminary design determined that post aeration would be necessary to meet existing limit



NPDES PERMIT MODIFICATION: DO

- Analyzed river flow to determine river flow during CEPT operation (< 4.6%)
- Scioto WWH criteria for DO is 4 mg/L min, 5 mg/L min over 24 hours
- DO from CEPT will be combined with final effluent
- No recognizable water quality benefits of achieving a higher effluent DO during high flows
- **Conclusion: a DO of 5 mg/L from the plant is reasonable during CEPT events.**



NPDES PERMIT MODIFICATION

- Met with Ohio EPA to review these permit limits of concern
- Submitted permit modification with PTI for Ohio EPA approval
- Recently issued draft permit with limit modifications as requested



NPDES PERMIT MODIFICATION: DRAFT PERMIT

- CEPT effluent must meet 30 mg/L TSS limit averaged across 7 activations
- Modified DO, pH, and ammonia limits for the combined plant discharge when CEPT is in operation
 - DO: 5.0 mg/L (vs. 7.0 mg/L otherwise)
 - Minimum pH: 6.0 (vs. 6.5 otherwise)
 - Ammonia: no limit, only monitoring (vs. seasonal limits otherwise)

QUESTIONS / DISCUSSION



THANK YOU

STACIA ECKENWILER, PE
Project Manager, City of Columbus
O: 614 645 0268
C: 614 769 0637
E: SEckenwiler@Columbus.gov

CHAD DUNN, PE
Associate Vice President, Arcadis
O: 614 985 9220
C: 614 596 1901
E: chad.dunn@arcadis.com

