



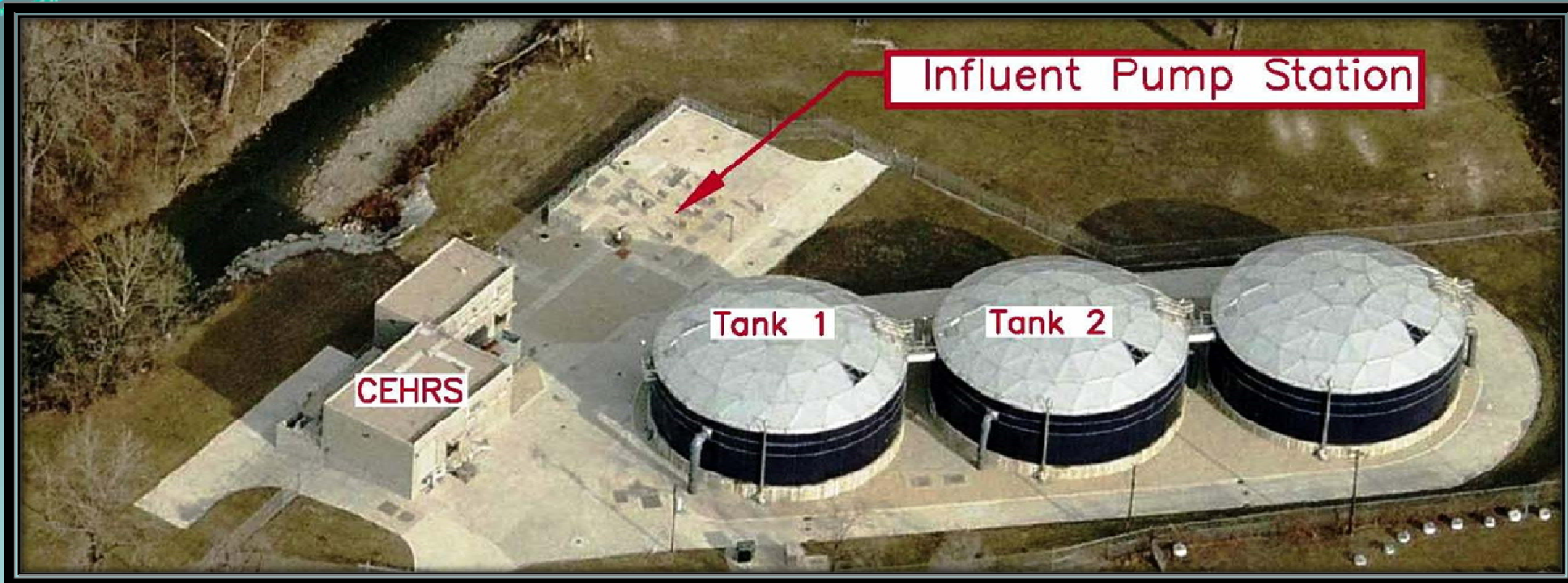
SSO 700 Storage and Treatment Facility

FACILITY OVERVIEW



Facility Overview

- Influent Pump Station

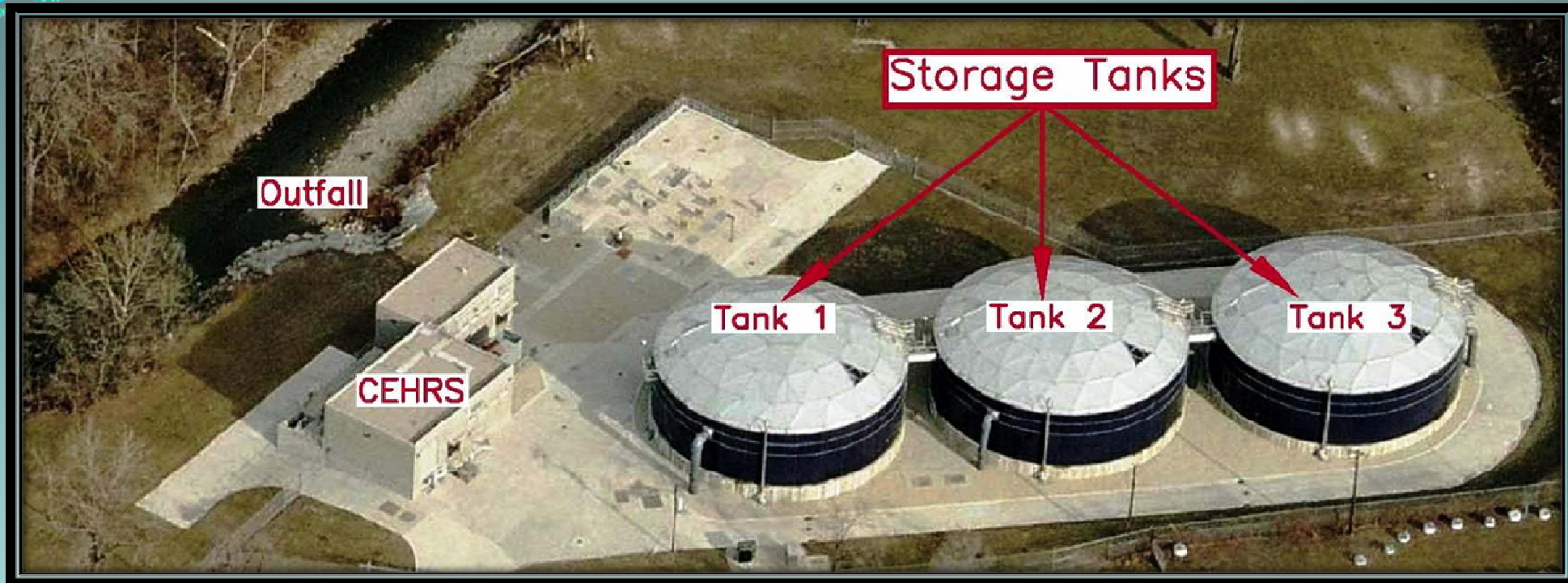


Influent Pump Station:

- 4 – 10 mgd submersible pumps
- Able to pump to Tank 1, Tank 2 or directly to CEHRS.

Facility Overview

- Influent Pump Station
- Storage Tanks



Storage Tanks:

- 3 – 1.2 million gallon tanks
- Tanks may store & release to sewer or release to CEHRS.
- During large storms, tanks may have combined discharge with CEHRS to outfall

Facility Overview

- Influent Pump Station
- Storage Tanks
- Screening

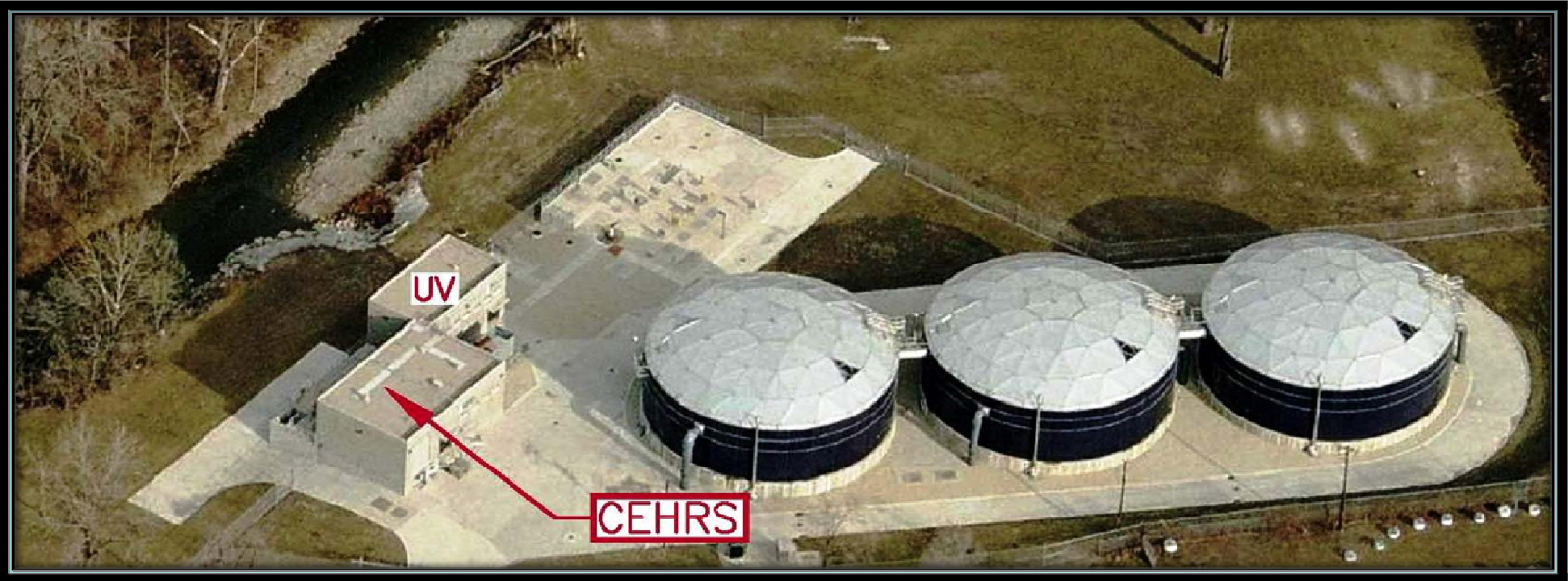


Screening:

- 1 – Influent rotary brush screen.
- 2 – 15 mgd mechanical screens - 6 mm effective size perforated plate.

Facility Overview

- Influent Pump Station
- Storage Tanks
- Screening
- CEHRS

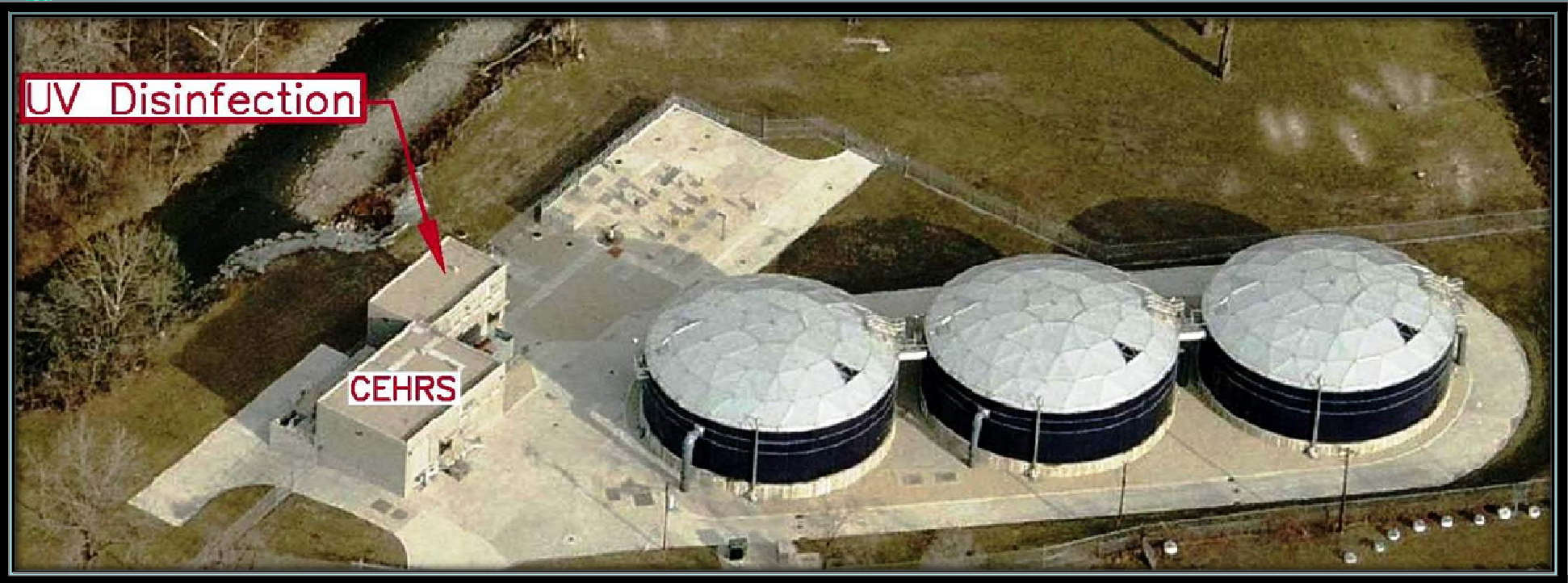


CEHRS:

- **3 mgd to 15 mgd capacity**
- **CEHRS detention time is 75-15 minutes respectively.**
- **Polymer, coagulant, and ballast sand added during high rate treatment.**

Facility Overview

- Influent Pump Station
- Storage Tanks
- Screening
- CEHRS
- UV Disinfection



UV Disinfection:

- **15 mgd firm capacity**

SAMPLING PROGRAM

Nine sampling events:

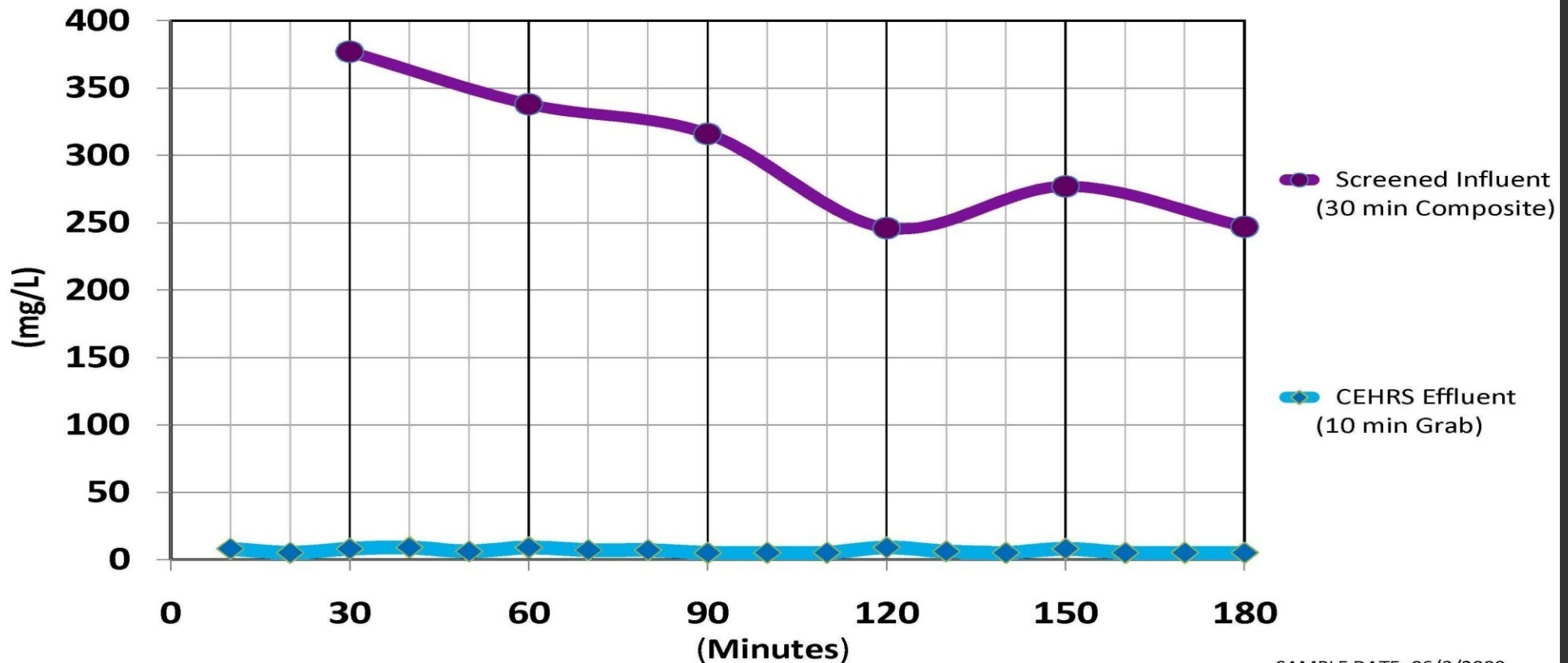
- 3 – Intentionally Stress System
- 3 – Determine Operational Optimization Parameters
- 3 – Observe Optimized System

RESULTS



Total Suspended Solids (TSS)

WWT 5

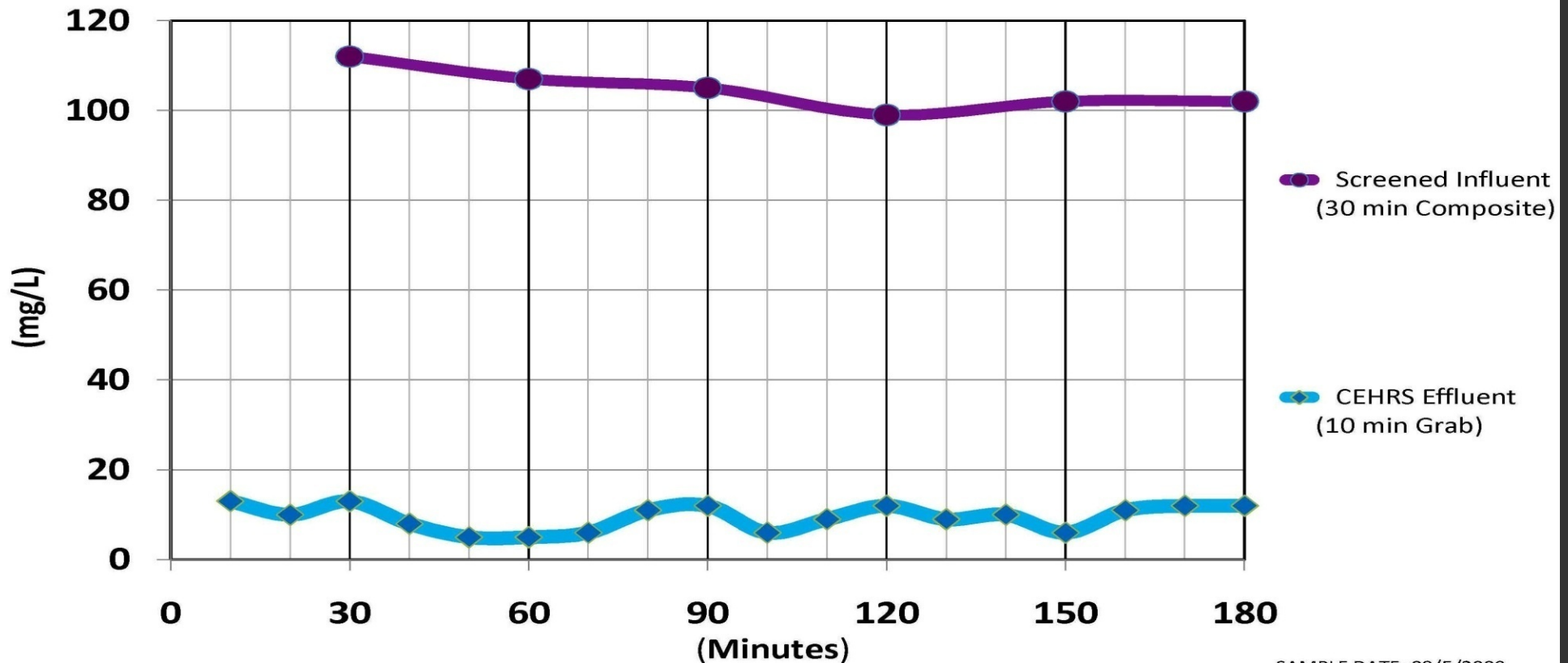


SAMPLE DATE: 06/3/2009

- 1,228 Pounds of TSS Removed in 3 Hours
- Percent Removal at 4.0 mgd: 98%

Total Suspended Solids (TSS)

WWT 6

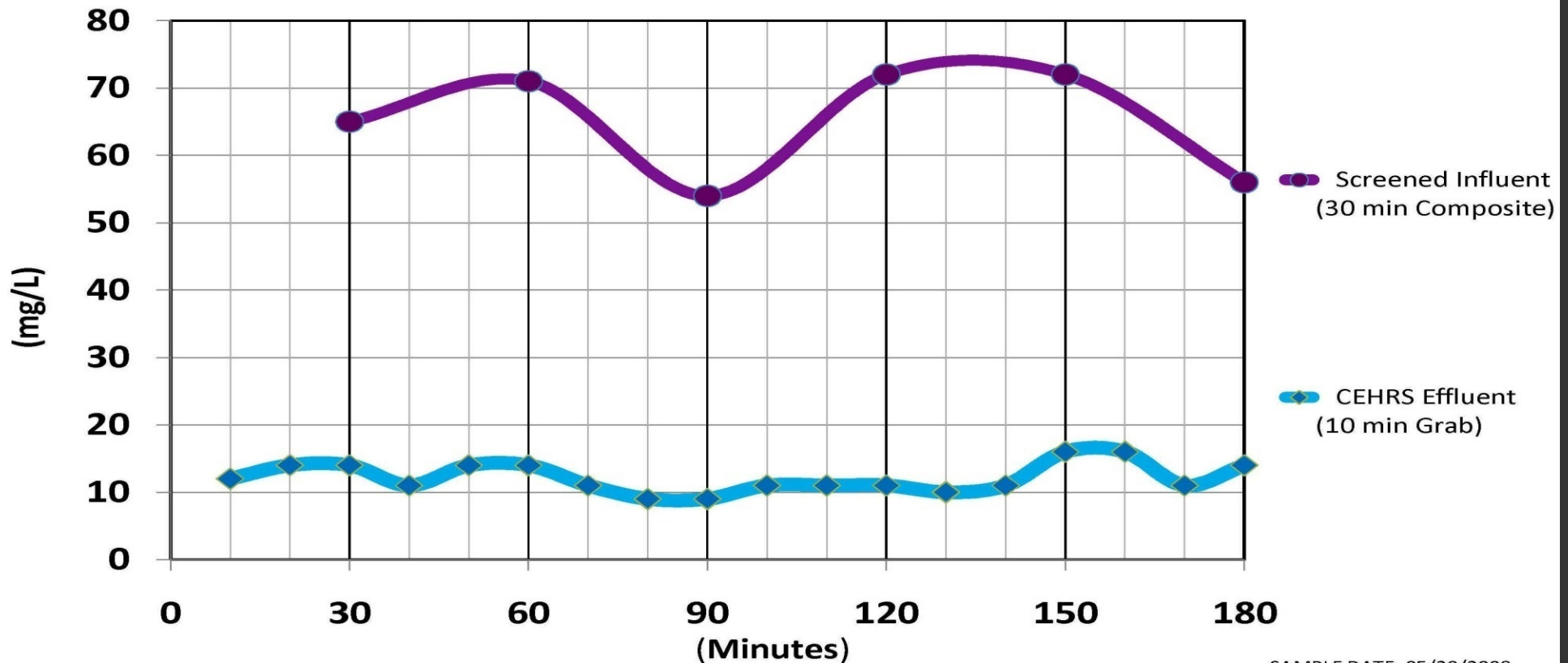


SAMPLE DATE: 08/5/2009

- 636 Pounds of TSS Removed in 3 Hours
- Percent Removal at 6.4 mgd: 91%

Total Suspended Solids (TSS)

WWT 2

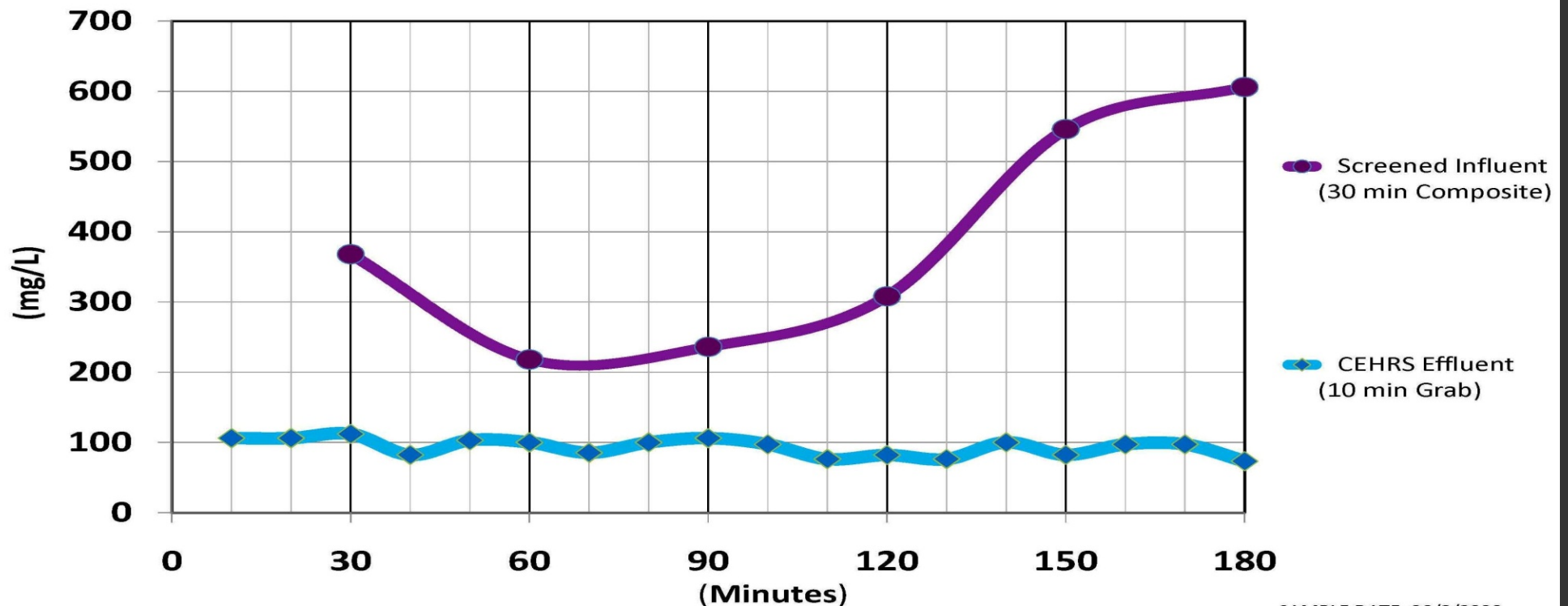


SAMPLE DATE: 05/20/2008

- 733 Pounds of TSS Removed in 3 Hours
- Percent Removal at 13.3 mgd: 81%

5-Day Carbonaceous Biochemical Oxygen Demand (CBOD₅)

WWT 5

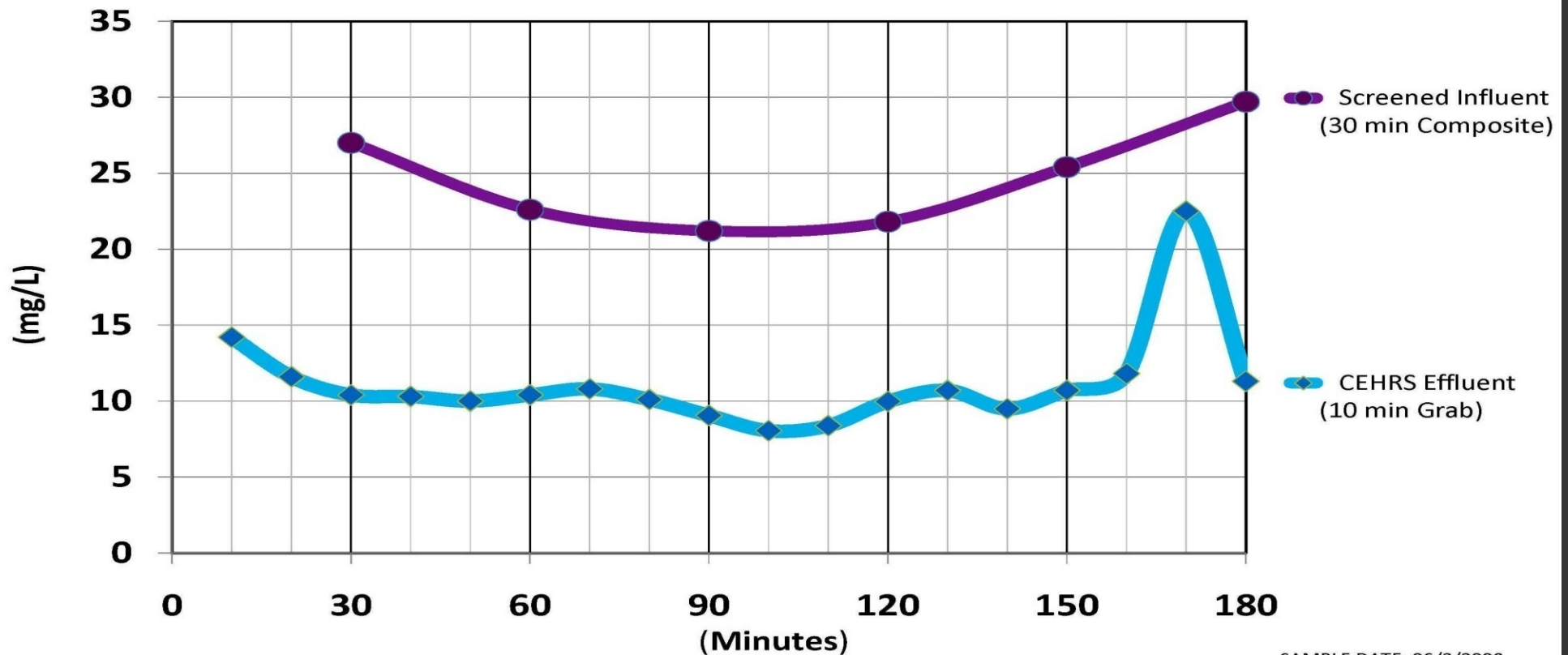


SAMPLE DATE: 06/3/2009

- 1,200 Pounds of CBOD₅ Removed in 3 Hours
- Percent Removal: 75%

Total Kjeldahl Nitrogen (TKN)

WWT 5

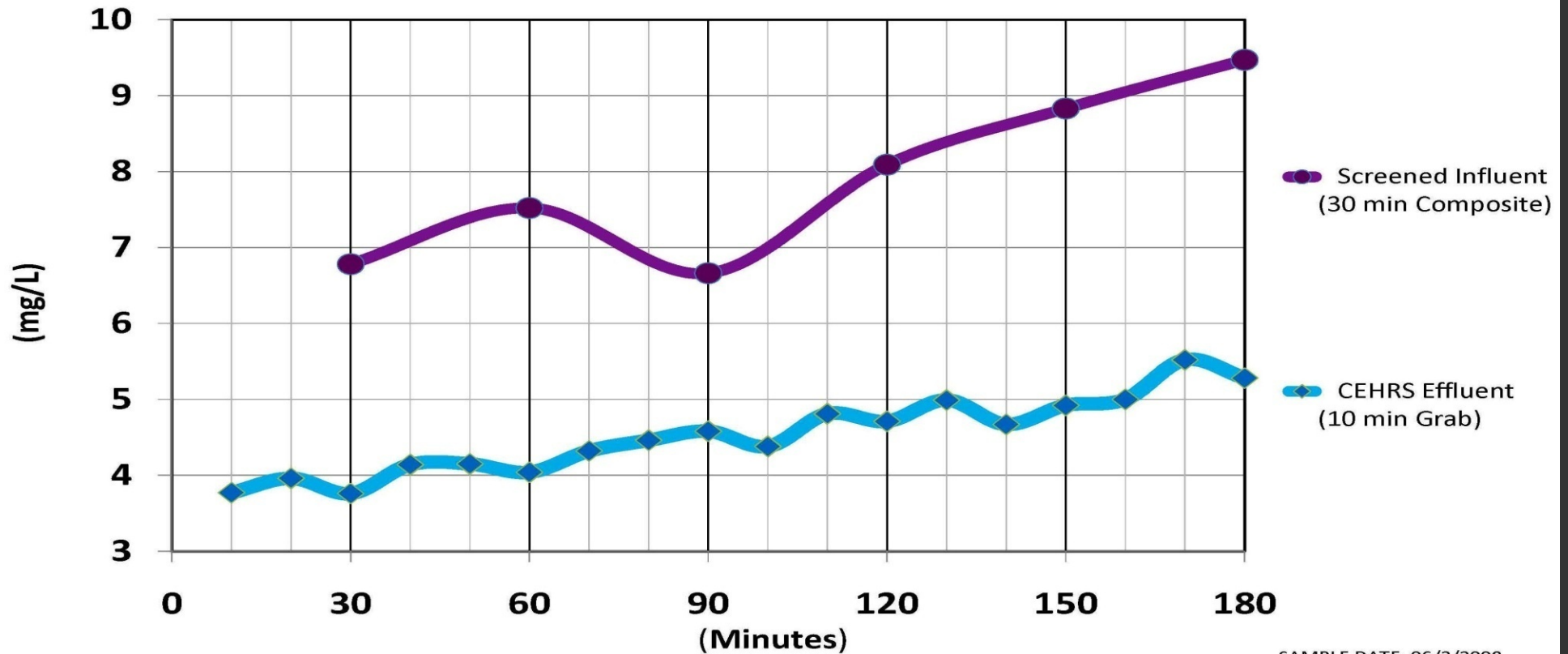


SAMPLE DATE: 06/3/2009

- **57 Pounds of TKN Removed in 3 Hours**
- **Percent Removal: 55%**

Ammonia (NH₃)

WWT 5

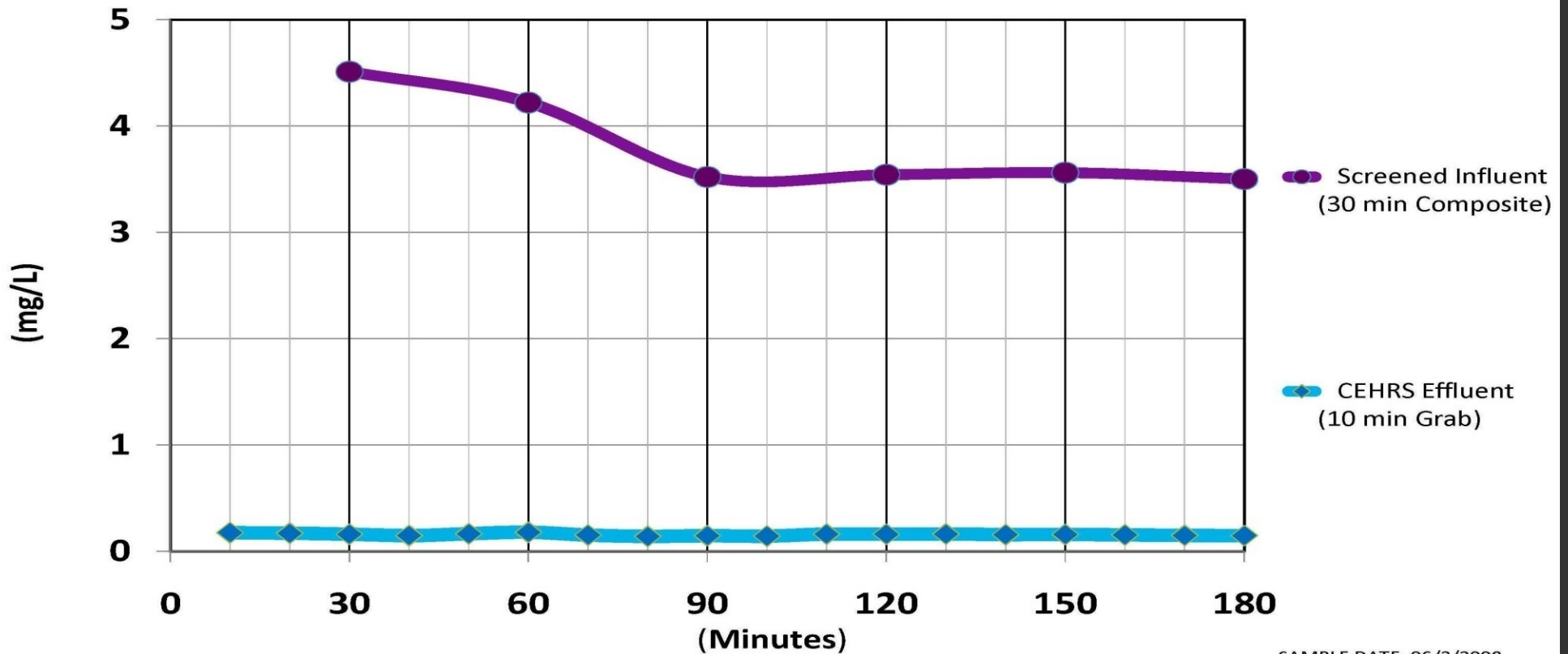


SAMPLE DATE: 06/3/2009

- 14 Pounds of NH₃ Removed in 3 Hours
- Percent Removal: 43%

Total Phosphorus (TP)

WWT 5

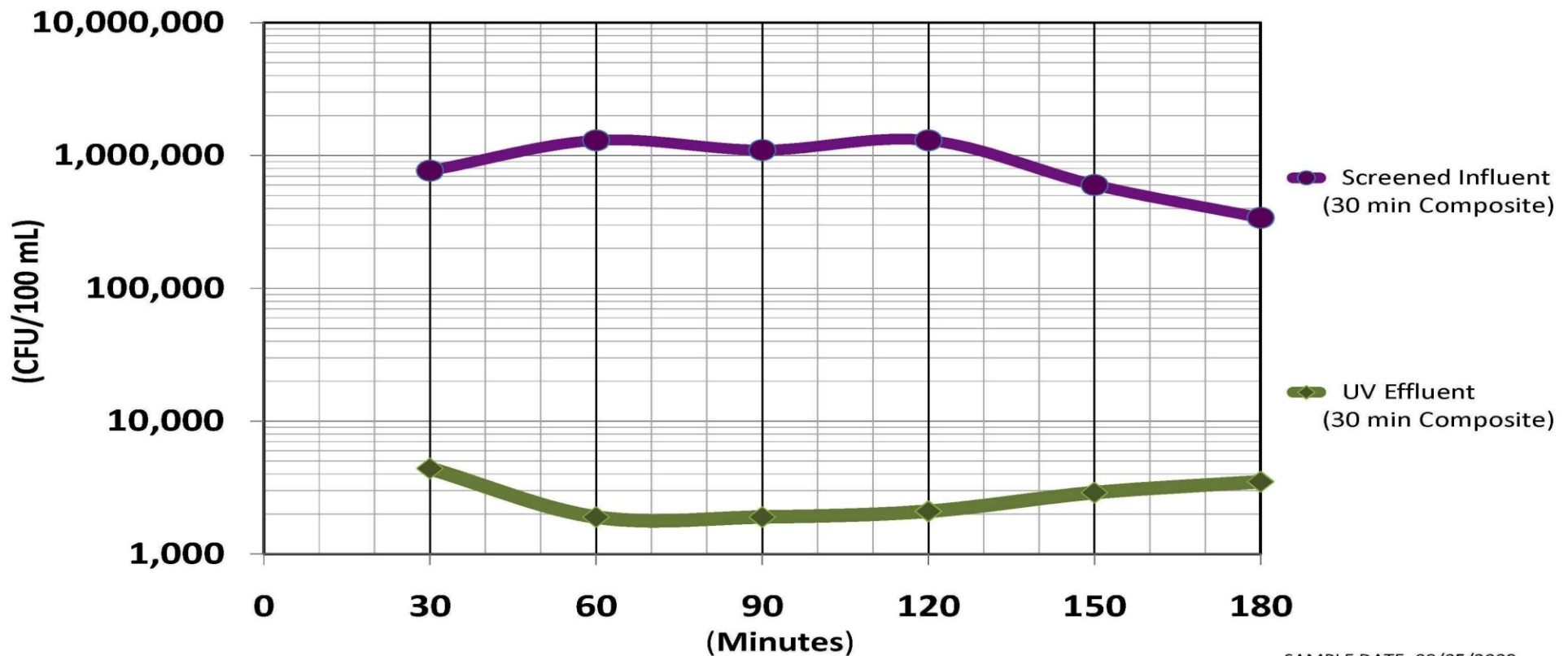


SAMPLE DATE: 06/3/2009

- 15 Pounds of TP Removed in 3 Hours
- Percent Removal: 96%

Escherichia Coliforms (E. Coli)

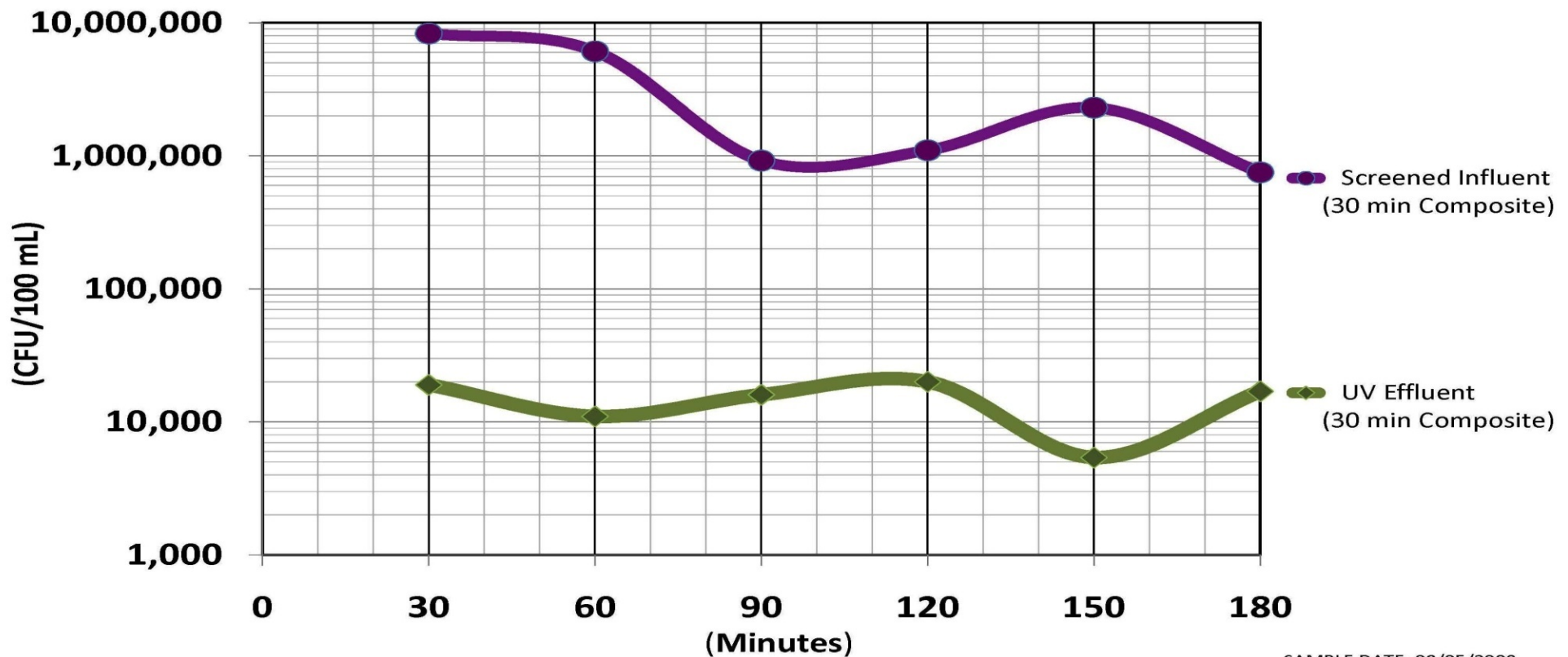
WWT 6



- **Percent Removal: 99.69% (2.51 Log Removal)**

Fecal Coliforms

WWT 6



- **Percent Removal: 99.55% (2.35 Log Removal)**

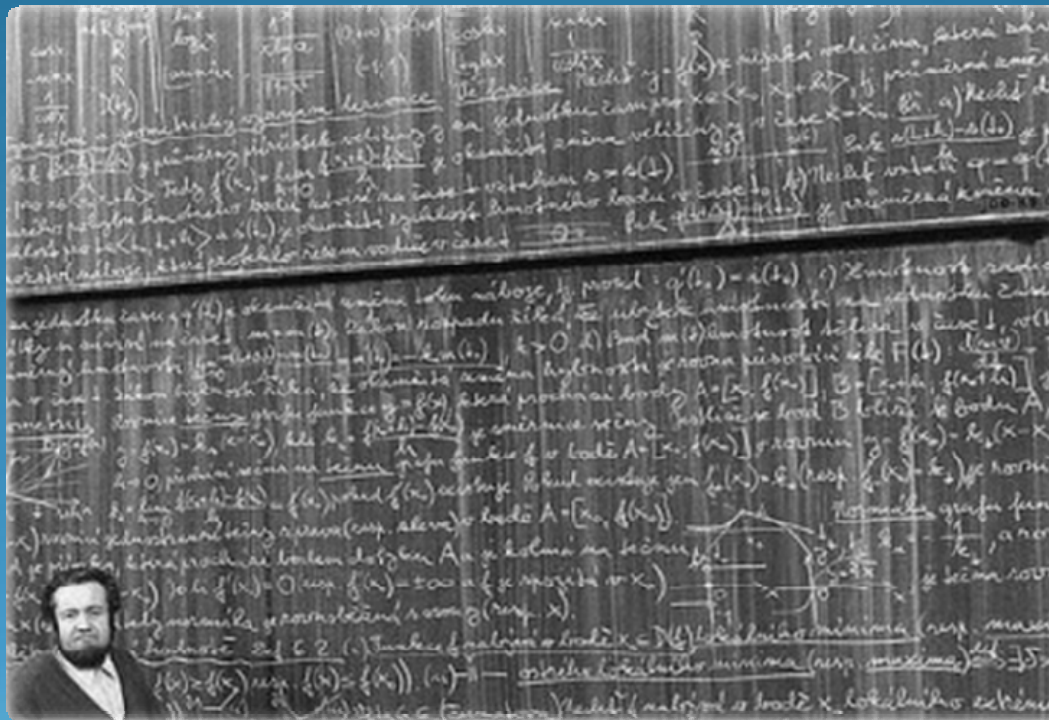
Facility Operational Summary (June, 2007 – June, 2008)

- **Number of Operational Events:**
 - 36
- **Hours of Operations: Storage Tanks & CEHRS**
 - 1,850 Hours & 1,380 Hours
- **Volume Stored & Returned to Sewer:**
 - 59,800,000 Gallons
- **Volume Treated By CEHRS:**
 - 380,000,000 Gallons
- **Volume Overflowed From Storage Tanks:**
 - 80,400,000 Gallons
- **Annual TSS Removal % (WWT 6 waste strength):**
 - 83%

Facility Operational Summary (November, 2008 – November, 2009)

- **Number of Operational Events:**
 - 35
- **Hours of Operations: Storage Tanks & CEHRS**
 - 640 Hours & 270 Hours
- **Volume Stored & Returned to Sewer:**
 - 79,800,000 Gallons
- **Volume Treated By CEHRS:**
 - 64,100,000 Gallons
- **Volume Overflowed From Storage Tanks:**
 - 32,100,000 Gallons
- **Annual TSS Removal % (WWT 6 waste strength):**
 - 85%

LESSONS LEARNED





Does the Technology Work?



Lesson Learned #1

- Photo: Two Beakers of Water
- One beaker is potable tap water the other is SSO 700 Storage & Treatment Facility effluent. If you are not 100% certain which is which...the speaker is not telling...and the system works very well.

Lesson Learned #2

- Photo: Horse Stable
- “Stable” operations is very important to successful operation.
 - The more stable flow rates, chemical doses and ballast sand volume can be held, the higher the effluent quality will be.
 - Make changes slowly.

Lesson Learned #3

- Photo: USS Yorktown
- Compared to a facility which operates 24/7/365; the training at a facility which operates 35 days a year needs to be more extensive and include more simulation events
- Operational design needs to be very intuitive

Lesson Learned #4

- Photo: 1937 Flood at Cincinnati
- Whatever the defined design storm event; there is a larger storm somewhere on the horizon. The first screen (brush screen) failed because it was hydraulically overwhelmed by “the bigger storm”. It has been supplemented with two mechanical screens. Designers need to design to handle the design storm and to handle that flow rate even when the bigger storm is underway.

Lesson Learned #5

- Photo: SSO 700 Storage & Treatment Facility Tank 1
- When filling tanks; tank 1 into tank 2 into tank 3; tank 1 will overflow because a construction field change occurred without asking the design team. The fill pipe between tanks 2 and 3 was raised one foot thus raising the hydraulic profile through the tanks.
- Fortunately, this isn't the normal intended operating sequence and no harm or repair is required once the problem was realized.
- Please contractors, build to the plans!

Lesson Learned #6

- Photo: SSO 700 Storage & Treatment Facility Tank 1
- Tank 1 was originally configured to receive and isolate the “first flush”. We never observed a first flush. By the time flow is high enough to divert flow from the trunk sewer to the storage facility the first flush was already past.

Lesson Learned #7

- Photo: Foam in UV Room
- Because we know less about what is in sewage than what we sometimes think we do, be prepared to make facility modifications in responses to surprises.....particularly if you are in a heavy industrial area.
- In this case intermittent foam, caused by industrial surfactant in the sewer, blossomed as soon as the flow was agitated going over the influent weir and at each subsequent point of agitation.

Lesson Learned #8

- Photo: Graph of WWT 1 CEHRS Effluent TSS & Turbidity
- Sludge Can **NOT** be recirculated. It will destroy the process in two HRT. It must be sent to the downstream sewer or stored.
- SSO 700 STF sends sludge downstream except 40-50 hours per year when interceptor level is too high. Use of storage tank 1 is being modified to store sludge on those occasions (happily it is not needed to store “first flush”. See Lesson Learned #6.

Lesson Learned #9

- Photo: Two Beakers of Water
- Combining good design, construction training, and operation: YES! We can build remote storage and treatment facilities that:
 - Remove as much as 85% of TSS on an annual basis
 - Remove as much as 65% of cBOD5 on an annual basis
 - Provide better than 99% reduction in bacterial counts
 - Can startup remotely while an operator is being mobilized



FIN



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