NORTHEAST SCHUYLKILL JOINT MUNICIPAL AUTHORITY
WASTEWATER TREATMENT FACILITY
RUSH TOWNSHIP, SCHUYLKILL COUNTY, PENNSYLVANIA

NPDES Permit No. PA0063878

ORGANIC LOADING STUDY

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WASTEWATER TECHNICAL ASSISTANCE PROGRAM

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Disclaimers:

Pennsylvania Regulations at 25 Pa. Code § 91.12 state, inter alia, that "Employees of the Department may not act as consulting engineers for a party…". This report and the and any recommendations represent an interpretation of data collected during the project and the best professional judgement of DEP WWTAP staff. The permittee/client, in conjunction with certified wastewater operator(s) and consulting engineer(s), should continue an independent investigation to determine the cause(s) of the existing organic overload, and implement any corrective actions required to address the organic overload conditions.

The mention of a brand of equipment is in no way an endorsement for any specific company. The Pennsylvania Department of Environmental Protection urges the permittee to research available products and select those which are the most applicable for its situation and compatible with existing equipment.

The goal of the Pennsylvania Department of Environmental Protection Wastewater Optimization Program is to improve receiving water quality through troubleshooting, training, and monitoring. Permittees may be encouraged to achieve effluent quality above and beyond current permit requirements.

Executive Summary

The Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment facility (WWTF) is located in Ryan Township, Schuylkill County, Pennsylvania. The WWTF treats wastewater generated by domestic, commercial, recreational, and industrial sources in Delano, Rush, and Ryan Townships in Schuylkill County. From August 23rd through October 11th, 2023, the Pennsylvania Department of Environmental Protection (DEP) Bureau of Clean Water, Wastewater Technical Assistance Program (WWTAP) staff worked with NESJMA and its engineers and certified wastewater contract operators to monitor influent organic loading at the WWTF.

For this project, WWTAP deployed HACH UVAS plus sc continuous-monitoring submersible probes and networking equipment at the WWTF to measure the ultraviolet absorption reading of dissolved organic material, which can be used to interpret Biochemical Oxygen Demand, 5-day (BOD_5) concentrations, in the influent flow. BOD_5 is the amount of oxygen required to stabilize biodegradable organic matter under aerobic conditions within a five-day period and represents microbial oxidation of pollutants in the activated sludge wastewater treatment units at the WWTF. The concentration of influent BOD5, as used in this report, represents organic loading to the WWTF. WWTAP staff conducted weekly site visits to ensure proper operation & maintenance of the continuous monitoring system and to complete bench testing and process control testing of WWTF treatment units.

At NESJMAs request, WWTAP staff also collected 24-hour composite samples over several weekends at the WWTF influent trough and at the Delano Township & Quakake wastewater pumping stations in the NESJMA sewer service area for bench testing and analysis.

Previous sampling by NESJMA and M&B Environmental, the authority's certified contract wastewater operator, determined that the WWTF is receiving influent wastewater with an elevated organic load, but source was not identified. A review of the data collected by the WWTAP continuous monitoring probes indicates that a facility within the NESJMA sewer service area is discharging wastewater with elevated levels of BOD_5 during the weekends (Friday through Monday morning). The elevated loading exceeds the WWTF design organic capacity and has the potential to impact the ability of the activated sludge treatment process to adequately treat wastewater to comply with the NESJMA WWTF National Pollutant Discharge Elimination System (NPDES) Permit conditions and requirements.

As of the date of this report, the sources of wastewater that could be causing the existing organic overload at the WWTF remain unidentified, but WWTAP staff are confident that the recommendations in this report will provide NESJMA with a framework to identify and address the issue.

Recommendations

Based on the outcome of the Organic Loading Study and discussions with WWTAP staff, the following recommendations are provided for ongoing improvement of the NESJMA WWTF.:

1. Organic loading at WWTF
   a. As noted in WWTAP weekly reports provided during the project, the WWTF receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends. NESJMA should continue to investigate discharges of high organic strength wastewater within the sewer service area. The weekly WWTAP project summary reports are included as Attachment G of this report.

b. Continue to characterize and monitor influent organic loadings and complete projects outlined under NESJMA's Corrective Action Plan to address organic overload conditions at the WWTF.
c. A review of BOD_5 sample results from MJ Reider, and Associates, Inc. (MJ Reider), the contracted environmental laboratory for WWTF sample analysis, indicates that some BOD_5 sample results are qualified with the note "B-03". The MJ Reider "B-03" qualifier indicates that BOD_5 sample method quality control samples failed to meet acceptance criteria and may be and indication that the results are not representative. WWTAP staff would strongly recommend that NESJMA coordinate with MJ Reider to address this issue. Additionally, NESJMA may collect duplicate samples for analysis at another accredited laboratory for comparison.

   The sample result reports provided by MJ Reider define the qualifier "B-03" as "The Glucose-Glutamic Acid (GGA) check was below the acceptable criteria of 198+30.5 mg/L." Part 6.b of Standard Method No. 5210B (for BOD_5 analysis) notes that "The glucose-glutamic acid check is the primary basis for establishing accuracy and precision of the BOD_5 test and is the principal measure of seed quality and set-up procedure." The MJ Reider note does not explain whether the glucose-glutamic acid (GGA) check was biased high (>198+30.5 mg/L) or low (<198.5+30.5 mg/L). There are several issues that can cause high and low biases in a GGA check. A few examples of those issues are incorrect seed production, incorrectly seeded GGA, the presence of toxic chemicals in the wastewater, or contamination of laboratory equipment.

2. Sewer Use Ordinance
   a. NESJMA, as authorized under section B.1.D.3 of its NPDES Permit, should review and revise its Rules and Regulations for Sanitary Sewer System, and sewer use ordinance / intermunicipal agreements (IMAs) for each contributing municipality (Rush, Ryan, and Delano Townships) to monitor and control discharges of industrial and nondomestic wastewater in its sewer service area. NESJMA's Rules & Regulations for Sanitary Sewer System, sewer use agreements, IMAs, and sewer ordinance should include, but not be limited to the following:
      i. General Prohibitions against pass through or interference.
      ii. Development and implementation of Local Limits for pollutants contributed by industrial users that result in interference or pass through. The development and implementation of local limits is required by state regulation (25 Pa. Code § 92a) for any POTW where interference or pass-through causes violations of NPDES Permit requirements.
      iii. Specific prohibitions to forbid the discharge of the eight categories of pollutants included in 40 CFR § 403.5.
      iv. Authorization for a representative of the authority to access/enter/inspect and conduct monitoring (by grab or composite sampling) of any industrial or commercial dischargers within the NESJMA sewer service area.
      v. Development and implementation of a rigorous Fats, Oils, and Grease (FOG) control program to monitor discharges of wastewater from commercial and industrial "nondomestic" facilities within the sewer service area. The NESJMA Rules & Regulations include a discussion of FOG controls and the authority of a plumbing inspector to observe a facility and its sewerage appurtenances (grease-traps, etc.), but it is unclear whether the authority and/or contributing municipalities are inspecting these facilities.

A copy of the Environmental Protection Agency (EPA) Model Pretreatment Ordinance is included with this report as Attachment J, for reference. Digital copies of the EPA's Model Pretreatment Ordinance and Guidance Manual for Preventing Interference at POTWs are also available at the following links:

https://www.epa.gov/npdes/national-pretreatment-program
https://www3.epa.gov/npdes/pubs/pretreatment_model_suo.pdf
https://www.epa.gov/sites/default/files/2015-10/documents/owm0194.pdf

3. WWTF Operations & Maintenance and Activated Sludge Treatment Process
   a. Continue efforts to identify and eliminate sources of Inflow and Infiltration (I&I) in the sewer service area.
   b. Waste and remove sludge at an increased frequency. WWTAP process control testing and an internal review of the WWTF electronic Discharge Monitoring Reports (eDMRs) indicate that NESJMA is not wasting or hauling enough sludge. Additionally, WWTAP staff used eDMR data to complete DEP's Sludge Generation Worksheet, which indicated that the facility is not wasting the expected volume of sludge needed to maintain a healthy activated sludge biomass. The Sludge Generation spreadsheet is readily available upon online at (Wastewater Operator Resources (pa.gov)) and a copy of the Sludge Generation worksheet completed using eDMR submission data is included as Attachment M in this report.
   c. In addition to the two sludge thickener tanks and sludge holding tank (T-501), NESJMA should utilize the four additional Aerobic Digester/Sludge Holding tanks (T-502, T-503, T-504, & T-505) that are not currently in service to increase sludge wasting capabilities.
   d. Increase frequency of process control testing at WWTF. Regular process control testing should be expanded and should utilize the facility's process control monitoring equipment. Specifically, the wastewater operators should increase the frequency of process control testing using the centrifuge for estimating Mixed Liquor Suspended Solids (MLSS), the clarifier sludge judge, and microscope to optimize and maintain solids mass balance in the activated sludge treatment process. A discussion of recommended process control testing and testing schedule is included as Attachment L in this report.
   e. Implement additional process control testing to optimize the aeration and solids mass balance in WWTF activated sludge biota. NESJMA should expand its process control testing program to monitor the Mean Cell Residence Time (MCRT), food to microorganism ratio (F/M), and Sludge Age in the activated sludge biota at the WWTF. A discussion of process control testing is included as Attachment L in this report.
   f. Continue to improve upon aeration tank and aerobic digester blower on/off aeration schedules.
   g. Ensure all permanent changes to the publicly owned treatment works are communicated with the DEP Northeast Regional Office, Clean Water Program, and that any adjustments or changes are made to existing DEP issued Water Quality Management Part II and NPDES Permits.
   h. Have the facility consulting engineer evaluate the condition of the aerators and aeration delivery to the secondary treatment process. Replace broken or inoperable diffusers and consider ways to drain, clean, inspect, and treatment tanks on an annual basis or at least once per permit cycle.
   i. Have the facility engineer evaluate ways to better deliver alkalinity chemicals to the secondary process using metering pumps or add as slurry. Use of a slurry or liquid feed system ensures consistent dosing and assures that the chemical is readily available to the activated sludge biomass.

WWTF Influent Organic Loading Evaluation

Background

A DEP review of the 2020 Annual Municipal Wasteload Report (Chapter 94 Report) submitted by NESJMA determined that the WWTF was in existing organic overload. In response to reported organic overload conditions at the WWTF, NESJMA developed a Corrective Action Plan (CAP) to determine the cause of the existing overload conditions and implement projects to bring the facility back into compliance with the approved design organic loading of the WWTF. The DEP Northeast Regional Office, Clean Water Program approved NESJMA's proposed CAP to address the hydraulic overload condition.

As part of the CAP, NESJMA and M&B Environmental, Inc., the WWTF contract wastewater operations company, completed additional BOD_5 sampling in the NESJMA sewer service area, at the last manhole prior to entering the WWTF, and in the WWTF influent trough before and after the mechanical screening unit. The results of the sampling under the CAP indicated significant differences in BOD_5 concentrations between concurrent samples collected at the sampling locations noted above, and that the WWTF regularly receives high organic strength wastewater from one or several connections/sources in the NESJMA sewer service area.

The discharges of high organic strength wastewater to the NESJMA sewer service area are the most likely cause of the existing organic overload conditions and may also be the cause of reported NPDES Permit final effluent exceedances due to interference with the treatment capacity of the WWTF activated sludge biota.

Scope of Organic Loading Study

From late-August to mid-October of 2023, the DEP WWTAP deployed continuous-monitoring equipment at the NESJMA WWTF in Barnesville, Pennsylvania. In cooperation with the DEP Northeast Regional Office Clean Water Program staff, WWTAP engaged NESJMA to develop a project to evaluate high organic strength wastewater influent flow at the WWTF. The evaluation team follows in Attachment A, for reference.

The NESJMA WWTF organic loading study was limited to the organic loading (BOD_5 concentrations) of influent wastewater at the WWTF and did not consider primary treatment, flow equalization, secondary treatment, sludge wasting and disposal rates, or the disinfection processes. The WWTAP Project Outline for the NESJMA WWTF Organic Loading Study is included as Attachment D, for reference.

NESJMA WWTF & Sewer Service Area

NESJMA owns and operates the WWTF and coordinates with the public works departments for Rush and Ryan Township to operate and maintain the Quakake and State Road wastewater pumping stations within its sanitary sewer collection and conveyance system. The WWTF is located along State Route 54 near Barnesville, Schuylkill County, and discharges treated wastewater to Pine Creek, a tributary of the Schuylkill River, under NPDES Permit No. PA 0063878.

The WWTF is designed as an extended aeration, activated sludge process. The WWTF treatment units consist of an influent mechanical screening unit, an equalization tank, three (3) extended air treatment tanks with clarifiers, two (2) sludge thickening tanks, five (5) aerobic digester / sludge holding tanks, and an ultraviolet disinfection system. A schematic of the NESJMA WWTF is included as Figure E-1 in Attachment E for reference.

NESJMA mainly serves residential areas and commercial properties from the communities of Barnesville, Grier City, Hosensock, Park Crest, Quakake and Tamanend in Rush and Ryan Townships, but also provides sewer service to Delano Township, a tributary municipality. The NESJMA sewer service area includes two known industrial facilities, Versum Materials, US, LLC., a specialty gas manufacturing facility in Rush Township, and the MAJIC Industrial Park in Delano Township, that may be sources of wastewater discharges with the potential to contribute to toxicity and/or high organic loading at the WWTF.

At the time of the WWTAP study, the MAJIC industrial park in Delano Township includes at least three metal fabrication facilities, a plastics manufacturing facility, and “Forestry Products”, a lumber and wood products manufacturing facility. In 2010, NESJMA surveyed the MAJIC industrial park facilities and requested additional information regarding the characteristics of each facility’s wastewater discharges to the NESJMA sewer service area. All facilities in the MAJIC park responded to the survey stating that the wastewater discharges only included domestic sources (bathrooms, hand-washing sinks, & showers).

Documentation accessed by WWTAP staff indicates that the Versum Materials facility discharges up to 0.02 million gallons per day (MGD) of wastewater to the NESJMA sewer service area. As of the date of completion of this report, Versum Materials has failed to respond to a mid-2023 request for information sent by NESJMA in for any records relevant to the Versum Materials facility wastewater discharge to the NESJMA sewer service area.

A review if available DEP records did not indicate whether Versum Materials and/or the MAJIC industrial park completes sampling to monitor or characterize pollutant concentrations in wastewater discharges that could increase organic loading and cause pass through or interference at the WWTF.

WWTAP Continuous Monitoring Equipment Deployment

Raw influent from the sanitary sewer system enters WWTF at the mechanical screen building and flows through the “pre-screen” influent trough to the mechanical screen (under steel casing), after which, flow makes a 90-degree turn and passes through the “post-screen” influent trough to discharge to the EQ tank. WWTAP staff installed two UVAS continuous monitoring probes in the WWTF influent trough before and after the mechanical screening unit. A schematic of the UVAS continuous monitoring probe installation locations at NESJMA WWTF are included as Figures E-2 & E-3 in Attachment E for reference.

The UVAS probes were installed using adjustable mounting systems bolted to the aluminum grating installed above the influent trough. The adjustable mounting systems allow WWTAP staff to install UVAS probes at approximately half the depth of flow levels in the influent trough during "normal" flow periods, and to align the probe bodies in the trough to prevent the sensor window from becoming obscured by the accumulation of inorganic solids (rags & “flushable” wipes) and microbial growth. Each probe was connected to a HACH SC200 probe controller system with a data display for monitoring influent BOD_5 concentrations and adjusting probe programs and probe data log transfers.

WWTAP staff visited the WWTF at least weekly to communicate with authority representatives and the contract wastewater operators, observe the operation of the continuous monitoring equipment, clean the probes to ensure proper functionality, and complete process control testing and treatment system monitoring at the WWTF. A review of UVAS probe data did not indicate a significant (>15%) difference in the BOD_5 concentrations before and after the mechanical screening unit when WWTF flows were not impacted by storm events and/ or excessive inflow &

infiltration. On September 15, 2023, WWTAP staff relocated the UVAS-2 probe from the influent trough to the equalization tank discharge flow splitter box prior to the WWTF secondary treatment system (aeration tanks).

At the request of WWTAP, M&B Environmental, Inc. contract wastewater operations staff collect weekly influent grab samples for analysis of BOD_5 during the continuous monitoring equipment deployment period. WWTAP staff used the results of those BOD_5 grab samples to check accuracy of UVAS probe data. Over the duration of the study, the WWTF influent BOD5 grab sample results were normally within 20% of the BOD_5 concentrations provided by the UVAS-1 continuous monitoring probe. WWTAP staff did not make any additional changes to the correction factor set for the UVAS-1 probe (1.0) at deployment.

Figure 1: UVAS continuous monitoring probe installation locations in the NESJMA WWTF influent trough from August 23rd (beginning of study) through September 15th, 2023

Figure 3: Photo of UVAS-2 continuous monitoring probe installation location at NESJMA WWTF flow splitter box from September 15th through October 11th, 2023 (end of study).

Figure 4: Photo of UVAS-2 continuous monitoring probe installation location (flow splitter box) in NESJMA WWTF from September 15th through October 11th, 2023 (end of study).

WWTAP Organic Loading Study Results

WWTAP staff installed continuous monitoring equipment at the NESJMA WWTF to monitor and record influent BOD_5 concentrations. Over the period of study, data collected by the continuous monitoring equipment identified that the WWTF receives frequent discharges containing BOD_5 concentrations (organic loading) that exceed the normal expected range for treatment facilities designed to treat wastewater generated from domestic sources.

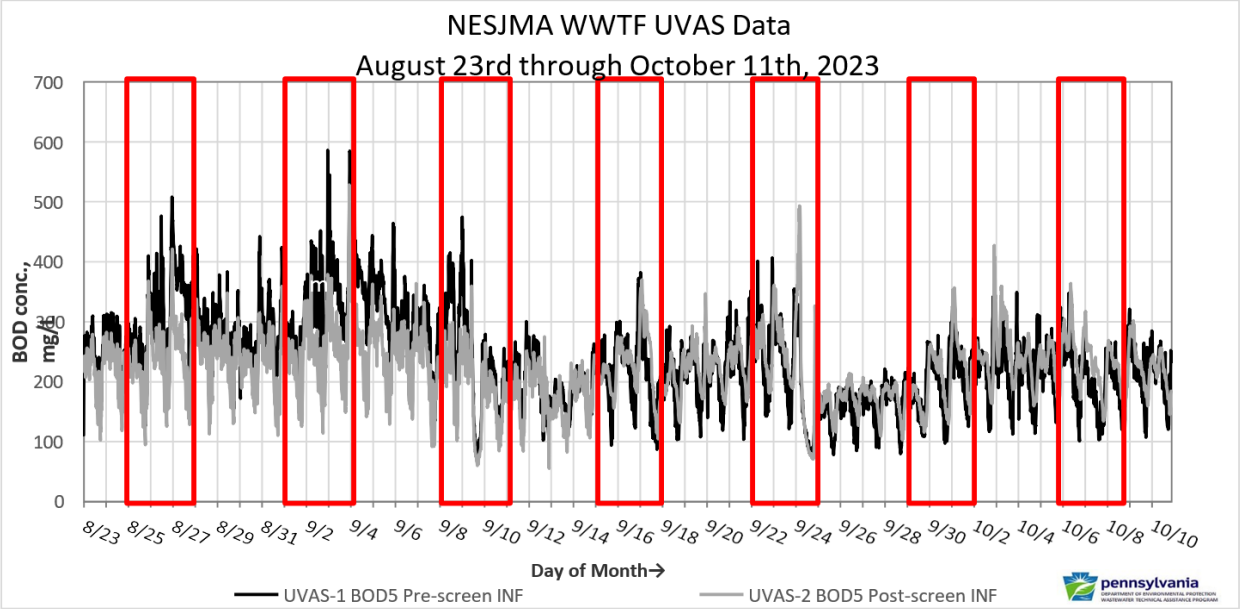
Weekly project updates were provided by WWTAP to NESJMA and M&B Environmental. The weekly project updates included a summary of UVAS data (maximum and minimum BOD_5 concentration) and graphs of UVAS probe data presenting daily, weekly, and all data collected to date during the study period. UVAS data summary graphs and copies of the WWTAP weekly project updates are included in Appendix E and F of this report. As previously noted in the WWTAP Equipment Deployment section (page 12) a comparison of UVAS probe data collected during the first 3-4 weeks of this study did not indicate significant differences (>15%) in BOD_5 concentrations between the UVAS-1 probe (pre-screening) and the UVAS-2 probe (post-screening), across the mechanical screening unit in the WWTF influent trough. Consequently, the pre-screen raw influent BOD_5 concentration data collected by the UVAS-1 continuous monitoring probe are used for determining any conclusions for this study.

A review of UVAS probe data indicates that influent discharges with highest BOD_5 concentrations in the WWTF influent flow often occurred on weekends between late Friday and early Monday. While the maximum concentrations recorded by the UVAS-1 probe readings were different from week-to-week, the regular frequency of elevated organic loading peaks indicate that there is an ongoing slug discharge of elevated organic strength wastewater to the sewer service area. A graph of UVAS probe data with UVAS-1 continuous monitoring probe BOD_5 concentration peaks highlighted in red is included on page 15 of this report.

As stated previously, the most likely cause of the organic overload conditions at the WWTF may be discharges of industrial and nondomestic wastewater from facilities in the sewer service area. These discharges can contain elevated levels of pollutants (including BOD_5) that impact the ability the WWTF activated sludge biota to adequately treat wastewater. Without additional sampling in the collection system and monitoring of facilities with industrial and nondomestic wastewater discharges, it is difficult to accurately prediction of the timing of the slug discharges due to the dynamics of sewer system flows and I&I influences.

The UVAS data and WWTAP bench testing results of composite samples collected at the Delano Township and Quakake pumping stations (see Graph 1 below), that serve facilities with the potential to discharge industrial and non-domestic wastewater to the sewer service area, indicate that NESJMA should continue to investigate the wastewater discharges from these facilities through facility tours, source determination, spill prevention & emergency response plan reviews, and wastewater discharge sampling. Additionally, NESJMA and WWTF operators have identified additional commercial (a catering and events facility) and a recreational (campground with dump station) establishments in the sewer service area with the potential for discharges of high organic strength wastewater.

WWTAP strongly recommends that NESJMA complete a comprehensive survey of any commercial, non-domestic, and industrial facilities and investigate any facilities with the potential to discharge high organic strength wastewater (schools, recreational & food establishments, etc.) in its sewer service area.



Graph 1: UVAS data collected between August 23rd & October 11th, 2023. UVAS-1 continuous monitoring probe data represented as BOD_5 concentration peaks observed over weekends (Friday to Monday) are highlighted in red.

WWTAP Composite Sampling Events & Analysis

After approximately three weeks of collecting continuous monitoring data using UVAS probes at the WWTF influent trough, the probe data indicated that the slug discharges to the WWTF with BOD_5 concentrations that exceed the upper limit of the "normal" expected range of domestic sewage (300 mg/L) often occurred over weekends (from late Friday through early Monday). To further investigate this trend, WWTAP staff deployed a SIGMA portable composite sampler at the WWTF to collect discrete hourly samples of the raw influent from 12:00 (noon) on Saturday,

September 16th to 11:00 on Sunday, September 17th and from 00:00 (midnight) to 23:00 on Sunday, October 1st, 2023. While UVAS-1 probe data did not match the extremely high BOD_5 concentrations (average ~300 mg/L and peaks >500 mg/L) recorded over the first three weekends of the study, the sampler was successful in collecting several discrete hourly grab samples concurrent with UVAS-1 probe data indicating BOD_5 concentrations >300 mg/L. WWTAP staff completed bench testing for Ammonia Nitrogen (NH_3-N) and Chemical Oxygen Demand (COD) on WWTF influent samples where the sample times matched the UVAS-1 concentrations >300 mg/L, and observed the samples for qualitative characteristics such as strong/abnormal malodors, scum, sheen, and excess solids.

The results of the bench testing for both WWTF influent composite sampler runs exceeded the upper range of the "normal" domestic wastewater concentration range for NH_3-N (>50 mg/L). Regrettably, the WWTAP does not currently have access to bench testing analysis for BOD_5, but it may be relatively safe to assume that the BOD_5 concentrations of "normal" raw domestic sewage can be calculated as half of the measured COD concentration. Following this assumption, the BOD_5 concentrations calculated from the bench testing results for COD exceeded 300 mg/L.

WWTAP coordinated with M&B Environmental wastewater operations staff to complete additional composite sampling events at the Delano Township and Quakake wastewater pumping stations. Both pumping stations are in the NESJMA sewer service area and were selected to investigate existing industrial wastewater discharges in each sewer subbasin.

The Delano Twp. wastewater pumping station was sampled from 12:00 on Saturday, October 7th to 11:00 on Sunday, October 8th, 2023. WWTAP staff picked up the composite sampler on Monday, October 9th and analyzed the discrete hourly samples for COD. The COD bench testing results (two samples >1,500 mg/L COD) indicate that the Delano Township wastewater pumping station may be receiving discharges from an industrial source.

The Quakake wastewater pumping station was sampled from 12:00 on Saturday, November 18th to 11:00 on Sunday, November 19th, 2023. WWTAP staff picked up the composite sampler on Monday, November 20th and analyzed the discrete hourly samples for COD and NH_3-N. On the day the composite sampler was set up and programmed (Friday, November 17th) WWTAP staff and the M&B Environmental wastewater operator observed a discharge of turbid, orange-brown colored wastewater from the Quakake gravity sewer into the Quakake wastewater pumping station wet well. On Monday, November 20th, WWTAP staff analyzed the discrete hourly samples for COD and analyzed one of every four samples for ammonia nitrogen. The discharge of turbid, orange-brown colored wastewater from the Quakake gravity sewer into the pumping station wet well and the COD & NH_3-N bench testing results indicate that the Quakake wastewater pumping station may be receiving discharges from an industrial source.

WWTAP completed qualitative observations on the Delano Twp. and Quakake wastewater pumping station composite samples and noted no significant differences (color, solids, foam, sheen, floatables, etc.) between samples.

The WWTAP summary reports for the WWTF influent composite sampler runs and Delano & Quakake wastewater pumping station composite sampler runs are included in Appendix H. Please note that all WWTAP process control and bench testing results are unofficial and do not represent sample analysis data from a NELAC/NELAP or DEP BOL registered and accredited environmental laboratory.

Sewer Use Rules & Regulation and Ordinance Review

Unmonitored and uncontrolled discharges of pollutants (including BOD_5) by facilities that discharge industrial and non-domestic wastewater can cause interference or pass through at the WWTF and limit the ability of the treatment system to adequately treat wastewater to comply with NPDES Permit requirements, DEP Rules & Regulations, and state and federal laws. NESJMA, as authorized under section B.1.D.3 of its NPDES Permit, has the authority to require dischargers of industrial and non-domestic wastewater to characterize and monitor all discharges to the NESJMA sewer service area. Specifically, the NESJMA NPDES Permit states “For all POTWs, where pollutants contributed by indirect dischargers result in interference or pass through, and a violation is likely to recur, the permittee shall develop and enforce specific limits for indirect dischargers and other users, as appropriate, that together with appropriate facility or operational changes, are necessary to ensure renewed or continued compliance with this permit or sludge use or disposal practices. Where POTWs do not have an approved Pretreatment Program, the permittee shall submit a copy of such limits to DEP when developed. (25 Pa. Code § 92a.47(d))”

As part of this study, WWTAP staff were able to review the 2005 NESJMA Rules and Regulations for Sanitary Sewer System (Sewer Rules & Regulations) to determine whether NESJMA provides adequate guidance for effective oversight and control of industrial and non-domestic wastewater discharges in the sewer service area. A copy of the NESJMA Sewer Rules & Regulations is include with this report as Attachment I, for reference.

WWTAP staff have determined that the Sewer Rules & Regulations include limited guidance regarding industrial and non-domestic wastewater discharges to the sewer service area. Section 19 of the Sewer Rules & Regulation, titled "Special Treatment of Sewage When Ordered by the Northeastern Schuylkill Joint Municipal Authority", includes the following language regarding the discharge of industrial and nondomestic waste,” Industrial waste shall not contain material injurious to the sewer system or biochemical treatment.” In the experience of WWTAP staff, this limited guidance does not provide NESJMA with an adequate framework to implement a program to thoroughly investigate wastewater discharges, and the enforcement authority to require facilities to monitor, report, and control discharges of pollutants that may cause interference or pass through at the WWTF.

While NESJMA is not required to develop and implement an industrial pretreatment program, the EPA’s Model Pretreatment Ordinance may be used as a guide for adopting new or revised provisions of local law to implement and enforce sewer use ordinance and industrial/nondomestic wastewater discharge pretreatment requirements. Specifically, NESJMA should revise the Sewer Rules and Regulation to include, but not be limited to; maximum pollutant discharge concentrations, prohibited discharge standards, accidental and slug discharge control plans, discharge self-monitoring and reporting, and the development of local limits.

A copy of the Environmental Protection Agency’s (EPA) Model Pretreatment Ordinance is included with this report as Attachment J, for reference.

The Environmental Protection Agency’s (EPA) Model Pretreatment Ordinance and Guidance Manual for Preventing Interference at POTWs are also available at the following links:

EPA Industrial Pretreatment Program resources
https://www.epa.gov/npdes/national-pretreatment-program
EPA Model Pretreatment Ordinance
https://www3.epa.gov/npdes/pubs/pretreatment_model_suo.pdf
EPA Guidance Manual for Preventing Interference at POTWs
https://www.epa.gov/sites/production/files/2015-10/documents/owm0194.pdf

WWTAP Process Control and Bench Testing

WWTAP staff conducted weekly testing and analysis of the WWTF treatment systems at the onsite process monitoring laboratory. The process control testing included colorimetric analysis for nutrients and wastewater strength and routine wastewater lab tests such as suspended solids by volume, sludge settleability, clarifier core sampling, oxygen uptake and respiration rate tests, and microscopic evaluation of the activated sludge.

The process control testing results are not included in this Organic Loading Study, but tables and graphs of the process control and bench testing results are included in Appendix F. Upon request, WWTAP may provide all process control data collected during the study to NESJMA.

WWTF operators conduct daily process control testing and analysis at the onsite laboratory. WWTF wastewater operators monitor the activated sludge solids inventory with 30-minute settleability testing on weekdays and monthly analysis of mixed liquor settleable solids (MLSS) by the accredited contract laboratory.

Based upon 30-minute settleability and MLSS results, the WWTF operators adjust the activated sludge solids inventory by wasting aeration tank mixed liquor. The wasted sludge is gravity thickened in the T-401 & 402 thickening tanks and T-501 sludge holding tank and hauled out by a contractor for disposal/treatment.

Using eDMR data submitted by NESJMA, WWTAP staff completed the DEP Wastewater Operators Tool for Sludge Volume Calculation spreadsheet to determine whether the facility coordinates waste sludge hauling & disposal. The Sludge Volume Calculation workbook indicates that the WWTF is not wasting or hauling an adequate volume of liquid sludge to optimize the activated sludge treatment biota. A link to the Sludge Volume Calculation spreadsheet at the DEP Bureau of Clean Water, Wastewater Operators Resources webpage and screenshot of the workbook are included in Appendix K.

Acknowledgements

WWTAP would like to thank members and staff of the authority, the WWTF daily operator and operator-in-responsible-charge from M&B Environmental, the consulting engineers from HRG, and staff from Rush, Ryan, and Delano Townships.

ATTACHMENTS:

Attachment A	NESJMA WWTF Organic Loading Study Team
Attachment B	DEP Wastewater Technical Assistance Program
Attachment C	WWTAP Continuous Monitoring Equipment
Attachment D	WWTAP Project Outline - NESJMA WWTF Organic Loading Study
Attachment E	NESJMA WWTF Reference Schematics
Attachment F	WWTAP - NESJMA WWTF UVAS Data Summary Graphs
Attachment G	WWTAP - NESJMA WWTF UVAS Weekly Summary Reports
Attachment H	WWTAP - NESJMA Composite Sample Testing Summary Reports
Attachment I	Existing NESJMA Sewer Use Rules & Regulations
Attachment J	EPA Pretreatment Model Ordinance
Attachment K	WWTAP Process Control Bench Testing Data
Attachment L	Recommended Process Control Testing
Attachment M	Sludge Calculation Spreadsheet - NESJMA WWTF

- *Complete copies of documentation in the attachments are embedded in this report as .pdf files.*
- *WWTAP will provide a .zip folder with the final report that includes complete copies of documentation referenced in the attachments.*

ATTACHMENT A: EVALUATION TEAM

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ATTACHMENT B: DEP WASTEWATER TECHNICAL ASSISTANCE PROGRAM

The DEP Bureau of Clean Water WWTAP offers a broad range of services including compliance assistance and on-site training in basic operational practices. An element of the program, the Wastewater Treatment Evaluation (WTE) employs instrument-based monitoring and analysis as an option for diagnosing problems and monitoring performance. This service, as originally constituted, seeks to improve effluent water quality at wastewater treatment facilities through establishment of sound process monitoring and control practices, and it is done with an emphasis on low-cost, easily practicable process adjustments rather than capital improvements and expenditures, although the latter is sometimes the only alternative to improving effluent compliance. Other aspects of WWTAP provide compliance assistance to facility owners and operators, but the instrument-based analysis seeks to build on existing compliance by promoting best practices, including laboratory-based monitoring, to achieve improvements in effluent quality that go beyond the basic requirements of a facility's NPDES permit.

Sometimes, it is not possible to enact low-cost improvements to a wastewater treatment process, and recommendations are made to investigate alternative treatment technologies that will incur significant capital investment to achieve improved effluent quality and more efficient operational practices. When this becomes evident, the data produced using instrumentation in a WWTAP study may provide the basis for such recommendations. DEP strongly recommends that facility owners and operators work with their preferred consulting engineers to properly evaluate and implement any of a wide array of process improvements that ensure high-quality treated effluent.

ATTACHMENT C: WWTAP CONTINUOUS MONITORING EQUIPMENT

Digital Continuous Monitoring Probes

- 1 x HACH SC200s controller
- 2 x HACH UVASplus SC probes

Various poles, mounts, connectors, extension cords, & appurtenances.

Process Control Laboratory Equipment

- 1 x Hach HQ4200 handheld meter with:
  - pH probe
  - LDO probe,
- LBOD probe (for OUR)
- 1 x HACH DR1900 spectrophotometer,
- 1 x HACH Digital Digestor/Heater Block

HACH TNTplus test vials for measuring:

- Chemical Oxygen Demand-HR (822),
- Nitrate-HR (839),
- Nitrite-LR (836),
- Ammonia-Nitrogen (NH3-N)-LR (830), HR (832), & UHR (833),
- Total Kjeldahl Nitrogen (TKN)-LR (880)
- Total Nitrogen-HR (827)
- Total Phosphorus (PO4-P)-HR (843)
- 1 x Raven Centrifuge
- 3 x Raven 1000 mL Settleometers
- 1 x HACH Alkalinity Test Kit (Titration)
- 1 x Binocular Microscope

Composite Sampling

- 1 x SIGMA Composite Sampler
- 24 x discrete hourly sample bottles

Various power cables & sampler appurtenances

ATTACHMENT D: PROJECT OUTLINE - NESJMA WWTF ORGANIC LOADING STUDY

Project Outline

Northeastern Schuylkill Joint Municipal Authority Wastewater Treatment Plant PADEP National Pollutant Discharge and Elimination System (NPDES) Permit No. PA0063878

Background:

A Department review of the 2020 Annual Municipal Wasteload Report (Chapter 94 Report) submitted by Northeast Schuylkill Joint Municipal Authority (NESJMA) determined that the wastewater treatment plant (WWTF) was in existing organic overload. In response to the Department's determination, NESJMA developed, and the Department approved, a Corrective Action Plan (CAP) to determine the cause of the overload and implement projects to bring the facility back into compliance with the approved design organic loading of the WWTP. Additionally, between June 2019 and June 2023, NESJMA reported approximately 140 exceedances of its WWTP NPDES Permit final effluent limits. As part of the CAP and its investigation into the cause of the NPDES Permit final effluent limit exceedances, NESJMA and MAB Environmental, Inc., the WWTP contract wastewater operations company, completed additional sampling of WWTP influent flows. The results of those samples indicate that the WWTP regularly receives high organic[1] strength wastewater from connections/sources in NSJMA's sewer service area. At this time, NESJMA and its wastewater operators and environmental consultants & engineers have determined that that the high organic strength wastewater may be the most likely cause of the organic overload conditions and the reported NPDES Permit final effluent exceedances due to toxicity and/or interference with the treatment capacity of the WWTP activated sludge microbial community.

In 2022, staff from the PADEP Northeast Regional Office Clean Water Program engaged the services of the Bureau of Clean Water Wastewater Technical Assistance Program (WWTAP) regarding the NPDES Permit exceedances and influent sampling results at the WWTP. WWTAP staff completed an initial site visit/assessment at the WWTP in June 2022 and have participated in additional meetings/discussions regarding the results of samples collected at the WWTP and in the NESJMA sewer service area. WWTAP staff agree that further investigation is needed to characterize high influent organic loading and treatment capacity at WWTP.

WWTAP Project Proposal:

WWTAP staff will install a selection of continuous monitoring equipment at NESJMA WWTP to investigate the high organic strength influent wastewater and possible interference with the treatment capacity of the NESJMA WWTP. WWTAP staff will complete at least one (1) weekly site visit to clean probes, check equipment, and complete process control testing for the WWTP. Within eight (8) weeks of striking equipment, WWTAP will deliver a project report that will include, at minimum; a summary of data & relevant findings, recommendations for WWTP optimization, and a discussion and resources for the investigation and elimination of slug discharges of high organic strength wastewater into the NESJMA system.

[1] During this project, "Organic" refers to concentrations & loadings of biochemical oxygen demand – 5 day (BOD5), carbonaceous biochemical oxygen demand 5-day (CBOD5), and chemical oxygen demand (COD).

Document 1: NESJMA WWTF Organic Study - WWTAP Project Outline (Double-click to open.)

ATTACHMENT E: NESJMA WWTF REFERENCE SCHEMATICS

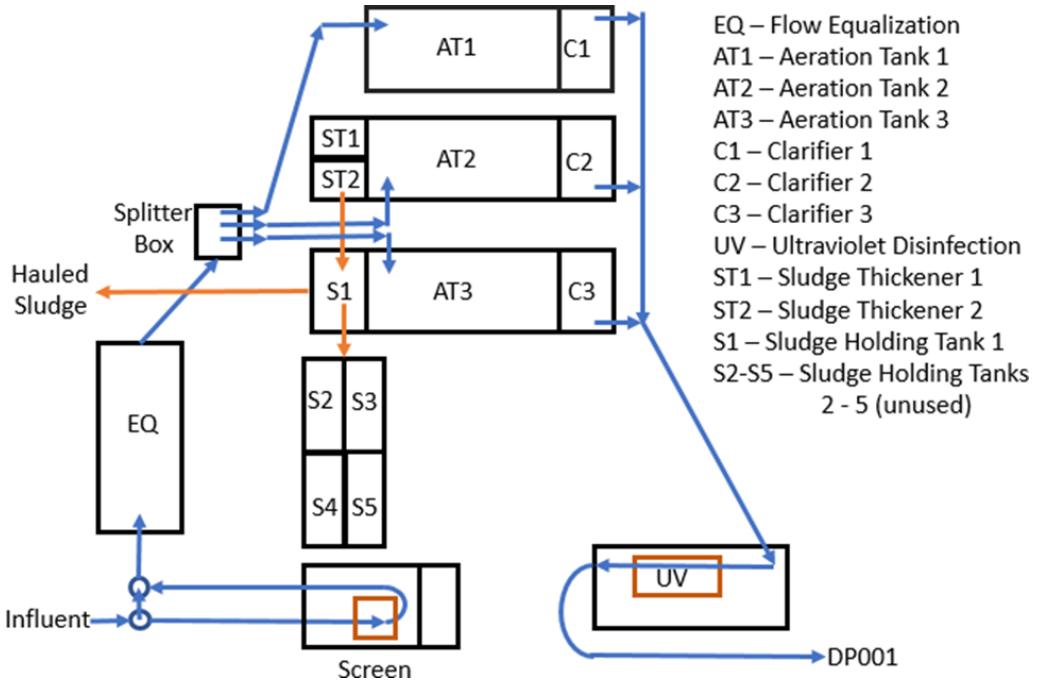


Figure E- 2: NESJMA Treatment Schematic

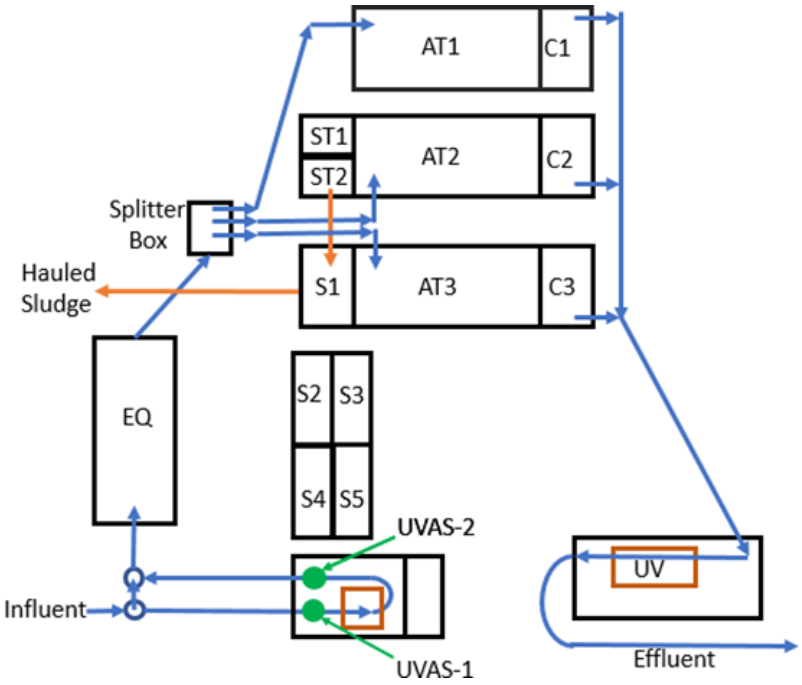


Figure E-2: UVAS continuous monitoring probe installation locations at NESJMA WWTF from August 23rd through September 15th, 2023

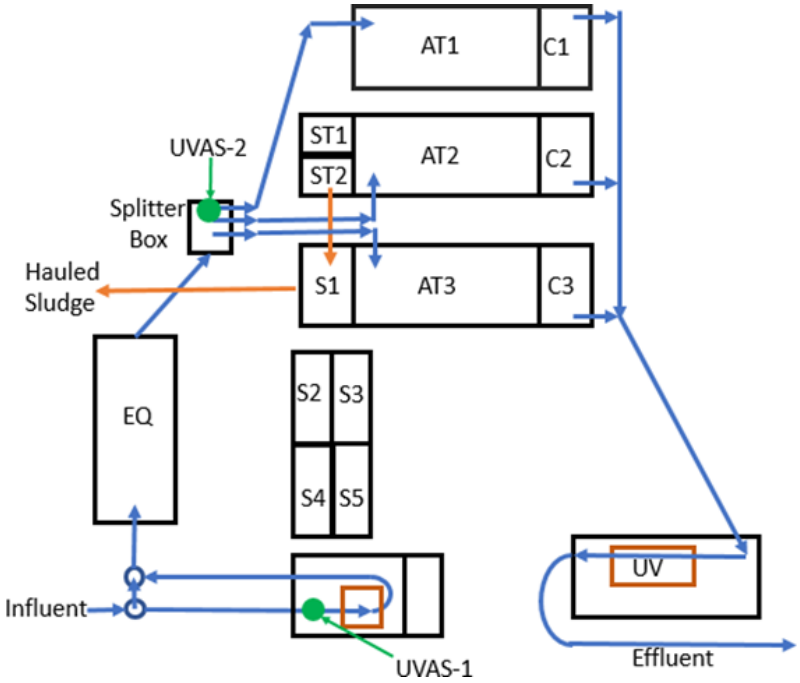
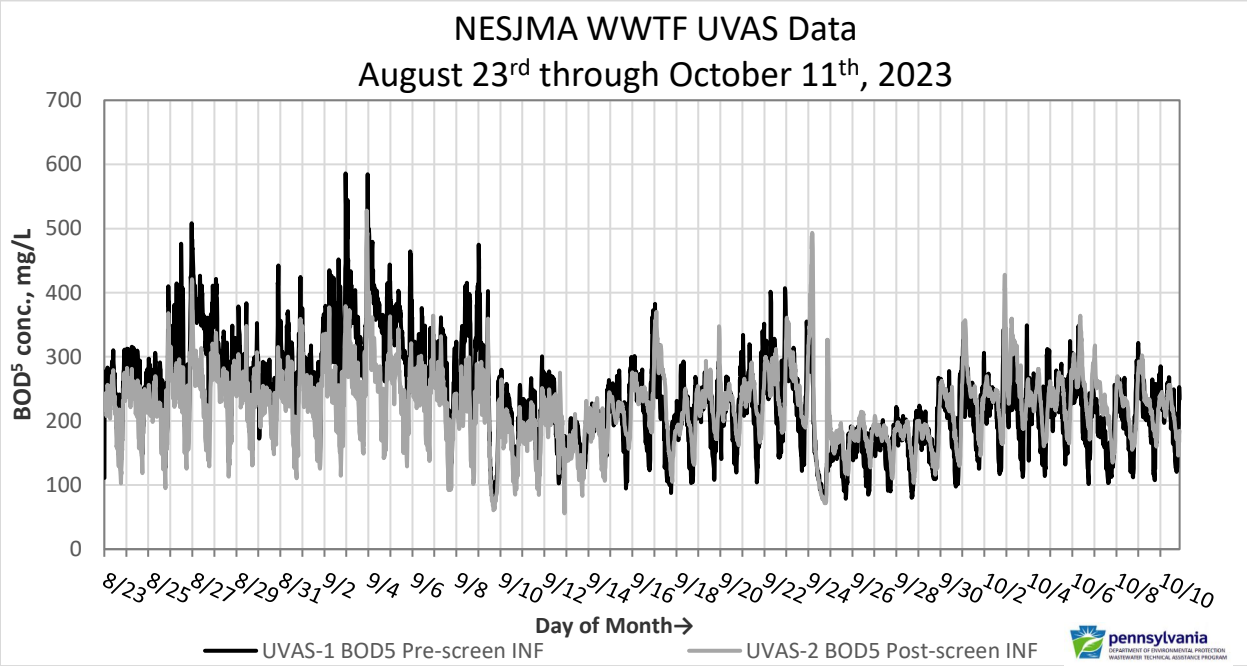
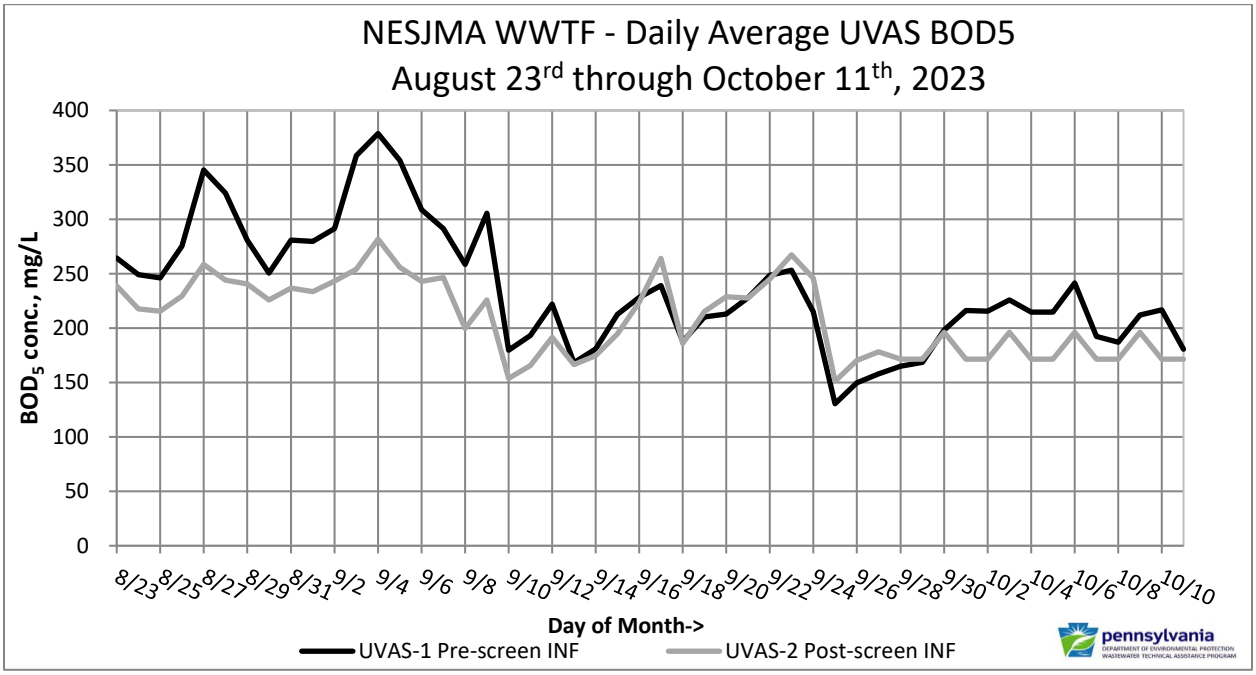
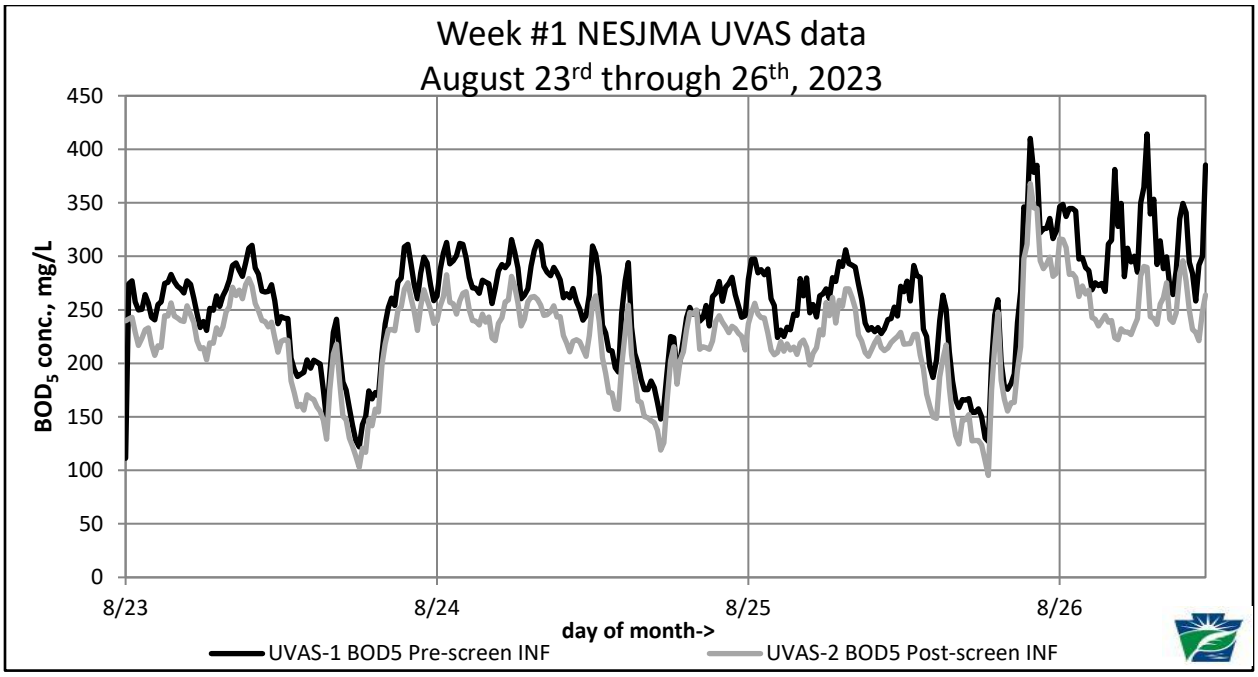


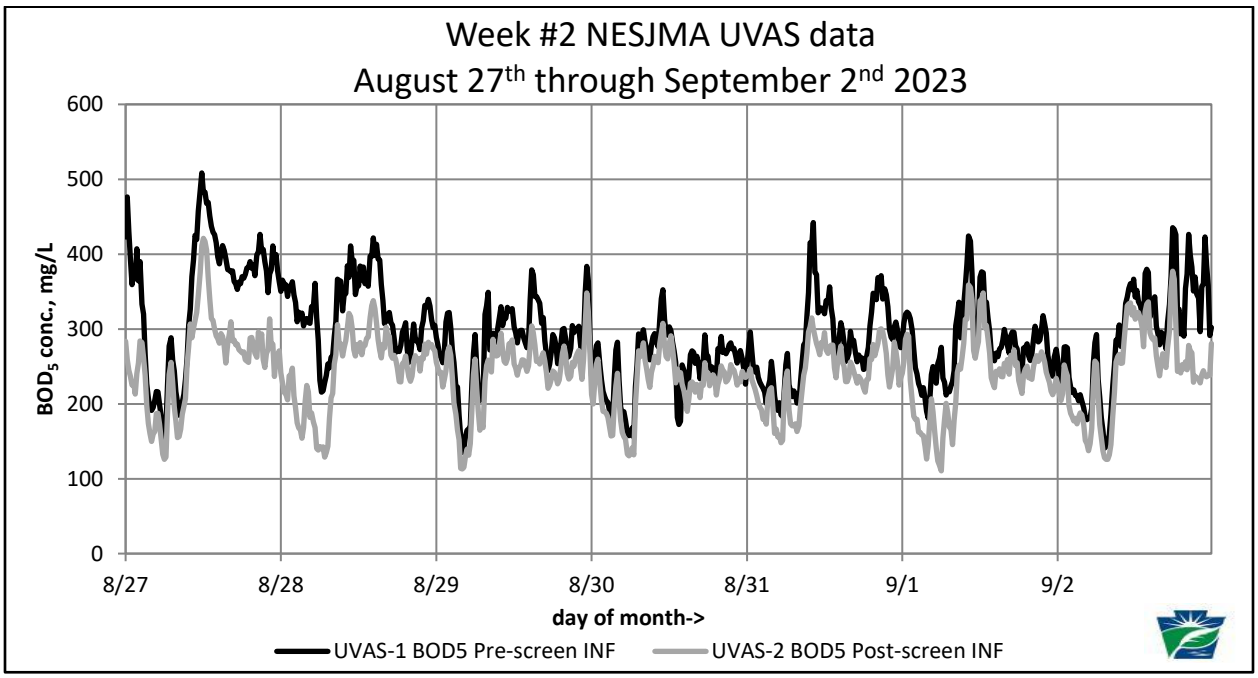
Figure E-3: UVAS continuous monitoring probe installation locations at NESJMA WWTF from September 15th through October 11th, 2023.

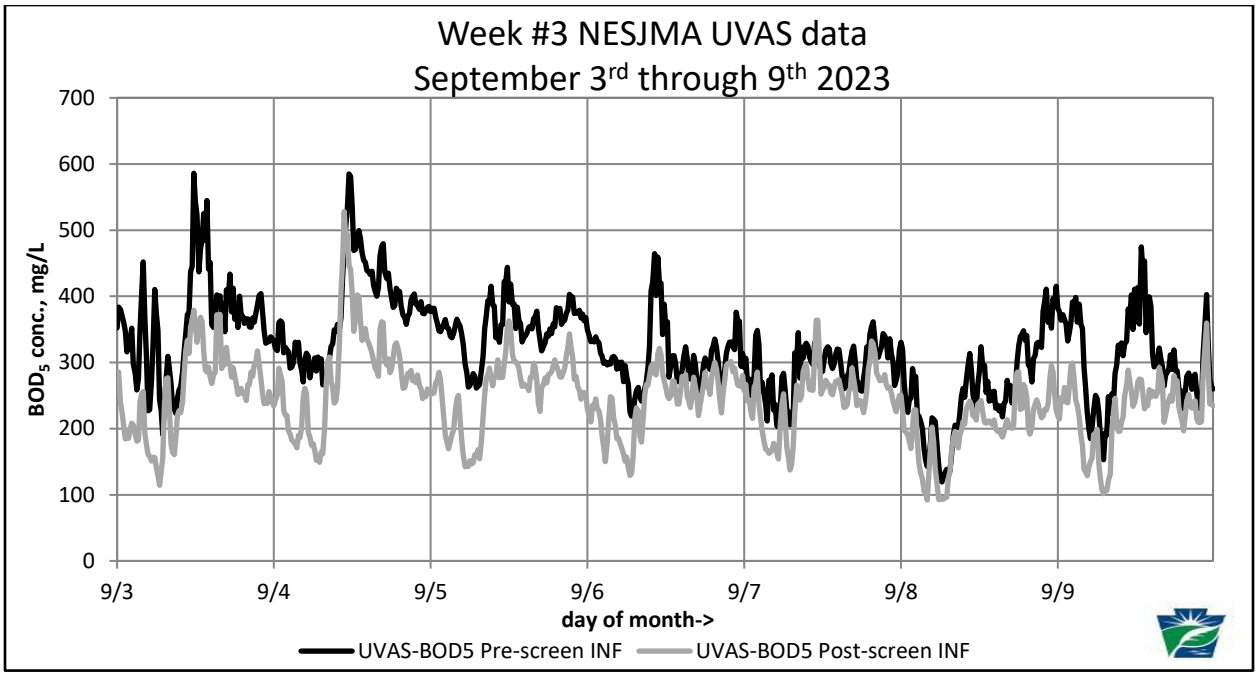
ATTACHMENT F: WWTAP - NESJMA WWTF UVAS DATA SUMMARY GRAPHS

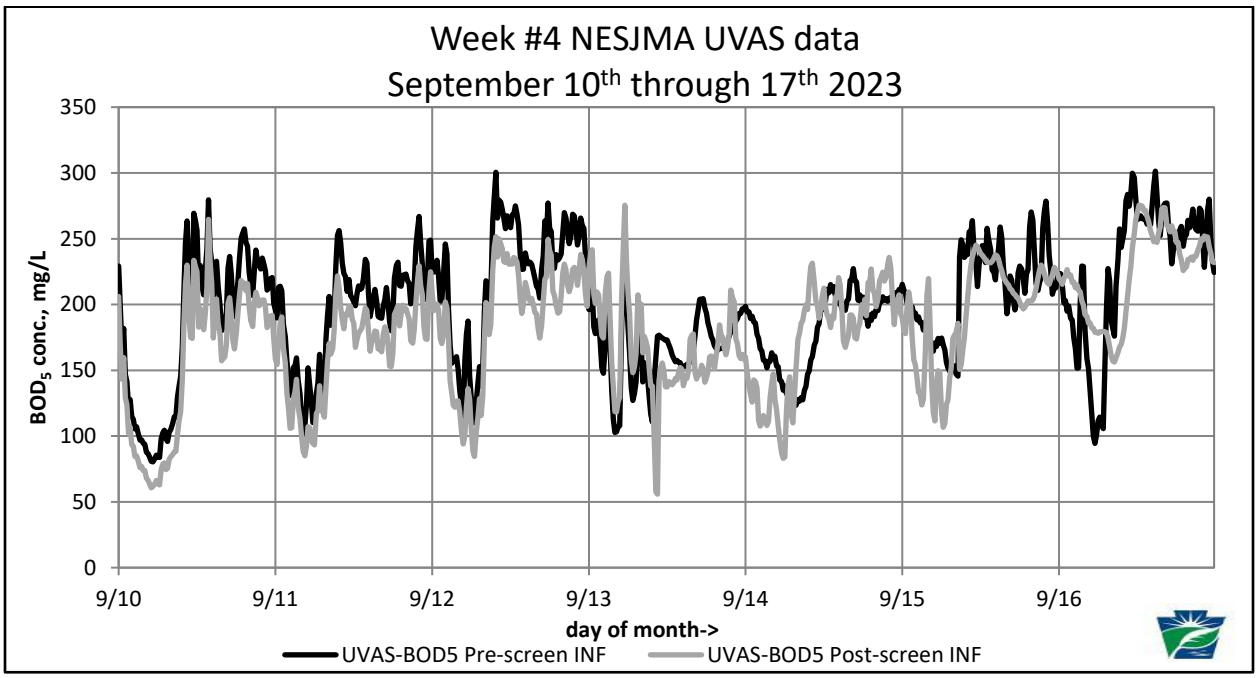


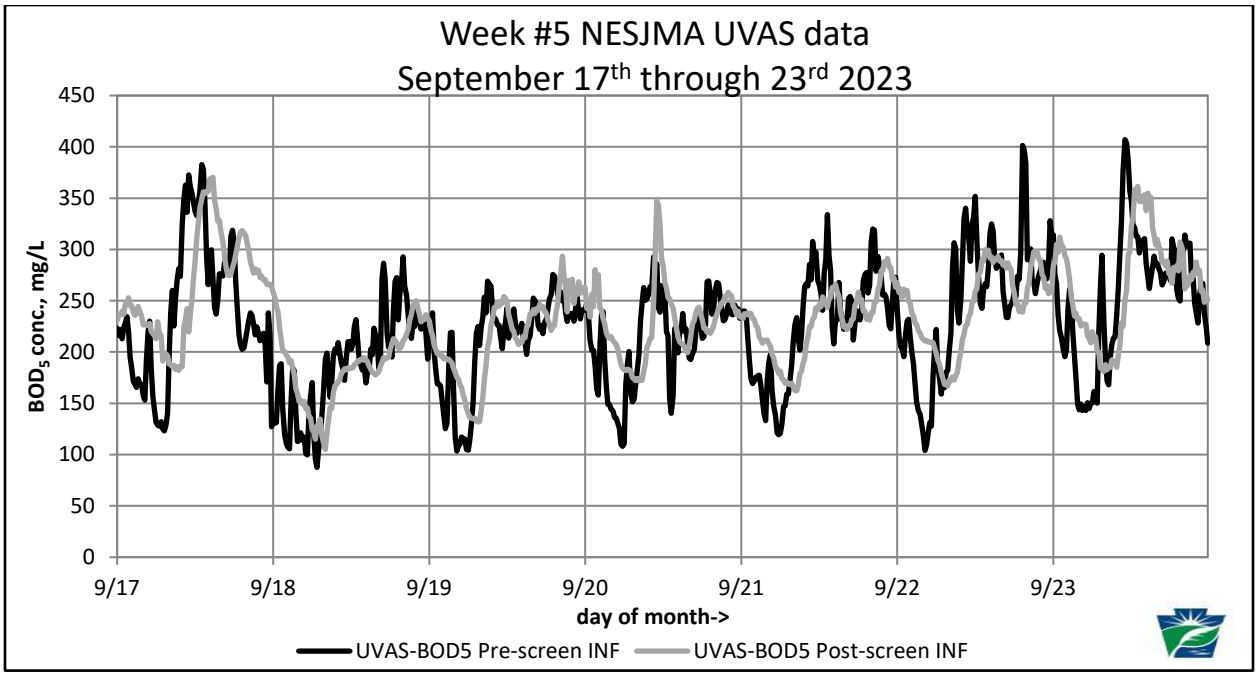


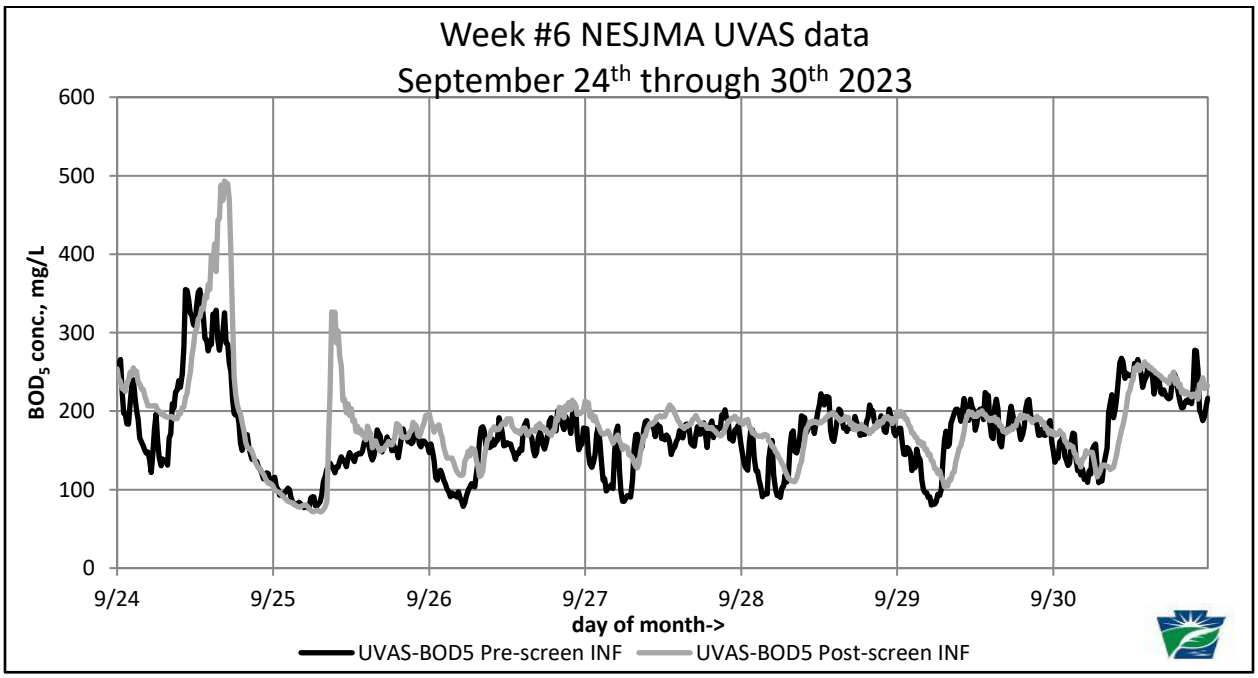

Week #1 NESJMA UVAS data
August 23rd through 26th, 2023
BOD5 conc., mg/L
450
400
350
300
250
200
150
100
50
0
8/23
8/24
8/25
8/26
day of month->
UVAS-1 BOD5 Pre-screen INF
UVAS-2 BOD5 Post-screen INF

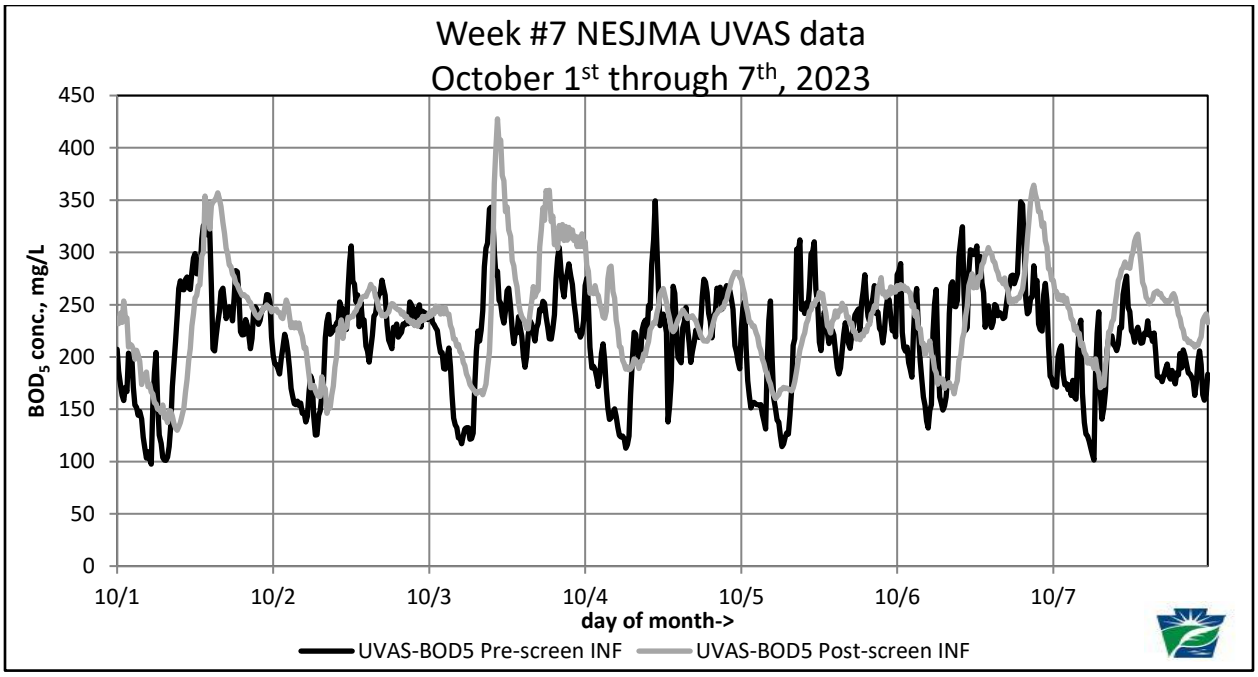

Week #2 NESJMA UVAS data
August 27th through September 2nd 2023
BOD5 conc., mg/L
600
500
400
300
200
100
0
8/27
8/28
8/29
8/30
8/31
9/1
9/2
day of month->
UVAS-1 BOD5 Pre-screen INF
UVAS-2 BOD5 Post-screen INF

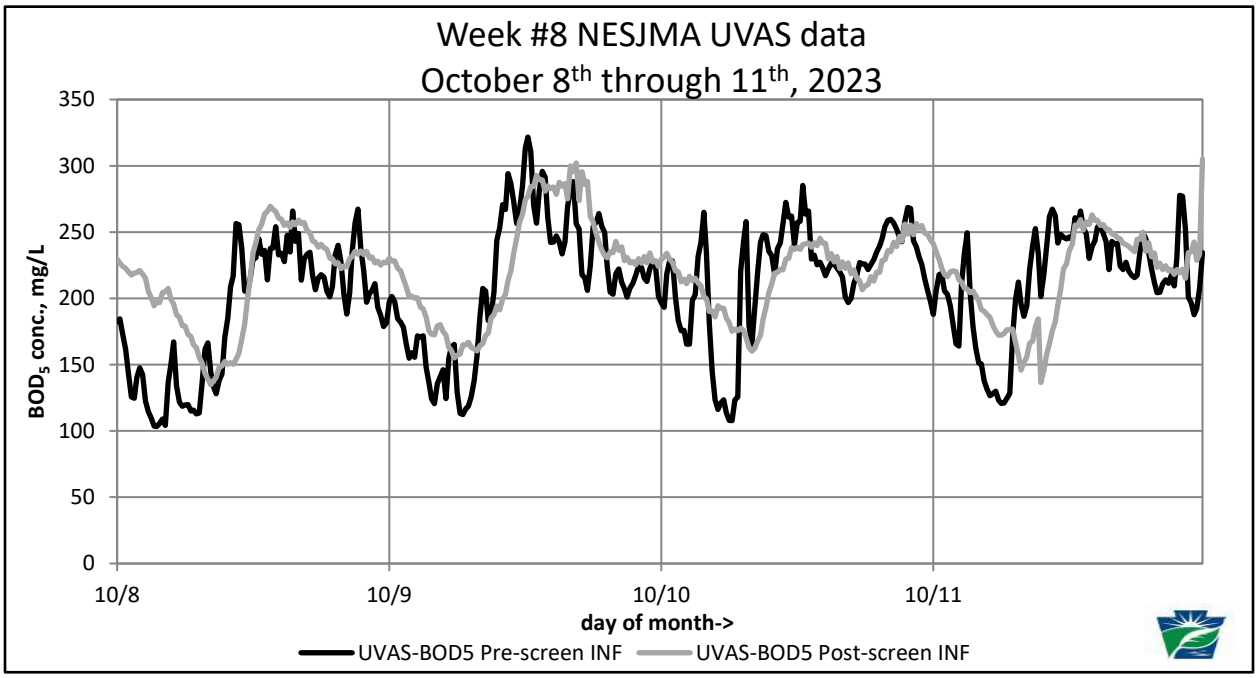

Week #3 NESJMA UVAS data
September 3rd through 9th 2023
700
600
500
400
300
200
100
0
BOD5 conc., mg/L
9/3
9/4
9/5
9/6
9/7
9/8
9/9
day of month->
UVAS-BOD5 Pre-screen INF
UVAS-BOD5 Post-screen INF


Week #4 NESJMA UVAS data
September 10th through 17th 2023
350
300
250
200
150
100
50
0
BOD5 conc., mg/L
9/10
9/11
9/12
9/13
9/14
9/15
9/16
day of month->
UVAS-BOD5 Pre-screen INF
UVAS-BOD5 Post-screen INF


Week #5 NESJMA UVAS data
September 17th through 23rd 2023
BOD5 conc., mg/L
450
400
350
300
250
200
150
100
50
0
9/17
9/18
9/19
9/20
9/21
9/22
9/23
day of month->
UVAS-BOD5 Pre-screen INF
UVAS-BOD5 Post-screen INF


Week #6 NESJMA UVAS data
September 24th through 30th 2023
BOD5 conc., mg/L
600
500
400
300
200
100
0
9/24
9/25
9/26
9/27
9/28
9/29
9/30
day of month->
UVAS-BOD5 Pre-screen INF
UVAS-BOD5 Post-screen INF





*WWTAP assembled daily graphs of UVAS plus SC continuous monitoring data. Daily graphs are included in the weekly reports provided in Attachment G and may also be provided to NESJMA upon request.

ATTACHMENT G: WWTAP – NESJMA UVAS WEEKLY SUMMARY REPORTS

Project Update - PADEP Wastewater Technical Assistance Program
Northeast Schuylkill Joint Municipal Authority Wastewater Treatment Plant
UVAS (BOD) Continuous Monitoring Data collected from September 20th through 27th, 2023

On August 23, 2023, PADEP Wastewater Technical Assistance Program (WWTAP) staff installed continuous monitoring equipment at the Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment plant (WWTP) to investigate high organic strength influent wastewater sources and the operation of the activated sludge treatment system. WWTAP staff installed two HACH Ultraviolet Absorbance/Transmittance Spectrum (UVAS) probes in the WWTP influent trough with a HACH SC200 controller unit. The HACH UVAS probes were programmed to collect data calibrated to Biochemical Oxygen Demand (BOD) every fifteen (15) minutes The first UVAS probe (UVAS-1) was installed in the WWTP influent trough prior to the mechanical screening unit and the second probe (UVAS-2) after screening. On September 15th, WWTAP staff moved the UVAS-2 probe to the EQ tank pump discharge flow splitter box prior to the aeration tanks.

On September 27th, WWTAP staff visited the WWTP to complete process control testing and transfer UVAS probe data collected between September 20th & 27th. A preliminary review of UVAS-1 probe data for September 20th through 27th by WWTAP staff observed that the WWTP received the highest strength organic wastewater (407 mg/L) on Saturday, September 24th, 2023. Additionally, a review of all UVAS probe data collected between August 23rd and September 27th indicates that the WWTP receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends. WWTAP staff recommends that NESJMA coordinate efforts to relocate the WWTAP composite sampler to collect hourly composite samples at the Delano sewage pumping station on Saturday, October 7th and/or Sunday, October 8th.

In response to high organic loading on weekends, WWTAP staff plan to program an influent sampler to collect hourly samples (post-screening) on Sunday, October 1st, (00:00 – 23:45) using a 24-hour influent composite sampler with discrete sample collection bottles. On Monday, October 2nd, WWTAP staff will observe the influent composite samples for abnormal qualitative characteristics (color, sheen, foam, significant malodors, etc.) and analyze samples for Chemical Oxygen Demand (COD) and other select parameters in correlation with elevated UVAS probe readings (>300 mg/L). WWTAP staff will continue to work with NESJMA and the WWTP contract operators (M&B Environmental, Inc.) to determine potential sources of high organic strength wastewater. WWTAP staff recommends that NESJMA coordinate efforts to relocate the WWTAP composite sampler to collect hourly composite samples at the Delano sewage pumping station on Saturday, October 7th and/or Sunday, October 8th.

Min/Max UVAS Data:

UVAS-1 BOD) High: 407 mg/L (Sun, Sept. 23rd at 11:00) Low: 72 mg/L (Mon., Sept. 25th at 06:00)
UVAS-2 BOD) High: 493 mg/L (Sun., Sept. 24th at 16:30), Low: 76 mg/L (Mon., Sept. 25th at 05:30)

Document 2: NESJMA UVAS Summary 20230823-20230831

Project Update - PADEP Wastewater Technical Assistance Program
Northeast Schuylkill Joint Municipal Authority Wastewater Treatment Plant
UVAS (BOD) Continuous Monitoring Data collected from September 27th through October 4th, 2023

On August 23, 2023, PADEP Wastewater Technical Assistance Program (WWTAP) staff installed continuous monitoring equipment at the Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment plant (WWTP) to investigate high organic strength influent wastewater sources and the operation of the activated sludge treatment system. WWTAP staff installed two HACH Ultraviolet Absorbance/Transmittance Spectrum (UVAS) probes in the WWTP influent trough with a HACH SC200 controller unit. The HACH UVAS probes were programmed to collect data calibrated to Biochemical Oxygen Demand (BOD) every fifteen (15) minutes. The first UVAS probe (UVAS-1) was installed in the WWTP influent trough prior to the mechanical screening unit and the second probe (UVAS-2) after screening. On September 15th, WWTAP staff moved the UVAS-2 probe to the EQ tank pump discharge flow splitter box prior to the aeration tanks.

On October 4th, WWTAP staff visited the WWTP to complete process control testing and transfer UVAS probe data collected between September 27th & October 4th. A preliminary review of UVAS-1 probe data for September 27th through October 4th by WWTAP staff observed that the WWTP received the highest strength organic wastewater (343 mg/L) on Sunday, October 1st, 2023. Additionally, a review of all UVAS probe data collected between August 23rd and October 4th indicates that the WWTP receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends.

In response to high organic loading on weekends, WWTAP staff plan to deploy a composite sampler to collect discrete hourly samples at the Delano Township wastewater pumping station on Saturday and Sunday, October 7th & 8th, (12:00 – 11:45). On Monday, October 9th, WWTAP staff will collect the sampler and analyze samples for Chemical Oxygen Demand (COD) and other select parameters (pH, Dissolved Oxygen, Total Nitrogen, Ammonia-Nitrogen) based on abnormal qualitative sample characteristics (color, sheen, foam, significant malodors, etc). WWTAP staff will continue to work with NESJMA and the WWTP contract operators (M&B Environmental, Inc.) to determine potential sources of high organic strength wastewater.

WWTAP staff plan to strike and remove the continuous monitoring probes form the NESJMA WWTP on Wednesday, October 11th, 2023. After removal of monitoring equipment, WWTAP staff will begin to analyze the data collected from August 23rd through October 11th to develop a report for the NESJMA project and can remain available for consultation if needed.

Min/Max UVAS Data:

UVAS-1 BOD) High: 343 mg/L (Sun., Oct. 1st at 09:30) Low: 80 mg/L (Fri., Sept. 29th at 05:15)
UVAS-2 BOD) High: 428 mg/L (Tues., Oct. 3rd at 10:30), Low: 76 mg/L (Fri., Sept. 29th at 07:15)

Document 3: NESJMA UVAS Summary 20230831-20230906

Project Update - PADEP Wastewater Technical Assistance Program
Northeast Schuylkill Joint Municipal Authority Wastewater Treatment Plant
UVAS (BOD) Continuous Monitoring Data collected from September 6th through 15th, 2023

On August 23, 2023, PADEP Wastewater Technical Assistance Program (WWTAP) staff installed continuous monitoring equipment at the Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment plant (WWTP) to investigate high organic strength influent wastewater sources and the operation of the activated sludge treatment system. WWTAP staff installed two HACH Ultraviolet Absorbance/Transmittance Spectrum (UVAS) probes in the WWTP influent trough with a HACH SC200 controller unit. The first UVAS probe (UVAS-1) was installed in the WWTP influent trough prior to the mechanical screening unit and the second probe (UVAS-2) after screening. On September 15, 2023, WWTAP staff moved the UVAS-2 probe to the EQ tank pump discharge flow splitter box prior to the aeration tanks. Both HACH UVAS probes were programmed to collect data calibrated to Biochemical Oxygen Demand (BOD) every fifteen (15) minutes.

On September 13th, WWTAP staff visited the WWTP to complete process control testing and returned on September 15th, 2023 to transfer UVAS probe data collected between September 6th & 15th and complete process control testing at the WWTP.

A preliminary review of UVAS probe data for September 6th through 15th by WWTAP staff observed that the WWTP received the highest strength organic wastewater in the afternoon hours on Saturday, September 9th, 2023. Additionally, a review of all UVAS probe data collected between August 23rd and September 15th indicates that the WWTP receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends. WWTAP programmed an additional influent sampler to collect hourly samples (post-screening) from Saturday, September 16th through Sunday, September 17th using a 24-hour influent composite sampler with discrete sample collection bottles. On Monday, September 18th, WWTAP staff will observe the influent composite samples for abnormal qualitative characteristics and analyze samples for Chemical Oxygen Demand (COD) in correlation with elevated (>400 mg/L) UVAS probe readings. WWTAP staff will continue to work with NESJMA and the WWTP contract operators (M&B Environmental, Inc.) to determine potential sources of high organic strength wastewater.

Min/Max UVAS Data:

Highest UVAS-1 BOD point: 475 mg/L (Saturday, September 9th, 2023 at 12:45)
Lowest UVAS-1 BOD point: 80 mg/L (Wednesday, September 13th, 2023 at 10:30)

Highest UVAS-2 BOD Point: 364 mg/L (Thursday, September 7th, 2023 at 11:00)
Lowest UVAS-2 BOD Point: 56 mg/L (Wednesday, September 13rd, 2023 at 03:45)

Document 4: NESJMA UVAS Summary 20230907-20230915

Project Update - PADEP Wastewater Technical Assistance Program
Northeast Schuylkill Joint Municipal Authority Wastewater Treatment Plant
UVAS (BOD) Continuous Monitoring Data collected from September 15th through 20th, 2023

On August 23, 2023, PADEP Wastewater Technical Assistance Program (WWTAP) staff installed continuous monitoring equipment at the Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment plant (WWTP) to investigate high organic strength influent wastewater sources and the operation of the activated sludge treatment system. WWTAP staff installed two HACH Ultraviolet Absorbance/Transmittance Spectrum (UVAS) probes in the WWTP influent trough with a HACH SC200 controller unit. The HACH UVAS probes were programmed to collect data calibrated to Biochemical Oxygen Demand (BOD) every fifteen (15) minutes The first UVAS probe (UVAS-1) was installed in the WWTP influent trough prior to the mechanical screening unit and the second probe (UVAS-2) after screening. On September 15th, WWTAP staff moved the UVAS-2 probe to the EQ tank pump discharge flow splitter box prior to the aeration tanks.

WWTAP staff virtually attended the NESJMA board meeting during the evening on Tuesday, September 19th. During the meeting WWTAP staff provided an informal summary of the NESJMA WWTP project and offered additional technical assistance regarding collection of composite samples at pump stations in the NESJMA sewer service area, sewer ordinance review, MSDS sheet review, and what to look for if/when touring facilities at commercial & industrial customers.

On September 20th, WWTAP staff visited the WWTP to complete process control testing and transfer UVAS probe data collected between September 15th & 20th. A preliminary review of UVAS probe data for September 15th through 20th by WWTAP staff observed that the WWTP received the highest strength organic wastewater on Sunday, September 17th, 2023. Additionally, a review of all UVAS probe data collected between August 23rd and September 20th indicates that the WWTP receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends. WWTAP staff plan to program an influent sampler to collect hourly samples (post-screening) on Monday, October 1st, (00:00 – 23:45) using a 24-hour influent composite sampler with discrete sample collection bottles. On Monday, October 2nd, WWTAP staff will observe the influent composite samples for abnormal qualitative characteristics (color, sheen, foam, significant malodors, etc.) and analyze samples for Chemical Oxygen Demand (COD) and other select parameters in correlation with elevated UVAS probe readings (>300 mg/L). WWTAP staff will continue to work with NESJMA and the WWTP contract operators (M&B Environmental, Inc.) to determine potential sources of high organic strength wastewater.

Min/Max UVAS Data:

UVAS-1 BOD) High: 475 mg/L (Sun., Sept. 17th at 13:13), Low: 87 mg/L (Mon., Sept. 18th at 07:00)
UVAS-2 BOD) High: 370 mg/L (Sun., Sept. 17th at 15:00), Low: 105 mg/L (Mon., Sept. 18th at 08:15)

Document 5: NESJMA UVAS Summary 20230915-20230920

Project Update - PADEP Wastewater Technical Assistance Program

Northeast Schuylkill Joint Municipal Authority Wastewater Treatment Plant

UVAS (BOD) Continuous Monitoring Data collected from September 20th through 27th, 2023

On August 23, 2023, PADEP Wastewater Technical Assistance Program (WWTAP) staff installed continuous monitoring equipment at the Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment plant (WWTP) to investigate high organic strength influent wastewater sources and the operation of the activated sludge treatment system. WWTAP staff installed two HACH Ultraviolet Absorbance/Transmittance Spectrum (UVAS) probes in the WWTP influent trough with a HACH SC200 controller unit. The HACH UVAS probes were programmed to collect data calibrated to Biochemical Oxygen Demand (BOD) every fifteen (15) minutes The first UVAS probe (UVAS-1) was installed in the WWTP influent trough prior to the mechanical screening unit and the second probe (UVAS-2) after screening. On September 15th, WWTAP staff moved the UVAS-2 probe to the EQ tank pump discharge flow splitter box prior to the aeration tanks.

On September 27th, WWTAP staff visited the WWTP to complete process control testing and transfer UVAS probe data collected between September 20th & 27th. A preliminary review of UVAS-1 probe data for September 20th through 27th by WWTAP staff observed that the WWTP received the highest strength organic wastewater (407 mg/L) on Saturday, September 24th, 2023. Additionally, a review of all UVAS probe data collected between August 23rd and September 27th indicates that the WWTP receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends. WWTAP staff recommends that NESJMA coordinate efforts to relocate the WWTAP composite sampler to collect hourly composite samples at the Delano sewage pumping station on Saturday, October 7th and/or Sunday, October 8th.

In response to high organic loading on weekends, WWTAP staff plan to program an influent sampler to collect hourly samples (post-screening) on Sunday, October 1st, (00:00 – 23:45) using a 24-hour influent composite sampler with discrete sample collection bottles. On Monday, October 2nd, WWTAP staff will observe the influent composite samples for abnormal qualitative characteristics (color, sheen, foam, significant malodors, etc.) and analyze samples for Chemical Oxygen Demand (COD) and other select parameters in correlation with elevated UVAS probe readings (>300 mg/L). WWTAP staff will continue to work with NESJMA and the WWTP contract operators (M&B Environmental, Inc.) to determine potential sources of high organic strength wastewater. WWTAP staff recommends that NESJMA coordinate efforts to relocate the WWTAP composite sampler to collect hourly composite samples at the Delano sewage pumping station on Saturday, October 7th and/or Sunday, October 8th.

Min/Max UVAS Data:

UVAS-1 BOD) High: 407 mg/L (Sun, Sept. 23rd at 11:00) Low: 72 mg/L (Mon., Sept. 25th at 06:00)

UVAS-2 BOD) High: 493 mg/L (Sun., Sept. 24th at 16:30), Low: 76 mg/L (Mon., Sept. 25th at 05:30)

Document 6: NESJMA UVAS Summary 20230920-20230927

Project Update - PADEP Wastewater Technical Assistance Program

Northeast Schuylkill Joint Municipal Authority Wastewater Treatment Plant

UVAS (BOD) Continuous Monitoring Data collected from September 27th through October 4th, 2023

On August 23, 2023, PADEP Wastewater Technical Assistance Program (WWTAP) staff installed continuous monitoring equipment at the Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment plant (WWTP) to investigate high organic strength influent wastewater sources and the operation of the activated sludge treatment system. WWTAP staff installed two HACH Ultraviolet Absorbance/Transmittance Spectrum (UVAS) probes in the WWTP influent trough with a HACH SC200 controller unit. The HACH UVAS probes were programmed to collect data calibrated to Biochemical Oxygen Demand (BOD) every fifteen (15) minutes. The first UVAS probe (UVAS-1) was installed in the WWTP influent trough prior to the mechanical screening unit and the second probe (UVAS-2) after screening. On September 15th, WWTAP staff moved the UVAS-2 probe to the EQ tank pump discharge flow splitter box prior to the aeration tanks.

On October 4th, WWTAP staff visited the WWTP to complete process control testing and transfer UVAS probe data collected between September 27th & October 4th. A preliminary review of UVAS-1 probe data for September 27th through October 4th by WWTAP staff observed that the WWTP received the highest strength organic wastewater (343 mg/L) on Sunday, October 1st, 2023. Additionally, a review of all UVAS probe data collected between August 23rd and October 4th indicates that the WWTP receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends.

In response to high organic loading on weekends, WWTAP staff plan to deploy a composite sampler to collect discrete hourly samples at the Delano Township wastewater pumping station on Saturday and Sunday, October 7th & 8th, (12:00 – 11:45). On Monday, October 9th, WWTAP staff will collect the sampler and analyze samples for Chemical Oxygen Demand (COD) and other select parameters (pH, Dissolved Oxygen, Total Nitrogen, Ammonia-Nitrogen) based on abnormal qualitative sample characteristics (color, sheen, foam, significant malodors, etc). WWTAP staff will continue to work with NESJMA and the WWTP contract operators (M&B Environmental, Inc.) to determine potential sources of high organic strength wastewater.

WWTAP staff plan to strike and remove the continuous monitoring probes form the NESJMA WWTP on Wednesday, October 11th, 2023. After removal of monitoring equipment, WWTAP staff will begin to analyze the data collected from August 23rd through October 11th to develop a report for the NESJMA project and can remain available for consultation if needed.

Min/Max UVAS Data:

UVAS-1 BOD) High: 343 mg/L (Sun., Oct. 1st at 09:30) Low: 80 mg/L (Fri., Sept. 29th at 05:15)

UVAS-2 BOD) High: 428 mg/L (Tues., Oct. 3rd at 10:30), Low: 76 mg/L (Fri., Sept. 29th at 07:15)

Document 7: NESJMA WWTAP UVAS Summary 20230927-20231004

Project Update - PADEP Wastewater Technical Assistance Program

Northeast Schuylkill Joint Municipal Authority Wastewater Treatment Plant

UVAS (BOD) Continuous Monitoring Data collected from October 4th through 11th, 2023

Between August 23rd and October 11th, 2023, PADEP Wastewater Technical Assistance Program (WWTAP) staff installed continuous monitoring equipment at the Northeast Schuylkill Joint Municipal Authority (NESJMA) wastewater treatment plant (WWTP) to investigate high organic strength influent wastewater sources and the operation of the activated sludge treatment system. WWTAP staff installed two HACH Ultraviolet Absorbance/Transmittance Spectrum (UVAS) probes at the WWTP with a HACH SC200 controller and display unit. The HACH UVAS probes were programmed to collect data calibrated to Biochemical Oxygen Demand (BOD) every fifteen (15) minutes. The first UVAS probe (UVAS-1) was installed in the WWTP influent trough prior to the mechanical screening unit and the second probe (UVAS-2) after screening (on 9/13 UVAS-2 was relocated to the EQ tank pump discharge flow splitter box). On October 11, 2023, WWTAP staff removed all continuous monitoring equipment from the NESJMA WWTP.

On October 11th, WWTAP staff visited the WWTP to complete process control testing and transfer UVAS probe data collected between October 4th and 11th. A preliminary review of UVAS-1 probe data for October 4th through 11th by WWTAP staff observed that the WWTP received the highest strength organic wastewater (348 mg/L) on Friday, October 6th, 2023. As noted in previous weekly reporting, the WWTP receives recurring discharges of high organic strength wastewater to the NESJMA sewer service area on weekends.

In response to high organic loading on weekends, WWTAP staff deployed a composite sampler to collect discrete hourly samples at the Delano Township wastewater pumping station on Saturday and Sunday, October 7th & 8th, (12:00 – 11:45). On Monday, October 9th, WWTAP staff collected the sampler and analyzed samples for Chemical Oxygen Demand (COD) and qualitative sample characteristics (color, sheen, foam, significant malodors, etc). The results of the COD bench testing are included in a table on page 2 of this weekly report. While the continuous monitoring equipment project has come to an end, WWTAP staff may be available to continue to work with NESJMA and the WWTP contract operators (M&B Environmental, Inc.) to determine potential sources of high organic strength wastewater discharges to the NESJMA sewer service area. WWTAP staff have begun analysis of the data collected from August 23rd through October 11th and expect to be able to present a final project report within eight (8) weeks.

Min/Max UVAS Data:

UVAS-1 BOD) High: 348 mg/L (Fri., Oct. 6th at 19:00) Low: 101 mg/L (Sat., Oct. 7th at 06:15)

UVAS-2 BOD) High: 364 mg/L (Fri., Oct. 6th at 21:00), Low: 135 mg/L (Sun., Oct. 8th at 08:15)

Document 8: NESJMA UVAS Summary 20231004-20231011

(Double-click to open.)

ATTACHMENT H: WWTAP COMPOSITE SAMPLE TESTING SUMMARY REPORTS

NESJMA WWTP - Special Testing Results
September 16-17, 2023, Discrete 24-Hour Influent Composite Sample

WWTAP staff stopped out to the WWTP on Monday, September 18, 2023, and to check the UVAS continuous monitoring probe data against the discrete hourly influent composite samples collected from 12:00 on Saturday, September 16th and 11:00 on Sunday September 17th, 2023.

The UVAS probe data indicated that there were only three (3) hourly samples with a UVAS-1 result > 300 mg/L (09/16 @ 14:00, 09/17 @ 10:00, & 09/17 @ 11:00) and I selected these samples for bench testing.

I observed no significant qualitative differences across the samples collected (abnormal malodors, color, sheen, foam, solids, etc.).

Bench Testing Results:

Date & Time	Parameter	Result (mg/L)
9/16/2023 14:00	UVAS-1 BOD	301
	COD	560
	TN	100.63
	NH3-N	46.56
	PO4-P	5.018
9/17/2023 10:00	UVAS-1 BOD	363
	COD	700
	TN	95.8
	NH3-N	61.6
	PO4-P	6.089
9/17/2023 11:00	UVAS-1 BOD	373
	COD	809
	TN	*161.98**
	NH3-N	79.69
	PO4-P	8.699

**Over Range*

Document 9: NESJMA Inf. Composite Sample Results 20230916-17

NESJMA WWTP - Special Testing Results
October 1, 2023, Discrete 24-Hour Influent Composite Sample

WWTAP staff stopped out to the WWTP on Monday, October 2nd to check the UVAS continuous monitoring probe data against the discrete hourly influent composite samples collected on Sunday 10/1/2023.
The UVAS probe data indicated that there were two (2) hourly samples with a UVAS-1 result > 300 mg/L (13:00 & 14:00) that were selected for additional bench testing. I observed no significant qualitative differences across the samples collected (abnormal malodors, color, sheen, foam, solids, etc.).

Date/Time	UVAS BOD5 Pre-screen INF	UVAS BOD5 Post Screen INF
	mg/L	mg/L
10/1/2023 13:00	312.82	296.76
10/1/2023 13:15	325.89	299.99
10/1/2023 13:30	323.63	353.91
10/1/2023 13:45	316.86	331.16
10/1/2023 14:00	337.27	346.92
10/1/2023 14:15	318.56	322.38

Table 1) 10/1/2023 NESJMA UVAS Probe Data where at least one 900 sec. BOD reading >300 mg/L

Bench Testing Results:

Info.	Parameter	Result (mg/L)
13:00		
UVAS-1	COD	1127
326 mg/L	TN	>120 (over range)
	NH3-N	64.9
14:00		
UVAS-1	COD	649
337 mg/L	TN	>120 (over range)
	NH3-N	51.3

Document 10: NESJMA Inf. Composite Sample Results 20231001

NESJMA WWTP - Special Testing Results
Delano Township Wastewater Pumping Station - 24-Hour Influent Composite Sampling (October 7-8, 2023)

WWTAP staff coordinated with M&B Environmental, the contract wastewater operator for NESJMA, to deploy a composite sampler at the Delano wastewater pumping station in Delano Township, Schuylkill County. The Delano pumping station collects domestic sewage from the village of Delano area and wastewater generated at the NAJIC Industrial Park. The composite sampler was programmed to collect discrete, hourly samples from 12:00 Saturday, October 7th to 11:00 Sunday, October 8th, 2023. At the time of the composite sampler deployment and during manual composite sampler operation to confirm that the sampler was in good working order, the wastewater pumping station contents appeared mostly clear with few suspended solids. WWTAP staff noted no significant qualitative differences (color, solids, floatables, sheen, foam, abnormal malodors, etc.) between hourly samples collected at the Delano Tw. Wastewater pumping station.

Bench Testing Results

Date & Time	COD Result (mg/L)
10/7/23 12:00	180
10/7/23 13:00	174
10/7/23 14:00	145
10/7/23 15:00	136
10/7/23 16:00	349
10/7/23 17:00	289
10/7/23 18:00	383
10/7/23 19:00	161
10/7/23 20:00	145
10/7/23 21:00	178
10/7/23 22:00	455
10/7/23 23:00	>1500*
10/8/23 0:00	632
10/8/23 1:00	113
10/8/23 2:00	908
10/8/23 3:00	118
10/8/23 4:00	104
10/8/23 5:00	489
10/8/23 6:00	>1500*
10/8/23 7:00	100
10/8/23 8:00	345
10/8/23 9:00	415
10/8/23 10:00	532
10/8/23 11:00	618

**Result over Range of HACH TNT 822 test

Document 11: NESJMA Delano Twp. PS Composite Sample Results 20231007-08

PADEP WWTAP Special Testing Results
NESJMA Quakake Sewage Pumping Station 24-Hour Composite Sampling (November 18-19, 2023)

WWTAP staff coordinated with M&B Environmental, the contract wastewater operator for NESJMA, to deploy a composite sampler at the NESJMA Quakake pumping station in Ryan Township, Schuylkill County. The Quakake pumping station collects domestic sewage from the Quakake/Tamanend area and wastewater generated at the Air Products: Versum Materials production facility. The composite sampler was programmed to collect discrete, hourly samples from 12:00 Saturday, November 18th to 11:00 Sunday, November 19th, 2023. At the time of deployment, the wastewater discharge to the pump station appeared to contain a significant concentration of orange-brown colored solids. WWTAP staff collected photographs of Quakake pumping station contents at the time of the composite sampler deployment and during manual composite sampler operation to confirm sample aliquot volume calibration (200 mL).

Calibration aliquot collected by sampler. Note the turbid, orange-brown colored wastewater in the sample bottle.

Quakake pump station wastewater in sampler tubing during sampler testing and rinse cycle. Note the orange-brown colored wastewater in the tubing.

Gravity sewer discharge into Quakake pumping station. Note the turbid, orange-brown color of the wastewater.

Document 12: NESJMA Quakake PS Composite Sample Results 20231118-19

(Double-click to open.)

ATTACHMENT I: EXISTING NESJMA SEWER USE RULES & REGULATIONS

NESJMA

Rec'd 4/20/23

NORTHEASTERN SCHUYLKILL JOINT MUNICIPAL AUTHORITY,

SCHUYLKILL COUNTY

RULES AND REGULATIONS

FOR

SANITARY SEWER SYSTEM

SEPTEMBER 2001
REVISED OCTOBER 20, 2005

ADOPTED : OCTOBER 20, 2005
RESOLUTION _____

PREPARED BY:

SYSTEMS DESIGN ENGINEERING, INC.
1032 JAMES DRIVE
LEESPORT, PA 19533

05-0401-0103

Document 13: NESJMA Rules & Regulations for Sanitary Sewer System (Double-click to open.)

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ATTACHMENT J: EPA PRETREATMENT MODEL ORDINANCE

EPA MODEL PRETREATMENT ORDINANCE

Office of Wastewater Management/
Permits Division

January 2007

U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

EPA 833-B-06-002

Document 14: EPA Model Pretreatment Ordinance (Double-click to open.)
https://www3.epa.gov/npdes/pubs/pretreatment_model_suo.pdf

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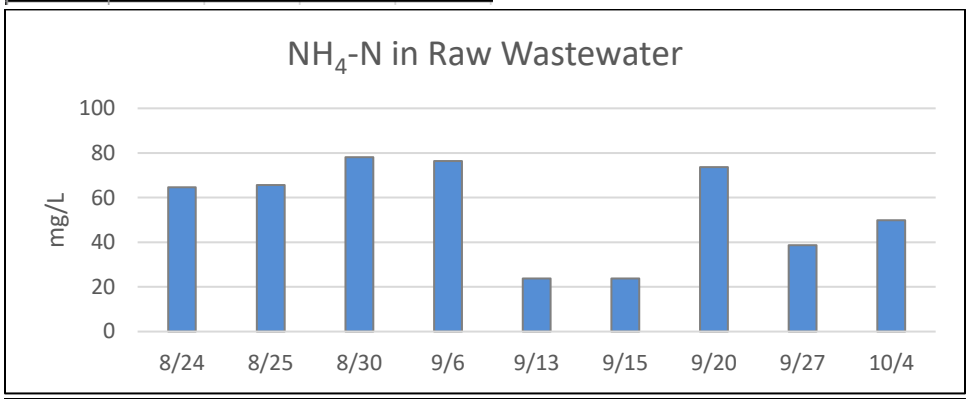
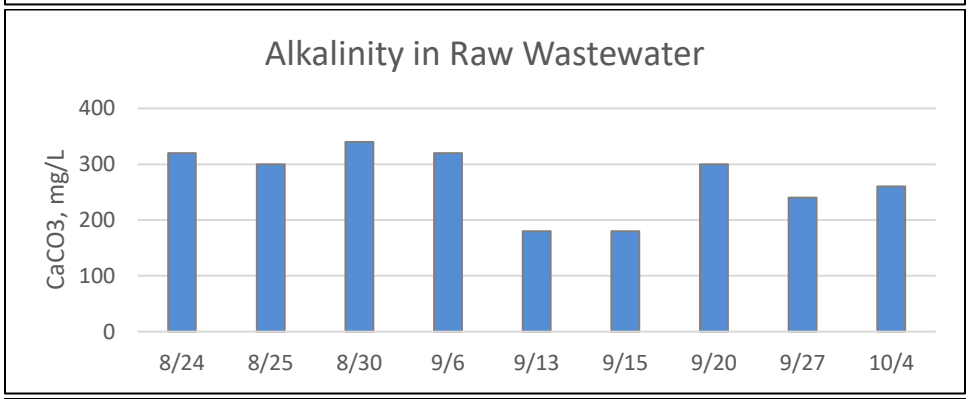
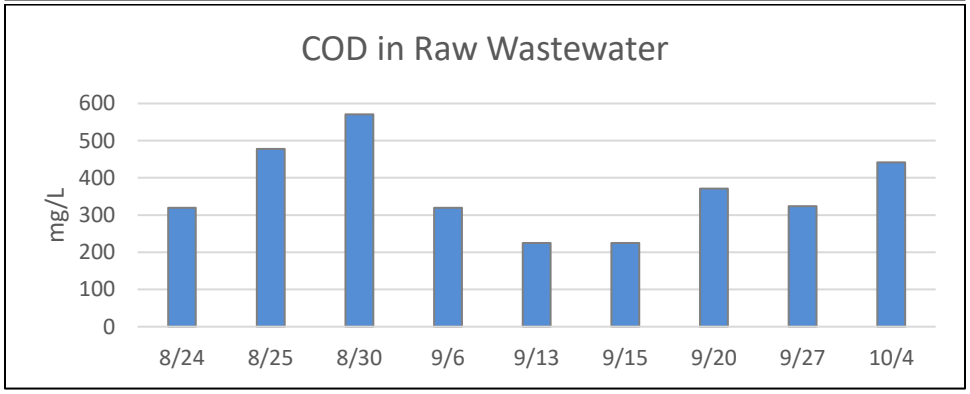
ATTACHMENT K: WWTAP PROCESS CONTROL BENCH TESTING DATA

Influent Bench Testing

	INF			
	COD	NH3-N	PO4-P	Alkalinity
8/24/2023	320	64.66	22.730	320
8/25/2023	478	65.65	8.196	300
8/30/2023	571	78.10	9.903	340
9/6/2023	320	76.33	16.024	320
9/13/2023	225	23.76	3.728	180
9/15/2023	225	23.76	3.728	180
9/20/2023	371	73.61	9.031	300
9/27/2023	324	38.72	5.012	240
10/4/2023	442	49.93	7.562	260
Average	364	54.95	9.546	271
Maximum	571	78.10	22.730	340
Minimum	225	23.76	3.728	180







Activated Sludge Biomass

	Process Control		
	MCRT	F/M	WSA
8/24/2023	49	0.008	47
8/25/2023	40	0.013	40
8/30/2023	28	0.018	31
9/6/2023	33	0.012	26
9/13/2023	50	0.006	58
9/15/2023	57	0.008	53
9/20/2023	53	0.012	51
9/27/2023	56	0.027	53
10/4/2023	56	0.015	53
Average	47	0.013	46
Maximum	57	0.027	58
Minimum	28	0.006	26

Activated Sludge Solids Testing

	MLSS											
	SSV30	SSV60	SVI30	SVI60	SSC30	SSC60	OUR AT1	OUR AT2	OUR AT3	RR AT1	RR AT2	RR AT3
8/24/2023	140	140	540	370	560	390	11.34	0.00	0.00	0.0	4.3	0.0
8/25/2023	150	90	570	390	420	310	10.50	10.98	9.96	10.0	4.0	2.8
8/30/2023	200	190	490	370	460	350	13.14	13.44	10.80	10.8	4.3	3.4
9/6/2023	200	190	490	370	500	370	11.88	15.48	13.32	13.3	4.6	4.1
9/13/2023	260	240	350	280	400	310	0.00	0.00	0.00	0.0	0.0	0.0
9/15/2023	250	230	340	280	350	300	16.80	11.70	12.66	12.7	4.9	3.3
9/20/2023	200	190	310	280	370	310	11.34	10.86	10.38	10.4	2.6	3.2
9/27/2023	250	230	290	250	350	290	9.60	10.02	10.32	10.3	2.2	2.9
10/4/2023	250	220	290	240	280	250	9.54	10.44	12.24	12.2	3.2	2.9
Average	211	191	408	314	410	320	11.77	11.85	11.38	11.4	3.8	3.2
Maximum	260	240	570	390	560	390	16.80	15.48	13.32	13.3	4.9	4.1
Minimum	140	90	290	240	280	250	9.54	10.02	9.96	10.0	2.2	2.8

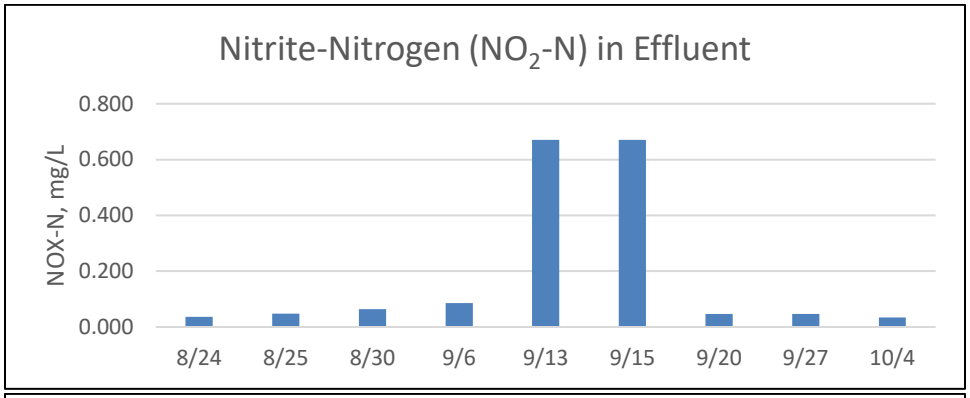
Activated Sludge Solids Centrifuge Testing

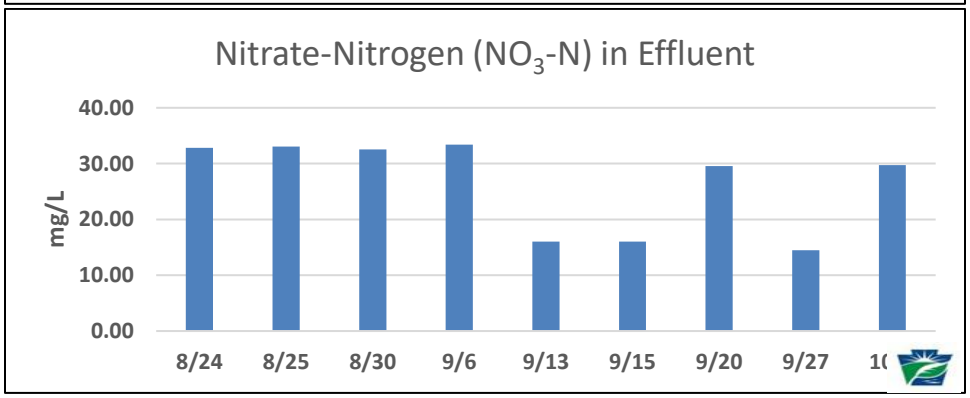
	Spins									
	AER1	AER2	AER3	Clar1	Clar2	Clar3	RAS1	RAS2	RAS3	WAS
8/24/2023	3.0	4.5	3.5	5.0	4.2	2.6	7.0	6.2	5.0	6.1
8/25/2023	3.0	4.5	3.5	5.0	4.2	2.6	7.0	6.2	5.0	6.6
8/30/2023	3.5	4.5	3.5	5.0	4.2	2.6	8.0	6.0	5.2	7.0
9/6/2023	3.0	4.3	3.5	5.0	4.2	2.6	7.5	6.0	5.3	6.8
9/13/2023	5.2	4.0	3.5	5.0	4.2	2.6	7.0	4.2	5.0	5.6
9/15/2023	4.0	4.2	3.2	5.5	2.2	1.8	7.8	4.5	4.0	5.4
9/20/2023	5.2	4.0	3.2	3.0	3.0	2.3	6.2	5.0	4.5	5.2
9/27/2023	5.0	4.0	3.5	3.2	2.2	2.5	6.5	4.2	4.5	5.1
10/4/2023	3.5	4.2	4.0	3.0	2.8	2.5	6.2	4.5	4.5	5.1
Average	3.9	4.2	3.5	4.4	3.5	2.4	7.0	5.2	4.8	5.9
Maximum	5.2	4.5	4.0	5.5	4.2	2.6	8.0	6.2	5.3	7.0
Minimum	3.0	4.0	3.2	3.0	2.2	1.8	6.2	4.2	4.0	5.1

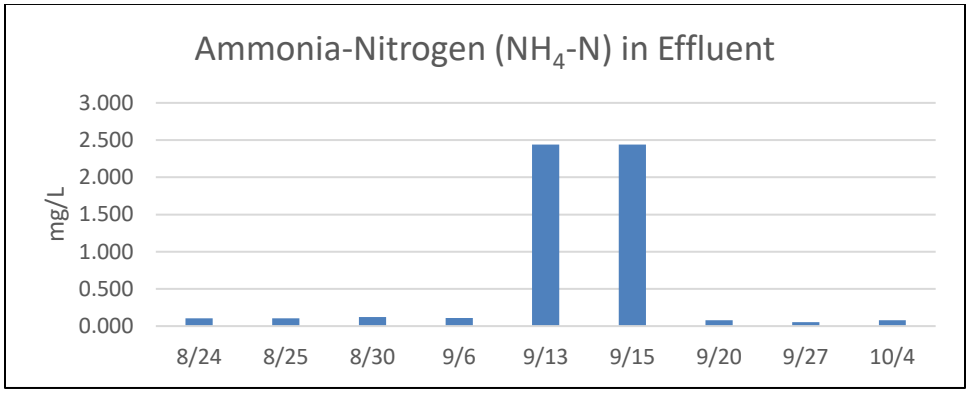
Effluent Bench Testing

	EFF						
	NH3-N	NO2-N	NO3-N	PO4-P	Alkalinity	TKN	Total N
8/24/2023	0.103	0.036	32.85	39.380	80	0.00	49.79
8/25/2023	0.104	0.048	33.03	6.090	80	0.00	53.38
8/30/2023	0.121	0.064	32.56	6.158	80	1.98	1.98
9/6/2023	0.108	0.086	33.39	6.403	80	8.50	8.50
9/13/2023	2.440	0.671	16.05	4.493	80	7.56	7.56
9/15/2023	2.440	0.671	16.05	4.493	80	7.56	7.56
9/20/2023	0.079	0.047	29.55	3.721	60	3.69	3.69
9/27/2023	0.051	0.047	14.46	2.331	60	0.01	0.01
10/4/2023	0.080	0.034	29.76	5.064	40	3.88	3.88
Average	0.614	0.189	26.41	8.681	71	4.74	15.15
Maximum	2.440	0.671	33.39	39.380	80	53.38	8.50
Minimum	0.051	0.034	14.46	2.331	40	0.01	0.01

** All WWTAP bench testing results are concentrations (mg/L)*







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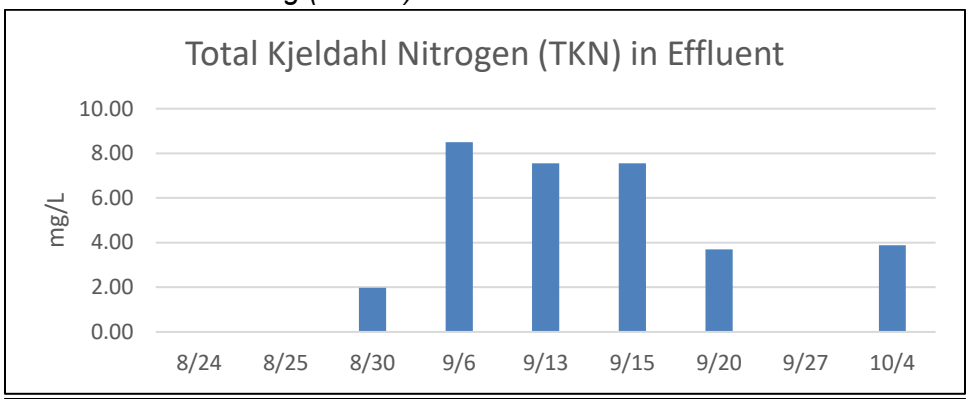

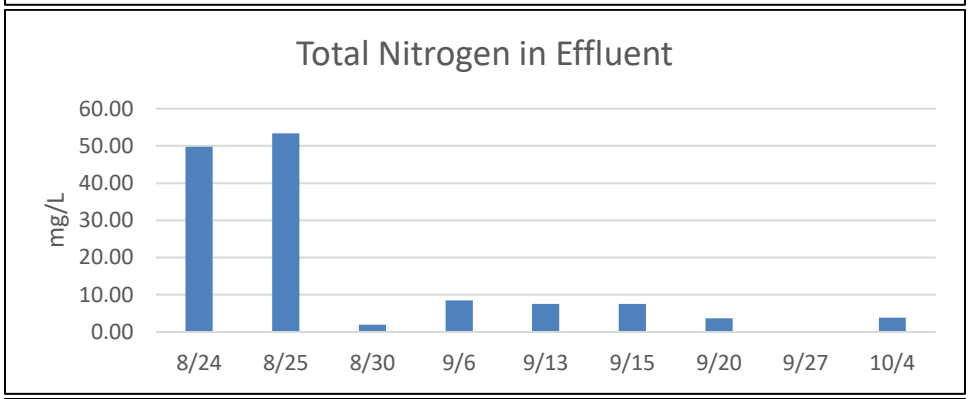

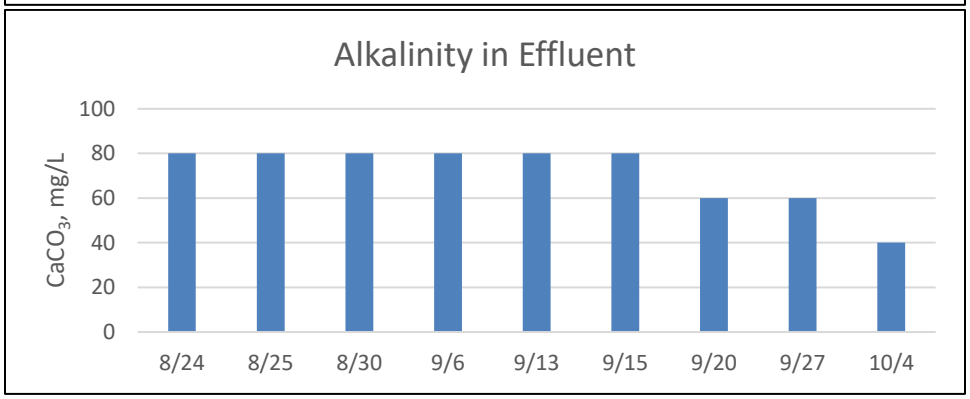

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ATTACHMENT L: RECOMMENDED MONITORING TESTS & FREQUENCIES

PROCESS CONTROL TESTS FOR DOMESTIC WASTEWATER TREATMENT FACILITIES

Activated Sludge Facility: Conventional, Complete Mix, Step Feed, or Extended Air
Less than and including 1.0 MGD (Page1 of 1)

SAMPLE PARAMETER	SAMPLE LOCATION	SAMPLE TYPE	3/WEEK	1/WEEK	2/MONTH
Raw Influent*					
BOD_5 and/or COD	Influent	Grab			X
TSS/VSS, NH_3-N, and pH	Influent	Grab			X
* Frequency of sampling may need to be increased or decreased depending on plant size or conditions.					
Aeration Basin					
MLSS/MLVSS (or centrifuge, with correlated data from periodic MLVSS values)	RAS line and effluent	Grab			X
Dissolved oxygen	Effluent	In situ		X	
Settleability (SV30)	Effluent	Grab	X		
pH	Effluent	Grab		X	
Microscopic examination	Effluent	Grab			X
Computation of SVI, F/M ratio, sludge age, and/or MCRT, as desired	Effluent	—	As data collected		
Secondary Clarifier					
Sludge blanket depth	As appropriate	In situ		X	
Final Effluent					
Parameters, sample types, and frequencies as required by permits.					

Process monitoring is vital to maintaining a well-operated wastewater treatment facility. Engineers design wastewater treatment plants to meet steady-state operating conditions based on constant parameters such as Food-to-Mass ratio, Solids Retention Time, or Cell Residence Time. In the absence of large flow equalization and storage capacity, treatment operators maintain F/M, SRT, or MCRT by controlling the amount of active biosolids available to treat the incoming organic and nitrogenous load. They do this by regulating sludge wasting rates.

Every treatment facility should waste a little bit of its biomass on a consistent schedule. Wasting sludge every day is ideal, but in small package plants this may not always be practical. However, wasting should be done no less than every few days in such facilities, as sludge wasting promotes growth of new microorganisms while removing those that are endogenous.

The table reproduced above lists suggested sampling frequencies for facilities of capacity up to 1.0 MGD. This represents the minimum monitoring requirements; however, experience suggests that process monitoring tests be performed more frequently when a facility is experiencing any changes. These changes include any process changes made by the operators and any changes due to unavoidable circumstances, such as slug loading or equipment service interruptions. Generally, the higher the level of treatment, the more process control testing is necessary. For example, denitrification operations require additional process monitoring when compared to nitrification operations.

Process Monitoring testing is often not the same as those performed by contract laboratories in that approved test methods are not utilized. Compliance testing refers to those analyses used by certified laboratories for reporting parameters required by the NPDES permit. Over the years, many small treatment facilities began to contract compliance testing to certified environmental laboratories. This eased the burden on operators, and it saved the facility owner the cost of maintaining certification of its own laboratory. However, over time, many facilities ceased to perform regular process monitoring tests, as well. It is important for operators to know the condition of their facilities, the sludge solids inventory, and the qualities of the treatment solids (i.e., quantity and quality of "bugs") to effectively optimize operations.

DEP's WWTAP has adopted the process monitoring tests recommended by US-EPA and the professional trade organization, Water Environment Federation (WEF.) These tests include the following:

- Centrifuge solids test: percent volume/volume measurement of activated sludge solids for activated sludge-type plants: Calculations stemming from this data include solids inventory (expressed as dimensionless "sludge units" (SLU).)
- Clarifier blanket level: a core-sampling of the clarifier contents provides a proportional quantity of mixed liquor and supernatant that can be used for developing awareness of how much mixed liquor is detained in the effluent clarifier, representing part of the overall sludge inventory.
- Settleometry test: 30- and 60- minute activated sludge settling rates in wide half-gallon or 1-liter, calibrated vessels: Settled sludge volume (SSV) is expressed in standard 30-minute intervals and used to calculate Settled Sludge Concentration (SSC) which is a qualitative measure of how well the activated sludge settles in the clarifier, mimicking clarifier performance in terms of supernatant quality as well. Using WCR, it is also possible to calculate and track Sludge Volume Index (SVI).
- Oxygen Uptake Rate (a.k.a. Soluble Oxygen Uptake Rate): By measuring the rate of dissolved oxygen depletion in a sample of mixed liquor, one may demonstrate the relative effect of BOD5 loading on the biomass, how quickly this material will be metabolized by the activated sludge organisms. Expressed in "milligrams Oxygen per hour," when mixed liquor volatile suspended solids concentration is known or can be extrapolated, then one may determine the actual Respiration Rate, in mg. Oxygen per hour per gram of activated sludge. OUR and RR are also useful for comparing the relative health of the biomass under toxic conditions, should there be undesirable contaminants in the raw wastewater, or anoxic conditions, should the aeration be insufficient to treat the incoming waste load using the available amount of oxygen.
- Raw Wastewater and Effluent Chemical Oxygen Demand (COD): an analog of the 5-day Biochemical Oxygen Demand test, COD can be determined in about three hours and give operators a quick assessment of relative strength of wastewater and/or the amount of material remaining in treated effluent, thereby providing an analog of treatment efficiency.
- Nutrient Tests: A portable wastewater laboratory provided during the WTE consists of materials for conducting various colorimetric analyses for nutrients such as ammonia-nitrogen, nitrite, nitrate, organic nitrogen, phosphorus, etc. to determine whether the facility is removing or treating nutrients. For process monitoring purposes, nutrient test strips provide ample, low-cost, low-trouble test results. They are available in most supplier catalogs (USA Blue Book, Hach, Grainger, et al.)
- Various other tests included in the portable wastewater laboratory include alkalinity testing (the buffering capacity of the mixed liquor or the clarified supernatant,) chlorides, sulfides, halogens such as Total Residual Chlorine and Free Chlorine, and metals including aluminum and iron, known contaminants to downstream aquatic life.

The objective of all this testing is to develop a unique profile for the facility useful in developing operations trends, showing conditions that become predictive of how the facility responds to various beneficial or adverse conditions that could affect effluent quality and treatment efficiency. Once sufficient data exists, operators should have a cogent understanding of how the facility responds to process adjustments and what they must do to maintain it in good condition.

Typically, operators should determine an overall treatment strategy for their facility, using standard industry calculations for:

- Food to Mass Ratio (F/M)
- Mean Cell Residence Time (MCRT)
- Sludge Age or Dynamic Sludge Age

These values can be determined using the equipment described above. These calculations provide set-points unique to the facility that can be adjusted either through changes in sludge wasting rates or, where possible, treatment capacity (by adding or subtracting additional treatment units,) assuming that the concentration of waste in the wastewater is a variable that operators cannot control.

ATTACHMENT M: SLUDGE CALCULATION SPREADSHEET - NESJMA WWTF

Solids Management (Sludge) Calculator

This worksheet calculates the expected sludge volume that should be produced by various treatment processes over a one-year period. Enter data into green cells - hit the Tab key to move between cells. Red cells are calculated.

Facility Name:	Northeast Schuylkill Jt. Muni. Auth	Permit No.:	PA0063878
Evaluation Period:	2/1/2022 (Enter Date)	to	1/31/2023 (Enter Date)
Design Flow:	0.245 MGD	Actual Annual Average Flow:	0.1424 MGD
Type of Biological Treatment Process:	Conventional Activated Sludge	Treatment Factor:	0.85
Type of Digestion Process:	Aerobic Digestion, HDT = 20	Digestion Factor:	0.7
Total Population Served by Treatment Plant:	3,859		

Average Annual Influent BOD5 Load (per Ch. 94 Report):	725.0	lbs/day	
Average Annual Influent BOD5 Load (Expected based on Population):	656.0	lbs/day	*(Population x 0.17)*
% of Influent BOD5 Load per Ch. 94 Report / Influent Load Expected:	110.5%		*(Influent Load per Ch. 94 Report / Influent Load based on Population)*
Average Annual Effluent Concentration of CBOD5 :	33	mg/L	***Assume 39.6 mg/L BOD5***
Average Annual Pounds (lbs) of BOD5 Discharged:	47.03	lbs/day	*(Actual Flow x Effluent BOD5 Concentration x 8.34)*
Influent BOD5 Load per Person per Day (based on Ch. 94):	0.188		*(Influent BOD5 Load per Ch. 94 Report / Population - 0.17 to 0.22 is typical)*
Pounds of BOD5 Removed (based on Ch. 94):	678.0	lbs/day	*(Influent BOD5 Load per Ch. 94 Report - BOD5 Discharged)*
Pounds of BOD5 Removed (based on Population):	609.0	lbs/day	*(Influent BOD5 Load Expected based on Population - BOD5 Discharged)*
Sludge Removed from Treatment Plant (Previous Year):	9.4 Dry Tons	=	18,740 Dry lbs

Sludge Production and Wasting Calculations

	Based on Chapter 94 Report	***Based on Population***
	678.0 BOD5 Removed / Day (lbs)	609.0 BOD5 Removed / Day (lbs)
X	0.85 Treatment Factor	0.85 Treatment Factor
	576.27 Daily Solids Production (lbs)	517.65 Daily Solids Production (lbs)
X	0.7 Digestion Factor	0.7 Digestion Factor
	403.39 Daily Digested Solids (lbs)	362.36 Daily Digested Solids (lbs)
X	365 Days per Year	365 Days per Year
	147,238 Solids Generated / Year (lbs)	132,260 Solids Generated / Year (lbs)
-	18,740 Solids Actually Wasted / Year (lbs)	18,740 Solids Actually Wasted / Year (lbs)
	128,498 Difference (lbs)	***113,520*** Difference (lbs)
	13% % of Expected Volume Wasted *(85 - 115% is generally acceptable)*	14% % of Expected Volume Wasted *(85 - 115% is generally acceptable)*
	1.8% Percent Solids of Wasted Solids	1.8% Percent Solids of Removed Solids
	991,824 Volume of Solids to Remove Annually (gallons)	890,925 Volume of Solids to Remove Annually (gallons)
-	126,236 Volume of Solids Actually Removed Annually (gallons)	126,236 Volume of Solids Actually Removed Annually (gallons)
	865,588 Difference (gallons)	***764,689*** Difference (gallons)

NESJMA Biosolids Worksheet for 2/1/22 through 1/31/23 (Double-click to open.)

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
WASTEWATER TECHNICAL ASSISTANCE PROGRAM