Amity Township WWTF

Wastewater Treatment Evaluation

Amity Township, Berks County

NPDES Permit No. PA0070351

Wastewater Treatment Evaluation

Bureau of Clean Water
Rachel Carson State Office Building
PO Box 8774
400 Market Street
Harrisburg, PA 17105-8774

Pennsylvania
Department of
Environmental Protection

2025

Disclaimers:

Pennsylvania Regulations at 25 Pa. Code § 91.12 state, inter alia, that "Employees of the Department [Department of Environmental Protection] may not act as consulting engineers for a party or recommend the employment of a particular consultant, gather the data for the design of [a] his treatment plant, prepare plans or act as an inspector on the construction of the project…". This report and any recommendations represent an interpretation of data collected during the project and the best professional judgement of Department staff. Permittees, in conjunction with certified wastewater operators and consulting engineers, should continue an independent investigation to determine the guidance and procedures necessary to optimize operations of the publicly owned treatment works (wastewater treatment facility and sanitary sewer collection and conveyance system).

The mention of a brand of equipment is in no way an endorsement for any specific company. The Pennsylvania Department of Environmental Protection (PADEP) Wastewater Technical Assistance Program (WWTAP) urges the facility owner / 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 PADEP WWTAP is to improve receiving water quality through troubleshooting, training, and monitoring. Permittees are encouraged to achieve effluent quality above and beyond current permit requirements.

Additional data and results from the PADEP WWTAP for this project may be available upon request. Please contact the WWTAP staff listed in Appendix A of this report or the Pennsylvania Department of Environmental Protection Bureau of Clean Water at RA-EPWWTAPROVIDER@pa.gov / (717) 787-6744

Executive Summary:

From August through October 2024, staff from the Pennsylvania Department of Environmental Protection (PADEP) Wastewater Technical Assistance Program (WWTAP) and Amity Township (Amity) collaborated on a project evaluate and improve wastewater treatment at Amity's wastewater treatment facility (WWTF) in Amity Township, Berks County, Pennsylvania. Recent reports that Amity has submitted to the PADEP document incidents where the facility received wastewater from the sanitary sewer system that impacted the WWTF activated sludge treatment system causing exceedances of the Amity WWTF National Pollutant Discharge Elimination System (NPDES) Permit final effluent discharge limits.

PADEP WWTAP staff were invited by the Amity Township Public Works Director and the wastewater operations consultant to perform an instrument-based evaluation of the WWTF and provide recommendations to support the facility's efforts to achieve and maintain compliance with NPDES Permit final effluent discharge limits Through analysis of data collected during the Wastewater Treatment Evaluation (WTE), WWTAP staff develop recommendations and guidance to optimize Biological Nutrient Removal (BNR) in the activated sludge treatment system and enhance the WWTF effluent discharge water quality, resulting in improvements to the Schuylkill River, Delaware River Watershed, and waters of the Commonwealth.

WWTAP projects are dynamic endeavors where PADEP staff and WWTF operators & consultants regularly engage in open discussion that can include a wide variety of topics and issues experienced by wastewater facilities across the Commonwealth. WWTAP staff strive to foster the free exchange of ideas, but this can create an environment. To focus efforts for the WTE, WWTAP staff submitted a Project Outline to Amity Township in August 2024.

The objectives listed in the project outline include:

1. WWTAP staff will complete an instrument-based evaluation of the WWTF and develop recommendations for optimizing the activated sludge treatment system to reduce effluent discharge nutrient loadings.
2. WWTF operators have documented recurring slug discharges of non-domestic and/or industrial waste in WWTF influent flows. Slug discharges known to contain organic loading concentrations (as Biochemical Oxygen Demand, 5-day (BOD5)) that exceed the upper limit in the expected range of organic loading for a domestic wastewater treatment facility (BOD5 < 350 mg/L). WWTAP will assist with monitoring influent flows to investigate the occurrence, frequency, and duration of slug discharges to the WWTF.
3. The WWTF upgrade and expansion project includes a significant investment in wastewater utility infrastructure. The installation of a Supervisory Control and Data Acquisition (SCADA) system and development of an effective process control plan will support the efficient operation of the WWTF and compliance with the requirements of Amity's NPDES Permit. WWTAP will provide discussion and training for WWTF operators and staff regarding operation and maintenance of continuous monitoring equipment proposed in the SCADA system and programming included in the WWTF upgrade and expansion project.

These are wins for the host community served by the treatment facility, for the facility owners and operators, for the regulatory community, and especially for the downstream users of the waters contributing to the Delaware River Watershed.

Operational Strengths

The following items are Operational Strengths that were identified during the WTE. These include strengths of both the wastewater operators and the facility itself:

1. WWTF operations are responsive to the results of regular process control testing,
2. Operators conduct routine assessments of treatment facility on a regular basis.
3. The facility has a registered laboratory for testing gravimetric solids and concentrations of nutrient parameters for process monitoring purposes aimed at permit compliance and process monitoring,
4. The laboratory appears to be well-organized for its current purposes.
5. Effective preventative maintenance of equipment.
6. Records indicate that facility equipment maintained and operated in balance, with records readily available for review.
7. Facility has generally maintained compliance with NPDES requirements.
8. Automatic samplers are located at the headworks and at the effluent discharge to the receiving stream. This equipment appears to be in serviceable working order to assure representative sampling and correct holding temperatures.
9. Staff maintain ongoing efforts for source determination and monitoring of non-domestic and industrial waste discharges to the sewer service area.
10. Staff regularly perform flow metering activities in the sewer service area for I&I detection and elimination projects.

Recommendations

While working on site, PADEP WWTAP staff often discussed ways to improve performance of the wastewater treatment process with the wastewater operations consultant and WWTF operators & staff. Based on the outcome of the WTE the following recommendations are made for ongoing and future improvement of the WWTF and Sanitary Sewer Collection and Conveyance System (SSCS):

Activated Sludge Wastewater Treatment System

- Continue to optimize oxidation ditch aeration program to support BNR and reduce WWTF final effluent discharge pollutant/nutrient loading.
- While the installation of dissolved oxygen (D.O.), continuous monitoring probes is planned as part of a WWTF upgrade project that is currently underway, Amity should investigate the installation of additional probes (pH & oxidation/reduction potential [ORP]) in the oxidation ditch treatment units. At times of the year when it is favorable to control the aeration cycles using D.O. and/or ORP-based control, the facility will see benefits of reduced energy consumption and costs for aeration.
- Have the facility engineer evaluate ways to deliver alkalinity chemicals to the activated sludge biomass using metering pumps or add as slurry, preferably over the course of the day. Adding alkalinity in the forms of bicarbonate or hydroxide will help to maintain a targeted range of pH within the activated sludge treatment units to optimize the activity of facultative bacteria for advanced biological nutrient removal (nitrification & denitrification).
- Develop an aerobic digester blower on/off aeration program to support energy efficiency and reduce nutrient loading in return flows (decant and filtrate).
- Develop and implement a rigorous process control testing to optimize the solids mass balance in WWTF activated sludge biota. Wastewater operators could support pollutant removal efficiencies in the treatment system by expanding the existing process control testing program to include monitoring Mean Cell Residence Time (MCRT), food to microorganism ratio (F/M), and Sludge Age in the biomass.

Influent Slug Loads from Facilities that Discharge Industrial & Non-Domestic Wastewater

- Amity should continue to investigate discharges of non-domestic and high organic strength wastewater within the sewer service area.
- Amity should develop a program for regular monitoring of industrial and nondomestic wastewater discharges in the sewer service area.

Wet Weather Operations and Inflow & Infiltration

- Development of a wet weather operations strategy to improve the performance and monitor the activity during periods of wet weather flow.
- Institute a rolling conditional analysis of the SSCS to identify and prioritize areas within the collection system for repair and replacement. This would include (but not be limited to) the use of camera/video monitoring systems, flow monitoring, and dye and smoke testing. Detailed mapping of the system should occur simultaneously.
- Develop a long-term control plan for rehabilitation of the SSCS based upon the information gained during the characterization of the system. Resources must be set aside on a yearly basis for collection system rehabilitation and repair.

Computerization & Automation of Records

- Consider automating all in-house recordkeeping for all maintenance tasks (preventive, routine, and reactive), and process control testing results in the laboratory. Though this evaluation did not examine the computer equipment used for administration, automation of the laboratory and recordkeeping functions at the sub-management level may reduce the keyboarding workload of the Public Works Director while automating many routine tasks.
- When installing continuous monitoring probes in the WWTF, consider having readily accessible graphics included in the planned Supervisory Control and Data Acquisition (SCADA) system programming, giving the operator ability to call up graphs covering specified periods of time.

Training and Support for Operators & Staff

- Continue cross-training personnel in all aspects of operating the wastewater treatment facility. Since new technology will be added to the treatment system, requiring increased specialization for power controls, process instrumentation, and SCADA, plant staff should all pursue training and expertise to upgrade and maintain their skills.
- Amity should hire a WWTF Superintendent or an Operator-In-Responsible-Charge to support the Public Works Director. It may be advantageous to have additional supervisory staff onsite that can focus solely on the operation and maintenance of the WWTF and SSCS.

Amity Twp. WWTF – WTE Results

The PADEP WWTAP offers a WTE that comprises round-the-clock monitoring of key treatment parameters with laboratory and practical experiences to optimize effluent quality by making process changes that do not typically involve significant capital projects. The WTE may be thought of as a custom-tailored trouble-shooting and comprehensive site inspection that aims to solve common wastewater treatment problems through interaction with licensed wastewater treatment operators. PADEP operates this program as part of a federal grant to reduce nutrient pollution in waters of the United States.

On August 21, 2024, WWTAP staff deployed continuous monitoring submersible probes and controller equipment in the WWTF influent trough, oxidation ditch treatment units, and final effluent prior to discharge to the Schuylkill River. Schematics of the WWTF and installation of the WWTAP continuous monitoring probe network are included in Attachment D of this report.

WWTAP staff visited the facility on a weekly basis to complete water quality testing and process control monitoring in the activated sludge treatment units to characterize the treatment efficiency of the WWTF.

Over the period of study, data collected by the continuous monitoring equipment identified that:

1) The WWTF receives frequent slug discharges containing BOD_5 concentrations (organic loading) that exceed 350 mg/L, the upper limit of the normal range for treatment facilities designed to treat wastewater generated from domestic sources.
2) The WWTF can optimize biological nutrient removal by the activated sludge biomass by instituting a more robust process control testing program.

Slug Loads Industrial & Non-Domestic Wastewater Discharges

The principal benefits of monitoring the organic loading of influent flows at the WWTF include:

- Elevated loading has the potential to impact the ability of the activated sludge treatment biomass to adequately treat wastewater.
- Prevent the introduction of pollutants into a WWTP that will interfere with its operation, including interference with its use or disposal of municipal sludge.

A review of data collected by the UVAS probe installed in the WWTF influent after the screening and grit removal processes indicate that the facility receives frequent slug loads of high organic loading (as BOD_5) in the WWTF influent flow. As of the end of the WTE project, WWTF operators have been unable to directly attribute the slug loads to specific dischargers or sewer customers, but surveillance and monitoring efforts continue. Table 1, below, includes industry standards for COD and BOD_5 concentrations in low, medium, and high strength domestic wastewater.

Table 1) Expected BOD_5 and COD concentrations in untreated domestic wastewater. (Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy - 2003)

Contaminant	Unit	Low strength	Medium strength	High strength
BOD_5	mg/l	110	190	350
COD	mg/l	250	430	800

While the maximum concentrations recorded by the UVAS probe readings were unpredictable, the WWTF is receiving discharges of wastewater with elevated organic loading, which is most likely attributed to slug discharge from non-domestic and industrial users in the sewer service area. Figures 1 and 2, below, include UVAS (as BOD_5) probe data indicating peaks where 15-minute BOD_5 readings and daily max BOD_5 readings exceed 350 mg/L.

Additionally, continuous monitoring probe data indicates that slug discharges of high organic strength wastewater may correlate with changes in influent wastewater pH. Figures 3 and 4, below, include graphs of influent UVAS and pH probe data for August and October 2024. Both graphs include incidents where elevated influent BOD_5 concentrations occur during periods with rapid changes in pH. It may be advantageous for the facility to install UVAS and/or pH continuous monitoring probes in the WWTF influent to detect slug loads entering the facility. If slug loads are detected, WWTF operators can change treatment flows (bypassing to lagoon or changing the treatment path) and/or adjust the operations strategy in response to potential interreference of treatment capacity caused by high organic strength influent wastewater.

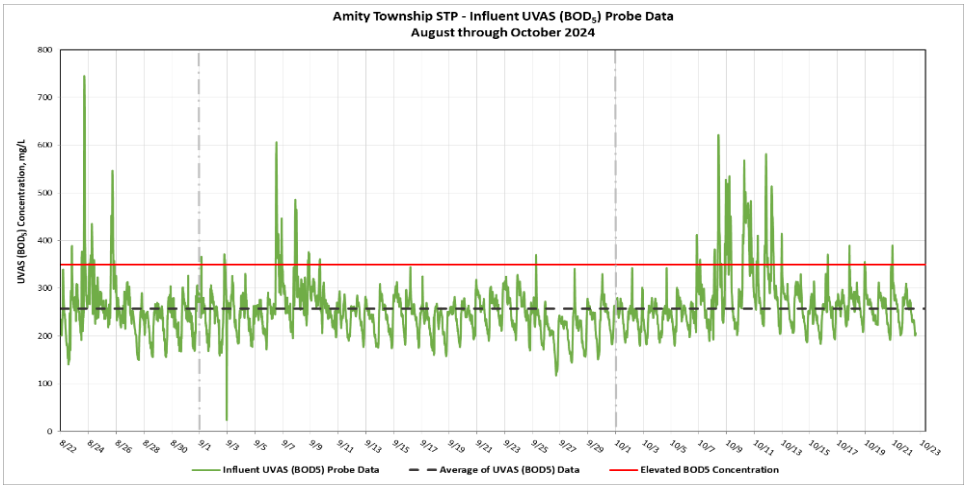


Figure 1) Graph of data collected by the Hach UVAS (BOD_5) probe at the Amity Twp. WWTF during WTE.

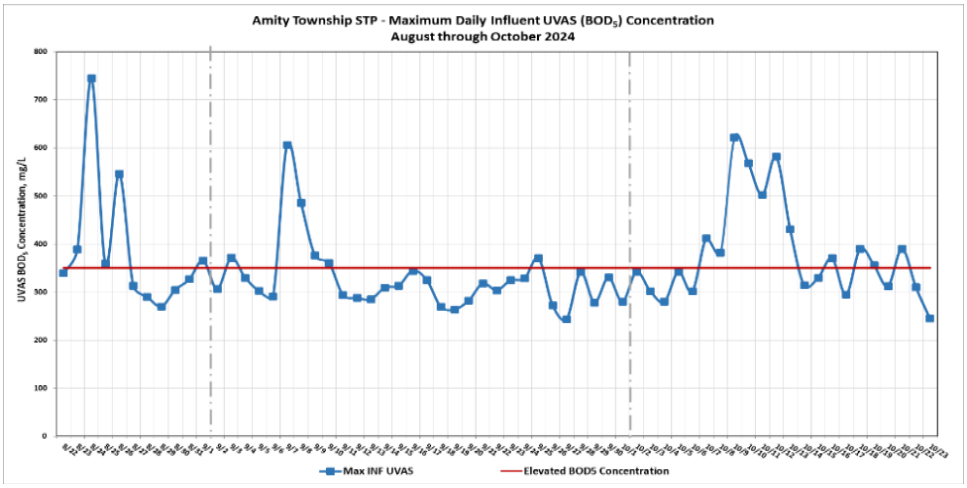


Figure 2: Graph of daily maximum data collected by the Hach UVASsc (BOD_5) at the Amity Twp. WWTP during WTE. Daily maximum BOD_5 concentrations exceed 350 mg/L on 22 of 62 project days.

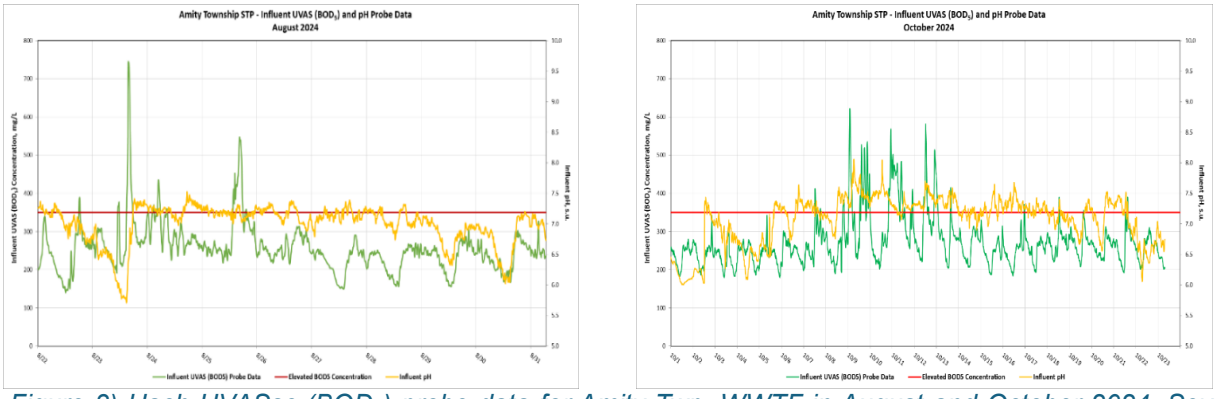


Figure 3) Hach UVASsc (BOD_5) probe data for Amity Twp. WWTF in August and October 2024. Several events on 8/25 and between 10/7 and 10/13 where elevated BOD_5 concentration data were recorded concurrent with increasing influent pH values.

As stated previously, the most likely cause of the organic overload conditions at the WWTF are 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.

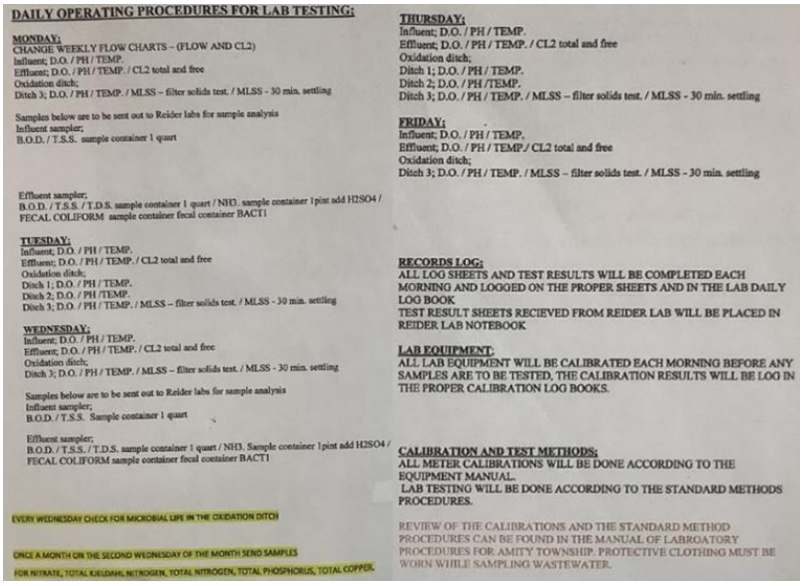
WWTAP staff strongly recommends that Amity continue to work towards completion of a comprehensive survey of any non-domestic, commercial, and industrial facilities in the sewer service area. and investigate any facilities with the potential to discharge high organic strength wastewater (schools, recreational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

WWTF Process Control Program and Optimizing Biological Nutrient Removal
There are various factors that impact the proper operation of the WWTF that can be addressed through development and implementation of a robust process control testing program. During wet weather events, washout of solids can impact nitrification in the oxidation ditch treatment units often relies on a long MCRT, this is tough to achieve with constant washouts. Another concern is settling characteristics of the biomass. It particular, filamentous organisms are a concern for poor settling of the biomass. Regular microscopic examinations are essential and can identify these organisms allowing action can be taken to keep them under control.

The principal benefits of optimizing the activated sludge solids treatment system and instituting a robust process control monitoring program at the WWTF include:

- Increased potential for compliance with NPDES Permit requirements and final effluent limits.
- Increased removal of nutrients (phosphorous, total nitrogen [ammonia-nitrogen, nitrite-nitrogen, and nitrate-nitrogen]) in the final effluent, reducing pollutants in downstream waters that are used for drinking water sources, wildlife & aquatic life, and various recreational uses.
- Potential reduction of electricity consumption due more efficient operation of treatment systems.

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 and mixed liquor settleable solids (MLSS) testing on most weekdays. Based upon clarifier sludge blanket depths and 30-minute settleability & MLSS results, the WWTF operators adjust the activated sludge solids inventory by wasting sludge to the digesters. An existing schedule for laboratory and process control testing at the Amity Twp. WWTF is included in Figure 4, below.


DAILY OPERATING PROCEDURES FOR LAB TESTING:

MONDAY:
CHANGE WEEKLY FLOW CHARTS – (FLOW AND CL2)
Influent; D.O. / PH / TEMP.
Effluent; D.O. / PH / TEMP. / CL2 total and free
Oxidation ditch;
Ditch 3; D.O. / PH / TEMP. / MLSS – filter solids test. / MLSS - 30 min. settling

Samples below are to be sent out to Reider labs for sample analysis
Influent sampler;
B.O.D. / T.S.S. sample container 1 quart

Effluent sampler;
B.O.D. / T.S.S. / T.D.S. sample container 1 quart / NH3. sample container 1pint add H2SO4 / FECAL COLIFORM sample container fecal container BACT1

TUESDAY:
Influent; D.O. / PH / TEMP.
Effluent; D.O. / PH / TEMP. / CL2 total and free
Oxidation ditch;
Ditch 1; D.O. / PH / TEMP.
Ditch 2; D.O. / PH /TEMP.
Ditch 3; D.O. / PH / TEMP. / MLSS – filter solids test. / MLSS - 30 min. settling

WEDNESDAY:
Influent; D.O. / PH / TEMP.
Effluent; D.O. / PH / TEMP. / CL2 total and free
Oxidation ditch;
Ditch 3; D.O. / PH / TEMP. / MLSS – filter solids test. / MLSS - 30 min. settling

Samples below are to be sent out to Reider labs for sample analysis
Influent sampler;
B.O.D. / T.S.S. Sample container 1 quart

Effluent sampler;
B.O.D. / T.S.S. / T.D.S. sample container 1 quart / NH3. Sample container 1pint add H2SO4 / FECAL COLIFORM sample container fecal container BACT1

EVERY WEDNESDAY CHECK FOR MICROBIAL LIFE IN THE OXIDATION DITCH

ONCE A MONTH ON THE SECOND WEDNESDAY OF THE MONTH SEND SAMPLES FOR NITRATE, TOTAL KJELDAHL NITROGEN, TOTAL NITROGEN, TOTAL PHOSPHORUS, TOTAL COPPER.

THURSDAY:
Influent; D.O. / PH / TEMP.
Effluent; D.O. / PH / TEMP. / CL2 total and free
Oxidation ditch;
Ditch 1; D.O. / PH / TEMP.
Ditch 2; D.O. / PH /TEMP.
Ditch 3; D.O. / PH / TEMP. / MLSS – filter solids test. / MLSS - 30 min. settling

FRIDAY:
Influent; D.O. / PH / TEMP.
Effluent; D.O. / PH / TEMP./ CL2 total and free
Oxidation ditch;
Ditch 3; D.O. / PH / TEMP. / MLSS – filter solids test. / MLSS - 30 min. settling

RECORDS LOG:
ALL LOG SHEETS AND TEST RESULTS WILL BE COMPLETED EACH MORNING AND LOGGED ON THE PROPER SHEETS AND IN THE LAB DAILY LOG BOOK
TEST RESULT SHEETS RECIEVED FROM REIDER LAB WILL BE PLACED IN REIDER LAB NOTEBOOK

LAB EQUIPMENT:
ALL LAB EQUIPMENT WILL BE CALIBRATED EACH MORNING BEFORE ANY SAMPLES ARE TO BE TESTED, THE CALIBRATION RESULTS WILL BE LOG IN THE PROPER CALIBRATION LOG BOOKS.

CALIBRATION AND TEST METHODS:
ALL METER CALIBRATIONS WILL BE DONE ACCORDING TO THE EQUIPMENT MANUAL.
LAB TESTING WILL BE DONE ACCORDING TO THE STANDARD METHODS PROCEDURES.

REVIEW OF THE CALIBRATIONS AND THE STANDARD METHOD PROCEDURES CAN BE FOUND IN THE MANUAL OF LABROATORY PROCEDURES FOR AMITY TOWNSHIP. PROTECTIVE CLOTHING MUST BE WORN WHILE SAMPLING WASTEWATER.

Figure 4) Amity WWTF Daily Operating Procedures for Lab Testing posted in the facility's onsite laboratory.

At a minimum, a good process control plan is well documented, easy to follow and should include, but not be limited to, the following elements:

- A description of average and seasonal characteristics of influent wastewater.
- A flow schematic of all processes (including recycle, supernatant or filtrate flows).
- Identification of each individual treatment unit and an assessment of its criticality.
- The normal operating ranges and expected removal efficiencies of each treatment unit.
- The sampling points, methods, and calculations to be used to make process control. adjustments and a schedule for carrying out these process control operations.
- A plan for monitoring all treatment units that includes identifying parameters to be monitored and corrective action plans when trigger parameters are reached.
- A preventative & emergency maintenance plan for process equipment including an inventory of essential spare parts and methods for emergency repairs. Plans should contain contact information for selected contractors, equipment manufacturers and vendors.

Some of these tests are recommended by wastewater operations and design manuals as standard, routine tests to be performed at the WWTF regularly. At times when the plant is upset or if the biological treatment is failing, both the facility NPDES permit, and the industry guidelines recommend increasing the frequency of these monitoring tests until the problem is resolved

During weekly site visits, WWTAP staff conducted various process control and bench testing of the WWTF treatment systems with equipment provided by the program. WWTF operators were kind enough to allow WWTAP staff to complete testing in the facility's onsite 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. Graphs of the process control and lab testing completed by WWTAP during this project are included in Appendix E.

Continuous immersion probes installed at the WWTF were used for data collection only. When installed as a permanent improvement after the planned upgrade and expansion project, these probes usually regulate a process, such as the use of dissolved oxygen residual probes that regulate the amount of aeration the activated sludge receives in the new and re-built oxidation ditch treatment systems.

Weekly WTE project updates were provided to WWTF operators and consultants. The weekly project updates included graphs of continuous monitoring probe data presenting daily, weekly, and all data collected to date during the study period. Weekly updates also provided project notes, and a summary of the process control and bench testing data collected during WWTAP site visits. Copies of the WWTAP weekly project updates and graph packs may be available upon request.

Graphing data provided by the continuous monitoring probe system will help to monitor and control the efficiency of wastewater treatment. Additionally, it provides some level of assurance against problems that occur when operators are not physically present on site. Figures 5 and 6, below, include graphs of DO and ORP readings from the #1 and #2 oxidation ditch treatment units collected during the WTE. The data trends included in both graphs indicate opportunities for improving the operations strategy of the oxidation ditch treatment unit for efficient BNR and pollutant removal in the activated sludge treatment system. Ensuring WWTF operators have access to live data and graphing trends available through the planned continuous monitoring probe system will be important for implementing the operations strategy to be developed by the wastewater operations and engineering consultant.

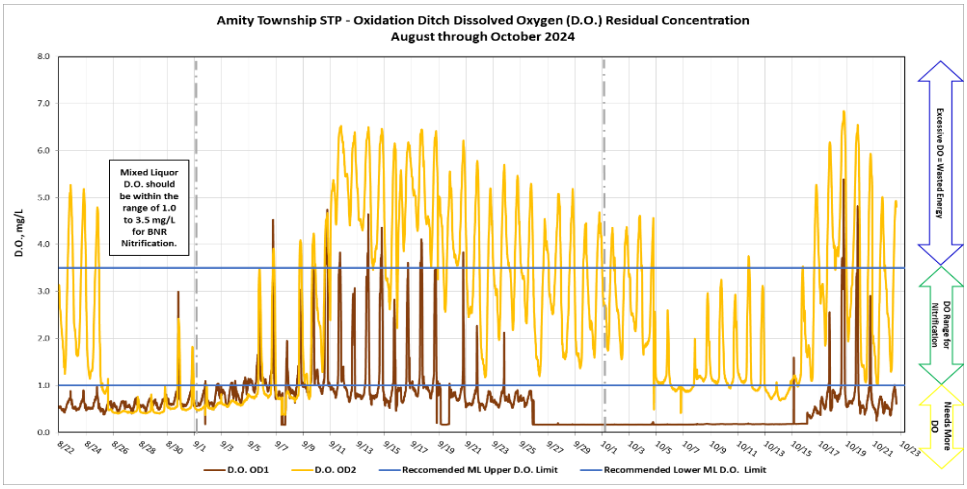


Figure 5) Graph of Oxidation Ditch #1 & #2 D.O. readings from the WWTAP continuous monitoring probe system installed at the Amity WWTF. Facility staff and operators should utilize data provided by the D.O. continuous monitoring probes proposed in the upgrade and expansion project to ensure oxidation ditch aeration systems are operated for efficient BNR and pollutant removal.

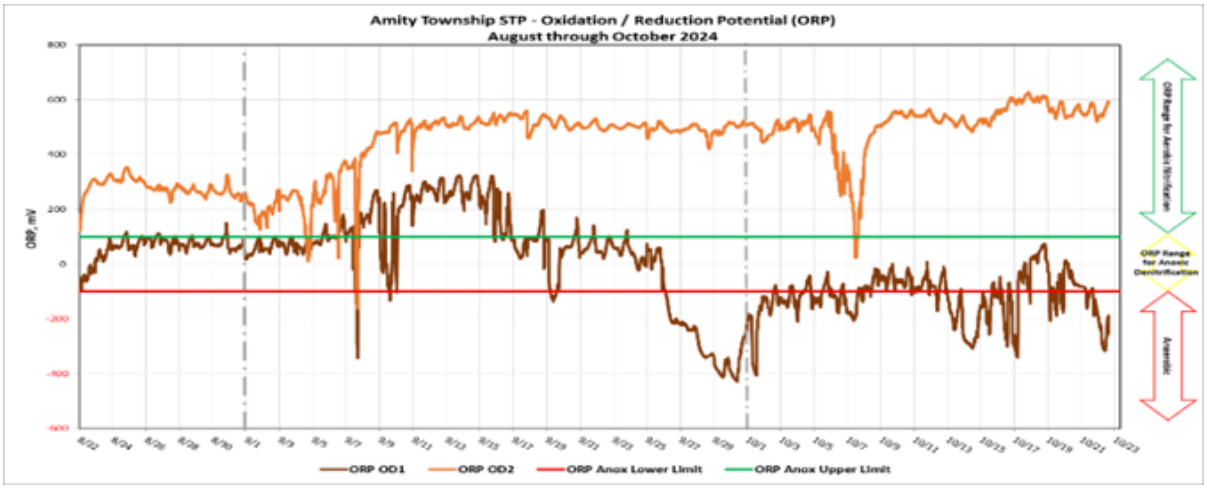


Figure 6) Graph of Oxidation Ditch #1 & #2 ORP readings from the WWTAP continuous monitoring probe system installed at the Amity Twp. WWTF. Facility staff and operators could utilize data provided by ORP continuous monitoring probes to optimize BNR and pollutant removal.

Amity Township "Public Sewer Disposal System" Municipal Ordinance

As part of this study, WWTAP staff reviewed Amity Township's local ordinance named "Public Sewer Disposal System" (Township of Amity, PA Municipal Ordinance § 23.301-407(2006)) to determine whether Amity maintains adequate guidance for effective oversight and control of industrial and non-domestic wastewater discharges in the sewer service area. WWTAP staff have determined that Amity's Public Sewer Disposal System Ordinance (Amity Sewer Ordinance) includes limited guidance regarding industrial and non-domestic wastewater discharges to the sewer service area. Section 19 of the Amity Sewer Ordinance 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." This language may not provide Amity 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 at the WWTF.

While Amity 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, Amity should revise the Sewer Ordinance 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.

EPA Industrial Pretreatment Program resources are available at the following link:
https://www.epa.gov/npdes/national-pretreatment-program .

Closing Comments & Acknowledgement

While there were concerns identified during this project, there are many positive aspects to the operation and maintenance of the WWTF. This report includes a few operational changes that should enhance the overall facility performance. The largest single problem that the facility has is influent slug loads that interfere with activated sludge biomass, and significant inflow and infiltration in the SSCS. This problem will require the ongoing efforts of all involved municipalities.

WWTAP would like to thank the Amity Township Public Works Director, the WWTF Superintendent, WWTF operators & staff, and the consulting operators & engineers from Entech for the opportunity to perform this study and for their participation in the monitoring of the WWTF and assisting PADEP staff in completing this evaluation. The PADEP wastewater technical assistance program stands ready to assist Amity Township with any of the recommendations or observations mentioned in this report

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LIST OF ATTACHMENTS

- ***Upon request, WWTAP* will *provide Amity Township with complete copies of all data & documentation generated during this project.***

- ***Additional WWTAP data & results for this project may be available upon request. Please contact the project manager listed in Appendix A of this report or the PADEP Bureau of Clean Water WWTAP at RA-EPWWTAPROVIDER@pa.gov / (717) 787-6744.***

Attachment A: RRMSA STP – Intermittent Aeration Study Project Team

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Amity Township Wastewater Treatment Plant

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Attachment B: Amity Township WWTF WTE - WWTAP EQUIPMENT

WWTAP Continuous Monitoring Equipment Deployment Photographs

Figure B-1: Photo of HACH UVAS and pH continuous monitoring probe installation location in the AMITY WWTF influent trough from August 21st through October 23rd, 2024.

Figure B-2: Photo of UVAS continuous monitoring probe installation location in the AMITY WWTF influent trough after the influent screening and grit removal processes.

Figure B-3: Photo of HACH pH, D.O., ORP, and MLSS continuous monitoring probe and SC1000 controller installation location in the AMITY WWTF oxidation ditch treatment units.

ATTACHMENT B: AMITY TWP. WWTF WTE - WWTAP EQUIPMENT (cont'd)

WWTAP Continuous Monitoring Equipment Deployment Photographs

Figure B-4: Photo of HACH pH, DO, ORP, and MLSS continuous monitoring probe installation location in the AMITY WWTF oxidation ditch #1 (outer) treatment unit.

Figure B-5: Photo of pH, DO, ORP, MLSS, and nitrate-nitrogen continuous monitoring probe installation location in the AMITY WWTF oxidation ditch #2 (middle) treatment unit.

Figure B-6: Photo of HACH SC1000 controller, airblast compressor (for cleaning AISE probe), AISE probe (ammonium-nitrogen), and and Nitratax+ (ntrate-nitrogen) continuous monitoring probe mounting installation location in the WWTP effluent trough after disinfection and post-aeration.

ATTACHMENT B: AMITY WTE - WWTAP EQUIPMENT (cont'd)

WWTAP Deployment Pictures for Amity WTE

Figure B-7: Photo of HACH SC4500+ controller, airblast unit compressor (for AISE probe), and Nitratax & AISE probe installation location in the WWTP effluent trough. The new SC4500+ controller was installed on September 17th, replacing the SC1000 controller and universal display.

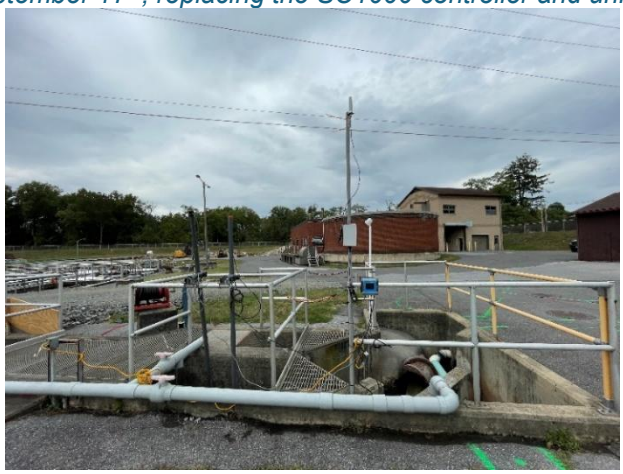

Figure B-8: Photo of HACH SC4500+ controller and pHD & UVAS continuous monitoring probe installation location in the Amity WWTP influent trough.

Figure B-9: Photo of PADEP WWTAP process control and bench testing equipment at AMITY WWTF laboratory. The WWTAP laptop includes the data logging and telemetry setup for remote access of data.

ATTACHMENT C: Curwensville Authority WWTF - WWTAP WTE Project Outline

8/14/2024

Wastewater Treatment Evaluation Project Outline
PADEP Bureau of Clean Water - Wastewater Technical Assistance Program
Amity Township Municipal Authority Wastewater Treatment Plant
Amity Township, Berks County, PA

Background:

Amity Township has reported NPDES permit violations and activated sludge wastewater treatment unit upsets at the wastewater treatment plant (WWTP) that have been attributed to high flows and the discharge of slug loads of pollutants from facilities that discharge wastewater into Amity's sewer service area. WWTP operators and engineers have investigated these issues and have determined that the facility receives elevated hydraulic loadings due to excessive Inflow & Infiltration (I&I) in the sanitary sewer collection and conveyance system (SSCS) during storm events, and high organic loadings in WWTP influent flows caused by discharges of pollutants from commercial, non-domestic, and/or industrial facilities in the Amity sewer service area.

Amity has submitted annual Chapter 94 Municipal Wasteload Management Reports (Chapter 94 Reports) to the Department that indicate organic and hydraulic overload conditions at the WWTP. In response, PADEP required Amity to submit a Corrective Action Plan (CAP) that outlined efforts by the municipality to address overload conditions. Amity's CAP outlined plans for the development of an Inflow and Infiltration (I&I) detection and elimination program in its SSCS, an Act 537 sewage planning special study update, and proposed a project for the upgrade and expansion of the WWTP.

In September 2024, Amity will begin construction for the WWTP expansion & upgrade proposed in the CAP. The PADEP has permitted an upgrade of the WWTP that includes a hydraulic and organic rerating of the WWTP after construction of new treatment units, the upgrade and rehabilitation of existing treatment units, and the installation of a Supervisory Control And Data Acquisition (SCADA) system to monitor the operation of treatment units at the facility. The current design of the WWTP has limited continuous monitoring or automated data collection systems and the new SCADA system will include the installation and networking of continuous monitoring equipment throughout the facility that need to be properly operated and maintained to ensure the collection of representative data.

In 2024, staff from the PADEP Bureau of Clean Water - Wastewater Technical Assistance Program (WWTAP) received a request for technical assistance from the consulting wastewater engineer for the Amity WWTP. WWTAP staff have met with WWTP operators and consulting engineers and agree to provide technical assistance through a rigorous Wastewater Treatment Evaluation project at the WWTP.

WWTAP Project Proposal:

WWTAP staff, in coordination with WWTP operators and engineers, will install a selection of continuous monitoring equipment at Amity WWTP for a Wastewater Treatment Evaluation (WTAE) project with the following objectives:

1) The WWTP continues to receive slug discharges of non-domestic and/or industrial waste with organic (as Biochemical Oxygen Demand, 5-day (BOD_5)) concentrations that exceed the upper limit in the expected range of organic loading for a domestic wastewater treatment facility (BOD_5 < 300 mg/L). WWTAP will assist with monitoring influent flows to investigate the occurrence, frequency, and duration of slug discharges to the WWTP.
2) WWTP operators strive to properly operate & maintain the facility to comply with NPDES Permit requirements. Part of the mission of PADEP WWTAP is to optimize wastewater treatment systems in an effort to reduce overall nutrient loading to waters of the Commonwealth. WWTAP staff will complete an instrument-based evaluation of the WWTP to determine whether the activated sludge treatment system could reduce effluent discharge nutrient loadings,
3) The WWTP upgrade and expansion includes a significant investment through the installation of a SCADA system. WWTAP will provide training for WWTP operators and staff regarding operation and maintenance of continuous monitoring equipment included in most SCADA systems.

1

Document C-1: Amity Twp. WWTF Wastewater Treatment Evaluation - WWTAP Project Outline

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ATTACHMENT D: Curwensville Authority WWTF Reference Schematics:

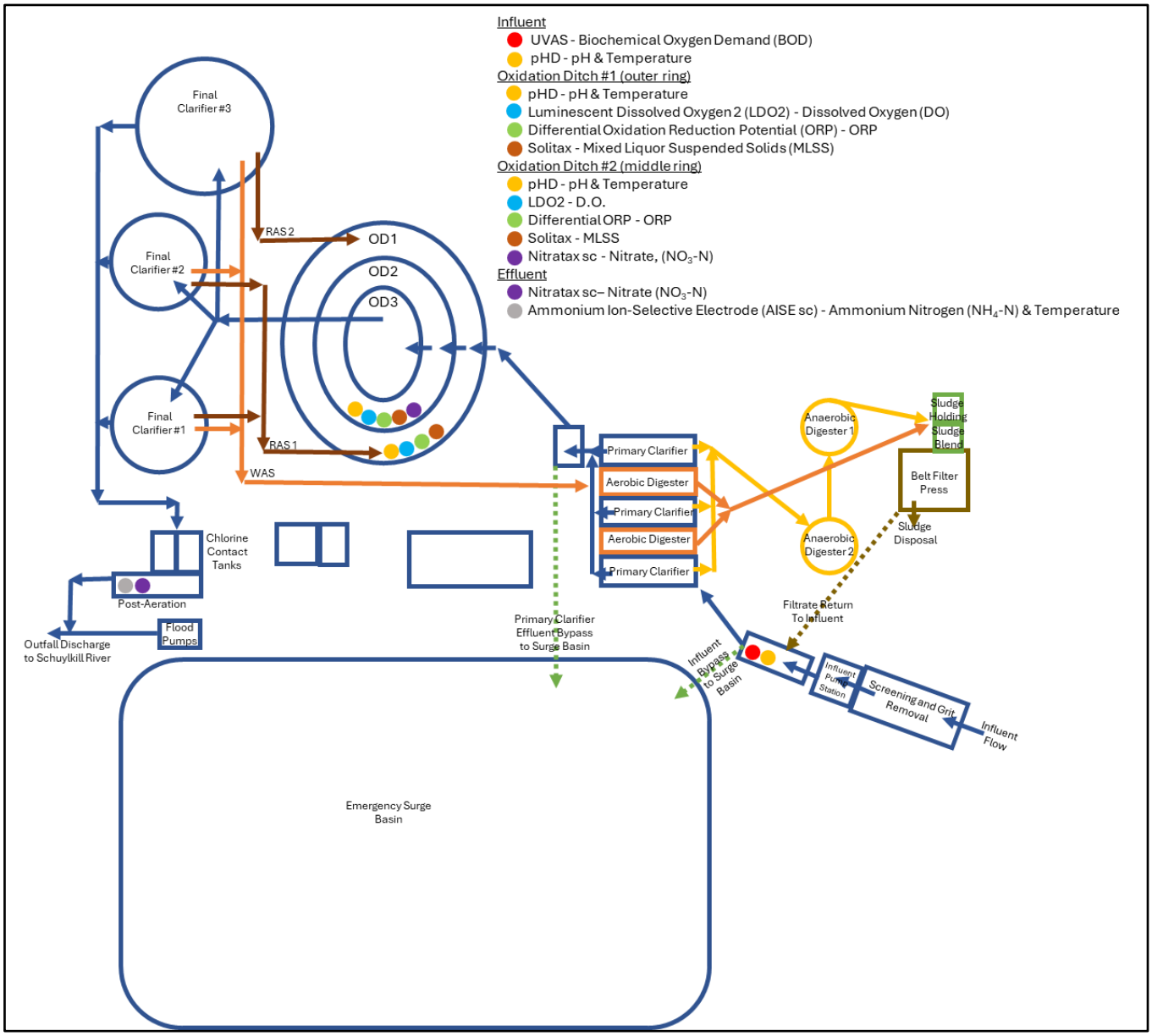

Figure D-1: WWTAP continuous monitoring probe installation locations at Amity Twp. WWTF from August through October 2024 (PADEP)

ATTACHMENT D: AMITY WWTF REFERENCE SCHEMATICS (Cont'd.)

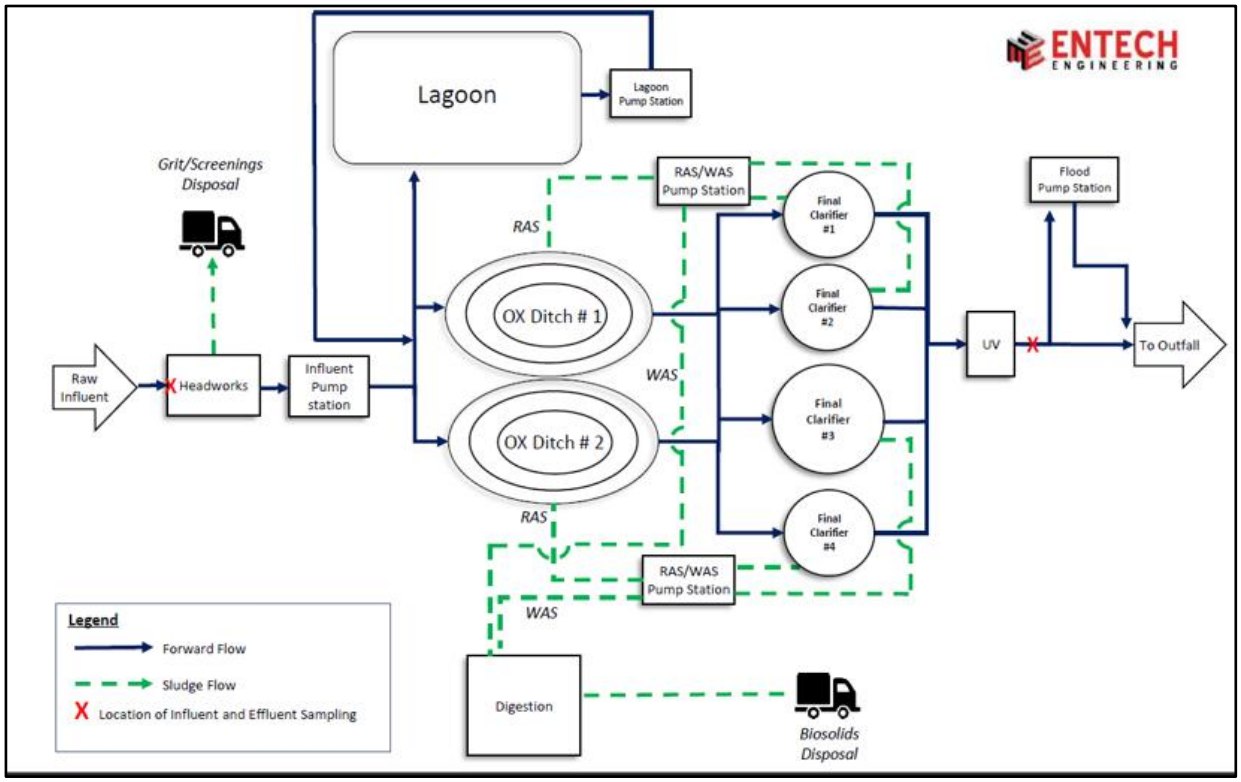

Figure D-2: WWTF Process Schematic from 2022 NPDES Renewal Application (July 13th, 2022).

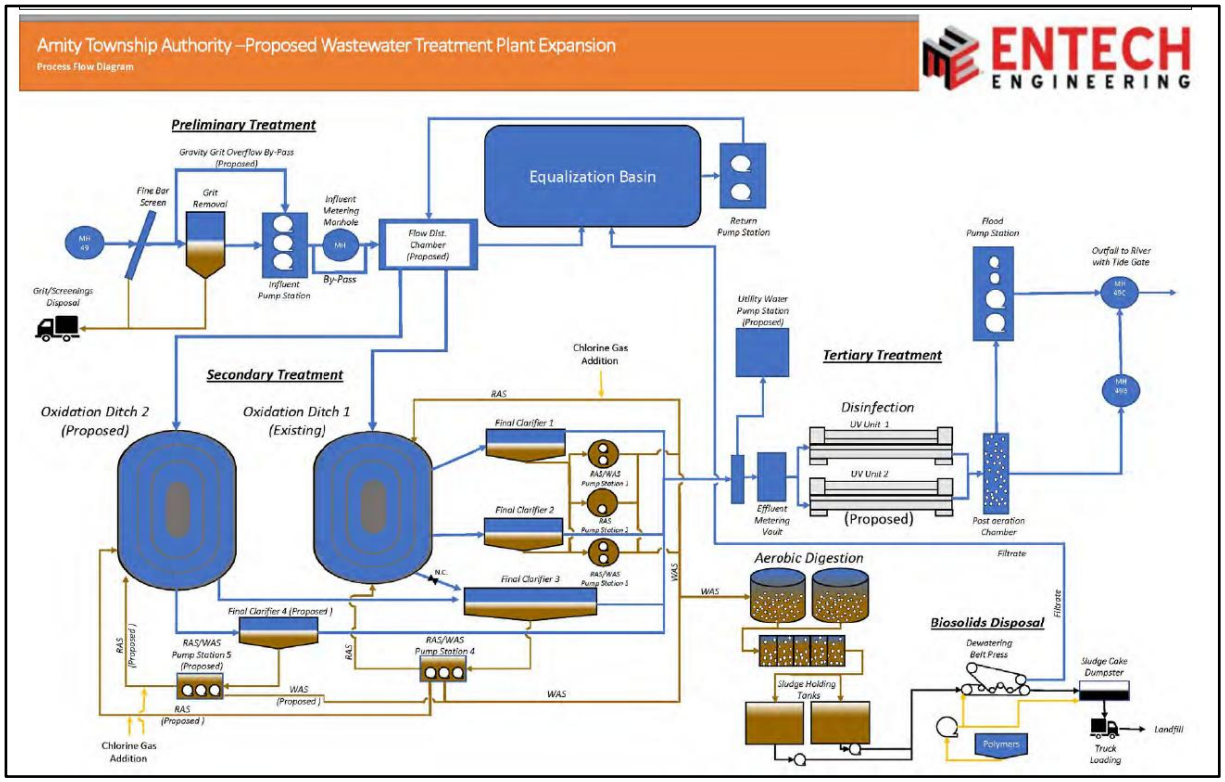

Figure D-3 WWTF Process Schematic from 2022 NPDES Renewal Application (July 13, 2023).

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Attachment E: WWTAP DATA & GRAPHS for Amity Township WWTF WTE

WTE Continuous Monitoring System Data Graphs for Full Study Period (8/22 to 10/23)

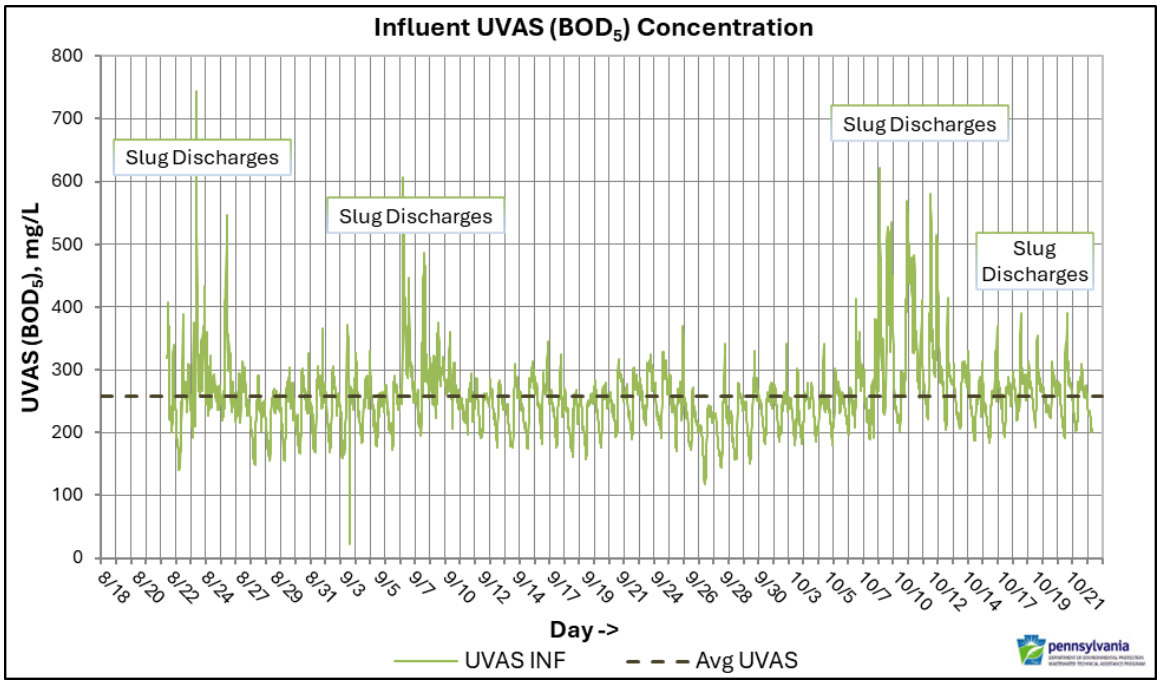


Figure E-1) Influent BOD_5 Data - HACH UVAS SC Probe

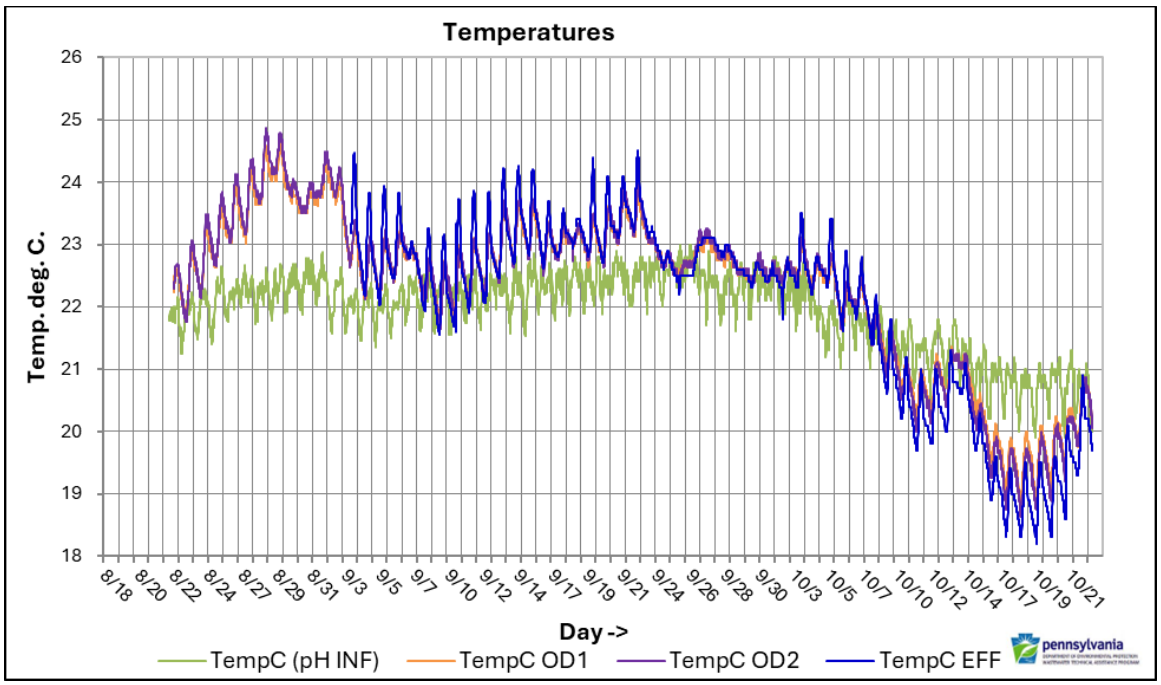


Figure E-2) Temperature Data - Influent, OD1, and OD2 HACH pH Probes, and Effluent AISE Probe

ATTACHMENT E: WWTAP DATA & GRAPHS - AMITY WWTF (Cont'd)

WTE Continuous Monitoring System Data Graphs for Full Study Period (8/22 to 10/23)

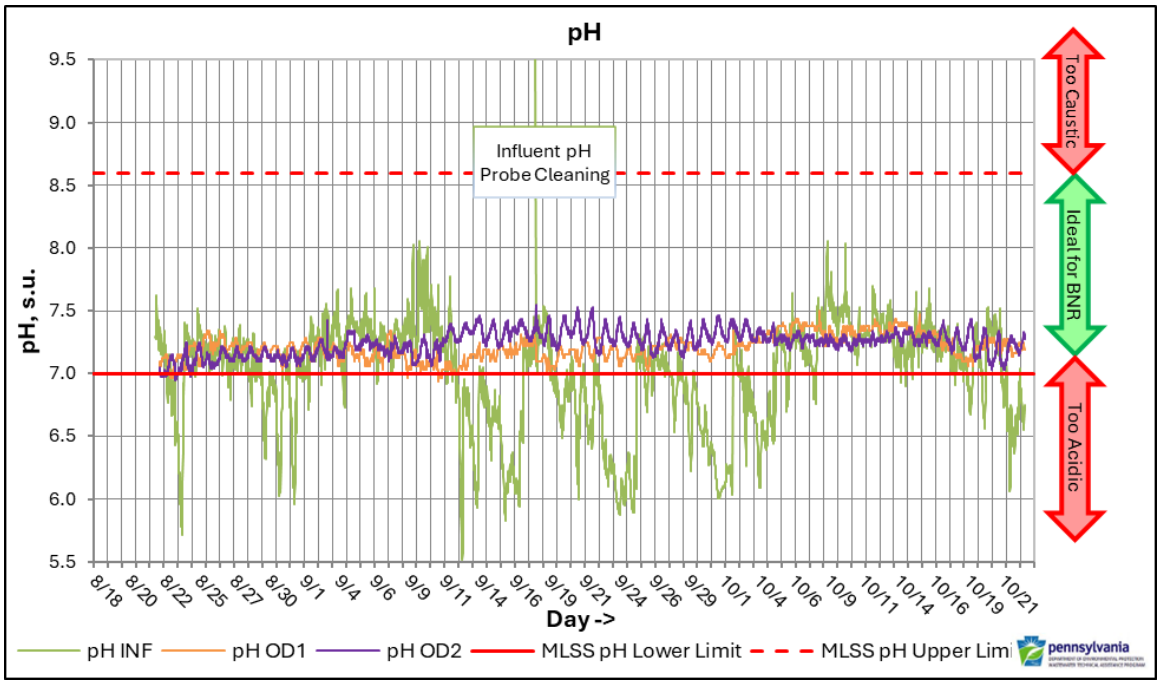


Figure E-3) pH Data – Influent, OD1, and OD2 pH Probes (with pH sensor)

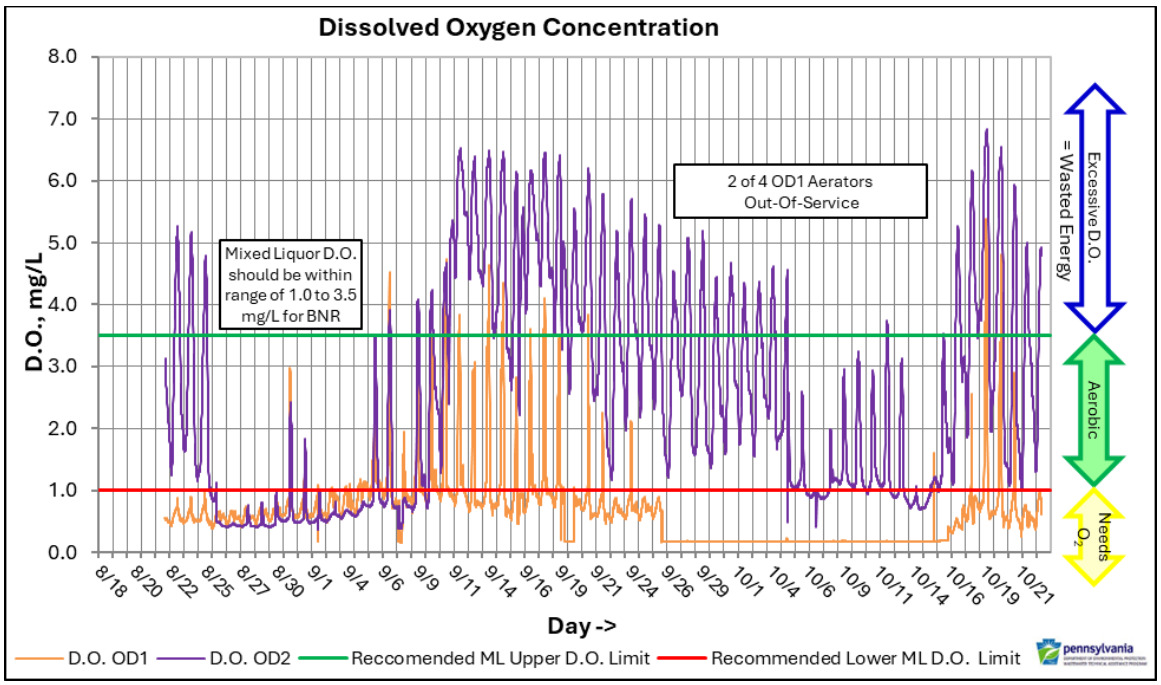


Figure E-4) D.O. Data – OD1 & OD2 LDO Probes

ATTACHMENT E: WWTAP DATA & GRAPHS - AMITY WWTF WTE(Cont'd)

WTE Continuous Monitoring System Data Graphs for Full Study Period (8/22 to 10/23)

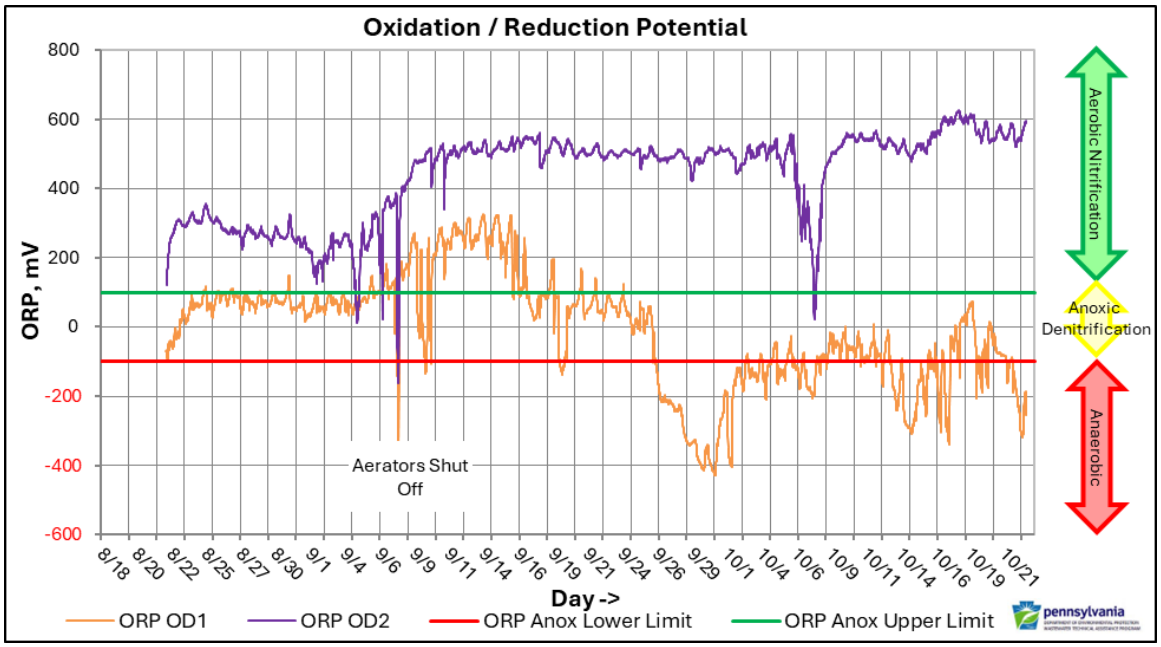


Figure E-5) ORP Data – OD1 & OD2 ORP Probes

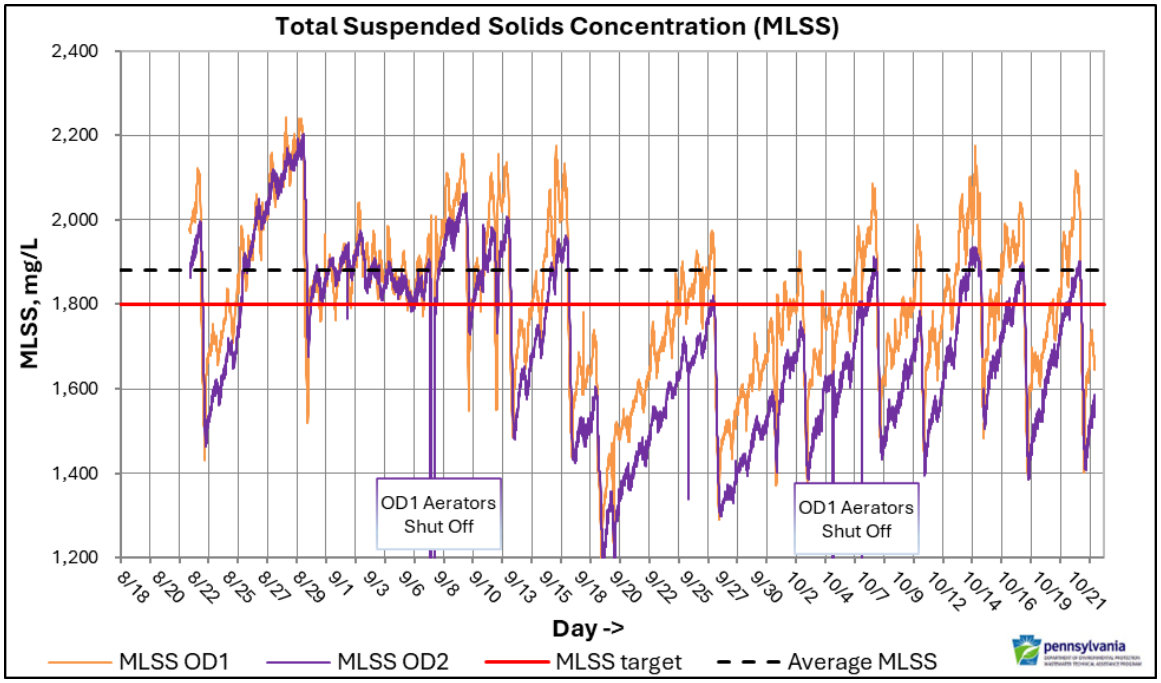


Figure E-6) MLSS Data – OD1 & OD2 Solitax (MLSS) Probes

ATTACHMENT E: WWTAP DATA & GRAPHS - AMITY WWTF (Cont'd)

WTE Continuous Monitoring System Data Graphs for Full Study Period (8/22 to 10/23)

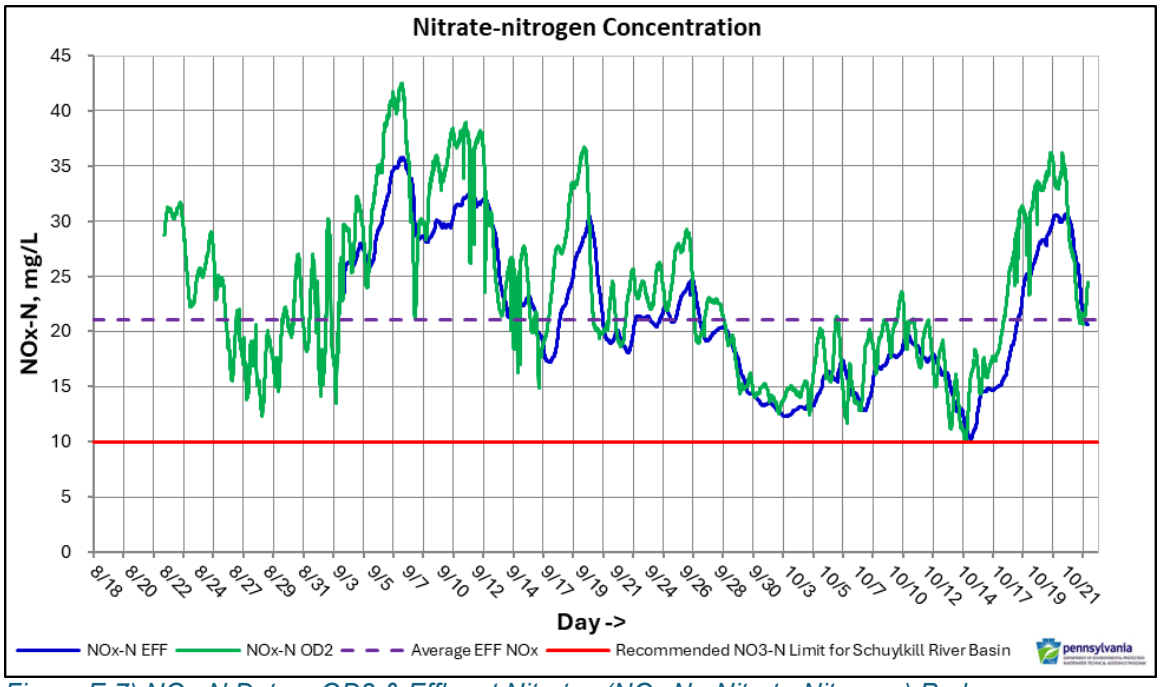


Figure E-7) NOx-N Data – OD2 & Effluent Nitratax (NO_3-N - Nitrate-Nitrogen) Probes

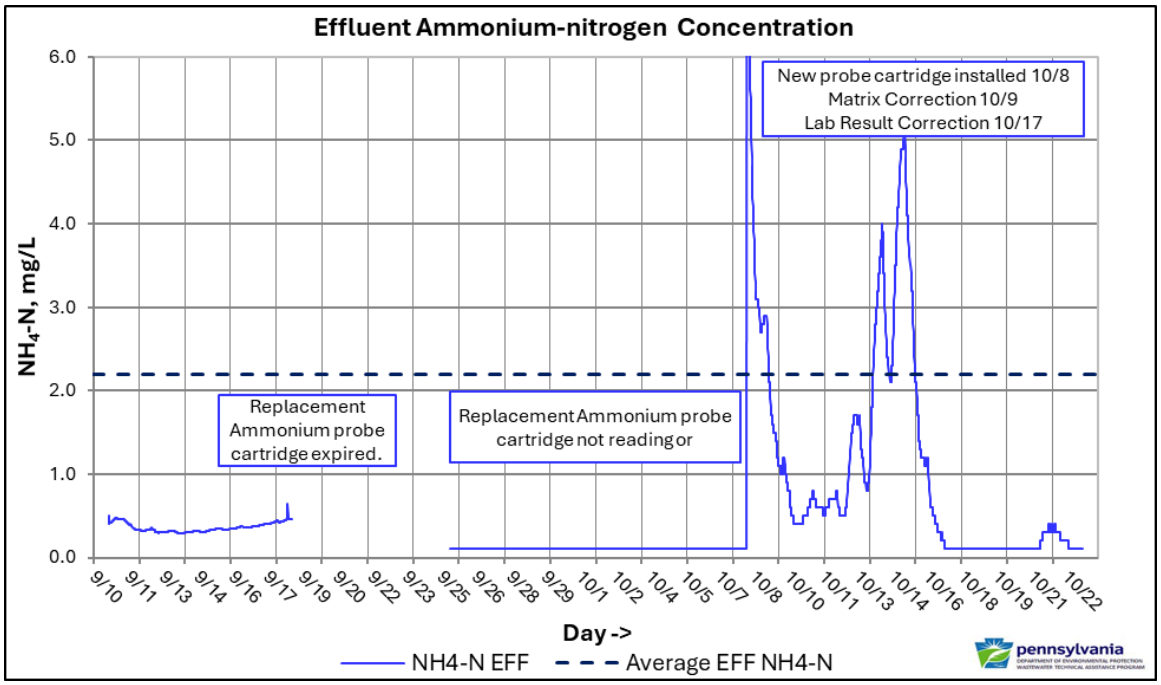


Figure E-8) Effluent Ammonium-Nitrogen (NH_4-N) – Effluent AISE (NH_4-N) Probe
**NH_4-N Average calculated from data collected between 10/8 & 10/23*

❖ ***Monthly, Weekly, & Daily graphs of WWTAP continuous monitoring data may be available upon request.***

ATTACHMENT E: WWTAP DATA & GRAPHS - AMITY WWTF (Cont'd)

WWTAP Bench Testing Results Graphs for Full Study Period (8/22 through 10/23)

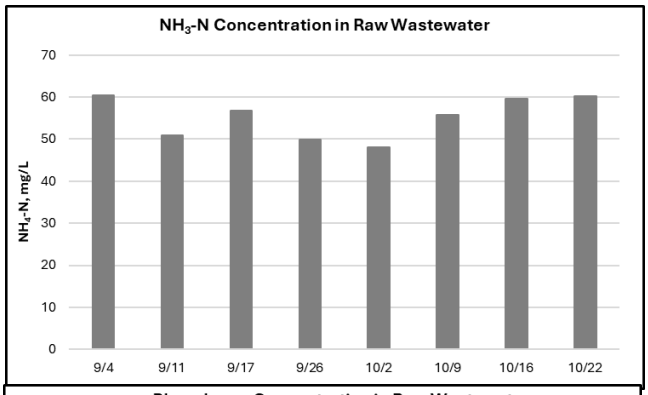


Figure E-9) Amity WWTF Influent Ammonia-Nitrogen concentrations.

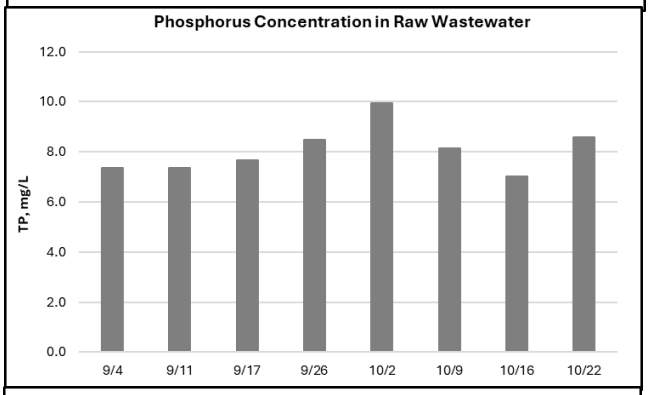


Figure E-10) Amity WWTF Influent Phosphorous concentrations.

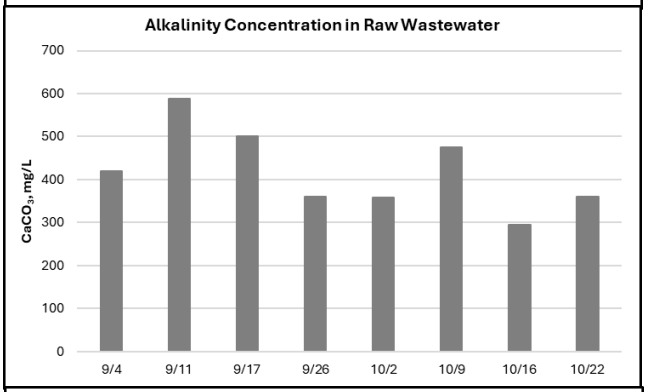


Figure E-11) Amity WWTF Influent Alkalinity concentrations

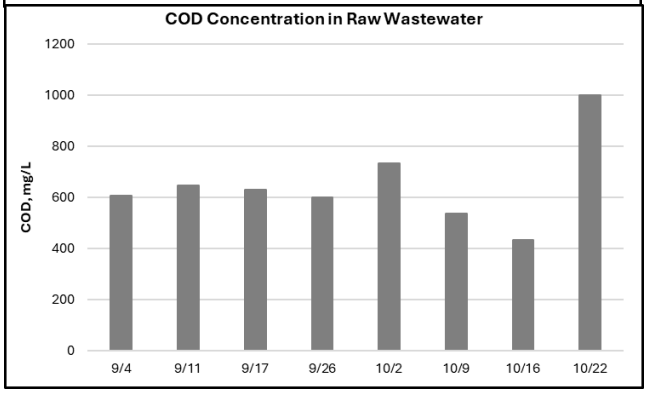


Figure E-12) Amity WWTF Influent Chemical Oxygen Demand (COD) concentrations.

ATTACHMENT E: WWTAP DATA & GRAPHS - AMITY WWTF (Cont'd)

WWTAP Bench Testing Results Graphs for Full Study Period (8/22 through 10/23)

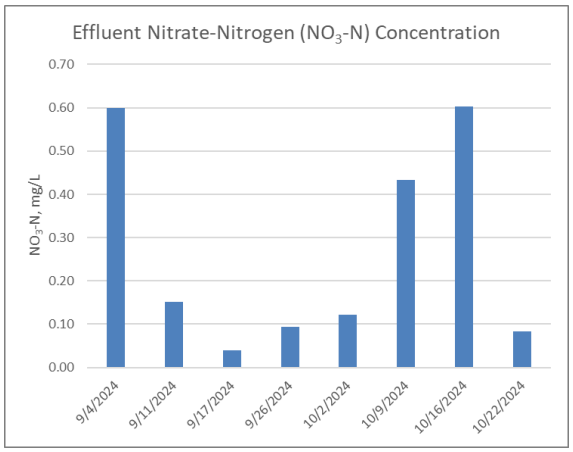


Figure E-13) Effluent Nitrate-Nitrogen results.

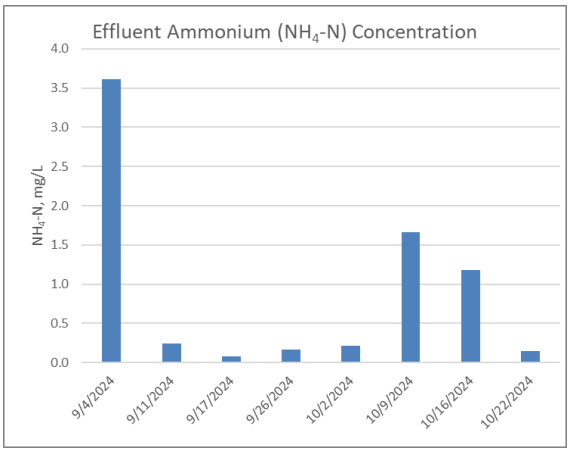


Figure E-14) Effluent Ammonia-Nitrogen results

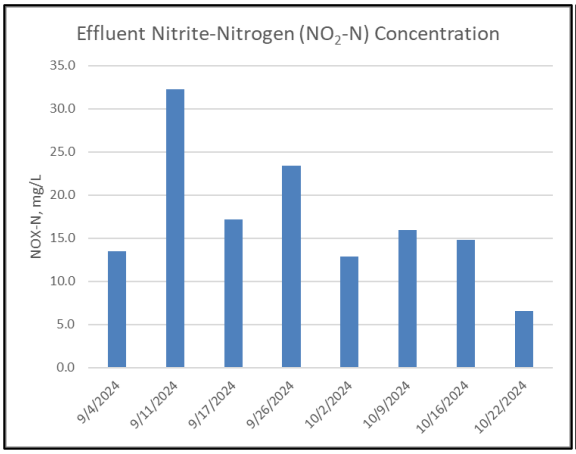


Figure E-15) Effluent Nitrite-Nitrogen results.

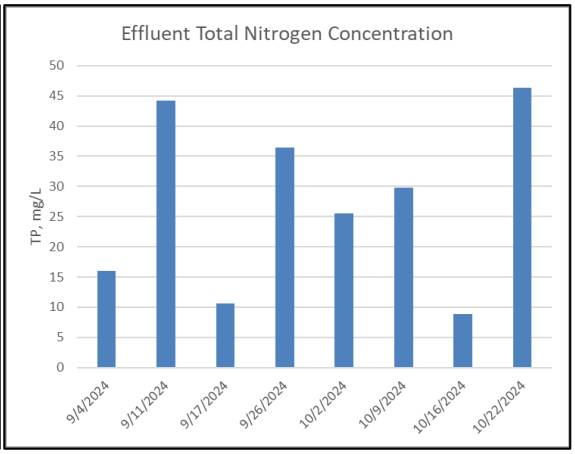


Figure E-16) Effluent Total Nitrogen results

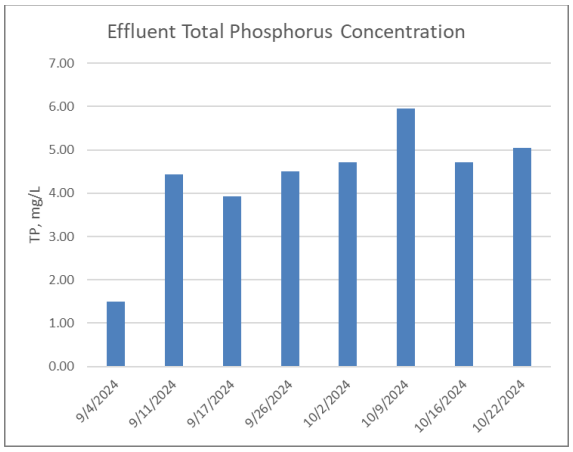


Figure E-17) Effluent Total Phosphorous results.

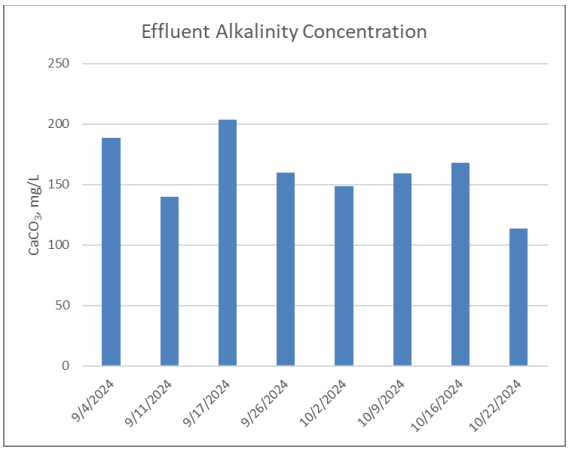


Figure E-18) Effluent Alkalinity results

ATTACHMENT E: WWTAP DATA & GRAPHS - AMITY WWTF (Cont'd)

WWTAP Bench Testing Results Graphs for Full Study Period (8/22 through 10/23)

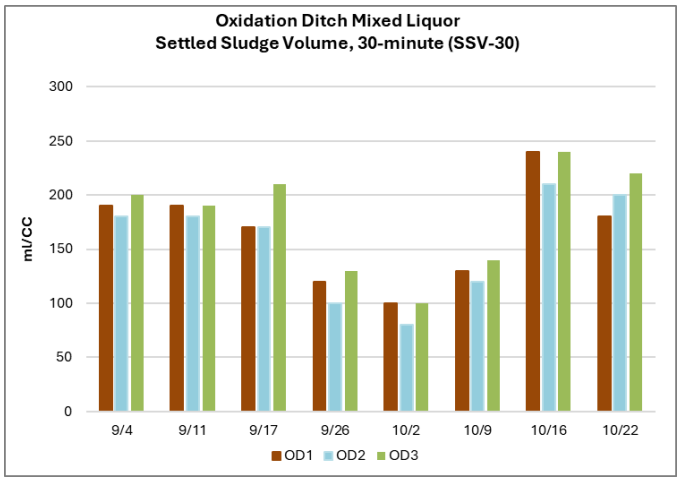


Figure E-19) 30-Minute Settleability (SSV)

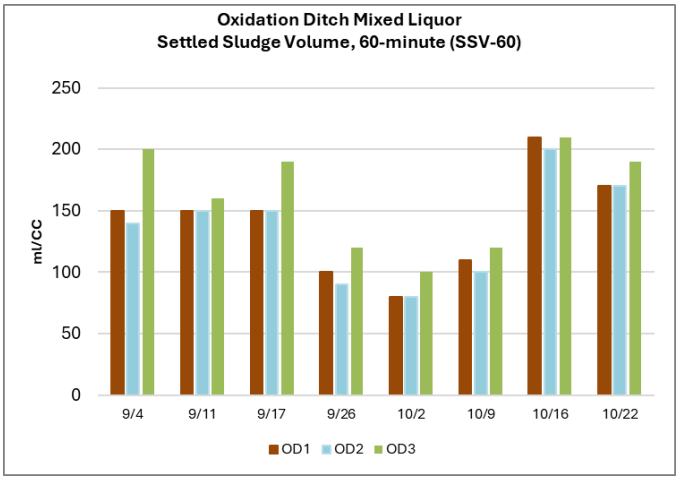


Figure E-20) 60-Minute Settleability (SSV).

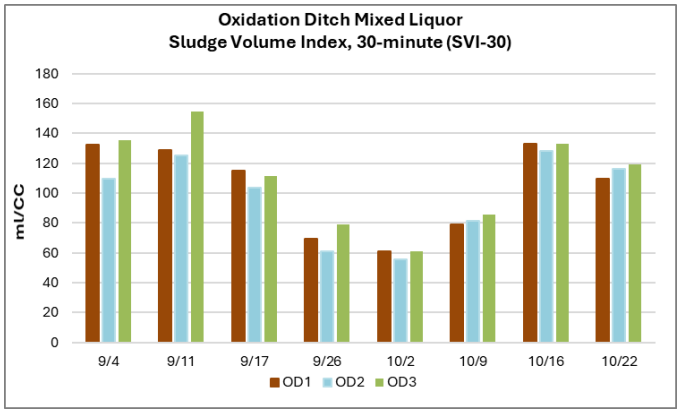


Figure E-21) 30-Minute SVI

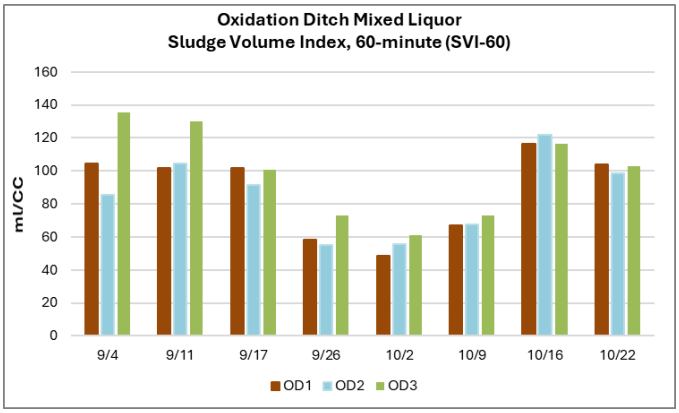


Figure E-22) 60-Minute SVI

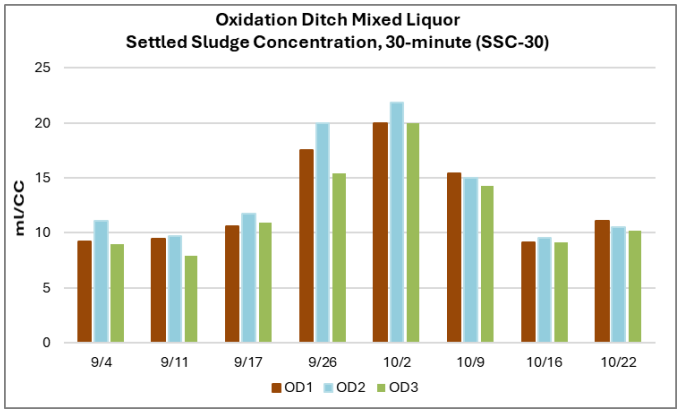


Figure E-23) 30-Minute SSC

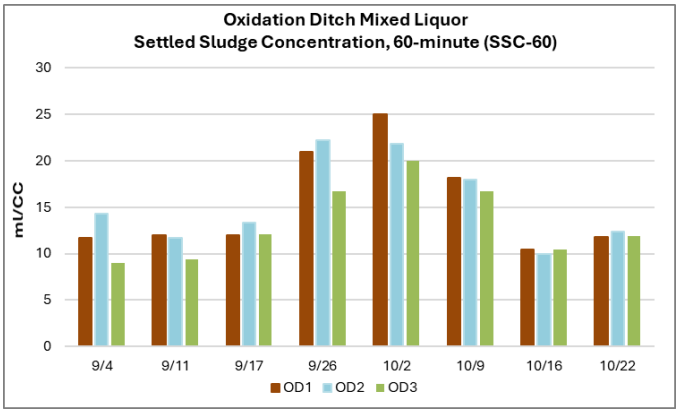


Figure E-24) 60-Minute SSC

ATTACHMENT E: WWTAP DATA & GRAPHS - AMITY WWTF (Cont'd)

WWTAP Bench Testing Results Graphs for Full Study Period (8/22 through 10/23)

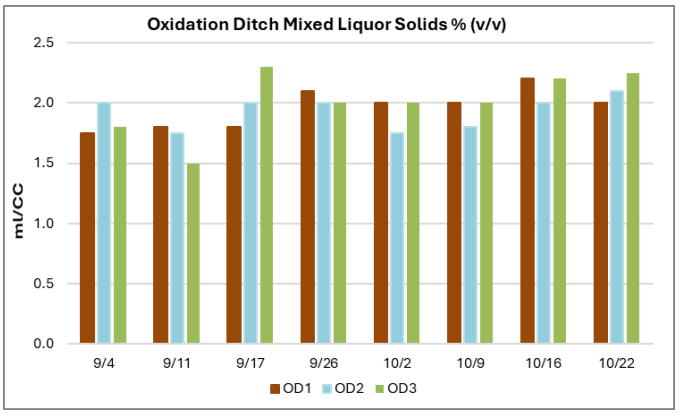
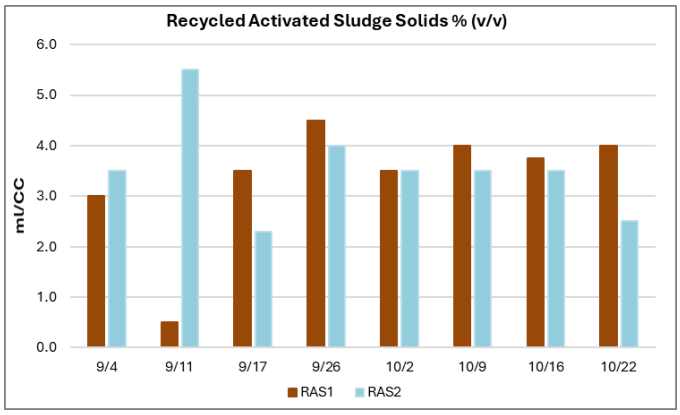


Figure E-25) Mixed Liquor % Solids
**15-Minute Centrifuge Spin Test*



E-26) Return Activated Sludge % Solids
**15-Minute Centrifuge Spin Test*

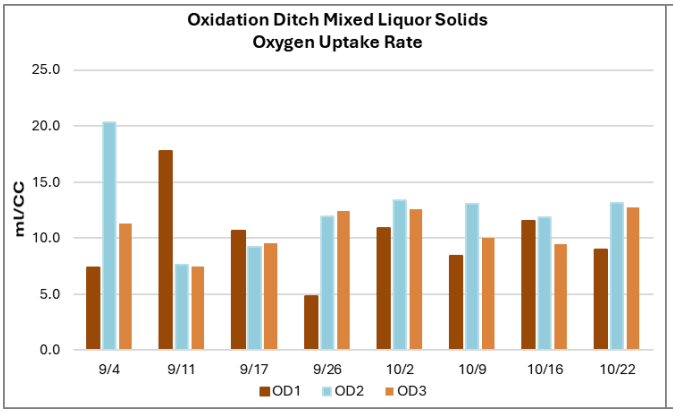


Figure E-27) Mixed Liquor Oxygen Uptake Rates
**15-Minute OUR Test*

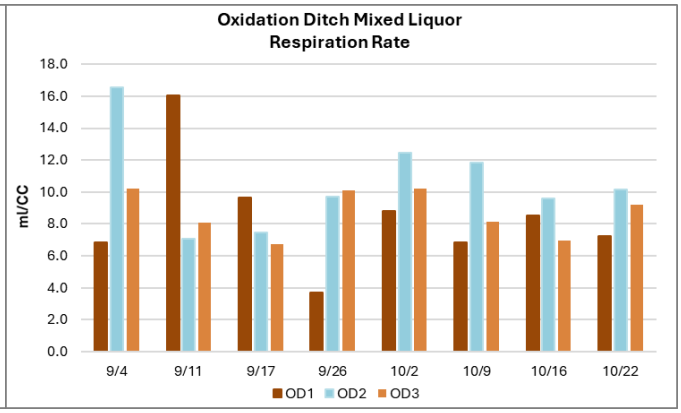


Figure E-28) Mixed Liquor Respiration Rate
**Calculated with 15-minute OUR Test*

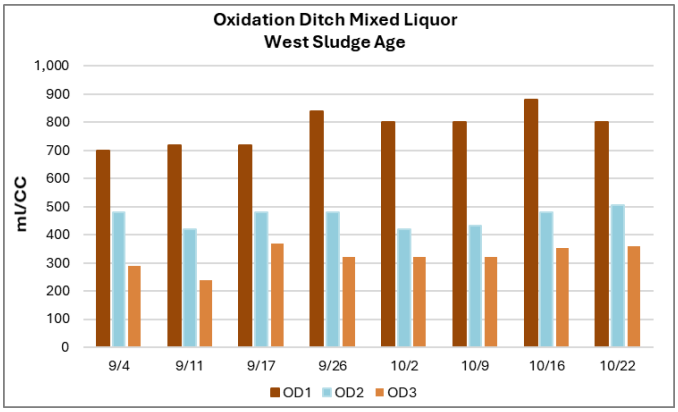


Figure E-29) Oxidation Ditch Sludge Age
** Calculated*