

Back River Wastewater Treatment Plant (WWTP) Progress Report August 19, 2022

Treatment Plant Overview

- One of the primary concerns at the WWTP is the processing and management of biosolids and the removal of solids from process equipment. The efficacious removal of biosolids is essential to maintaining total nitrogen and phosphorus effluent concentrations within permit limitations. In addition to the solids that are generated on a daily basis, any buildup of solids within the treatment system must be removed.
- The Maryland Environmental Service (MES) has helped accelerate the timeline of certain maintenance and repair projects at Back River to get process operations functioning to the desired levels.
 - During the August 2, 2022 weekly meeting at the WWTP, MES' key recommendations to Baltimore City for operation of the plant included the development of a preventative maintenance schedule to ensure that recent repairs are maintained, establish Standard Operating Procedures, implement training programs, provide better workstations for staff, and develop a straightforward procurement process.

Primary Treatment

- The primary settling tanks (PSTs) allow the solid material within the wastewater to be easily separated by settling to the bottom or floating to the surface for removal.
 - Schedule:
 - Currently, three PSTs (#1, #8, and #11) of the 11 are functioning.
 - PST #1 has been repaired and was back online on July 18, 2022.
 - PST #7 is scheduled to be online by September 2022.
 - MES has cleaned PST #7, and is now awaiting parts to make the repairs.
 - Baltimore City Department of Public Works (DPW) is focusing on the remaining PSTs.
 - Two PSTs (#2 and #9) are expected to be online by January 2023.
 - PST #2 is 85% cleaned. Inspection revealed damage to the floor. Repairs will be necessary.
 - PST #10 is expected to be online by April 2023.
 - Two PSTs (#3 and #4) are expected to be online by August 2023.
 - Completion dates for two PSTs (#5 and #6) are to be determined.
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 - PST #5 is being cleaned by DPW contractors.
 - **Odor complaints were received beginning on August 15, 2022 from Baltimore County residents downwind of the WWTP sludge lagoons where the sludge/wastewater is being stored.**
 - As of August 19, 2022, the contractor is adding wood chips to the sludge as a bulking material to reduce/eliminate odors
 - Baltimore City is conducting air monitoring in accordance with the requirements of its air permit.

Secondary Treatment

- Biological Treatment Activated Sludge.
 - Newly constructed Activated Sludge Plant #4 is online and performing satisfactorily.
 - The facility is sending 50-60% of the flow through the Activator #4 due to better treatment performance and efficacy.
 - **Currently, influent flows are down so DPW will be taking one of the older activator plants offline to remove the accumulation of solids from the tanks to perform maintenance and equipment repairs.** Though flow rates are down, the wastewater flowing through the plant will help prevent stagnation of the water.
 - Once completed, this project will improve nitrogen removal and reduce solids concentrations in the biological reactors.
- Secondary Clarifiers
 - There are 36 secondary clarifiers.
 - Each Activated Sludge Plant #2, #3 and #4 has 12 secondary clarifiers.
- A third-party engineering assessment determined that the Return Activated Sludge (RAS) pumps and wasting pumps require replacement. RAS pump failure would cause poor performance of the biological reactors and wasting pump failure would cause a buildup of solids in the treatment system.
 - RAS and sludge pumps are being evaluated and repaired in the Activated Sludge Plant #3, and two pumps are on order.
- The secondary clarifiers #5B, #7A, #16A and #16B associated with Activated Sludge Plant #2 are not in service. Secondary clarifiers #11A and #12B associated with Activated Sludge Plant #3 are not in service and Activated Sludge Plant #4 has one secondary clarifier (#18) that is not functional due to a problem with the diffuser.
 - MES is assessing the secondary clarifiers and making repairs as necessary.
- A third-party contractor is cleaning out the scum pits on the secondary clarifiers #11, #12, #13, and #14.
- **The sludge blankets on the secondary clarifiers have gone from 10 to 2 feet, which signifies a reduction in the amount of solids within the secondary treatment phase.**
- **MES installed a scum arm scraper plate and placed clarifiers #13A and #16A back into service.**
 - Clarifier #13A operates in manual mode.

Tertiary Treatment

- Denitrification Filters (DNFs)
 - The facility has 52 DNFs designed to achieve effluent nitrogen concentrations at or below 3 milligrams per liter (mg/l) total nitrogen. **As of July 19, 2022, all 52 filters are online.**
 - The Back River WWTP was experiencing problems with the DNFs due to excess solids. **The solids concentration going into the filters have been reduced since March 2022.**
 - Control system problems due to electrical issues caused some of the filter quads to not function as designed.
 - ProStart, a private contractor hired by DPW to operate the DNF system, has temporarily corrected the problem by connecting a portable power supply that will be used until the electrical components are repaired and connected. MES has performed an evaluation of malfunctioning level transducers and control units, and there are plans for more comprehensive evaluations of the DNF system once needs are confirmed.
 - Once completed, the filters can be backwashed frequently to remove solids.

- Sand Filters
 - The treatment system has 48 sand filters. **Currently, 20 of the sand filters are functioning, and the other 28 are not functioning due to various equipment failures, insufficient sand, and mechanical issues.**
 - MES is evaluating the sand filters and their mechanics are replacing and repairing components.
 - Repairs to sand filters #17, #19, #42, #31, and #14 are underway.
 - There are 10 pumps and isolation valves for the sand filters on order. 20 carriage motors for sand filter repairs were received for installation.
 - Repairs to Sand Filter #7 are underway with the anticipated return to service in August 2022.

Biosolids Management

- Sludge dewatering is handled through a centrifuge.
 - Two of four centrifuges (#1 and #2) are currently operational.
 - Centrifuge #3 has been refurbished and installation will begin in August 2022. Once the installation is completed there will be three active centrifuges for dewatering.
 - A minimum of two centrifuges are required to meet the current average conditions.
 - Reliability and redundancy of centrifuges are necessary to perform dewatering operations. Equipment such as the centrifuge feed pumps, flushing water booster system, and Centrate pumps have operational problems that need to be addressed.
 - The centrate for Centrifuge #1 is very dark with significant solids accumulation.
 - Centrifuge #4 is on-site, but not installed. Installation anticipated the week of September 6, 2022.
 - **Only two of the eight polymer pumps used for polymer addition are functional. The other six need to be replaced.**
 - Trucks are transporting sludge to the Veolia compost facility.
 - MES reported on July 18, 2022 that sludge is now being processed at volumes (65-70 dry tons per day) that have significantly reduced the on-site sludge inventory.
 - Since July 31, 2022, Synagro's dryers have been shut down on three occasions (August 2, 3, and 5, 2022), due to low total solids feed to the centrifuges, issues maintaining flow over 100 gallons per minute, and a sludge tank leak at the gravity belt thickener (GBT).
 - **MES investigated the problem and determined that no sludge had been pumped to the "loop" line or Tank 26/Tank 1 for at least 3 days.** The operator reports that one of the thickened sludge pumps that feeds the hi-rate digesters is out of service (Pump 2B).
 - If no sludge is fed to the digesters, no sludge is being sent to the pelletizer and the centrifuges. The level in Tank 26 is very low (almost to the bottom) and is most likely the cause as to why the sludge feed solids are so low to the dryers.
 - The leak at the GBT has been repaired and the dryers have been restarted.
 - Synagro's sludge processing remains reduced through August 18, 2022.

- Gravity Belt Thickeners
 - There are a total of eight GBTs. At the current average daily flow conditions, six GBTs are required.
 - **The July 8, 2022 report showed that only four GBTs were functioning.**
 - Repairs were made to two additional GBTs so **as of July 19, 2022 there are now six GBTs online.**
- Gravity Sludge Thickeners
 - There are six Gravity Sludge Thickeners (GSTs).
 - At the current design average flow of 130 million gallons per day (MGD), only one GST is required.
 - **Two GSTs are fully operational.**
 - The remaining GST's can feed flow and draw solids, but the gravity thickening mechanism is not functional. DPW should achieve reliability and redundancy on GST operation in conjunction with the PSTs brought online.
 - MES repaired the scum arm scraper on GST #3 and it has been placed into service.

Staffing

- DPW reviewed staff roles and stressed the necessity for communication, teamwork, and cooperation between MES and DPW.
- DPW is in the process of hiring additional maintenance technicians.

Monitoring Results

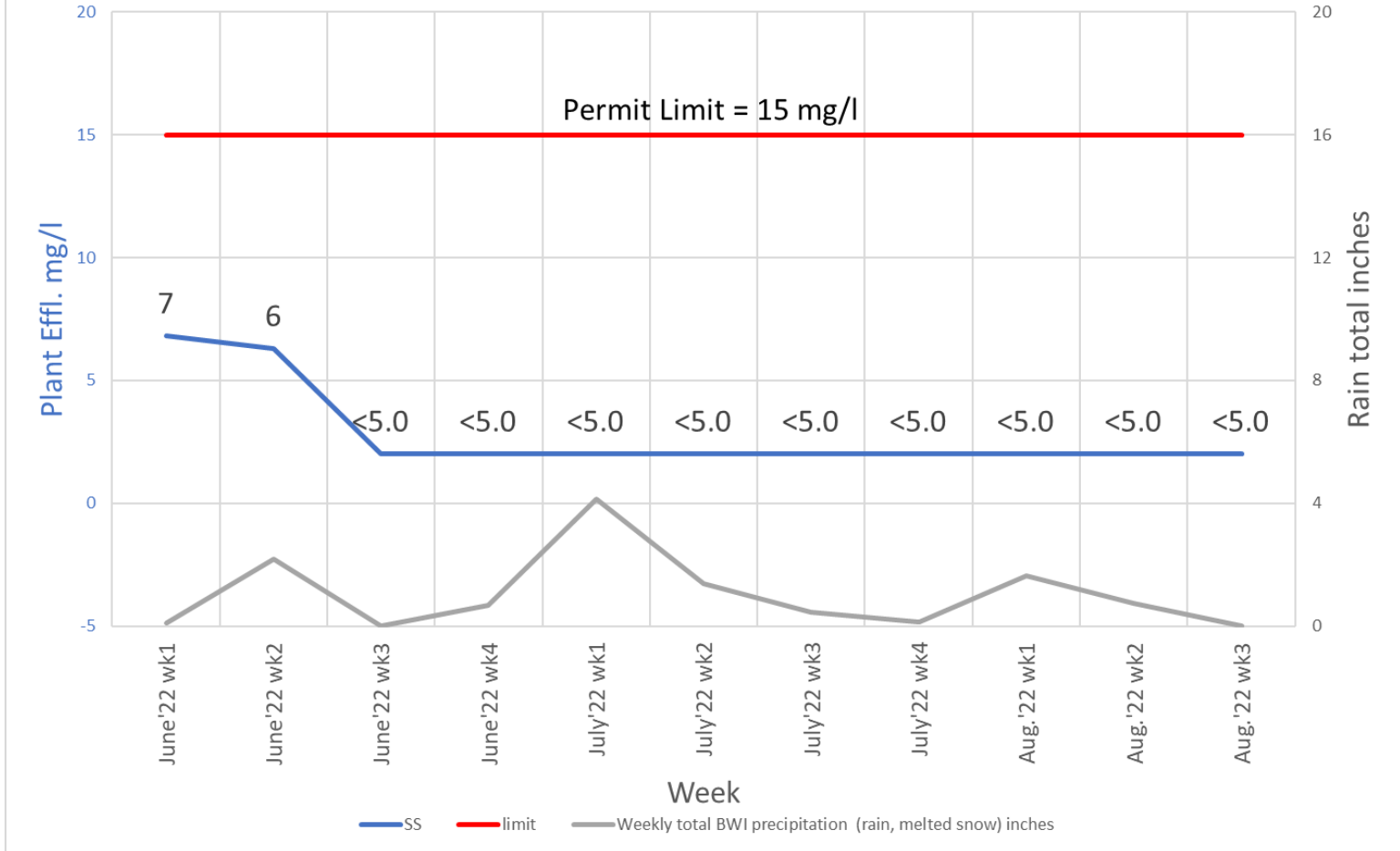
- **The analytical data demonstrates that there has been some measured progress made toward getting the Back River WWTP into compliance with its discharge effluent permit limits.**
 - The Total Suspended Solids (TSS) concentration has been a factor in creating high nutrient concentrations.
 - Data from June 2022 show that the monthly average TSS concentration at discharge point Outfall 001 is 3.25 mg/L compared to 21 mg/L for January 2022, 17.5 mg/L for February 2022, 14.2 mg/L for March 2022, 7.5 mg/L for April, and 8.75 mg/L for May 2022.
 - **Data indicates progress toward the goal of removing the accumulation of solids from the treatment system.**

Final Effluent Analytical Results

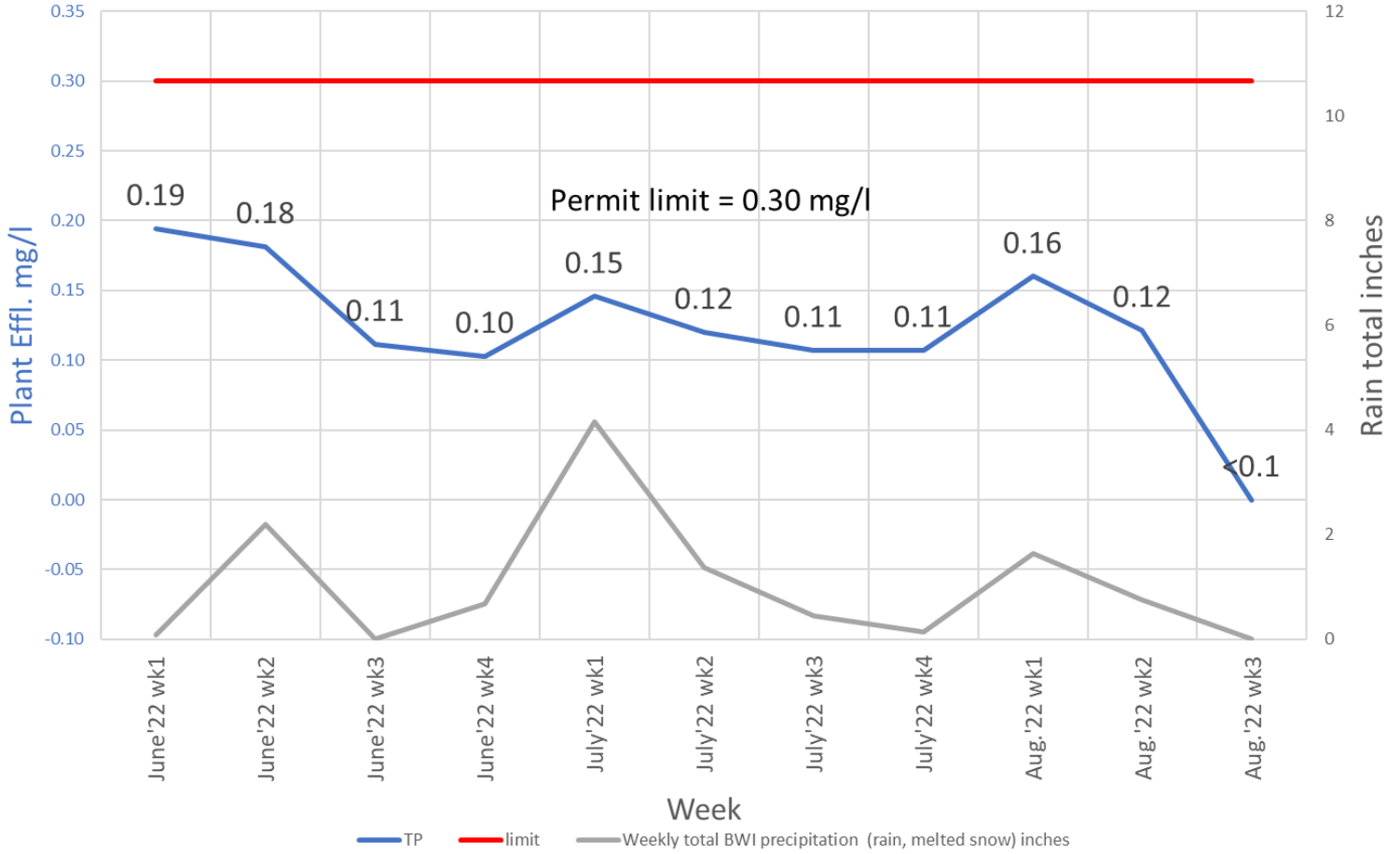
- The results of recent effluent monitoring by the Maryland Department of the Environment show significant improvements in the quality of the final effluent and are comparable to the analytical results being reported by DPW.

Graphs Showing Reported Final Effluent Concentrations and Loading Performance for 2022

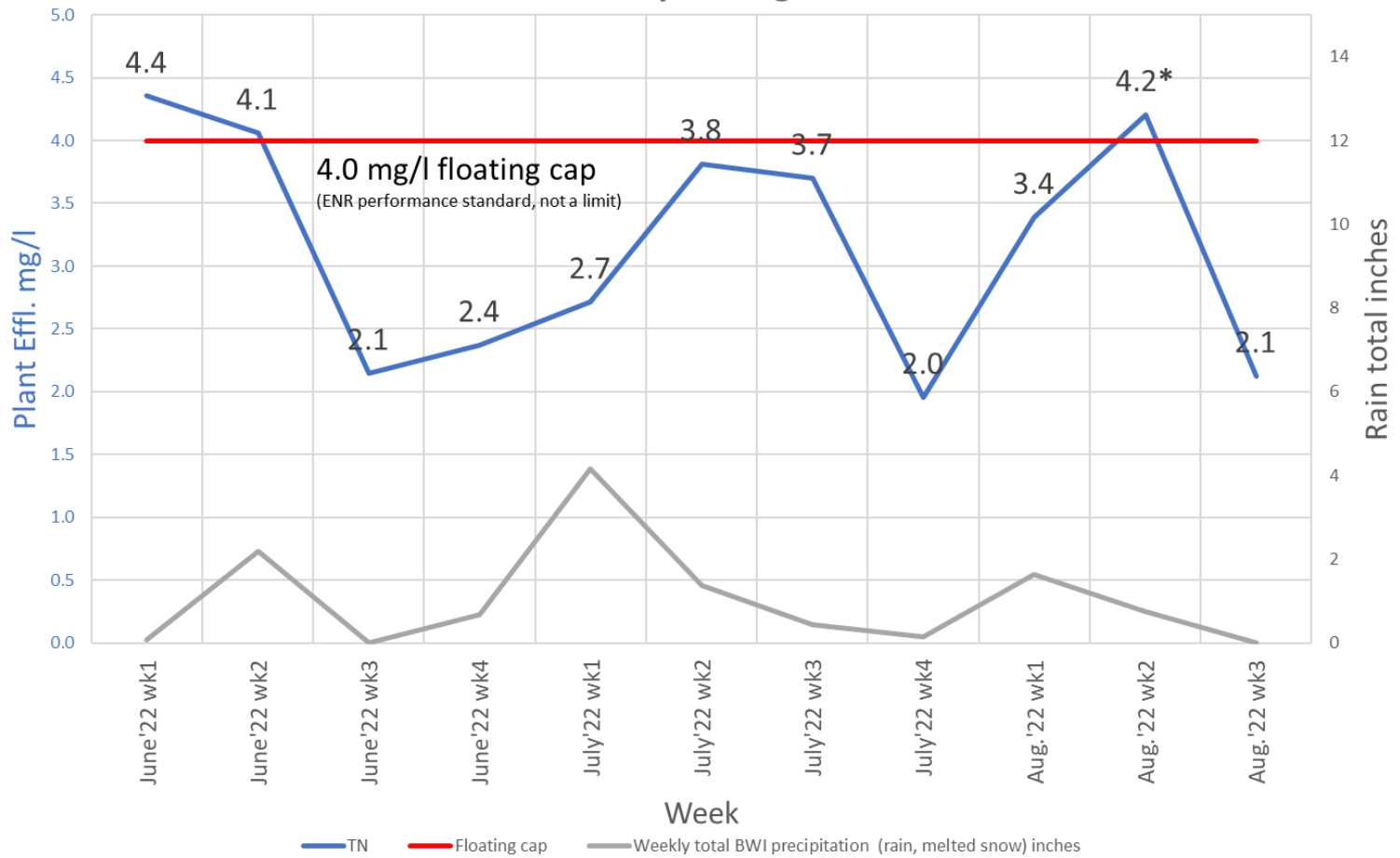
**City of Baltimore, Back River W.W.T.P.
TSS Concentration Outfall 001
Weekly Average**



City of Baltimore, Back River W.W.T.P. T.P. Concentration Outfall 001 Weekly Average



City of Baltimore, Back River W.W.T.P. T.N. Concentration Outfall 001 Weekly Average



*During the last inspection, the Back River WWTP staff indicated that in July, there were three significant storms, a power outage, and a failure of the blower switches causing a significant impact on treatment causing a rise in nitrogen levels. See the bottom of page 3 to the top of page 4 of the 8/16/22 Compliance Evaluation Report for information regarding the Total Nitrogen spike.