

Memorandum

December 14, 2021

TO: Historical Memo

FROM: Rick Butler. Process Control Supervisor

SUBJECT: South Treatment Plant at Renton (STP)
November 2021 Operating Record

Operations in November 2021 was characterized by very wet weather (though without a big storm), normal air temperatures, cooler wastewater temperatures, good effluent quality, essentially no nitrification, very little deicer, normal septage loads, minimal wastewater flow from the Brightwater service area, essentially all process tanks in service (some with leaky drains that complicated influent sample values and secondary MLSS control during the first half of the month, very little offsite reclaimed water application, and 50-60% of possible scrubbed gas sales.

The STP met all its conventional permit limits for secondary effluent. Final effluent quality averaged 6-mg/L carbonaceous BOD (cBOD₅), 11-mg/L TSS and 10-mg/L total BOD₅. Respective removals were 97%, 96% and 95%.

Flow averaged 92-mgd (compared with October's average of 60-mgd), with 0.3-mgd from the Brightwater service area. The max-day flow was 148-mgd on Nov. 12 which was the result of the max-day rainfall of 1.26-inches on Nov. 11 followed by 0.68-inches on Nov. 12. The max-hour flow for the month was about 172-mgd on Nov. 12. All flows received secondary treatment, i.e., no flows were diverted around the secondary process.

10.26-inches of rain fell in November (Seatac Airport) with a max-day of 1.26-inches on Nov. 11 and a 4-day rainfall of 3.78-inches on Nov. 11-14. November's historic rainfall average is 6.31-inches; the highest recorded November rainfall was 15.63-inches (2006). Daily high and low air temperatures averaged 53°F and 43°F, which are 1°F to 2°F higher than the long-term averages. The wastewater temperature dropped notably across the month, from about 67°F to about 63°F.

Offsite Flows and Loads: 2.20-MG of septage were received at South Plant in November, accounting for an estimated 6% to 7% of STP's influent solids load. Southern Transfer (aka Allentown) flow averaged 11.0-mgd with max-day flow of 23.2-mgd on Nov. 14. York P.S. flow (i.e., Brightwater based flow) averaged 0.3-mgd with a max-day flow of 1.9-mgd on

Nov. 2. York/BW flows accounted for <1% of the influent TSS load at the STP. Very little deicer was sent to the STP in November.

Sampling and Analyses: All permit-required samples (influent and effluent) were collected and analyzed. The final ETS effluent sample line/sampler was usually chlorinated every other day. The measured influent loads were significantly affected by leaking aeration tank/clarifier drains during the first half of the month. During the first half of the month, the influent loads averaged 94-tons/day BOD₅, 73-tons/day cBOD₅, and 114-tons/day TSS. During the second half, after most of the leaking drains had been closed, measured influent loads averaged 82-tons/day BOD₅, 64-tons/day cBOD₅, and 87-tons/day TSS. The effluent chlorine (Cl₂) at the ETS outfall was below the 0.75-mg/L daily average and 0.5-mg/L monthly average limits.

STP Facilities Status: In November, essentially all process tanks were in service. The secondary process was operated to avoid nitrification until the very end of the month. The gas scrubbing system operated near half capacity all month, injecting high quality gas into PSE's natural gas pipeline. Process heat was provided by the solid's boiler (fueled by natural gas) and electric boiler in main control; the electric boiler was started Oct. 10. The maintenance building electric boiler remained off. Class-A reclaimed water (RW) was applied offsite on just one day and was used for internal process applications all month.

12 of 12 primary clarifiers, 4 of 4 aeration tanks (ATs), 24 of 24 secondary clarifiers, and 2 of 2 chlorine contact channels (CCC) were in service all month. 4 to 5 of the six DAFTs were in service. DAFT2 remained out of service. DAFT3 followed by DAFT1 were taken out of service starting Nov. 9 for emergency repairs. Five of five anaerobic digesters were in service. Dewatering operated every day. On November 30, STP operated with all 12 primary tanks, all 4 ATs, all 24 secondary clarifiers, both CCC, four DAFTs and all five digesters.

Primary Treatment: 12 of 12 primary tanks were in service. Primary effluent TSS and BOD averaged 75-mg/L and 123-mg/L, resulting in removal rates of 70% for TSS and 44% for BOD. The hydraulic loading rate (HLR) averaged 1427-gpd per ft² of tank surface area. The max-day HLR was 2254-gpd per ft².

Secondary Treatment: The secondary process was operated to grow phosphorus accumulating organisms (PAOs) and to avoid nitrification until the end of the month when it was operated to achieve some degree of nitrification. All four ATs and all 24 clarifiers were in service all month. The ATs were operated in plug flow mode (i.e., AT feed gates open only in Pass-1) most of the month and step feed mode during higher flows. An ½-pass un-aerated zone in Pass-1 was maintained throughout the month.

The MLSS concentration was in the 2600-3200 mg/L range during the first half of the month with a solids retention time (SRT) near 5-6 days. For the second half of the month, the MLSS concentration was increased to 3500-3800 mg/L with a SRT of an estimated 7-10

days. The MLSS was increased to test how much nitrification could be achieved without a negative impact to the MLSS's ability to settle and clarify. The RAS return rate was 40% until the later part of the month when it was increased to 60% to aid with denitrification. Biomass settling was very good in November, with the sludge volume index (SVI) usually in the 60 - 80 mL/g range.

Aeration tank air use averaged 61 million-ft³/day for the month. Daily use was in the 50-60 million-ft³/day range for the first half of the month, and 70-80 million-ft³/day late in the month as nitrification started to occur at the higher MLSS concentrations. D.O. setpoints were 2.0- mg/L (for both Passes 1&2 and 3&4) for the month's first half and 2.75-mg/L and 3.0-mg/L, respectively, for the remainder of the month.

Nutrient Removal. Nitrogen (N) removal averaged 29%. Effluent ammonia (NH₃) averaged 28-mg/L as N and 20,840-lbs/day. Effluent nitrite plus nitrate (NO₂+NO₃) averaged <0.8-mg/L as N. The secondary process did start to nitrify during the second half of the month as demonstrated by the decrease in the effluent NH₃-N load and increase in effluent NO₂+NO₃ load. Specifically, the effluent NH₃-N load was in the 20,000 - 28,000 lbs/day range during the first half the month and dropped below 15,000-lbs/d by month's end. Also, effluent NO₂+NO₃ averaged <177-lbs/d as N (<0.2-mg/L) for the month's first half and reached 2,675-lbs/d (3.8-mg/L) as N by month's end.

Phosphorus (P) removal averaged 62%. Effluent Total-P averaged 2.1-mg/L and 1572-lbs/day. Effluent alkalinity was in the range of 135,000 - 150,000 lbs./day as CaCO₃ until the end of the month when it had dropped to 94,000 lbs./day, further confirmation of nitrification. Analyses for N and P constituents were usually performed once per week (Tuesday samples only). NH₃ analysis was also performed on Sunday samples.

Disinfection: 42,666 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in November. This resulted in an average dose of 1.9-mg/L as chlorine (Cl₂) based on effluent flow. Daily hypochlorite use was usually in the 1100-1500 gpd range, except during the higher flows of mid-month when daily use was in the 1600-2000 gpd range. Higher short-term doses (6-10 mg/L dose for 2-hours) were applied every other week to control bio-growth on the surfaces of the contact channels and ETS forebay. The daily Cl₂ residual at the ETS outfall was always <0.50-mg/L. Dechlorination (via sodium bisulfite) was not required. RAS chlorination was not practiced. Prechlorination was not practiced in November.

Both the north and south CCCs were in service all month. A gate installed between the north and south CCCs at POD4 forces PODs 5&6 effluents to flow down the south CCC while POD1-4 effluents flow down the north CCC. The north CCC was disinfected using the "west" hypochlorite system and the south CCC was disinfected using the "east" hypochlorite system.

DAFT: An average of 79 dry-tons/day (0.31-mgd at 6.2% TS) of thickened raw sludge (THS) was produced by the DAFTs. Two large DAFTs and two or three small DAFTs were in service through the month. 13,200-lbs of polymer (Polydyne WE-1531) were added to DAFT feed sludge in November for an average dose of 5.5-lb active/dry ton THS or 3.4-lb active/dry ton DAFT feed solids. The solids loading rate (SLR) averaged near 18 lbs./d/ft² for the smaller DAFTs and near 24 lbs./d/ft² for the larger DAFTs. The larger DAFTs were loaded heavier mid-month to facilitate emergency repairs to the smaller DAFTs. Only one fizz system per tank was operated except for 12-days mid-month when both fizz systems were operated on the larger DAFTs because of their higher SLRs.

Anaerobic Digestion: Time and temperature requirements for Class B biosolids were met via digestion. All five digesters were in service. Digesters 1-4 were the primary digesters, operated in parallel and fed equal amounts of THS. Each discharged to Digester 5 which served as the blending tank before dewatering. Over the month, the digester detention time averaged 38-days with Digester 5 providing 3-days of the 35-days. Volatile solids (VS) reduction averaged 61.4% and total solids (TS) destruction averaged about 54%. The VS loading rate averaged about 0.10-lbs./day/ft³ for the four primary digesters. The VS/TS percent entering and leaving the digestion process averaged 87.3% and 72.6%, respectively. The alkalinity levels were usually in the range of 7800-8500 mg/L as CaCO₃ for Digester 1-4. Digester temperatures were in the 98-100°F range.

The gas and pumped mixing systems of the digesters operated in a “normal” mode. In other words, one of the two gas mixing compressors were in service per digester, and the “C-1” bottom-to-top pumped mixing system pumped directly to the top of the digesters (instead of into the “C-2” side-to-side pumped system). Air-spargers are available to control any accumulation of scum/sludge on the digester covers.

Dewatering/Biosolids: 1015 dry-tons biosolids (4132 wet-tons at 24.6%TS) were hauled in November. The dry tons of digested solids produced was closer to 999 dry tons since the digester inventory decreased by 16 dry tons over the month. Biosolids were distributed between Eastern WA. agricultural sites and Western WA. forest lands in a 31:69% split (wet tons). An estimated 50,228 lbs.-active polymer were applied for dewatering biosolids resulting at an average dose near 49.5 lb.-active/dry ton hauled. The polymer was Polydyne WE586, a 41.5% cationic emulsion solution.

Biosolids were dewatered every day. Dewatering operation was essentially 24-hour shifts on weekdays and half-day shifts on weekends, with two centrifuges usually in operation and the third centrifuge brought on-line occasionally. Centrifuge feed rates were usually near 150-160 gpm per centrifuge. Gas-scrubbing water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs.