

Memorandum

May 10, 2022

TO: Historical Memo

FROM: Rick Butler. Process Control Supervisor

SUBJECT: South Treatment Plant at Renton (STP)
April 2022 Operating Record

Operation in April 2022 was characterized by below average rain, daily flows usually in the 60-75 mgd range, no big rain storms, warmer wastewater temperatures but colder than normal air temperatures, good effluent quality, notable nitrification through the month, little deicer BOD loads, normal septage loads, very little wastewater flow/load from the Brightwater service area, many process tanks in service, Class-A reclaimed made available to customers all month, and 100% scrubbed gas capacity and sales. There were no overflows in April.

The STP met its conventional permit limits for secondary effluent. Final effluent quality averaged 4-mg/L carbonaceous BOD (cBOD₅), 5-mg/L TSS and 19-mg/L total BOD₅. Respective removals were 98%, 98% and 94%. Maximum weekly-average values were 4-mg/L, 6-mg/L and 21-mg/L, respectively.

Flow averaged 67-mgd this month. This lower flow (compared with March's average of 89-mgd) is reflective of the end of the wet weather season, with two months of rain averaging 3-inches/month and very little flow from the Brightwater service area. STP's max-day flow was only 91-mgd on Apr. 4, the result of 0.78-inches of rain on Apr. 3 and 4. All flows received secondary treatment, i.e., no flows were diverted around the secondary process.

2.71-inches of rain fell in April (Seatac Airport). April's historic rainfall average is 3.18-inches; the highest recorded April rainfall is 6.53-inches (1991). The max-day rainfall was only 0.55-inches on Apr. 4, resulting in a daily flow of 91-mgd on Apr. 4. Daily high and low air temperatures averaged 55°F and 39°F, which are each about 4°F lower than the long-term averages. The wastewater temperature started the month at 62 and increased consistently to 64°F by month's end.

Offsite Flows and Loads: 2.43-MG of septage were received at South Plant in April. A small portion of that total was due to Cedar Hills Landfill leachate that was hauled into septage due to a blocked sewer line. Thus, actual septage was slightly lower than 2.34-MG and probably accounted for an estimated 8% of STP's influent solids load. Southern Transfer (aka Allentown) flow averaged 5.7-mgd with a max-day flow of 15-mgd on Apr. 4. York P.S.

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flow (i.e., Brightwater based flow) averaged 0.3-mgd with a max-day flow of 1.7-mgd on Apr. 14. This max-day York P.S. flow was the result of planned maintenance work at Brightwater, and not due to a capacity limitation at Brightwater. York/BW flows accounted for <1% of the influent TSS load at the STP. Approximately six tons of deicer BOD was sent to STP over 11-days in April, for a monthly average load of 0.2-tons/day. The max-day deicer BOD load was 0.7-tons on April 19.

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 averaged 83-tons/day BOD₅, 63-tons/day cBOD₅, and 77-tons/day TSS. These are reflective of loads that would be expected based on the deicer and septage loads, operating conditions and mass balances across the treatment plant. The effluent chlorine (Cl₂) at the ETS outfall was below the permitted max-day limit of 0.75-mg/L daily average and the monthly average limit of 0.5-mg/L.

STP Facilities Status: In April, essentially all process tanks were in service though some process tanks were removed from service since the wet weather season has passed. The secondary process was operated to achieve partial nitrification while maintaining a population of phosphorus accumulating organisms (PAOs). The gas scrubbing system operated at full 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) only; the two electric boilers were off. The reclaimed water (RW) facility was in service throughout the month, producing Class-A quality RW for customers as needed. RW was used for internal process applications all month.

7 to 11 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. 5 of 6 DAFTs were in service. DAFT-5 remained out of service. Five of five anaerobic digesters were in service. Dewatering operated every day. On April 30, STP operated with 7 of 12 primary tanks, all 4 ATs, all 24 secondary clarifiers, both CCC, five DAFTs and all five digesters.

Primary Treatment: 11 of 12 primary tanks were in service. North Primary 4 remained out of service for repairs. The four southwest primary tanks (S. Tanks 5-8) were taken out of service mid-April to prepare for some repairs to the influent discharge/distribution channel in May. Primary effluent TSS averaged 89-mg/L resulting in an average TSS removal rate of 66%. The hydraulic loading rate (HLR) averaged 1400-gpd per ft² of tank surface area for the month. Primary effluent TSS was closer to 95-100 mg/L with only seven tanks in service at an average HLR near 1400-gpd per ft².

Secondary Treatment: The secondary process was operated to partially nitrify while also trying to maintain a population of PAOs. All four ATs were in service all month with all 24 clarifiers. The ATs were operated in plug flow mode (i.e., AT feed gates open only in Pass-1) all month. A ½-pass un-aerated zone in Pass-1 was maintained throughout the month.

The MLSS concentration was in the 3300-3600 mg/L range for the first half of the month with a solids retention time (SRT) in the 5.2 - 6.0 day range. For the latter half of the month, the MLSS was in the 3000-3200 mg/L range with a SRT of 4.6 - 5.2 day range. For the month, the SRT averaged 5.1-days. The RAS return rate was constant at 3.6-MGD per clarifier. A 3.6-MGD per clarifier RAS rate had a corresponding average RAS return rate of about 135%. The high, constant RAS rate was selected to improve denitrification. Biomass settling was satisfactory through April, with SVI levels climbing through the month. The SVI was usually in the 140-160 mL/g range for the first half and then 160-200 mL/g range for the second half. The increase in SVI had little to no impact on effluent quality.

Aeration tank air use averaged 71 million-ft³/day for the month. Daily use was usually in the 68- 76 million-ft³/day range, with a peak use of 80 million-ft³/day. D.O. setpoints were moved up and down through the month with the MLSS changes. The DO setpoints were 1.6-mg/L for both Passes 1&2 and 3&4 to start the month. These setpoints were gradually dropped to 1.3-mg/L at mid-month. The DO setpoint for Passes 1&2 was increased to 2.2-mg/L by month's end – without increasing the DO setpoint for Passes 3&4 – to force more nitrification in the first two passes (which may allow Pass-3 to possibly be used for denitrification).

Nutrient Removal. Nitrogen (N) removal averaged 58%. Effluent ammonia (NH₃) and nitrite plus nitrate (NO₂+NO₃) averaged 11.5-mg/L as N and 8.0-mg/L as N, respectively, resulting in an average effluent Total Inorganic Nitrogen (TIN) of 19.5-mg/L. On a mass basis, the daily average effluent NH₃, NO₂+NO₃, and TIN loads were 6286-lbs./day, 4433-lbs./day and 10,719-lbs./day, respectively. The secondary process nitrified all month, with slightly greater nitrogen removal later in the month. It's interesting to note that the lbs./day of effluent NH₃ increased across the month, and the lbs./day of effluent NO₂+NO₃ only dropped slightly, resulting in an increase of about 2000-lb/d effluent TIN across the month. N analyses were performed three times per week, including a Sunday sample.

Phosphorus (P) removal averaged 58%. Effluent Total-P averaged 2.5-mg/L or 1455-lbs/day. Effluent Total-P loads (lbs/d) was reasonably high to start the month (1500 – 1800 lb/d) while they dropped to below 1000-lb/d near month's end. Effluent alkalinity started the month near 50,000-lbs./day as CaCO₃ and increased to greater than 70,000-lbs./day by month's end, reflecting the higher effluent NH₃-N lbs./day. P analyses were performed once per week.

Nutrient General Permit. April 2022 was the first month that STP's effluent was subject to the monitoring and action limit requirements of the Puget Sound Nutrient General Permit (PSNGP). South Plant's permit number is WAG994573. All of the monitoring requirements of the PSNGP were met this month. Effluent monitoring of NH₃, NO₂+NO₃, TIN and TKN occurred three days per week, influent monitoring of TKN and NH₃-N occurred three days per week and influent monitoring of NO₂+NO₃ occurred two days per week. As mentioned

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previously, effluent TIN averaged 19.5-mg/L as N and 10,719-lbs/day as N for the month. South Plant's effluent TIN load in April was well under STP's permitted effluent TIN action level of 20,110-lbs/d (which is the daily average of the 7.34 million lbs. action level for South Plant based on 365 days). Thus, the monthly total effluent TIN load in April was 321,583-lbs, and the year-to-date effluent TIN load is also 321,583-lbs since April 2022 was the first month of permit coverage. Total nitrogen removal at STP averaged 58% in April.

Disinfection: 28,985 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in April. This resulted in an average dose of 1.7-mg/L as chlorine (Cl₂) based on effluent flow. Daily hypochlorite use was usually in the 900-1300 gpd range until the end of the month when daily use was closer to 800-gpd. 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 <0.75-mg/L. Dechlorination via sodium bisulfite was not required. RAS chlorination and prechlorination was not practiced in April.

Both the north and south CCCs were in service. A gate between the north and south CCCs near POD4 forced PODs 5&6 effluents to flow down the south CCC while POD1-4 effluents flowed 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 95 dry-tons/day (0.39-mgd at 5.9% TS) of thickened raw sludge (THS) was produced by the DAFTs. One large DAFTs and all four small DAFTs were in service. DAFT5 remained out of service for repairs. 14,850-lbs of polymer (Polydyne WE-1531) were added to DAFT feed sludge in April for an average dose of 5.2-lb active/dry ton THS or 3.1-lb active/dry ton DAFT feed solids. The solids loading rate (SLR) averaged near 22 lbs./d/ft² for the smaller DAFTs and 32 lbs./d/ft² for the larger DAFT. All of the DAFTs operated with only one fizz system except for 15-hours during April 25-26 when two systems were in service.

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 32.5-days with Digester 5 providing 4.5-days of the 32.5-days. Volatile solids (VS) reduction averaged 62.9% and total solids (TS) destruction averaged about 55%.

The VS loading rate averaged about 0.11-lbs./day/ft³ for the four primary digesters. The VS/TS percent entering and leaving the digestion process averaged 87.5% and 72.2%, respectively. The alkalinity levels were usually in the range of 7100-7700 mg/L as CaCO₃ for Digester 1-4. Digester temperatures were usually in the 99-101°F range, with some slightly higher and lower values for Digester 3 specifically.

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: 1184 dry-tons biosolids (5512 wet-tons at 21.5%TS) were hauled in April. The dry tons of digested solids “produced” were essentially the same as the dry tons hauled since the overall digester inventory changed very little over the month. About 59% of the biosolids (based on wet tons) were distributed to Western WA. forest sites and 41% to Eastern WA. agricultural sites. An estimated 61,986 lbs.-active polymer were applied for dewatering biosolids resulting at an average dose near 51.5 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 always in operation and the third centrifuge brought on-line frequently after the first week. Centrifuge feed rates were usually in the range of 150-170 gpm per each. Gas-scrubbing water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs.