

Memorandum

May 15, 2020

TO: Historical Memo

FROM: Carol Nelson, Process Analyst
Pete Carter, Process Engineer

SUBJECT: Brightwater Treatment Plant
April 2020 Operating Record

All discharge permit requirements were met in April at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.0-mg/L and <2.0-mg/L, respectively, and removals were both $\geq 99\%$. All Fecal Coliform results were less than 1-cfu/100-mL. Effluent pH was maintained between 6.7 and 7.2. Continuous dosing of 25% caustic soda (NaOH) was required to assure permit compliance for pH.

Effluent flow to Puget Sound averaged 15.4-mgd. BWTP's max-day flow was 19.5-mgd on April 4. No reclaimed water was distributed offsite this month. An average of 2.4-mgd influent was directed to South Plant in April because of foaming issues in BWTP's Secondary and Digestion processes. The redirection of flow from Brightwater to South Plant did not contribute to any overflow or bypass. Membrane capacity was adequate for the influent flow in April, ranging between 31-mgd and 35-mgd. An average of 0.2-mgd effluent was recycled to the Influent Pump Station (IPS) to flush the influent gates and the reclaimed water line after it was filled with effluent; a small portion of flow was used for the initial filling of the reclaimed water line. Thus, Influent flow to the BWTP averaged 15.6-mgd.

April rainfall totaled 2.4-inches based on local rain gauges. Most rain fell April 1-3 (0.62-inches), and April 22-23 (1.19-inches). Precipitation recorded for SeaTac Airport totaled 1.7-inches for the month, which is 1.0-inch below normal. Local area temperatures were 2.0°F above normal this month. Membrane effluent temperatures increased from 60.3°F to 63.2°F across the month.

All permit-required samples were collected and analyzed. Influent TSS and BOD results for April 2 and 13 were rejected because the results were anomalously low. In both cases, the influent sample lines were subsequently cleaned. The wet well level was lowered on a daily frequency in April, increasing the potential for accumulating rags in the influent lines. Staff will continue to work on additional modifications to improve the effectiveness of the automatic backflushing of the sampler in the coming months.

Influent Pumping: Influent flow was pumped with one to two of the smaller raw sewage pumps (RSPs) this month. Two RSP operation occurred from April 1 to April 4. After April 4, only one RSP was operated to restrict flow and better manage foaming issues in the plant. The maximum flow setpoint for Hollywood Pump Station was 13.5-mgd. North Creek P.S. was used to redirect flows to South Plant.

The practice of "pumping down" the wet well nearly every day was continued in April. In January, the pump-downs were successful at moving large volumes of grit, grease, and rags from the IPS wet well to Brightwater's headworks/screens. Staff continued to observe better performance of the RSPs and lower accumulation of rags on the influent screens in March and April. Influent flow was directed to

only two of the Influent Distribution and Screen Channels, with the goal of reducing grit accumulation in the channels (by increasing the flow velocity). Influent screens 3 and 4 remained out of service.

Primary Treatment: Three of five primary clarifiers (PC) were in service. Solids return flows were directed to PC-1. Regular cleaning of the primary screens continued. A low dose of poly-aluminum chloride (PAC) was added to PC-4 between April 7 and 21 with the goals of improving foaming in the digesters (by increasing the primary sludge to secondary sludge ratio) and in the aeration tanks (by lowering the secondary aeration demand). PAC addition did increase primary solids capture, but it is unclear whether it improved the digestion or secondary treatment processes.

Secondary Treatment: Three aeration basins (AB's) were in service this month. The MLSS averaged 9,720-mg/L and ranged from 8570 to 10,700 mg/L. The solids retention time (SRT) averaged 31-days, which is 8-days more than March's average. Secondary foam was persistent throughout the month. Excessive foam may be related to multiple factors, including influent changes related to the COVID-19 virus response, an increase in the proportion of flow from the Hollywood area, reduced RAS flow, and lower DO concentrations early in the year. The aeration blowers were usually in air-flow control mode (rather than DO-control mode) to better control the foam. Aeration air flow averaged 19,810 scfm, which is nearly 1,200 scfm higher than in March. Running in air-flow control mode was the primary reason for increased air use, along with the longer SRT and more frequent "pump downs". Average DO concentrations were usually held at the desired setpoints, although they dropped below setpoint every afternoon and evening. Surface wasting was the primary method to maintain the MLSS and SRT.

Total-N removal averaged 43%. Full nitrification was achieved most of the month while denitrification was minimal. Ammonia was present in the effluent every afternoon because of inefficient oxygen transfer and the ammonia load from the solids return flows. Effluent $\text{NH}_3\text{-N}$ averaged <0.6-mg/L and effluent nitrite/nitrate (NO_2+NO_3) averaged 33-mg/L as N. Influent TKN averaged 61-mg/L, which is higher than usual for the month of April.

Caustic soda (NaOH) was continually dosed to the secondary process to ensure minimum effluent pH limits were met, and to achieve complete nitrification. The dose averaged 3,913-gpd of 25% NaOH solution or 251 gallons/MG of influent, which is nearly 30 gallons/MG higher than in March.

Membrane effluent turbidity averaged 0.03 - 0.07 NTU. Membrane Trains were in "backpulse" mode this month which helps to reduce membrane fouling when filterability is poor. The turbidity of Train 8 permeate was adequate with two cassettes out of service; two of Train 8's cassettes were repaired in April. Membrane air scour was in LEAP "low" mode until April 8 because filterability was good. However, LEAP low mode contributes to lower DO concentrations in the RAS, which may contribute to lower DO in the aeration basins. After April 8, the LEAP high mode was used. Approximately 5,043-gallons of 12.5% NaOCl were used for membrane maintenance cleans. An additional 1323-gallons of NaOCl was used for a recovery cleans on Trains 5 and 6.

Membrane capacity ranged from 31-mgd to 35-mgd this month, with the lower capacity occurring in the middle of the month. This range was adequate to process the influent flow. Soluble COD (sCOD) in the MLSS continued to correlate well with filterability, i.e., filterability typically degrades when the sCOD in the MLSS is greater than 100-mg/L. SCOD in the MLSS averaged 91-mg/L this month, with values occasionally above 100-mg/L. The maximum hourly flux during peak flow tests was between 13.1 and 15.5 gpd per ft^2 of membrane surface in April.

Table 1 below shows the weekly average trans-membrane pressure (TMP), membrane permeability, and SRT. The rated instantaneous peak hourly flow for one membrane train is 4950-gpm. Peak flow tests were run on two trains per day. Flow setpoints for the peak flow tests were adjusted up/down

depending on the “before-BP” TMP. The flow setpoint for the peak tests ranged between 3750-gpm and 4200-gpm this month.

Disinfection: Approximately 10,040 gallons of 12.5% NaOCl were used in April for final effluent disinfection and process water at IPS. (An additional 280 gallons was used to prepare the reclaimed water system for service.) Hypochlorite effluent disinfection was equal to an average dose of 2.6-mg/L as Cl₂. Hypochlorite was applied through the diffuser. Effluent Cl₂ residual at the outfall (aka Point Wells) met both the monthly and max-weekly permit limits. The monthly average and maximum weekly residuals were 0.13-mg/L and 0.18-mg/L, respectively.

Odor Control: The Odor Control (OC) facilities performed well this month. Two carbon vessels were changed out in April.

Table 1. Trans-membrane pressure, membrane permeability, and SRT.

Parameter	Week ending 4/6	Week ending 4/13	Week ending 4/20	Week ending 4/27
TMP before backpulse, average psi ²	-4.0	-1.3	-1.1	-1.4
TMP before backpulse, peak flow test, psi	-7.5	-7.3	-4.3	-2.7
Permeability temperature-corrected ¹ , gfd/psi	2.2	2.0	4.1	5.8
Flow target for peak flow test, gpm	4130	3840	3760	3990
Flow hourly average during peak flow test, gpm	3290	3050	3010	3230
MB Effluent temperature, degrees F	60.7	61.4	62.1	62.8
SRT, days	39.6	28.0	34.9	23.5
MLSS, mg/L	10,430	10,170	9,570	9,410

¹ Temperature-corrected Permeability based on Peak Flow Test.

² TMPs during the moderate flow period of the day

Thickening: All three gravity belt thickeners (GBTs) were rotated in service this month. The GBTs thickened feed sludge from an average of 1.7% total solids (TS) to 6.6% TS, with an average solids capture of 94.5%. Thickened sludge production totaled 700 dry tons. The polymer dose for thickening averaged 7.3 pounds active polymer per dry tons solids processed.

Anaerobic Digestion: The digestion process met time and temperature requirements for Class B biosolids production. Two digesters and the blended storage tank were in service at the beginning of April. In mid-April the third digester was placed back in service. In the active digesters, the solids retention time averaged 26 days, temperature averaged 97°F, and volatile solids (VS) destruction averaged 62%. The total solids concentration in the active digesters averaged 3.1 % with a VS fraction of 81% VS/TS. The average digester VS load was 0.156 lbs-VS/cu-ft./d with two digesters in service. Monthly gas production is estimated to be 13.6 million ft³ (based on flow meters and VS destruction).

Dewatering/Biosolids: 989 wet tons (199 dry tons at 20.1 % TS) of biosolids were produced and 1041 wet tons (209 dry tons) were hauled in April. Solids recovery in the dewatering process averaged 94.0%. Polymer dosage averaged 58.7 lbs-active per dry ton processed. Dewatering operated 20 days in April using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.8% TS at 80.5% VS/TS. Biosolids product averaged 20.0% TS at 82.9% VS/TS for centrifuge 1 and 20.1 % TS at 82.8 % VS/TS for centrifuge 3.