

Memorandum

July 15, 2020

TO: Historical Memo

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

SUBJECT: Brightwater Treatment Plant
June 2020 Operating Record

All discharge permit requirements were met in June at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.1-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 7.6. Continuous dosing of 25% caustic soda (NaOH) was required to assure permit compliance for pH. Magnesium hydroxide ($Mg(OH)_2$) was used instead of NaOH for five days in June.

Effluent flow to Puget Sound averaged 12.5-mgd. BWTP's max-day flow was 14.5-mgd on June 5. Influent flow to the BWTP averaged 12.8-mgd. Less than 0.1-mgd reclaimed water was distributed offsite this month, and 0.06-mgd of effluent was discharged to York via the reclaimed water line. Less than 0.2-mgd effluent was recycled to the Influent Pump Station (IPS) to flush the influent gates, as well as for tank filling and sprays for the liquid stream processes. An average of 6.1-mgd influent was directed to South Plant in June because of foaming issues in BWTP's Secondary process. 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 June, ranging between 38-mgd and 42-mgd.

June rainfall totaled 3.2-inches based on local rain gauges. Most rain fell June 11-13 when 0.88-inches fell. Precipitation recorded for SeaTac Airport totaled 2.3-inches for the month, which is 0.7-inch above normal. Local area temperatures were 0.9°F above normal this month. Membrane effluent temperatures increased from 65.5°F to 67.5°F across the month.

All permit-required samples were collected and analyzed. Staff will continue to work on additional modifications to improve the effectiveness of the automatic backflushing of the influent sampler in the coming months. Influent concentrations were higher on days when the wet well level was intentionally pumped down to remove grease and rag accumulation from the wet well.

Influent Pumping: Influent flow was pumped with one of the smaller raw sewage pumps (RSPs) this month. From June 1 to June 8, influent flow was restricted to less than 15-mgd to better manage foaming issues in the plant. Flow was further restricted to less than 13-mgd after June 8. 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 was discontinued until the last week of June. From January to May, staff observed benefits from the frequent pumping down of the wet well but became concerned about the possibility that the pump down events were one of the factors contributing to secondary foaming. Pumping down the wet well occurred on June 24, 25, and 29, when the foaming subsided. In previous months, the practice of pumping down the wet well daily was correlated with better performance of the RSPs and lower accumulation of rags on the influent screens. 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 in the two channels in service). 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 until June 9 when it was directed to PC-2. From June 9 to the end of the month PC-2, PC-3, PC-4 were in service. PC-3 was out of service from June 3 to June 9 for cleaning. PC-1 was taken out of service on June 9 for cleaning and inspection. Regular cleaning of the primary screens continued.

Secondary Treatment: Three aeration basins (AB's) were in service this month. The MLSS averaged 7,144-mg/L and ranged from 5,433 to 9,033 mg/L. The solids retention time (SRT) averaged 16.2-days, approximately 16 days less than May's average. Secondary foam continued to be persistent throughout the month. Measures taken this month to decrease foam included reducing the MLSS concentration through surface wasting and mixed liquor wasting, decreasing the SRT, and operating the aeration blowers in air-flow control mode (rather than DO-control mode). Surface wasting was accomplished both by use of a vactor truck, between June 1 and June 19, and continued use of the secondary scum wasting system. By June 24, the MLSS concentration had dropped to 6100-mg/L and the foam collapsed. Aeration air flow averaged 18,850 scfm, approximately 1,100 scfm lower than in May. Average DO concentrations were at or above the desired concentrations.

Total-N removal averaged 32%. Full nitrification was achieved most of the month while denitrification was minimal. Effluent NH₃-N averaged <0.1-mg/L and effluent nitrite/nitrate (NO₂+NO₃) averaged 36-mg/L as N. Influent TKN averaged 55-mg/L, which is low for a summer month. Influent TKN typically averages 60 to 70-mg/L between May and October.

To ensure minimum effluent pH limits were met and to achieve complete nitrification, alkalinity was added continuously with either NaOH or Mg(OH)₂. Mg(OH)₂ addition is a full-scale trial to determine if there are benefits to the secondary process and cost-savings as a result of using Mg(OH)₂ instead of NaOH. The caustic soda dose averaged 3493-gpd of 25% NaOH solution or 272 gallons/MG of influent. The Mg(OH)₂ dose averaged 1540-gpd of 59% solution or 120 gallon/MG of influent (for June 23 - 27). On June 27, the mixer for the Mg(OH)₂ system failed; the system was repaired and returned to service by mid-July. Further tuning of the Mg(OH)₂ dosing system will continue in the coming months.

Membrane effluent turbidity averaged 0.05 - 0.08 NTU. Membrane Trains were in "relax" mode and LEAP "low" mode this month because filterability was good. One additional cassette was repaired in Train 8; all cassettes are in service this month. No recovery cleans were performed this month. Approximately 3232-gallons of 12.5% NaOCl were used for membrane maintenance cleans.

Membrane capacity ranged from 38-mgd to 42-mgd this month, with the lower capacity occurring in the beginning of the month. This range was adequate to process the influent flow. Soluble COD (sCOD) in the MLSS continued to correlate well with filterability as well as temperature, i.e., filterability typically degrades when the sCOD in the MLSS is greater than 100-mg/L. sCOD in the MLSS averaged 64-mg/L this month, with all values below 100-mg/L. The maximum hourly flux during peak flow tests was between 15.5 and 17.3 gpd per ft² of membrane surface in June.

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. Normally, flow setpoints for the peak flow tests were adjusted up/down depending on the "before-BP" TMP. Flow setpoint for the peak tests ranged between 4300-gpm and 4800-gpm this month. Because influent flow was restricted because of foam, the flow setpoint was left at 4500-gpm after June 15 to reduce the stress on the membranes.

Disinfection: Approximately 7,955 gallons of 12.5% NaOCl were used in June for final effluent disinfection and process water at IPS. An additional 1,300 gallons was used for the reclaimed water system. Hypochlorite

effluent disinfection was equal to an average dose of 3.0-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 0.186-mg/L and 0.216-mg/L, respectively.

Odor Control: The Odor Control (OC) facilities performed well this month.

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

Parameter	Week ending 6/1	Week ending 6/8	Week ending 6/15	Week ending 6/22	Week ending 6/29
TMP before backpulse, average psi ²	-1.0	-0.9	-0.9	-0.8	-0.7
TMP before backpulse, peak flow test, psi	-2.5	-2.3	-2.4	-2.1	-2.4
Permeability temperature-corrected ¹ , gfd/psi	6.4	7.3	7.4	7.8	6.8
Flow target for peak flow test, gpm	4170	4470	4715	4500	4500
Flow hourly average during peak flow test, gpm	3415	3680	3815	3680	3680
MB Effluent temperature, degrees F	65.6	65.5	66.1	66.2	67.5
SRT, days	27.7	18.8	15.1	16.1	13.9
MLSS, mg/L	8730	8200	7625	6460	6090

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 1.3% total solids (TS) to 6.2% TS, with an average solids capture of 92.3%. Thickened sludge production totaled 596 dry tons. The polymer dose for thickening averaged 7.9 pounds active polymer per dry tons solids processed.

Anaerobic Digestion: The digestion process met time and temperature requirements for Class B biosolids production. Three digesters and the blended storage tank were in service in June. In the active digesters, the solids retention time averaged 50 days, temperature averaged 99 °F, and volatile solids (VS) destruction averaged 62.3%. The total solids concentration in the active digesters averaged 2.67 % with a VS fraction of 81.7% VS/TS. The average digester VS load was 0.076 lbs-VS/cu-ft./d. Monthly gas production is estimated to be 10.6 million ft³ (based on flow meters and VS destruction).

Dewatering/Biosolids: 909 wet tons (163 dry tons at 19.7 % TS) of biosolids were produced and 980 wet tons (163 dry tons) were hauled in June. Solids recovery in the dewatering process averaged 93.8%. Polymer dosage averaged 53.3 lbs-active per dry ton processed. Dewatering operated 26 days in June using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.44% TS at 80.9% VS/TS. Biosolids product averaged 19.5% TS at 83.4% VS/TS for centrifuge 1 and 19.8 % TS at 83.4 % VS/TS for centrifuge 3.