

Memorandum

August 14, 2020

TO: Historical Memo

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

SUBJECT: Brightwater Treatment Plant
July 2020 Operating Record

All discharge permit requirements were met in July at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.2-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 6.5 and 7.5. Continuous dosing of 25% caustic soda (NaOH) was required to assure permit compliance for pH until July 14th. Magnesium hydroxide ($\text{Mg}(\text{OH})_2$) was used instead of NaOH after July 14.

Effluent flow to Puget Sound averaged 13.6-mgd. BWTP's max-day flow was 16.9-mgd on July 30. Influent flow to the BWTP averaged 14.2-mgd. Approximately 0.4-mgd reclaimed water was distributed offsite this month, and 0.1-mgd of effluent was discharged to York via the reclaimed water line. Less than 0.1-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 2.8-mgd influent was directed to South Plant in July to allow the plant to allow for the recovery of the secondary process, tuning of the magnesium hydroxide addition system, and for planned maintenance. 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 July, ranging between 36-mgd and 42-mgd.

July rainfall totaled 0.5-inches based on local rain gauges. On no day was rainfall more than 0.2-inches. Precipitation recorded for SeaTac Airport totaled 0.2-inches for the month, which is 0.5-inch below normal. Local area temperatures were 1.3°F above normal this month. Membrane effluent temperatures increased from 67.5°F to 70.2°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. Influent flow was restricted to less than 14-mgd from July 1 to July 7, 16-mgd from July 7 to 17, and 18-mgd from July 17 to the end of the month. Flow was restricted to accommodate recovery of the foaming event that ended in late June, for tuning of the magnesium hydroxide addition, and for scheduled maintenance. At times, magnesium hydroxide did not keep up with the demand for alkalinity. When this occurred, additional sodium hydroxide was used and the influent flow was reduced. For five hours on July 29, all influent flow - except for the flow from the Swamp Creek interceptor - was directed to North Creek P.S. to accommodate scheduled maintenance that included removing and replacing an electrical meter at IPS and replacing power supplies for control system hardware at Brightwater and at IPS. The maximum flow setpoint for Hollywood Pump Station was 13.5-mgd. North Creek P.S. was used to redirect flows to South Plant via York P.S.

The practice of “pumping down” the wet well occurred on 19 days in July, primarily during weekdays. 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 four 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-2. From July 9 to the end of the month, PC-1, PC-2, PC-4 were in service. PC-1 was out of service from July 1 to July 9 for inspection. PC-3 was taken out of service on July 9 for cleaning and inspection. Regular cleaning of the primary screens continued. PC5 remained out of service this month.

Secondary Treatment: Three aeration basins (AB's) were in service until July 21 when AB#3 was taken out of service, thus leaving only two AB's in service. The MLSS averaged 4,830-mg/L and ranged from 4,000 to 5,560 mg/L. The solids retention time (SRT) averaged 13.5-days, approximately 3 days less than June's average. The lower MLSS concentration and SRT facilitated maintenance of DO concentrations after taking AB#3 out of service. AB#3 was taken out of service for an annual inspection and installation of the flap gate in the drain channel between the aerobic and anoxic zones. The flap gate will reduce short circuiting between the anoxic and aerobic zones. Secondary foam was minimal this month. The SRT and MLSS was maintained by surface wasting over the scum gates. Aeration blowers were in air-flow control mode until July 14 when they were returned to DO-control mode. Air-flow mode had been helpful in collapsing the foam in June. Aeration air flow averaged 11,900 scfm, approximately 6,900 scfm lower than in June. Average DO concentrations were at or above the desired concentrations.

Total-N removal averaged 37%. Full nitrification was achieved most of the month while denitrification was minimal. Effluent $\text{NH}_3\text{-N}$ averaged $<0.2\text{-mg/L}$ and effluent nitrite/nitrate (NO_2+NO_3) averaged 38-mg/L as N. Influent TKN averaged 63-mg/L, which is typical for a summer month.

To ensure minimum effluent pH limits were met and to achieve complete nitrification, alkalinity was added continuously as either 25% NaOH or 59% $\text{Mg}(\text{OH})_2$. $\text{Mg}(\text{OH})_2$ addition is a full-scale trial to determine if there are benefits to the secondary process and cost-savings as a result of using $\text{Mg}(\text{OH})_2$ instead of NaOH. The caustic soda dose averaged 3388-gpd of 25% NaOH solution or 254 gallons/MG of influent. The $\text{Mg}(\text{OH})_2$ dose averaged 1858-gpd of 59% solution or 123 gallon/MG of influent (for July 14 - 31). Between July 1 and July 14, the $\text{Mg}(\text{OH})_2$ addition was out of service while the tank mixer was replaced. Further tuning of the $\text{Mg}(\text{OH})_2$ dosing system will continue in the coming months.

Membrane effluent turbidity averaged 0.06 - 0.09 NTU. Membrane Trains were in “relax” mode and LEAP “low” mode this month because filterability was good. All cassettes were in service this month. Recovery cleans were performed on Trains 3 and 7 this month. Approximately 3850-gallons of 12.5% NaOCl were used for membrane maintenance cleans and 1280-gallons of the same solution were used for recovery cleans.

Membrane capacity ranged from 36-mgd to 42-mgd this month, with the lower capacity occurring after July 21. This range was well above the range needed 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 125-mg/L this month, with values over 150-mg/L after July 21. The maximum hourly flux during peak flow tests was between 14.1 and 16.9 gpd per ft^2 of membrane surface in July.

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 TMP

before backpulse. Flow setpoint for the peak tests ranged between 4100-gpm and 4500-gpm this month. The flow setpoint was reduced after July 20 because some train TMPs had reached -8.0-psi.

Disinfection: Approximately 20,100 gallons of 12.5% NaOCl were used in July for final effluent disinfection and process water at IPS. An additional 3,600 gallons was used for the reclaimed water system. Hypochlorite effluent disinfection was equal to an average dose of 6.8-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 0.14-mg/L and 0.16-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 7/6	Week ending 7/13	Week ending 7/20	Week ending 7/27
TMP before backpulse, average psi ²	-0.7	-0.9	-1.0	-1.0
TMP before backpulse, peak flow test, psi	-2.9	-3.5	-5.6	-6.9
Permeability temperature-corrected ¹ , gfd/psi	5.7	4.7	2.9	2.5
Flow target for peak flow test, gpm	4500	4500	4500	4160
Flow hourly average during peak flow test, gpm	3660	3700	3690	3310
MB Effluent temperature, degrees F	67.5	67.8	68.5	69.6
SRT, days	13.7	10.5	14.9	13.2
MLSS, mg/L	5165	4685	4290	4910

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 1.6% total solids (TS) to 6.3% TS, with an average solids capture of 91.8%. Thickened sludge production totaled 636 dry tons. The polymer dose for thickening averaged 7.8 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 July. In the active digesters, the solids retention time averaged 31.4 days, temperature averaged 99 °F, and volatile solids (VS) destruction averaged 61.4%. The total solids concentration in the active digesters averaged 2.79 % with a VS fraction of 82.9% VS/TS. The average digester VS load was 0.089 lbs-VS/cu-ft./d. Monthly gas production is estimated to be 10.7 million ft³ (based on flow meters and VS destruction).

Dewatering/Biosolids: 1273 wet tons (247 dry tons at 19.4 % TS) of biosolids were produced and 1297 wet tons (252 dry tons) were hauled in July. Solids recovery in the dewatering process averaged 94.4%. Polymer dosage averaged 51.8 lbs-active per dry ton processed. Dewatering operated 28 days in July using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.46% TS at 81.8 % VS/TS. Biosolids product averaged 19.4% TS at 84.1% VS/TS for centrifuge 1 and 19.5 % TS at 84.1 % VS/TS for centrifuge 3.