

Memorandum

May 14, 2020

TO: Historical Memo

FROM: Carol Nelson, Process Analyst
Samayyah Williams, Process Engineer

SUBJECT: Brightwater Treatment Plant
April 2021 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 <1.2-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 6.6 and 7.5. Continuous dosing of 59% Magnesium Hydroxide ($\text{Mg}(\text{OH})_2$) was required to assure permit compliance for pH. All permit-required samples were collected and analyzed.

Effluent flow to Puget Sound averaged 17.7-MGD. The max-day effluent flow was 21.3-MGD on April 1. Influent flow averaged 17.7-MGD; less than 0.1-MGD effluent was recycled to the Influent Pump Station (IPS). No reclaimed water was distributed offsite. Influent flow redirected to South Treatment Plant averaged less than 0.1-MGD. Flow was redirected primarily via the North Creek Pump Station (PS) to facilitate cleaning of the influent pump station (IPS) wet well. The redirection of flow from BWTP to South Plant did not contribute to any overflow or bypass. From April 27 to April 30, influent flow included approximately 0.5-MG of effluent drained from the reclaimed water line. Membrane capacity was adequate for the influent flow in April with measured capacity ranging between 43-MGD and 45-MGD.

April rainfall totaled 1.3-inches based on local rain gauges. The highest rainfall event occurred on April 24 (0.5-inches). The maximum influent and effluent flow occurred on April 1. Precipitation recorded for SeaTac Airport totaled 1.0-inches for the month, which is 1.7-inches below normal. Local area air temperatures were 3.0°F above normal this month. Membrane effluent temperatures increased from 60.0°F to 63.5°F between April 1 and April 30.

All permit-required samples were collected and analyzed. Influent sample results for April 5 and April 28 were rejected because of unusually low TSS results; it's likely that the sampling system was plugged. Influent and effluent BOD incubated samples collected between April 25 and April 29 were outside of their temperature range from sometime after 10:30AM on April 30 to a time after 07:00 on May 1. The incubator temperature was restored on May 1 and the 5-day incubation period continued. Less than the ideal three seed dilutions and sample duplicates were used for BOD sample reporting from April 25, 27, and 29. BOD results for the April 28 samples did not meet QA/QC criteria and were not reported. All reported results were within QA/QC limits and were consistent with the days before April 25 and after April 30.

Influent Pumping: Influent flow was pumped using the two small raw sewage pump sets (RSP). Two RSPs were required for up to 8 hours per day, while just one RSP operated the other times of the day. Only one RSP was required on three days. In April, when influent was diverted to South Plant, it was usually sent via York PS and the North Creek PS. On two days in April, influent flow was also directed to

South Plant via the Hollywood diversion and York PS to facilitate testing of the diversion gates. The maximum flow setpoint for Hollywood PS remained at 13.5-mgd. The 13.5-mgd flow cap prevents high levels in the conveyance system between Hollywood P.S. and Woodinville PS.

The IPS wet well was “pumped down” on 21 days in April to remove grease and rags. The resulting low wet well level was maintained for a longer period every Tuesday and for shorter periods on the other weekdays. On all but 4 days this month, there was redirection of influent flow during the pump downs. Influent flow to the plant was reduced for 2 hours on 3 of the days, and 8 hours on another day to control the rate of screenings arriving at the headworks. Influent flow was directed to only Influent Screens 1 and 2 this month, with the goal of reducing grit accumulation in the channels. Repair of Influent Screen 3 continued this month.

Primary Treatment: Three of five primary clarifiers (PC), PC-1, PC-2, and PC-4, were in service this month. Solids return flows were directed to PC-2 this month. Regular cleaning of the primary effluent screens continued.

Secondary Treatment: All three aeration basins (AB's) were in service this month. The MLSS averaged 7,755-mg/L and ranged from 7,170 to 8,230 mg/L. The solids retention time (SRT) averaged 23.5-days. Secondary foam was minimal this month. The SRT and MLSS was maintained by surface wasting over the scum gates. Aeration blowers were in DO-control mode this month. Aeration air flow averaged 11,270-scfm. On average, DO concentrations were at or above the desired levels. Construction activities included vendor acceptance-testing of the new aeration flow control valves for each aeration zone.

Total-N removal averaged 30%. Full nitrification was achieved this month while denitrification was minimal. Effluent $\text{NH}_3\text{-N}$ averaged $<0.1\text{-mg/L}$, effluent nitrite/nitrate (NO_2+NO_3) averaged 40-mg/L as N and Influent TKN averaged 60-mg/L, 7-mg/L higher than it was in March.

Alkalinity in the form of a 59% $\text{Mg}(\text{OH})_2$ solution was added to the secondary process to ensure minimum effluent pH limits were met and to achieve complete nitrification. $\text{Mg}(\text{OH})_2$ addition is a full-scale trial to determine any operational benefits and cost-savings compared with using 25% NaOH solution. The 59% $\text{Mg}(\text{OH})_2$ solution dose averaged 2,275-gpd or 129 gallons/MG of influent, which is nearly 8% greater than the dose used in March. The increase was due to an increase in the demand because of the increased influent ammonia concentration in April. The $\text{Mg}(\text{OH})_2$ pumping system had adequate capacity for the alkalinity demand in April. No NaOH was used for alkalinity addition this month. A new level sensor for the $\text{Mg}(\text{OH})_2$ bulk tank was installed in March, improving inventory control. A new flowmeter to further improve monitoring and control will be installed in May.

Membrane effluent turbidity averaged 0.02 - 0.04 NTU. Membrane Trains were in “relax” mode and LEAP “low” mode this month because filterability was very good. All cassettes were in service. Approximately 5290-gallons of 12.5% NaOCl were used for membrane maintenance cleans, and 1470-gallons for recovery cleans on Trains 2 and 4.

Membrane capacity remained between 43-mgd and 45-mgd this month, with very little change in permeability. This range was well above the range needed to process the influent flow. Soluble COD (sCOD) in the MLSS averaged 64-mg/L this month, which is 8-mg/L lower than last month. Filterability, as measured by the peak flow tests described below did increase slightly, correlating with the lower sCOD this month. The maximum hourly flux during peak flow tests was between 16 and 18 gpd per ft^2 of membrane surface in April.

Table 1 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 are adjusted up/down depending on the TMP before backpulse. The flow setpoint remained at 4800-gpm this month. TMPs did not drop below -4.0 psi during the peak flow test this month, indicating that the capacity is adequate for the peak hourly design flow. Changes in permeability with time are observed more easily when the flow setpoint remains constant.

Disinfection: Approximately 7,210 gallons of 12.5% NaOCl were used in April for final effluent disinfection and process water at IPS. The hypochlorite effluent disinfection dose averaged 1.9-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 0.06-mg/L and 0.7-mg/L, respectively.

Odor Control: The Odor Control (OC) facilities performed well this month. Repairs on the hypochlorite and caustic addition systems continued this month. Other work that is ongoing includes replacement of one fan motor mount in the Headworks / Primary area and investigation into the cause of the catastrophic loss of one fan motor in the Secondary area. The redundant systems were in service while these two fans were out of service. Maintenance work was also performed on the bioscrubber recirculation systems this month to ensure adequate flow through the Headworks and Solids bioscrubbers.

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

Parameter	Week ending 4/5	Week ending 4/12	Week ending 4/19	Week ending 4/26
TMP before backpulse, average psi ²	-1.1	-1.0	-1.0	-1.0
TMP before backpulse, peak flow test, psi	-2.8	-2.7	-2.7	-2.3
Permeability temperature-corrected ¹ , gfd/psi	6.9	7.2	7.2	8.1
Flow target for peak flow test, gpm	4800	4800	4800	4800
Flow hourly average during peak flow test, gpm	3854	3896	3928	3898
MBR Effluent temperature, degrees F	60.1	60.7	61.4	62.9
SRT, days	20.5	28.1	24.9	21.5
MLSS, mg/L	7347	7540	8100	7920

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 1.4% total solids (TS) to 6.8% TS, with an average solids capture of 92.3%. Sludge loading to the thickeners totaled 695 dry tons. The polymer dose for thickening averaged 5.8 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 April. In the active digesters, the solids retention time averaged 34.7 days, temperature averaged 98.7°F, and volatile solids (VS) destruction averaged 59.9%. The total solids concentration in the active digesters averaged 2.9% with a VS fraction of 82.6% VS/TS. The average digester VS load was 0.113 lbs-VS/cu-ft./d. Monthly gas production was measured to be 15.2 million ft³ (based on the flow meters).

Drawdown of the storage tank began April 20 for the upcoming foam spray project scheduled to begin early July 2021. The project requires the storage tank to be drained, flushed, purged, and locked out prior to start of work. Similarly, drawdown of sludge levels in Digester 3 occurred the same day to prepare the tank for operation as the temporary digested sludge storage tank. It is expected to operate as the storage

tank until foam spray project work is completed in November 2021 and following additional modifications to the low-pressure gas supply piping leading to the waste gas burners.

Dewatering/Biosolids: All biosolids met the requirements for Class B. Dewatering operated all 30 days in April, using both Centrifuges 1 and 3. Centrifuge feed averaged 2.5% TS and 82.0% VS/TS for the month. Centrifuge biosolids product averaged 20.0% TS at 84.2% VS/TS for centrifuge 1 and 20.4% TS at 83.9% VS/TS for centrifuge 3. A total of 291 dry tons of solids were processed (according to the feed flow meters and % solids) and 1,365 wet tons (276 dry tons at 20.2% TS) of biosolids cake were produced. A total of 1,423 wet tons (287 dry tons) of biosolids cake were hauled in April. Solids recovery in the dewatering process averaged 94.4%. Polymer dosage averaged 51.2 lbs-active per dry ton produced.