

Memorandum

October 15, 2020

TO: Historical Memo

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

SUBJECT: Brightwater Treatment Plant
September 2020 Operating Record

All discharge permit requirements were met in September at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged 1.5-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 7.0 and 8.0. Continuous dosing of 59% magnesium hydroxide ($\text{Mg}(\text{OH})_2$) was required to assure permit compliance for pH. Caustic soda (NaOH) was used to supplement the dose of $\text{Mg}(\text{OH})_2$ during 20 days of the month, primarily at a low dose during the evening hours.

Effluent flow to Puget Sound averaged 16.1-mgd. BWTP's max-day flow was 18.2-mgd on Sep 25. Influent flow to the BWTP averaged 16.3-mgd. Less than 0.2-mgd effluent was recycled to the Influent Pump Station (IPS) to flush the influent gates, and for tank filling and sprays for the liquid stream processes. Very little reclaimed water was distributed offsite this month. An average of 0.6-mgd influent was directed to South Plant in September to allow for planned maintenance, wet well cleaning, and tuning of the magnesium hydroxide addition system. 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 September, ranging between 41-mgd and 42-mgd.

September rainfall totaled 4.5-inches based on local rain gauges. Most rain fell on Sep 18-19 (0.8-inches) and Sep 23-26 (3.4-inches). Precipitation recorded for SeaTac Airport totaled 2.5-inches for the month, which is 1.0-inch above normal. Local area temperatures were 4.2°F above normal this month. Membrane effluent temperatures increased during the first two weeks of the month, from 70.6°F to 71.8°F, and then decreased by 1°F (to 70.8°F) during the last two weeks.

All permit-required samples were collected and analyzed. The results for the Sep 24 influent sample were rejected because of low TSS results; most likely the sampling system was plugged. 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 20-mgd this month. Flow was restricted to accommodate tuning of the $\text{Mg}(\text{OH})_2$ addition, and for maintenance of Aeration Basins. Two RSP operation results in a flow of over 24-mgd; this causes additional load on the screenings systems and increases alkalinity addition pumping requirements. The $\text{Mg}(\text{OH})_2$ pump will be upsized next month so sufficient $\text{Mg}(\text{OH})_2$ can be added at the higher flows. 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. Influent flow was briefly

directed to South Plant on Sep 30 for repairs to the process water system and preventative maintenance on electrical transfer switches.

The practice of “pumping down” the wet well occurred on 18 days in September. In previous months, the practice of pumping down the wet well daily 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. 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. PC-1, PC-2, PC-4 were in service all month and PC5 and PC3 remained out of service. Plans were made to inspect and install a new scum skimmer in PC-3. Regular cleaning of the primary screens continued.

Secondary Treatment: Two aeration basins (AB's) were in service in September. The MLSS averaged 7,390-mg/L and ranged from 5,570 to 8,500 mg/L. The solids retention time (SRT) averaged 22.6-days, approximately 7.5 days more than August's average. AB#1 was out of service from Aug. 28 to Sep. 27, AB#3 was out of service from Sep. 27 to Oct. 1. Maintenance inspected and replaced aeration fouled diffusers in AB#1, primarily in zones 3 and 4. Construction activities performed in September included installation of spool pieces in the aeration headers for AB#1 and AB#3. The spool pieces will facilitate the installation of flow control valves and flowmeters for each aeration zone later this fall. Secondary foam was minimal this month. The SRT and MLSS was maintained by surface wasting over the scum gates. Aeration blowers were in to DO-control mode this month. Aeration air flow averaged 10,820 scfm, approximately 100 scfm higher than in August. Average DO concentrations were at the desired concentrations during most of each day.

Total-N removal averaged 43%. Full nitrification was achieved most of the month while denitrification was minimal. Effluent $\text{NH}_3\text{-N}$ averaged <0.8-mg/L and effluent nitrite/nitrate (NO_2+NO_3) averaged 35-mg/L as N. Influent TKN averaged 66-mg/L, 4-mg/L lower than in August.

To ensure minimum effluent pH limits were met and to achieve complete nitrification, alkalinity was added continuously as 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 $\text{Mg}(\text{OH})_2$ dose averaged 1,763-gpd of 59% solution or 108 gallon/MG of influent. Caustic soda was used to supplement the $\text{Mg}(\text{OH})_2$ dose at a higher dose, averaging 2460-gpd or 153-g/MG of influent, during 7 days of the month. The higher dose was needed while repairs were made to the $\text{Mg}(\text{OH})_2$ pump. For the rest of the month, the caustic soda dose was lower, averaging 690 gpd or 42 g/MG of influent. Plans are in place to install a larger $\text{Mg}(\text{OH})_2$ dosing pump soon in order to meet the full alkalinity demand, and then retune the controls.

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 5 and 6 this month. Approximately 5040-gallons of 12.5% NaOCl were used for membrane maintenance cleans and 1080-gallons of the same solution were used for three recovery cleans. The field service representative from Suez visited to assist with cassette inspections, adjusting the program from peak flow tests, and checking the leap aeration system. Fiber damage was discovered on Train 3, but the train performed adequately this month.

Membrane capacity remained between 41 and 42-mgd this month, with permeability improving across the month. 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 66-mg/L this month, 40-mg/L lower than last month. There was also a longer SRT during the last two weeks of the month. The maximum hourly flux during peak flow tests was between 13 and 16 gpd per ft² of membrane surface in September.

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 were adjusted up/down depending on the TMP before backpulse. The flow setpoint remained at 4500 gpm this month to reduce an excess stress on the membrane system while influent flows were low.

Disinfection: Approximately 7930 gallons of 12.5% NaOCl were used in September for final effluent disinfection and process water at IPS, based on totalized flowmeter readings. The hypochlorite effluent disinfection dose averaged 2.4-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 <0.05-mg/L and 0.08-mg/L, respectively. A sizeable leak in the hypochlorite piping near the recirculation pumps, estimated to be 14,200 gallons, was discovered and repaired. Any leaks from this area are pumped back to the plant headworks. The size of the leak was estimated from tank levels and deliveries to Brightwater.

Odor Control: The Odor Control (OC) facilities performed well this month. Repairs on the hypochlorite addition systems continued this month.

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

| Parameter | Week ending 9/7 | Week ending 9/14 | Week ending 9/21 | Week ending 9/28 |
|---|-----------------|------------------|------------------|------------------|
| TMP before backpulse, average psi ² | -0.8 | -0.8 | -0.9 | -0.9 |
| TMP before backpulse, peak flow test, psi | -2.0 | -2.1 | -2.0 | -1.9 |
| Permeability temperature-corrected ¹ , gfd/psi | 7.1 | 7.1 | 7.1 | 7.8 |
| Flow target for peak flow test, gpm | 4500 | 4500 | 4500 | 4500 |
| Flow hourly average during peak flow test, gpm | 3429 | 3473 | 3418 | 3341 |
| MB Effluent temperature, degrees F | 71.3 | 71.5 | 71.9 | 71.2 |
| SRT, days | 17.5 | 17.7 | 30.3 | 26.3 |
| MLSS, mg/L | 6470 | 7170 | 7810 | 7750 |

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 1.5% total solids (TS) to 6.1% TS, with an average solids capture of 92.0%. Sludge loading to the thickeners totaled 662 dry tons. The polymer dose for thickening averaged 8.0 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 September. In the active digesters, the solids retention time averaged 48 days, temperature averaged 99°F, and volatile solids (VS) destruction averaged 63.7%. The total solids concentration in the active digesters averaged 2.73% with a VS fraction of 82.9% VS/TS. The average digester VS load was 0.076 lbs-VS/cu-ft./d. Monthly gas production is estimated to be 13.5 million ft³ (based on flow meters and VS destruction).

Dewatering/Biosolids: A total of 1251 wet tons (268 dry tons at 20.2% TS) of biosolids were processed through dewatering and 1422 wet tons (287 dry tons) were hauled in September. Solids recovery in the dewatering process averaged 93.8%. Polymer dosage averaged 54.2 lbs-active per dry ton processed. Dewatering operated 30 days in September using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.41% TS at 81.3 % VS/TS. Biosolids product averaged 20.3% TS at 83.2% VS/TS for centrifuge 1 and 20.1 % TS at 83.1 % VS/TS for centrifuge 3.