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## STAFF REPORT

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| **Agenda Item:** | 8 | **Name:** | Mike Reed |
| **Proposed No**.: | 2021-B0014 | **Date:** | February 3, 2021 |

**SUBJECT**

Treatment Plant Flows and Loadings Study Summary Report, November 2019

**SUMMARY**

The Treatment Plant Flows and Loadings Study Summary Report (November 2019), prepared under contract for the Wastewater Treatment Division, summarizes projections and identifies capacity limitations for each major treatment process at WTD’s regional wastewater treatment plants—West Point Treatment Plant, South Treatment Plant, and Brightwater Treatment Plant. The Report notes that water conservation efforts have reduced the amount of potable water used on a per capita basis within the service area of the plants, directly impacting the amount of wastewater flow, but not impacting solids loading. As a result, wastewater flows at the plants now contain more load per flow than previously.

The report identifies a number of key systems that are nearing or at capacity, including primary clarifiers at South Plant; raw sewage pumps, secondary system aerators and digestion aerators at West Point, and aeration basins and centrifuges at Brightwater.

**BACKGROUND**

The volumes of projected wastewater flows (liquids) and loads (solids) compared to plant treatment processing capacity are critical to assessing the need for upgraded or added treatment capacity. The November 2019 Treatment Plant Flows and Loadings Study Summary Report (“the Report”) summarizes capacity limitations for major system components at each of the regional treatment facilities, and describes projected solids and liquids volumes in coming years and decades. The Report, prepared under contract by Brown and Caldwell, is based on population and employment forecasts provided by the Puget Sound Regional Council that reflect the most recent U.S. Census data; as well as WTD water use, water conservation and service area growth rate assumptions.

Council staff notes several key considerations regarding the Report:

* The Report notes that current regulatory requirements are assumed. Committee members are aware that major additional regulatory requirements related to nutrients removal are currently being developed by the Washington Department of Ecology.
* While it is noted that capacity limitations can be reported in a number of ways according to different flow periods, this report relies primarily on monthly average flows and loadings; peak flows will significantly exceed monthly averages.

**Treatment Plant Flows and Loadings Study Summary Report**

The Wastewater Treatment Division has historically updated its Flows and Loads projections every ten years. Historically, wastewater “flows” were taken as the key indicator in evaluating processing capacity; flows and loads volumes were anticipated to vary in approximately equal proportions.

However, in recent years, jurisdictions have undertaken aggressive water conservation measures. As a result, the report indicates, the relationship between liquid flows and solids loading has shifted; loading of solids is the greater near-term concern generally, as population growth has accelerated over the past decade.

Wastewater treatment facilities are complex systems, composed of numerous components; these various components have different capacity limits. Overall capacity limits are defined by the components with the most constrained limits, and addressing these lower limits by upgrading or expansion can mitigate short-term capacity constraints.

**Plant-Specific Flows and Loadings—Limits and Anticipated Exceedance Dates**

**South Plant**

The current design maximum month flow capacity (144 mgd) is not expected to be exceeded until after 2040.

Current design maximum month loads, expressed as Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS), are expected to reach limits sooner; for BOD, limits of 251,000 lbs/day are projected to be reached in 2030, while TSS load limits of 235,000 lbs/day are projected to be reached in 2025.

***South Plant Near Term Capacity Limits***

Primary clarifiers at South Plant are currently “at capacity” due to surface overflow rate limitations; the Report indicates that this is not considered a “hard” limitation because the clarifiers are not hydraulically limited until after 2050, and higher flows can pass through the clarifiers; however, the removal efficiency will decrease, increasing loadings to the downstream secondary system.

Digesters will reach capacity limits within the next 10 years (the Report was published November 2019); this limitation can be delayed by improving the digester heating system.

**West Point**

The current design maximum month flow capacity (215 mgd) is not expected to be exceeded until 2050.

For BOD, limits of 201,000 lbs/day, are already being approached according to the Report; observed loadings of about 185,000 lbs/day for 2018 are reported. The Report also indicates that TSS load limits of 218,000 lbs/day are also being approached; observed loadings of about 200,000 lbs/day for 2018 are reported.

***West Point Near Term Capacity Limits***

West Point is operating near or at capacity for raw sewage pumps, secondary system aerators, and digestion aerators. A current project would increase raw sewage pump capacity; while Stage 1 aerators are approaching capacity limits, there is currently excess secondary clarifier capacity, so this limitation wouldn’t pose an immediate plant capacity constraint, according to the Report. Several options are identified by the Report to increase digester capacity, including addition of a new digester, conversion to an advanced digestion process, or addition of a pretreatment process to accommodate higher organic solids loading rates.

**Brightwater**

The current design maximum month flow capacity (40.9 mgd) is not expected to be exceeded until about 2037.

For BOD, limits of 66,063 lbs/day were projected to be reached in 2020 (observed loadings over 50,000 lbs/day were reported for 2018), while TSS load limits of 61,400 lbs/day are projected to be reached in 2023 (observed loadings of about 45,000 lbs/day were reported for 2018),.

***Brightwater Near Term Capacity Limits***

The Brightwater MBR system has experienced temporary reductions in capacity due to poor sludge filterabiity; historical data indicate large variability in membrane capacity. Based on recent performance, two more membrane basins would be needed by 2025.

The aeration basins and the aeration system are already capacity limited. Aeration Basin 4 is currently needed, and Aeration Basin 5 will be needed around 2027. An aeration system improvement project is currently underway, which may extend aeration blower capacity. The Report notes that the need for additional aeration basin capacity could be delayed by operating primary clarifiers in an alternative mode that would have the effect of increasing overall sludge production rates; this would accelerate solids treatment capacity constraints.

The capacity of centrifuges, and the dewatering system, is currently capacity limited. A third centrifuge is needed to increase dewatering system capacity. If the operating schedule of the dewatering system was extended from the current 18 hours/day to continuous operation, overall capacity would increase but the system would still be at capacity according to the Report.

**Next Steps**

Under “Next Steps”, the Report notes that it has identified capacity needs but did not identify specific projects or approaches to address those needs, and that detailed alternative analyses, including cost estimates and asset management considerations, are needed to determine specific operational or capacity expansion projects. Evaluating options and defining projects to address near term process capacity constraints should be initiated soon, the Report recommends. WTD will need to begin planning for midterm and long-term capacity concerns as well, as planning, design and construction of those major projects can take ten years or more.

**INVITED**

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**ATTACHMENTS**

1. Treatment Plant Flows and Loadings Study Summary Report, November 2019
2. WTD Treatment Plant Flows and Loadings Study Presentation