WATER DESIGN-BUILD COUNCIL

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CHALLENGE

Located on the banks of the Puget Sound, Joint Base Lewis McChord (JBLM), was faced with meeting the wastewater treatment needs of a growing population with a 60-year old wastewater treatment facility. The US Army Corps of Engineers (ACOE) was challenged with the following: improving treatment technologies to remove nutrients; effectively operating the plant which experiences significant swings in seasonal flows and loads; and helping the existing operations and maintenance (O&M) plant staff transition to a new facility with higher operational complexity.

APPROACH

ACOE selected CDM Smith as an integrated design-build firm to design, construct and commission a new 4.4 mgd wastewater treatment facility within 720 days on a green field site adjacent to the existing wastewater plant. The state-of-the-art treatment facility was designed to support, ultimately achieving "zero discharge" goals by providing tertiary treatment with membrane filtration and ultraviolet (UV) disinfection for potential future re-use of 100% of the plant effluent, as well as anaerobic digestion, producing a Class B bio-solid. In addition, space was accommodated on site and within buildings for future facility expansion. The new treatment facility included:

- Influent pump station with self-cleaning wet well and automated de-ragging
- Influent screens, complete with screenings washer/compactor and grit removal.
- Rectangular primary clarification – with controls to capture shock loadings.
- Four-stage Bardenpho process with high-efficiency turbo blowers and circular secondary clarifiers to achieve 3 mg/L total inorganic nitrogen. (BioWin modeling was used to optimize the size of the secondary system, and minimize use of methanol for supplemental carbon).
- Tertiary treatment utilizing pressure membrane filtration and UV disinfection.

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- Multi-purpose UV disinfection, designed to treat to secondary effluent standards or reuse standards depending on whether treating secondary clarifier effluent or membrane permeate.
- Gravity belt thickeners for sludge thickening, anaerobic digestion with use of biogas for process heating, followed by belt filter press dewatering and on-site storage of Class B biosolids.
- Site/civil design, including a safe and logical traffic circulation (vehicular and pedestrian) and parking, utility connections, and the required fire pumping and storage system.

Because of the design-build approach, CDM Smith and ACOE were able to engage with stakeholders early and collaborate throughout the project to fast-track the schedule.

RESULTS

Design-build provided CDM Smith with extra time to optimize the layout of the facility. The streamlined site design involved collocating the thickening and dewatering facilities, positioning the main electrical building near the largest electrical loads, and separating the administration building from the main plant traffic. The end result was an efficient and operator-friendly layout, which reduced the facility footprint. The new administration building was also designed with a state-of-the-art laboratory and is on track to achieve LEED Silver (or possibly Gold) certification. Construction features included the use of locally sourced materials, natural day lighting, and rain gardens for storm water management. The plant was recently successfully started with simultaneous decommissioning of the old plant and has now entered a period of performance testing to demonstrate the full range of operability. The new plant has quickly achieved effluent quality in conformance with Washington discharge limits. Moreover, it is in the process of achieving further nutrient removal and reuse water quality to fully support a "zero discharge" facility that will continue to serve JBLM's needs well into the future as well as remain a reliable environmental steward in the northwest and the Puget Sound watershed.

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