

PROJECT DESCRIPTION

Grantee: Town of Front Royal

Grant: #440-S-14-08

The Front Royal Wastewater Treatment Plant (WWTP) is a 4.0 million gallon per day (mgd) municipal wastewater treatment plant that currently treats an average flow of 3.25 mgd to typical secondary effluent limits for biological oxygen demand (BOD) and total suspended solids (TSS). Effluent from the facility is discharged to the Shenandoah River.

The Virginia DEQ (VADEQ) has developed a waste load allocation for the Front Royal WWTP, limiting the amount of nitrogen and phosphorus that the plant can discharge annually. These limits are 48,729 lbs/year total nitrogen (TN) and 3,655 lbs/yr total phosphorus (TP) and will go into effect when the VADEQ issues the Certificate to Operate (CTO). The Front Royal WWTP will be required to undergo a plant upgrade in order to comply with this waste load allocation. At the plant expansion capacity of 5.3 mgd, the resulting effluent annual average TN and TP concentration limits will be 3.0 mg/L and 0.22 mg/L, respectively, in order to meet the annual waste load allocation.

Three alternatives were considered for the Front Royal WWTP ENR Upgrade and Expansion. A Four-stage Bardenpho process enhanced with magnetite ballasted settling and followed by secondary clarifiers was selected. This technology which uses magnetite to increase the specific gravity of biological floc. This process allows for higher concentrations of mixed liquor in the aeration tanks (allowing a four-stage process to fit within the same tankage as a conventional MLE) and higher loading rates to the clarifiers (reducing the clarifier surface area required). This process can achieve low levels of effluent TP without downstream filtration.

The following list of improvements is based on the Preliminary Engineering Report (PER):

- New Headworks Building Including Fine Screening – not grant eligible
- New Grit Removal System – not grant eligible
- New Primary Clarifier – partially grant eligible
- Existing Primary Clarifier Improvements – not grant eligible
- New Reactor Flow Distribution Box – partially grant eligible
- Existing Reactor Tank Improvements – partially grant eligible
- New Post Anoxic and Reaeration Reactors – partially grant eligible
- New Process Equipment Building – partially grant eligible
- Parallel Final Clarifier Flow Distribution Box – partially grant eligible
- Existing Final Clarifier Improvements – not grant eligible
- New Final Clarifiers and Return Activated Sludge (RAS) Pumping Station – partially grant eligible
- New UV Structure – not grant eligible
- Chemical Feed Facilities for Alum, Caustic Soda, and Supplemental Carbon – grant eligible
- New Sludge Cake Storage Building – partially grant eligible
- Conversion of Existing Digesters to Auto-Thermal Aerobic Digesters (ATAD) – partially grant eligible
- Second Dewatering Fan Press (to be installed by the Town, not included in primary contract) partially grant eligible