

Recent Wastewater Challenges in the Village of Greene, N.Y.

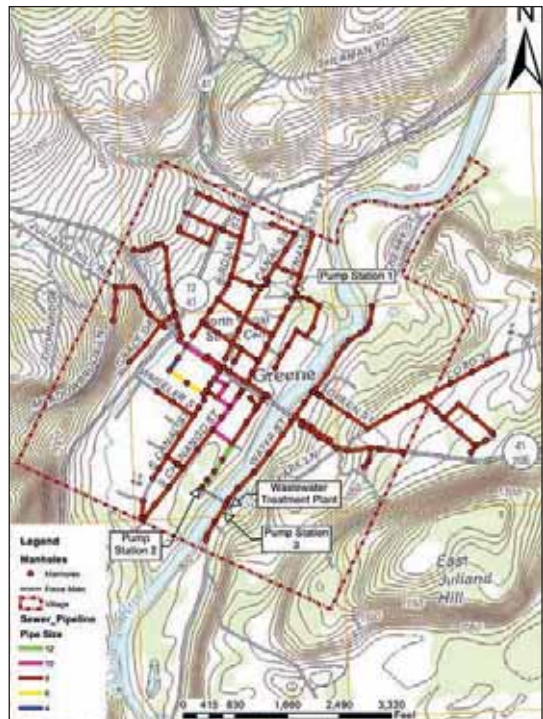
by Jason L. Bellis

The Village of Greene, New York (the Village) is in the southwest corner of Chenango County, approximately 18 miles northeast of the City of Binghamton, New York. The Village is situated on the Chenango River at the intersection of New York State Route 12 and New York State Route 206. It is centered within the Town of Greene and has a total land area of approximately 1.1 square miles with a population of approximately 1,600 persons.

The Village Sanitary Sewer Collection System

The Village sanitary sewer collection system (*Figure 1*) consists of roughly 8.8 miles of gravity sewer main, a portion of which was installed in the 1920s, with the majority installed in 1968/1969 as Class 240 asbestos cement pipe. Additionally, roughly 1,000 feet of force main serves three pump stations in the Village. Presently, there are no known combined storm/sanitary sewers existing within the Village. However, prior to 1968/1969, the existing storm system was utilized as a combined sewer. The existing storm sewer, constructed around 1920, consists of 2-foot sections of vitrified clay pipe with bituminous or oakum joints.

In 1980, an evaluation of the existing sanitary collection system was performed, which included the results of physical surveys, rainfall simulation, preparatory cleaning and internal inspections. The study concluded there was “excessive” infiltration and inflow in the collection system, and a system rehabilitation program was proposed. In 2012, the Village was awarded an Engineering Planning Grant through the New York State Consolidated Funding Application to generate a Preliminary Engineering Report to further evaluate the existing sanitary collection system; develop a preliminary basis of design for rehabilitation, inclusive of estimated capital, operation and maintenance costs; and provide the foundation for the Village and project stakeholders to pursue project funding.



Credit: Larson Design Group

Figure 1. Map of the Village of Greene Sanitary Collection System

The Village Water Resource Recovery Facility

In 1968, the Village of Greene Water Resource Recovery Facility (Village WRRF) was constructed and was designed to provide 80 percent Biological Oxygen Demand (BOD) and suspended solids (SS) removal at a design flow rate of 0.45 million gallons per day (MGD). The original treatment facility consisted of a fixed-film treatment process via a high-rate trickling filter, with primary and secondary settlement through clarifiers. Sludge handling consisted of an anaerobic digester, covered drying beds and land disposal. In 1986, significant improvement projects were implemented which included construction of a headworks building to enclose the influent screening, and the addition of an aerated grit chamber and flow measurement. The project also included repairs to the primary clarifier and trickling filter tanks as well as a new sludge drying building. The chlorination disinfection building was also upgraded.

The Village WRRF and the Chesapeake Bay Nutrient Removal Initiative

The Chesapeake Bay currently receives an excess loading of nitrogen, phosphorous and sediment from its surrounding watershed, resulting in a depleted oxygen level in the Bay's waters. This oxygen depletion adversely impacts aquatic life, including fish, crab and oyster populations, which subsequently impacts the economy of local communities. The United States Environmental Protection Agency (USEPA) created goals for watershed jurisdictions to achieve a 60 percent reduction of nutrients, based upon nutrient loading observed in 2009 received by Chesapeake Bay (*USEPA 2010*). Included in this objective is a deadline of 2017 to set controls in place to meet the reduction goals, and a deadline of 2025 to achieve the nutrient and sediment allocations required. The New York State Department of Environmental Conservation (NYSDEC) has proposed a modification to the current SPDES permit serving the Village WRRF to meet these goals.



Existing facility shown here contains the control building, aerobic digester and clarifier.

Credit: Jason Bellis, Larson Design Group

Table 1. Summary of Waste Loading, Average from July 2010 to January 2014

	INFLUENT	EFFLUENT	PERMITTED UP TO 2017	PERMITTED 2017–2025	PERMITTED AFTER 2025
Average Daily Sewage Flow	0.32 MGD	0.32 MGD	0.45 MGD		
Average BOD ₅ Loading	176.8 mg/l	22.6 mg/l	40 mg/l		
30-Day Average	436.4 lbs/day	55.1 lbs/day	150 lbs/day		
Suspended Solids Loading, 30-Day Average	167.8 mg/l	16.6 mg/l	40 mg/l		
	388.1 lbs/day	40.5 lbs/day	150 lbs/day		
Percent Removal, BOD ₅ and SS	—	BOD ₅ 86% SS 89%	85% Removal of BOD ₅ and SS		
Settleable Solids Loading, Daily Max	—	<0.1 ml/l	0.3 ml/l		
Total Phosphorous Loading	6.57 mg/l P 16.7 lbs/day	2,754 lbs/year	Monitor	1,020 lbs/year	761 lbs/year
Total Nitrogen Loading	37.8 mg/l N 98.2 lbs/day N	16,986 lbs/year	19,000 lbs/year		
Notes: BOD ₅ = Five-day Biological Oxygen Demand mg/l = milligrams per liter; ml/l = milliliters per liter MGD = million gallons per day lbs/day = pounds per day; lbs/year = pounds per year					

Table 1 summarizes the Village's annual average sewage flow to the Village WRRF from June 2010 to January 2014, as documented in the Village's monthly Wastewater Facility Operation Reports. The plant, after 46 years of service, is still operating above its designed pollutant removal parameters for BOD and SS. However, the plant was designed during an era where nutrient loading was not identified as a significant issue, thus nutrient removal was not included in the plant design. Based on current nutrient loading, the Village WRRF will not meet phosphorous levels required by 2017, nor the more stringent levels required by 2025. While the average nitrogen loading over the timeframe observed (from June 2010 to January 2014) is below the nutrient loading limit, 32 percent of the months are at or above 95 percent of the effluent limit, and 13 percent of the months are out of compliance, based on the 31 months in which sufficient data is available to calculate the 12-month rolling average.

From 2011 to 2015, the Village of Greene began the process of evaluating upgrades to their existing WRRF in response to the Chesapeake Bay Nutrient Removal Initiative, and sought funding for the necessary improvements to meet the federal and state mandates. On April 9, 2015, the Village was notified by the New York State Environmental Facilities Corporation (NYSEFC) that the Village was eligible for up to \$6.6 million in Clean Water State Revolving Fund (CWSRF) interest-free financing for a term of up to 30 years. The Village's projected cost was \$6.7 million, but the financing package they presented included previous funding assistance: \$44,960 through the CWSRF Planning Grant; and the NYSDEC Water Quality Improvements Project Grant of \$80,000. On December 17, 2015, NYSEFC further awarded the Village up to \$1.6 million in grant monies through the New York State Water Grants program.

Available Alternatives for WRRF Upgrades

Several alternatives were considered for the upgrades to the Village WRRF, for both short-term and long-term solutions to address two concerns: (1) the pressing nutrient loading requirements of their SPDES permit, modified per NYSDEC's Phase II Watershed Implementation Plan; and (2) structural issues with the existing WRRF. The Village's existing WRRF is permitted for 0.45

MGD, with an average of about 0.33 MGD observed at the plant, and a peak flow of 1.87 MGD, based upon the capacity of the pump stations that feed the treatment plant facility.

The following alternatives were evaluated:

- 1) Keep the existing system;
- 2) Retrofit the existing WRRF with chemical addition;
- 3) Retrofit the existing WRRF with chemical addition and structural rehabilitation; and
- 4) Build a new sequencing batch reactor (SBR) facility.

After evaluating the alternatives described above, as well as assessing the existing facility's capacity for nutrient removal and its current condition, it was recommended that the Village of Greene implement a new SBR WRRF along with the necessary collection system improvements. This alternative would provide the Village with a long-term, cost effective solution for their existing insufficient and aged WRRF. With an estimated budget of \$6.7 million for the necessary improvements, the project is currently under construction with an estimated completion date of November, 2017.

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Reference

U.S. Environmental Protection Agency. *Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment*. Washington, D.C.: December 29, 2010.

