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2023 GUIDE TO

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pumping stations for
remote communities



Preserving a town's natural resources with an all-terrain sewer

By Joseph Harmes

In 1870, the first settlers christened tiny Confluence, Pennsylvania, for its location at the junction of the Casselman River and Laurel Hill Creek with the Youghiogheny River. But, like many hamlets scattered throughout the region, it has struggled to maintain a population of more than 1,000, or to attract industry of any real size.

In less than a generation, however, Confluence has transitioned from stagnation and a fading industry that could have ravaged scenic hills, old-growth forests, sparkling creeks and the remote habitats of endangered species into a robust economic juncture of prized recreational venues for hiking, fishing, kayaking, rock climbing and boating. It is also financially buttressed during the winter by four area ski resorts and miles of cross-country paths.

ECONOMIC FUTURE IN PERIL

But, as this burgeoning economy was being shaped, its aging and failing combined sewer system (CSS) threatened its future. In 2014, Confluence's outfalls became the focus of a lawsuit filed by Pennsylvania's Future, an out-of-town citizen group. It alleged that the Confluence Borough Municipal Authority, as operator of the publicly-owned treatment works, violated the *Federal Water Pollution Control Act* and the Pennsylvania Clean Streams Law.

Within a month the group offered to drop the case under a consent decree mandating "a plan to engineer and construct a new pressure sewage collection and conveyance system for the borough, to replace the existing gravity flow network in order to eliminate SSOs (sanitary sewer overflows) and maintain compliance with effluent limitations."

The existing gravity sewer (about 7,600 m of pipe of which 4,850 m consisted of pre-1970 terra cotta pipe, rang-



The E/One grinder pump station can send wastewater through small-diameter, inflow-and-infiltration-free pressurized pipe for a distance of more than five kilometres.

ing from 200 mm – 350 mm in diameter) would be left in place to become a separate stormwater collection and conveyance system.

Five years prior to the lawsuit, Confluence had contemplated, designed and planned a sewer rehab project, calling for separating the combined sewer into a dedicated gravity sanitary sewer line and another gravity sewer for stormwater.

Septic systems were not an option as a "Sewage Facilities Plan" prepared in 2010 found approximately "80 percent of the borough's land unsuitable for any type of on-lot disposal systems", largely due to steep slopes and flooding. Only five percent of the land in the area contains soils suitable for septic disposal systems, the report added. "Approximately 10 percent of the land contains soils that would be moderately suitable for septic disposal systems."

ABANDONING GRAVITY

"My first task when taking over the Confluence project (around 2014) was to finish the plan and proceed with construction," says John Larimer, the borough's engineer, now with CME Management. "I disagreed with the plan and proposed the pressure sewer replacement for several reasons. Gravity sewers cannot and will not work in an area surrounded by water. Pressure sewers can and will work."

"We were contacted by the engineering firm in 2014 to explore part of the project as a pressure sewer," says Benjamin Dorsch who was with Trombold Equipment Company at the time. "The whole pressure sewer design started as a feasibility exercise based on Google Earth. In less than two weeks we had an entire layout with calculations back in the engineer's hands for the entire system. The Pennsylvania Department of Environmental Protection approved it to replace the entire gravity sewer system and this was written into the Consent Decree."

Larimer says he was attracted to the All-Terrain Sewer (ATS) manufactured by Environment One Corporation (E/One), after reading case studies about its gravity to pressure sewer conversion projects.

"Leaving the existing gravity sewers in place solved the stormwater problem," Larimer adds. "We separated the sewer out of the stormwater rather than take the stormwater out of the sewer. Gravity sewers would have been in excess of 6 m in depth. We eliminated the lift station at the treatment plant, which was a maintenance nightmare, especially during rain events."

The E/One grinder pump station begins with a tank about the size of a tall refrigerator that is buried in the ground, its lid easily camouflaged with

minor landscaping. Components include a 1-hp, semi-positive displacement pump, which can send wastewater through small-diameter, inflow-and-infiltration-free pressurized pipe for a distance of more than five kilometres, or vertically up 55 m to a force main or treatment plant.

A WATER-TIGHT SOLUTION

A critical, persistent problem plaguing Confluence's CSS was inflow and infiltration (I&I) which can create detrimental environmental and economic effects on the overall operation of the wastewater collection and treatment station. The borough identified 101 sources of I&I, including downspout drains, catch basins, service laterals, manhole seals, and basement drains.

An ATS is constructed of PVC pipe with solvent-welded joints and leak tested to the same standards used for potable water supply piping networks. Water-tight and virtually leak-free, it is not subject to infiltration from groundwater or from surface stormwater entering through leaking pipe joints and manholes. The reduced I&I can result in smaller treatment system sizing, thereby saving capital costs. In northern climates, the pipe is buried beneath the frost line. Over 100,000 ATS units have operated for decades throughout the Nordic countries.

A CONVERGENCE OF SAVINGS

The Confluence Borough Municipal Authority Wastewater Treatment Plant was constructed in 1975 with a design capacity of 518,000 litres per day, with a peak daily flow rate of 1.3 million litres per day. Daily flow periodically exceeded design capacity during wet weather periods because stormwater and stream flow infiltrated the borough's collection and conveyance system.

The ATS significantly reduced the sewer rehab budget and improved the WWTP's efficiency as it eliminated the need for a 7.6 m deep confined space raw sewage pump station at its headworks. Instead, individual grinder pumps will convey sewage to the treatment plant.

When the ATS entered the discussion as an alternative solution, Confluence compared the costs and scope of its two alternatives. "Preliminary cost estimates indicated the pressure sewer system installation to be comparable or less than the cost of gravity sewer replacement. The gravity sewer would address only portions of the system and the pressure sewer would address the entire system," said CME's Uniform Environmental Report.

The plan to upgrade the existing gravity system and WWTP carried a preliminary price of almost US\$6 million. The estimated cost in 2015 of installing the ATS and abandoning the existing system in place for stormwater use was found to be US\$800,000 cheaper.

In 2019, just before the project broke ground, the Pennsylvania Infrastructure Investment Authority put the final tab at US\$9 million dollars to connect all 422 households (homes and multi-residential) in the borough, with a service area of approximately 4.35 km².

ATS GOES ONLINE

The project was completed in 2020. The ATS incorporates 373 Simplex (one pump) station, four Duplex stations (two pumps inside the same housing) and one Triplex station to serve mobile home parks. Three other Triplex units were allocated for senior citizen apartment complexes. A portion of the budget also funded gravity stormwater pipe repairs and WWTP upgrades.

The majority of new pipelines, including three river crossings, were constructed in road rights-of-way, requiring only minimal lane closures or detours because of the use of horizontal direct drilling. No adverse impacts on agriculture, state parks, forests or trails were reported and the area's historic Native American cultural landmarks were preserved.

"Simply put, we basically ran the old gravity sewer system while building the ATS," says Larimer. "Once it was intact, customers were switched from the old to the new while both systems were maintained. The old system was abandoned in place once everyone was switched to the new system." ■

Joseph Harmes is a freelance writer with Environment One who has documented the evolution and acceptance curve of low-pressure sewer systems since the early 1990s. Email: escritorsma@gmail.com. For more information, visit: www.eone.com

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