Lined Up

Rural borough implements trenchless technologies in sanitary sewer rehab

By Matthew J. Peleschak

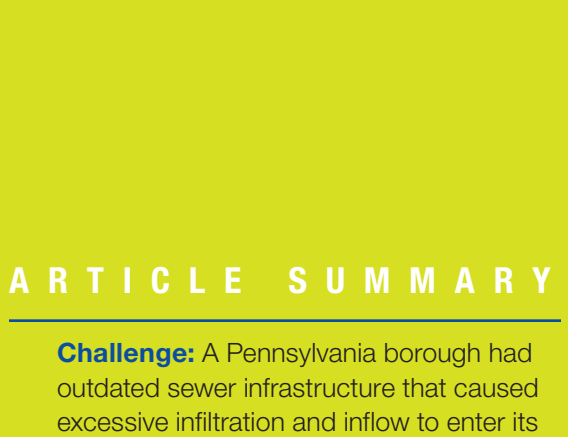
The borough of South Williamsport is located in Lycoming County along the scenic banks of the West Branch Susquehanna River in north central Pennsylvania. The borough was founded in 1886, during the post-Civil War era when logging was a major industry along the river. For most of the year, the borough is a small residential community of approximately 6,400 people with small businesses; however, during the last week of August each year, it transforms into a bustling town with many international visitors. The borough is home of Little League Baseball, which hosts the Little League World Series every year.

ARTICLE SUMMARY

Challenge: A Pennsylvania borough had outdated sewer infrastructure that caused excessive infiltration and inflow to enter its collection system during wet weather.

Solution: To meet a consent order and agreement, the borough developed its Wet Weather Sewage Flow Management Plan, which included plans to rehabilitate mains and manholes using trenchless technology.

Conclusion: By eliminating the need for open-cut methods, the borough cut construction costs in half and met its compliance deadline.



Sanitary Sewer Rehab Project No. 1 included replacing roughly 8,300 ft of sanitary sewer, 100 lateral connections and point repairs and 65 manholes.

The Scenario

Built in the early 20th century, the borough's sewage collection and conveyance system consists of approximately 30 miles of collector and interceptor sewers and two pump stations. There are approximately 3,000 properties connected to the system. At the time of construction, state-of-the-art technology was vitrified clay pipes and brick manholes.

Defective building sewers and illegal connections, such as sump pumps, roof drains and basement and/or foundation drains, were primary sources of excessive infiltration and inflow that entered the borough's collection system during wet-weather events. As a result, the borough had to convey untreated sewage directly to the West Branch Susquehanna River or Hagerman's Run, a stream that flows through the borough. Peak wet-weather sewage flows exceeded 10 times the average daily flow.

In 2006, the borough entered into a consent order and agreement with the Pennsylvania Department of Environmental Protection (DEP) to develop the Wet-Weather Sewage Flow Management Plan to identify steps the borough would take to eliminate the bypassing of untreated sewage.

Borough engineer Larson Design Group (LDG), headquartered in Williamsport, Pa., completed a detailed investigation of the borough's sewer system and developed the wet-weather management plan. The borough council wanted a long-term fix, not a temporary solution that would pass the problem on to the next generation. LDG recommended a four-prong approach for managing wet-weather sewage flows:

1. Rehabilitate approximately 25% of the public collection system;
2. Inspect and enforce corrections of defective building sewers and illegal connections from private property systems;
3. Construct wet-weather sewage flow management facilities; and
4. Implement a long-term operation and maintenance program.

Because of the large peaking factor, completing only a single capital improvement project would not have solved the borough's problems of sewage bypasses. Project leaders had to take a holistic approach, repairing as much of the system as was financially feasible, then construct a wet-weather management system that would handle the rest.

As one component of the borough's Wet Weather Sewage Flow Management Plan, LDG obtained regulatory permits and approvals and prepared the construction contract documents, drawings and specifications for Sanitary Sewer Rehabilitation Project No. 1, which included the replacement of approximately 8,300 ft of 8- and 15-in. sanitary sewer, approximately 100 lateral connections and point repairs and 65 manholes. It also included the trenchless rehabilitation of 31,000 ft of 8- and 12-in. vitrified clay pipe, 600 lateral connections and 500 vertical ft of manholes.

Due to the existing condition of the collection system, one method for repair would not have worked. Some of the mains and manholes were in such structural disrepair that it made more sense to replace them, while others were adjacent to many other underground utilities that it was better to line them.

The project was bid in October 2008 and was awarded to HRI, Inc., a local excavation company, for $4.8 million. HRI subcontracted with three trenchless rehabilitation companies to complete the project: Progressive Pipeline Management (PPM), Rockaway, N.J.; Video Pipe Services (VPS), Newfield, N.J.; and Terre Hill Composites (THC), Ephrata, Pa.

Liner Solutions

HRI subcontracted with PPM to install cured-in-place pipe (CIPP) linings for the sanitary sewer mains. PPM is a certified installer of Lightstream, an ultraviolet (UV) light-cured fiberglass lining technology developed and designed by International Pipelining (IPL) Technologies.

This CIPP liner is impregnated with the resin at IPL's manufacturing facility and is encapsulated between an outer UV-protectant foil and an inner PVC foil. This improves handling of the material, as well as increases the shelf life (the time from when the liner is impregnated until it is installed) from one week to several months. In addition, the UV-activated resins eliminate the need for refrigerated trucks typically associated with thermo-activated resins. The resultant product is a new pipe that is stronger than the original pipeline and installed at a lower cost and

more quickly than the current felt-based lining systems available today.

While the fiberglass provides strengths as much as six times greater than traditional felt liners, the major benefits are truly in the installation process. Once the liner is winched into place and inflated, the "light train" allows the installer to inspect the installation with closed-circuit television cameras incorporated into the light train before beginning to cure the liner.

The onboard data management system provides high-quality computer-generated reports with color graphics and video stills. Any defect in the installation can be identified and corrected before initiating the curing process. With traditional liners, most defects are excavated and replaced after the liner has been cured. In addition, sensors in the light train allow the installer to monitor parameters such as air temperature and pressure throughout the entire line, which results in uniform curing. This is not possible with felt liners.

"Being a local contractor, we have a vested interest in selecting the best materials for our local clients," said Jim Hess, HRI project manager. "Due to the many advantages the UV light-cured liners like Lightstream have over other types of lining systems, we felt they were the best fit for the borough's project."

PPM installed Lightstream technology, a UV light-cured fiberglass CIPP lining, in the sanitary sewer mains.

Once a sewer main was lined, VPS installed lateral connection liners at each of the lateral reinstatements to seal the sewer main lining at these points. Without these lateral connection liners, the amount of reduction in infiltration within the system would be minimal. VPS utilized EPROS DrainLCR lateral connection liner for the project. The liner consists of a silicate reaction resin-coated felt tubing that is installed by using trenchless "pull in, inflate and cure" methods. The system included approximately 12 in. of liner in each of the laterals, as well as a full wrap within the sewer main. This provided both a watertight seal and stable connection with the main pipe.

Finally, THC installed Multiplexx PVCP liners within the brick manholes. This patented composite lining system stopped infiltration between the bricks and provided corrosion protection. Just like CIPP, the resin-saturated liners are installed under pressure. The installation process uses constant air pressure to force the liner to the contours of the brick manholes. Super-heated water is pumped into the liner to accelerate curing of the modified epoxy resins.

Project Follow-Up

The entire project is scheduled to be completed in December 2009, in compliance with the DEP consent order. If conventional open-cut construction methods had been used, the borough would have missed its deadline and the estimated construction cost would have been more than double the current estimated cost. WWD

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