

Pinetops, N.C., Completes Sewer System Overhaul

By Dick Schantz

The Town of Pinetops, N.C., had to reduce its sewage flow by 70 percent if it was going to meet the environmental requirements of a special order of consent (SOC) that also prohibited additional service connections.

Town officials knew they had a one-time opportunity with limited funding to permanently correct their sewer collection system. Commissioning an engineering study and following extensive review and discussion of the engineer's recommendations, Pinetops officials proceeded with a sewer rehabilitation project using proven trenchless sewer system rehabilitation techniques.

In 1996 the State of North Carolina EPA issued a SOC to the Town of Pinetops, temporarily permitting the Town to operate its sewage treatment plant, rated at 300,000 gal per day (gpd), at capacities up to 540,000 gpd. The SOC placed a moratorium on new sewer connections, required Pinetops officials to develop a corrective action plan to reduce treatment plant loading and implied a substantial fine would be levied if the treatment plant discharge exceeded the permitted 540,000 gpd.

The sewer treatment plant outfall goes into the Tar River, then to the Pamlico River leading directly into Pamlico Sound, a significant national and state recreation, wildlife and seashore area in north-easter North Carolina. Town officials reviewed and questioned the engineering study they had commissioned and agreed with the selected combination of trenchless technologies to rehabilitate their sewer collection system.

Today, the work is complete, has been tested by a number of heavy summer rainstorms and the Town of Pinetops is successfully meeting the conditions required for lifting the SOC and connection moratorium.

The Project

Pinetops, located in the coastal plain of North Carolina, with a population of about 1,500, has 60,000 ft of sewer mains. As a small rural town, the expected sewerage rate of 50 to 60 gpd per person should result in a treatment plant load of about 90,000 gpd. The treatment plant design capacity of 300,000 gpd was more than sufficient and was acceptable during normal weather conditions, but this section of the state has strong seasonal thunderstorms and is often hit with large rain storms associated with Atlantic Ocean hurricanes moving up the East Coast.

Under normal weather conditions, the treatment plant load was in the range of 200,000 to 300,000 gpd, however, during the wet season the added inflow and infiltration (I/I) increased the plant loading to 700,000 to 1 million gpd, well beyond the design or permitted capacity. When a \$3 million sewer construction grant from the state became available, town officials knew they had a "one-time" chance to solve their sewer problem. For help, the town management turned to Mack Gay Associates, a civil engineering firm headquartered in Rocky Mount, N.C., asking it for recommendations.

Pinetops officials gave Mack Gay these basic guidelines: (1) develop a plan to permanently reduce the treatment plant outfall to meet the requirements for removing the SOC, (2) minimize disruption of the town streets and community cohesiveness during construction and (3) accomplish the work within the available budgeted money.

Mack Gay's report concluded that using trenchless rehabilitation processes was the best solution. The study identified that there was a major I/I contribution from the laterals and lateral connections, investigated and compared the economics of dig and no-dig sewer repair, evaluated various mainline and lateral relining products, manhole rehab methods plus a lateral to main connection and sealing product known as Top Hat.

The main points of the sewer rehabilitation program proposed by Mack Gay included:

- The collection system in areas subject to normal and seasonal high groundwater levels had to be fully sealed below the water table.
- The lateral connection cracks identified in the PVC truss pipe Y connections would be repaired with the Top Hat process, thus eliminating infiltration in about 30 percent (17,000 ft) of the existing 60,000-ft sewer system.
- Start rehabilitation work in areas with most severe I/I.
- Rehabilitate and seal all the manholes using cementations and epoxy coating methods.
- Raise manhole covers and seal manhole cone joints to above surface stormwater levels.
- Line 30 percent (20,000 ft) of the sewer mains that are most subject to infiltration using CIPP process.
- Line a selected group of 250 laterals from the CIPP lined mains to the edge of street right of way (ROW) and install clean outs at ROW.



Southwest Pipeline and Trenchless Corp. Top Hat crew placing Top Hat applicator into manhole.

- Dig and replace about 100 laterals and/or main connections to the CIPP rehabilitated pipe that could not be repaired with trenchless techniques.
- Install 250 Top Hat lateral seals (1) sealing newly lined laterals to the CIPP relined pipe, (2) repairing truss pipe lateral Y connections and (3) repairing break-in taps at the sewer mains.

The project is now completed with about two-thirds of the collection system rehabilitated. The targeted 70 percent reduction in sewer flow to the treatment plant during normal weather and storm conditions has been achieved. Town personnel and engineers continue to monitor stormwater conditions and visually inspect those areas of the collection system suspected of contributing inflow and/or subjected to high surface stormwater levels.

The remaining project contingency funds are being used to rehabilitate portions of the system identified during the visual inspections as sources of I/I. This work includes repair/reline problem laterals, install additional Top Hats to seal lateral joints and raise and/or seal additional manholes showing signs of inflow. The effectiveness of the reduced I/I has been confirmed by treatment plant operators who now occasionally recycle plant outflow water mixing it with incoming sewage to maintain a solids level range that optimizes plant performance.

Mack Gay Associates determined from its study the key to successfully stopping infiltration was a collection system permanently sealed below the water table. That fact was confirmed during construction. As the project progressed, the CIPP work and manhole rehabilitation were first undertaken and began during the winter months when the water table was lowest and did not provide significant reduction of infiltration.

Once the lateral liners were put in and the Top Hat lateral seals installed, a visible decline in infiltration was recorded at the treatment plant and this continued as more and more of the system was closed by sealing the laterals at the main connection with Top Hat. Engineers continue to confirm the groundwater around the CIPP liners and manholes rapidly seeks the easiest route it can find into the sewer system, thus all laterals and lateral to mainline connections below the water table had to be sealed if the 70 percent reduction was to be reached.

Mack Gay will continue to monitor I/I in Pinetops to understand how the groundwater around the sealed system migrates and if new underground channels develop from the rehabilitate sewer sections into the remaining sewer lines increasing infiltration rates within the remaining 40 percent of the collection system that was not rehabilitated.



Typical installed Top Hat lateral seal.

Project Insights

The Pinetops sewer collection system rehabilitation project is a good case study because it has all the features of a large sewer system rehab project yet it was accomplished in a relatively short period of time with personnel continuity and system operating data available showing the impact of each work phase on the collection systems performance.

Mack Gay site manager Marty Pittman, was onsite throughout the study and construction period and was the “project champion” from the beginning. Starting with the engineering study, he and the resident inspector performed all of the manhole inspections, supervised and witnessed the cleaning and videotaping of the sewer lines, investigated and wrote portions of the engineering report including the research on no-dig technologies. Once the project was awarded, the same team supervised the construction phase. No work was done without onsite inspection of the work in progress.

Relining of the sewers under the main street and highway were done at night resulting in little interference to the normal daytime pedestrian and highway traffic. The work proceeded with minimal community impact, as evidenced by a local gentleman who asked: “when is this sewer project going to start?” and was pleasantly surprised to learn that more than 90 percent of the work had been done.

There was a lot of conversation and coordination between the various installation supervisors and the crews gained appreciation for the effectiveness of their work and how it integrated with the other contracts and rehab processes. It was a successful team effort from beginning to end.

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