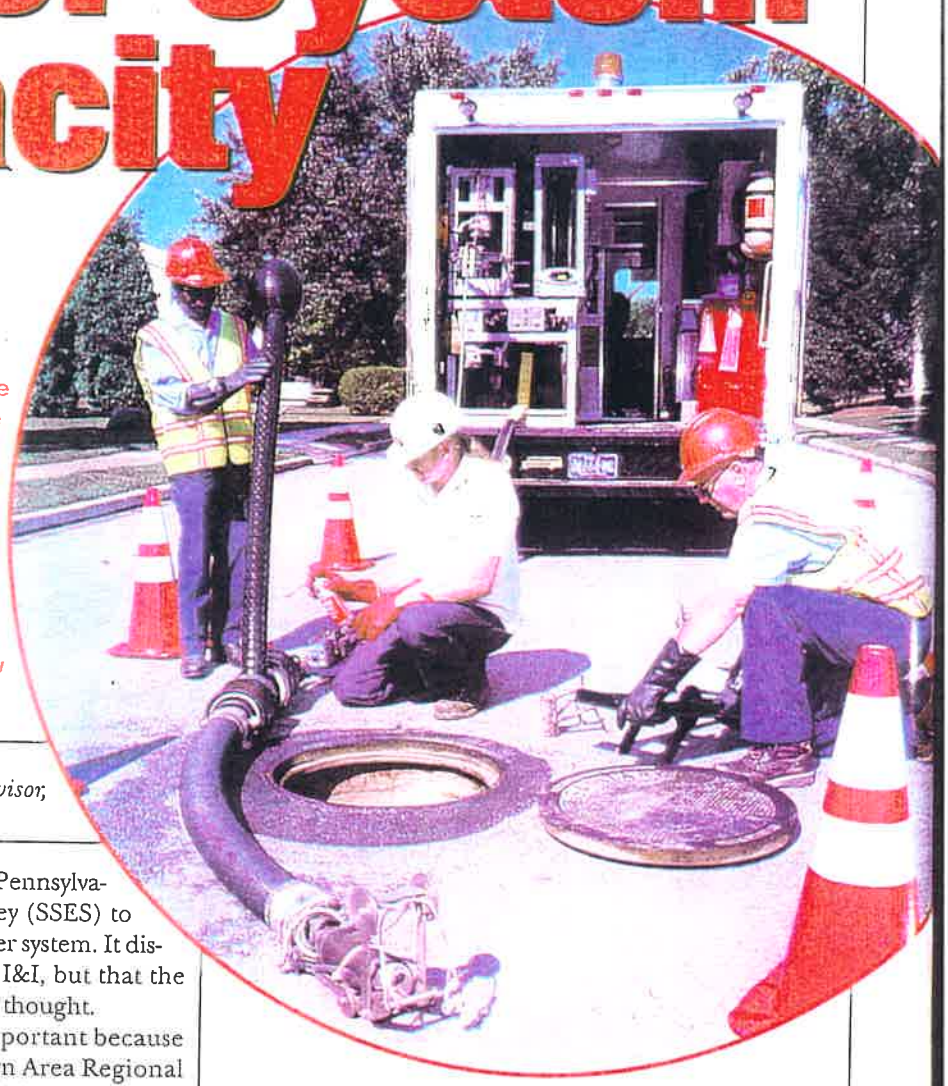
CHEMICAL GROUT HELPS

Increase Sewer System Capacity



A Downingtown grout crew prepares its lateral packer for the test and seal operation.

Some sewer districts have learned they can use chemical grout to stop leaks, then sell their excess capacity to other municipalities for more than the cost of the rehabilitation. Other districts have learned other ways to actually profit from their investment in reducing inflow and infiltration (I&I).

Rick Harris
Mr. Harris is Sewer Maintenance Supervisor, Borough of Downingtown, Pennsylvania.

In 1992, the borough of Downingtown, Pennsylvania, did a sewer system evaluation survey (SSES) to determine the exact condition of its sewer system. It discovered the system had a great deal of I&I, but that the overall flow was not as great as previously thought.

Determining the actual flow was important because Downingtown shared the Downingtown Area Regional Authority (DARA) treatment plant with four other boroughs. Each borough had an allotment, and also paid a prorated fee based on each borough's flow to the plant. In the past, all of the cities except Downingtown metered their flow. After the metered flows were added together and subtracted from the total, Downingtown was assessed for the remainder. The SSES showed that Downingtown was not responsible for all of the remaining flow, so it began saving money immediately.

However, much work remained. The flow monitoring had shown a total of 451,100 gpd (almost 25 percent of the average daily flow) was infiltrating into the system. According to the allowable infiltration rates established by the EPA, nearly half of this amount, 195,670 gpd, was considered excessive. Inflow was also a serious problem and was addressed by replacing old manhole frames and covers with new ones, which were machined and had self-sealing O-rings.

It was impossible to determine the amount of inflow that was entering the system after each rain because the flow recorders would spike completely off the charts and not return to a readable range for a day or two. After the manhole frames and covers were replaced, the flow

recorders showed a small spike after each rain, but to date, have not exceeded the readable range.

The areas of the system that had the most infiltration were attacked first with chemical grout. The first contract was for cleaning, TV inspecting, testing, and sealing 4,689 linear ft of mainline. A total of 1,440 joints were tested, and 2,154 gallons of chemical grout were used to seal the 1,164 joints that were found to be leaking.

The second contract involved 5,376 linear ft of sewer, which contained 1,176 pipe joints. During the project, 844 gallons of chemical grout was used to seal the 468 leaking joints. In total, the two contracts stopped 110,000 gpd of groundwater infiltration.

At that time, Downingtown's allotment in the treatment plant was about 2.0 mgd, and its daily flow was approximately 1.3 mgd. When a neighboring borough needed to increase its allotment in the treatment plant, Downingtown discovered it could sell its excess allotment for $8 per gallon. As a result, Downington sold 300,000 gpd of its allotment for $2.4 million.

Recently, Downingtown used a government grant to clean up an old mill site so 150 new homes could be built at that location. The capacity to add that many taps had been gained by reducing I&I. In fact, enough capacity was gained by sealing laterals in one two-block area to add all of those new homes.

The section with the most severe infiltration was 1,513 ft long and contained 41 service laterals. The pipeline had been rehabilitated a few years earlier with a cured-in-place liner, but the groundwater had migrated to the lateral connections. The situation was so bad that the flow from one lateral connection alone was measured at 18,000 gpd. Chemical grouting the lateral connections and the first six ft of the service lines eliminated 60,000 gpd of infiltration from the pipeline.

Since the last time Downingtown sold some of its allotment in the DARA treatment plant, the value of that allotment has increased considerably. Recently, a neighboring borough needed to increase its allotment and agreed to pay Downingtown $20 per gallon for any allotment it could spare.

Even though Downingtown's sewer system is small, it has been able to eliminate a tremendous amount of infiltration. This allowed the borough to sell some unused allotment for enough to pay for the grouting operations and help finance other departmental costs such as salaries and equipment.

Enough treatment plant capacity was gained by sealing laterals in one two-block area to add 150 new homes to the system.

SAVING EXPANSION COSTS

In 1993, Wayne County, Michigan, and 13 communities that contributed to a local sanitary sewer treatment plant were sued by the EPA and state of Michigan because the treatment plant was bypassing combined sewage into the Detroit River during rain events.

Each community was asked to determine how much I&I it could eliminate from its system, and a plan was devised to accommodate the remaining total. The preliminary plan assumed the treatment plant capacity could be expanded somewhat, but a massive tunnel system would have to be built to transport the excess flow and store it until it could be treated. Cost of the transportation and storage system was estimated at $100 million.

Each community then faced the choice of spending money to reduce its I&I or spending money to pay its prorated part of the new facilities. Riverview, one of the more aggressive communities, and its consultant, Hennesey Engineers, (Trenton, Michigan), studied its options carefully.

Dan McNulty, P.E., was project engineer for Hennesey Engineers at the time. He explained that at the end of the study, Riverview decided the most cost-effective point on the "Cost vs. I&I Elimination" curve was 36 percent. The calculations convinced Riverview it could eliminate 36 percent of its I&I for less than it would cost to pay for transporting and temporarily storing that flow. The 12 other communities projected their own numbers, but all were less than Riverview's.

Riverview's remediation program included four primary types of rehabilitation. Chemical grout would be used to seal all trunk line joints throughout the system. Smaller lines that were accessible in alleys and other non-disruptive areas would be removed and replaced. Cured-in-place pipe would be used to reconstruct damaged lines in congested areas. All manholes within the system would be fitted with watertight covers, and those with leaking walls would be grouted.

Skip Bainbridge, project coordinator of the Riverview remediation program, said 90 percent of Riverview's entire collection system was rehabilitated. "We came in six months ahead of schedule and under budget. We achieved a 50 percent overall reduction in rain-dependent inflow and infiltration, and we reduced our assessment in the storage tunnel by $5 million."

SAVING A SYSTEM

McNulty, currently with Atwell-Hicks, Inc. (Ann Arbor, Michigan), pointed out that rehabilitation also adds valuable life to a sewer system. "As long as infiltration is left unchecked, it will continue to deteriorate your sewer system," he said. "Anytime you stop infiltration, you stop erosion of sidefill support and the dangers and costs associated with that. So, in addition to reducing treatment costs and possibly storage fees, you can greatly reduce emergency repairs, street damage, and basement backups while you extend years of service to your system. It definitely pays to stop leaks." PW