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PLANNING MAKES PERFECT

Tennessee utility's comprehensive mitigation plan brings significant flow reductions

By Jared Raney

efore 2003, the Hallsdale-Powell Utility District in Tennessee was doing little to stem rampant inflow and infiltration in its system. When they received a consent order in 2004 from the Environmental Protection Agency, they had to play serious catch-up.

To do so, they started from the ground up, building a comprehensive management plan out of nothing.

First was creating a GIS map and collecting the data to populate it. They managed to do so in only a few years' time, including flow monitoring and video inspection of high-priority areas.

The key to their success was sticking to a long-term plan, allowing a projected decrease of 33 percent wetweather volume, and an average daily dry-weather flow decrease of 65 percent.

PREPARING THE PLAN

Inspection didn't begin until 2006, and under their long-term strategy, it would continue at an ongoing rate of 10 percent of the system per year.

Unfortunately, after three years, they struggled to meet that goal, inspecting just 23 percent of the system



The Hallsdale-Powell Utility District service area in suburban Knoxville, Tennessee.



WWTP Flow - Pre & Post Rehabilitation Conditions

in that time. They also found that the financial burden was significant, averaging over \$700,000 per year (which includes cleaning costs for severely impaired areas).

Despite that, the district persevered and by 2011 had inspected around 50 percent of the mainlines.

They determined that 70 percent of their rainfalldependent I&I was contained within 33 percent of the monitored area.

REHABILITATING THE SYSTEM

The first round of rehab projects was completed in 2009 — a full gamut of repair, rehabilitation and replacement. Everything from cured-in-place pipe lining, opencut replacement, point repairs, pipe bursting, manhole lining and service lateral repair.

However, 97 percent of the nearly 160,000 linear feet of rehabilitated pipe was completed using trenchless methods. By the end of 2011, the city had spent over \$7.5 million on rehabilitation efforts.



Flow Monitoring Basins — 2003 Temporary Flow Monitory Study



CCTV Inspections Completed (2006-2010)

"Through a strategic plan of pre-rehabilitation monitoring, a prioritization plan was formulated that encompassed both inspection and rehabilitation activities," according to a study on the project. "By following this plan, the Hallsdale-Powell Utility District has been able to focus dollars on priority areas of the system while measuring successes and noting parts of the plan that need modification."

For a suburban area just outside of Knoxville, I&I is an important issue. Having a long-term strategy allows the city to keep in line with the Clean Water Act and minimize further system deterioration.

"Once completed, post-rehabilitation monitoring was conducted to verify rehabilitation effectiveness and reprioritize the collections system for the next round of inspection and rehabilitation projects," the study says.

A 2011 flow study, with nine permanent flowmeters and 33 temporary meters alongside five rain gauges confirmed the validity of their long-term strategy.

RESULTS SPEAK FOR THEMSELVES

"Despite 2009 being one of the wettest years on record, the lowest observed flows were 741,000 gallons

"By following this plan, the Hallsdale-Powell Utility District has been able to focus dollars on priority areas of the system while measuring successes and noting parts of the plan that need modification."

below that measured in 2007 (one of the driest years on record according to the National Climatic Data Center)," the study says. "Additionally, a decrease of 874,000 gallons was observed in average flows from 2009 to 2010, during which the majority of the CIPP projects were completed."

As with any successful I&I program, both inspection and rehabilitation are ever ongoing. But so far, the results indicate dramatic improvements to the system, all thanks to a comprehensive, long-term approach to monitoring, rehab and I&I management. **ISI**





A trenchless crew from TLC Plumbing & Utility pulls a heated PVC pipe through an existing line during a relining project in northeast Albuquerque, New Mexico.



Specialists in Trenchless Services

Technology investments help **TLC Plumbing & Utility become** a big player in pipe rehabilitation

STORY Ken Wysocky | PHOTOS Roberto Rosales



ne of the keys to TLC Plumbing & Utility's success has been its focus on meeting customer needs by continually expanding services, including trenchless pipeline rehabilitation.

The company — with nearly 560 employees, hundreds of service vehicles and a sprawling fleet of equipment — began in 1987 with just one worker: founder Dale Armstrong. The company's dramatic transformation into a multimillion-dollar-a-year company underscores the power of investing heavily in new technology and providing customers whatever they need.

"Embracing new technology has been a big contributor to our success," says Brian Baughman, who manages the recently formed trenchless department at the Albuquerque, New Mexico-based company. "Newer machines and equipment allow us to work faster and more efficiently and do projects that other companies can't do. We really pride ourselves on being able to figure out how to do the jobs that others turn down."

"We really pride ourselves on being able to figure out how to do the jobs that others turn down."

A good example is a project TLC recently completed for the Albuquerque Water Utility Authority. During the roughly

Brian Baughman three-month-long, \$1 million-dollar job, crews replaced approximately 5,600 feet of deteriorated 8-inch-diameter sewer main, most of it concrete pipe. TLC used Thermoform PVC pipe lining technology from Warrior Trenchless Solutions to restore the pipes.

"The host pipes were eroded to the point that the sidewalls were gone or on the verge of collapse, plus there was a lot of heavy root intrusions and built-up silt and debris," Baughman explains. "In some cases, the lines were basically nothing more than holes in the ground."

TLC crews also rehabbed about 30 manholes within the work zones, which were scattered around the city — approximately seven work sites in all. That included regrouting the manholes with Alumaliner, a calcium aluminate mortar product made by Quadex (part of Vortex), replacing ring covers and pouring new concrete pads around them.

The project also showcased the company's reputation for innovation. Because the pipes were so badly deteriorated, crews couldn't use jetters to clean out the debris in preparation for lining. "That would've only made things worse," Baughman says.

So the company fabricated a shovellike device out of a section of steel pipe, then attached it to a robotic cutter manufactured by Schwalm USA. "It was not a fast process," Baughman says. "The robot would scoop up debris, then travel back to a manhole where a vac truck would suck up the debris.

"But we got the pipes into a state where they could accept the Thermoform PVC pipe, which is able to bridge gaps where there is no host pipe, which is one of the system's advantages. It all speaks to our ability to think outside the box and innovate."

TLC PLUMBING & UTILITY Albuquerque, New Mexico

OWNER: Dale Armstrong FOUNDED: 1987

EMPLOYEES: 560

SERVICES:

Trenchless pipe rehabilitation, plumbing and drain cleaning, construction infrastructure services, heating and cooling

> WEBSITE: www.tlcplumbing.com

EMBRACING INNOVATION

The company formed a trenchless department in September 2018, a move that reflects the growing importance of this specialty service. The goal: A more intense and dedicated emphasis on trenchless pipeline rehab, a market with big growth potential due to aging underground infrastructure.

"Trenchless employees used to be part of a construction and small-site utilities group, and after we'd finish a trenchless job, the guys would go back to civil construction work," Baughman explains. "Now we can focus solely on trenchless work and groom our employees to become specialists in this technology."

The company's initial foray into trenchless technology centered on pipe bursting, using systems made by Pow-R Mole Trenchless Solutions for smallerdiameter pipes (6 inches or less) and TT Technologies for larger pipes (from 6 to 18 inches in diameter).

But Thermoform fold-and-form PVC pipe is playing an increasingly larger role in the company's trenchless rehab efforts. Baughman cites lower startup costs for equipment, less-expensive materials and an easier installation process than some cured-in-place pipe systems. In addition, he says, the PVC system is more eco-friendly than some lining systems.

The move into Thermoform technology has been fruitful; Baughman notes that TLC has installed about 20,000 feet of PVC liner in the last year, mostly rehabbing 8-inch-diameter host pipes. And that number will increase to about 30,000 feet by spring, based on the company's current backlog of work.

SMOOTH PROGRESSION

Armstrong founded TLC as a plumbing outfit that did mostly residential service and new construction work. But that focus gradually broadened to include small-site utility work, with the company serving as a subcontractor installing residential storm and sewer drains, waterlines, fire-protection systems, gas lines and the like.

Thermoform fold-and-form PVC pipe is playing an increasingly larger role in the company's trenchless rehab efforts.



TLC's trenchless division is continuing to grow with new technologies and services.

"Dale started this business by himself 31 years ago with a vision of a diverse company," Baughman says. "Dale trusted employees to take off and run with things, and that is one of the main things that spurred our growth."

Armstrong also wanted to provide clients with great customer service, which often led to providing more services. Consider the small-site utility work, for instance, which eventually led TLC into underground street utility work. That, in turn, required TLC to hire subcontractors to do asphalt and concrete work, Baughman notes.

"To increase efficiency, we decided to provide paving services as well. And that naturally led into civil concrete work — pouring curbs and gutters, sidewalks and so forth."

That one-stop-shop mentality eventually bred even more services, such as replacement of sewer lateral lines, then rehabbing waterlines and sewers lines via trenchless technology. "That's when we started doing pipe bursting," Baughman says. "We felt that this technology



"Dale started this business by himself 31 years ago with a vision of a diverse company. Dale trusted employees to take off and run with things, and that is one of the main things that spurred our growth."

Brian Baughman

FORMING AN EDGE

TLC Plumbing & Utility's growth in trenchless pipe rehabilitation services has helped a great deal by its use of Thermoform fold-and-form PVC pipe lining technology from Warrior Trenchless Solutions.

In essence, here's how the Warrior Trenchless Solutions system works: The PVC pipe comes in rolls, with the pipe shaped into a flattened "C" or "H" shape to allow for easier insertion into the host pipes. (The pipe is available in diameters ranging from 4 to 36 inches, as well as varying wall widths.) Prior to installation, crews heat up a roll by encapsulating it with tarps, then using a steam generator made by Sioux to inject heat through the middle of the spool upon which the pipe is wound, says Brian Baughman, manager of the company's trenchless department.

"We heat the pipe to 195 degrees F," he explains. "At that point, it's malleable enough to pull it off the spool with a high-speed winch." The PVC pipe is pulled into the host pipe from manhole to manhole, leaving enough extra pipe on each end to stick out of each manhole; that allows workers to install a rubber bypass plug on each end, he says.

Then steam as well as compressed air is injected through the plugs, which "inflates" the pipe from its "C" or "H" shape, forcing it to conform to the shape of the host pipe. While maintaining pressure, crews then cool the pipe down by pumping in chilled air, which converts the pipe back into its normal hardened state.

"The most critical part of the process is maintaining both the proper air pressure and temperature as the pipe is processing," Baughman says. "We use pressure and temperature gauges on both ends. A typical processing time is about 40 minutes. We're not really curing it, just cooling it back down to its normal PVC state."

The final steps involve trimming the pipe to fit and reinstating any lateral lines with robotic cutters manufactured by Schwalm USA and TRY TEK Machine Works. Including equipment setup and breakdown, it typically takes a day to complete one manhole-to-manhole installation, Baughman says.



LEFT: Heated PVC pipe being inserted in a manhole. BELOW: The pipeline where the heated PVC pipe will be inserted.



"We felt that this technology best fit the applications we were doing at the time. We were among the first companies in our region to get into pipe bursting."

Brian Baughman

best fit the applications we were doing at the time. We were among the first companies in our region to get into pipe bursting."

INVESTING IN TOMORROW

To support its trenchless services, TLC has developed a large fleet of equipment, including Envirosight robotic pipeline-inspection cameras, HDPE pipe fusion machines from McElroy, trailer jetters built by Spartan Tool, pipe bursting systems from Pow-R Mole and TT Technologies, robotic cutters manufactured by Schwalm USA and TRY TEK Machine Works, and bypass pumps made by Griffin Pump & Equipment and Godwin Pumps, a Xylem brand.

To clean sewers, TLC also owns a Vactor 2100 combination vacuum truck built on a 1998 Freightliner FL8 chassis with an 8-cubic-yard debris tank, a 1,000-gallon water tank, a 4,500 cfm blower and a water pump that generates 80 gpm at 2,500 psi. The company also owns many John Deere excavators and backhoe loaders made by Case Construction Equipment.

"Dale always likes to consider new technology," Baughman says of the company's large investment in equipment. "He's not afraid to invest in new technology."

Looking ahead, Baughman envisions continued growth for the company's trenchless pipe rehab services. It's currently expanding into CIPP pipe lining using a system made by Perma-Liner Industries. "We just did our first application of CIPP at a General Mills factory here in town," he says.

"I want to do whatever it takes to ensure we're the local front-runner on trenchless technology ... and to continue to provide specialty services to our customers," he adds. "If it's pipe, we want to rehab it. We feel like the sky's the limit." ISI

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UP IN THE AIR

Minneapolis takes advantage of drone technology to more effectively monitor rooftop vents during annual smoke testing

By Kyle Rogers

ump smoke into a sanitary sewer system and observe. It's a common method municipalities use to identify illicit sewer connections. But even a fairly straightforward process has room for improvement, as the city of Minneapolis has shown.

For the past two years, the city's Surface Water and Sewers Division has experimented with using a drone in its annual smoke testing in hopes of improving efficiency as well as worker safety. Smoke testing in residential neighborhoods presented no problems, says Katrina Kessler, director of the Surface Water and Sewers Division, but when the environment shifted to industrial and commercial areas, it wasn't as easy.

"The smoke testing primarily involves city staff standing in the middle of the right-of-way and looking at the top of buildings," Kessler says. "That works fine if it's a residential neighborhood with shorter buildings, but when it's a large commercial building where you actually need to have someone go up on the roof in order to check if the smoke is venting in the right places, there can be complications. You have to find the right person who knows how to access the roof of these buildings, and then you may come to find that the

vents are in difficult places and it's unsafe to be up on top of the roof."

The city decided that a drone could potentially be an answer to eliminating those complications while still getting a proper view of the rooftops of Minneapolis' largest structures. The smoke testing proThe City of Minneapolis Surface Water and Sewers Division has employed drones in its smoke testing program to get a better look at the tops of buildings without having to send workers onto private property.

gram began in 2007, and the city dedicates the months of August through October to it. A drone was first brought in for 2017's round of testing.

"The city has worked with a consulting firm that has one drone," Kessler says. "The firm operates the drone with a two-person crew, and we have two people from the city there as well, watching the video footage as it's being shot, because

the consultant doesn't have as much experience knowing what to look for."

In 2017, the city conducted smoke testing for 717 total blocks, with the drone being used on 118 of those. The drone footage was able to identify 13 illicit connections. In 2018, the drone was again used on 118 of a total of 654 blocks that were smoke tested. No illicit connections were identified by the drone from this most recent go-around of testing.

"Overall we're very pleased with the results," Kessler says. "We did get good images and were able to view and identify illicit connections. We definitely gained efficiencies. We estimate that for each larger building we smoke tested with the drone, it took us 15 to 30 minutes less than it would



"Overall we're very pleased with the results. We did get good images and were able to view and identify illicit connections. We definitely gained efficiencies."

Katrina Kessler

have getting in the building, talking to people and walking around on the roof. Using the drone required fewer city staff, but we still had the consultant. That was kind of a wash, but without the drone, it would have taken longer and we would have gotten less done. And it's definitely a win in the safety column."

However, something extra the city had to be cognizant of by using a drone was the issue of privacy. Kessler says her division made sure to communicate with the public to inform them that the drone would be limited to commercial areas and large buildings with flat roofs and would only be operated from the public right-of-way. And the crew was careful with how exactly the drone was operated.



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"Essentially what would happen is the staff would be in the middle of the street, fly the drone up above the building, turn it to look at the top of the building and bring it back down," Kessler says. "They weren't flying over the roof. We wanted to make sure we weren't infringing on private property."

There are about three more years of smoke testing left to cover the entire

Surface Water and Sewers Division crew members get a drone's eye view of a nearby building during a smoke testing project.

city, but in the meantime, Kessler says the city is looking at potentially procuring its own drone for other beneficial uses within the Public Works Department. Stormwater outfall inspections is one of those possibilities.

"A lot of the city ultimately outfalls to the Mississippi River, and some of those outfalls are high up on bluffs or in difficult areas that you can't really access except by boat and only when the conditions are safe to do so," Kessler says. "That's one thing we thought about going forward."

Acquiring a drone would require Federal Aviation Administration licensure for employees to be able to operate it, and privacy would continue to be a concern if the city ends up going that route.

"We want to make sure we have the support of the elected officials and that we're following the right legal processes if we go and get a drone ourselves. So we're not there yet, but we're exploring the option," Kessler says.

For any other municipalities contemplating using a drone to aid day-to-day operations, Kessler emphasizes the vital role of communication.

"I would say that communication is really important, both with elected officials and the city attorney's office as well as citizens." **ISI**



The Newmarket (New Hampshire) Environmental Services Department crew replaced sewer lines all the way to private homes as part of a proactive approach to reducing I&I.

"At one point in 2009, it showed that our infiltration and inflow was upward of 360,000 gallons a day on average."

FACING THE CHALLENGE

A small utility takes on inflow and infiltration with capital improvements and data collection

STORY Erik Gunn | PHOTOS Oliver Parini

ike many operators of older sewer collection systems, Newmarket, New Hampshire, has had to combat major problems with inflow and infiltration in its wastewater collections system.

Nestled some 60 miles north of Boston, Newmarket is a one-time mill town that has evolved into a bedroom community with old factories now made over into residential lofts and a variety of small businesses. The older portions of the town's 22 miles of sewer mains date back to the early 1900s. The lines are a mix of asbestos cement, clay and plastic, and they are being upgraded with modern plastic materials.

Newmarket has proactively faced the challenge, undertaking major renovations in its sewer operations while planning ahead for more.

POROUS PIPES

Aided by government grants, Newmarket evaluated the entire sewer collections system starting in 2009. The worst I&I problems were in the town's New Village district, says Sean Greig, director of the Newmarket Environmental Services Department.

"At one point in 2009, it showed that our infiltration and inflow was upward of 360,000 gallons a day on average" when big storms hit.

The area was targeted for a total replacement of sewer lines — all of it "pretty porous" clay pipe, Greig says. (Water mains in the area were replaced, too, to amortize the disruption to roadways caused by the digging.)

The town also didn't stop with replacing the sewer mains. "We replaced services all the way to the houses," he adds. In place of the original clay pipes or

older-generation plastic pipes, the town has opted for SDR 35 plastic piping. Next was a manhole repair project at a cost of \$100,000. Between the two

efforts, the town was able to reduce I&I down to about 150,000 gpd, Greig says. The entire I&I initiative was triggered by a major rehab of the town's wastewater treatment plant. In discussions with town officials who ultimately had to sign off on the investments, Greig pointed out the \$11 million price tag for the wastewater project. "It's more expensive to treat each gallon going through that facility, so we should probably go out and try and remove as much I&I as we can while we're waiting for that new facility to be built."

Now at the top of his agenda is an overhaul for the town's six wastewater pumping stations, as well as development of an asset management and growth plan drawing on the 2017 build-out study.

MAP AND INSPECT

In 2012 the department invested in GPS mapping technology using Trimble Yuma GPS-equipped field tablet computers.

"It was expensive," he recalls — in the range of \$13,000 for five units. But with it, "We have mapped our entire water and wastewater system." When the department's iPad-equipped systems technician goes out to do repairs, he can lock in on the exact spot thanks to the GPS record and load it into the iPad's map to record the information. And when new mains are installed, the department can get exact location records from the start.

Most recently, the department acquired a sewer camera and has been using it to inspect lines after every cleaning.



Todd Gianotti (left) and Joel Drelick review sewer line records in the field using a field tablet computer (Trimble Yuma).



Newmarket Environment Services Department crew members Ben Trottier, left, Joel Drelick, back, and Sam Heffron clean a sewer main.



"It's more expensive to treat each gallon going through that facility, so we should probably go out and try and remove as much I&I as we can while we're waiting for that new facility to be built." Sean Greig

Sean Greig, director of the Newmarket Environment Services Department

For Greig, the equipment investment pays double dividends. For one thing, it helps stretch a tight labor market. "When you have good equipment and you give it to people who know how to use it, we don't need as many people because the equipment's doing the work," he points out.

And by owning it and using it in-house, the department gets the full advantage of the information it collects. "We're spending a lot of money on

engineering," he points out. "Don't we want to have as much information as we can get for the engineer?" But by the same token, he continues, it makes more sense, instead of paying an engineer's rates to collect the information, to collect it in-house and have access to it all the time. "Once we've gotten all the information, we're learning how to use it and make it work for ourselves." **ISI**



EPOXY USED TO PROTECT PUMP STATION

PROBLEM:

Epoxytec's Urethane Modified Epoxy system was specified by Miami-Dade County, Florida, to upgrade and protect an existing pump station. This system has been specified in the county for over two decades. It is a proven system with a strong



reputation for application simplicity and outperforming other options in substrate repair and protection. Epoxytec's UME system consists of a hybrid epoxy cementitious underlayment for repairing concrete and an epoxy top-coat composite system to line and protect the substrate. The application by Champion, an Epoxytec Certified Contractor, ensured this project's success.

SOLUTION:

Hydroblasting was used to remove the existing coating to meet NACE Standard No. 5/SSPC-SP12. **Epoxytec's Mortartec Ceramico** was then applied as the repair material to resurface, patch and fill voids and bug holes on the concrete substrate. This process, as well as the entire project application, was overseen by Dan Gibbens, project manager for Champion. "Ceramico was applied without any problems. It was cut and dry, nice and easy," Gibbens says. Next, two coats of Uroflex were spray applied. Epoxytec provides Uroflex in a two-coat color system to assist with ease of application.

Result: All parties involved with this application were satisfied with the outcome. "The project was finished on time with no major issues," Gibbens says. Epoxytec's Uroflex, as applied by Champion's expert crew, will ensure a long service life for Hialeah Pump Station 106. **877-463-7699; www.epoxytec.com**

THREE-HOUR PATCH REPAIR SOLUTION PREVENTS MALL SHUTDOWN

PROBLEM:

Located in the city's South Beach neighborhood, Bal Harbour Shops is one of Miami's most exclusive high-end shopping locations. However, the mall had a hole in an 8-inch sewer line running from the front of the building to the street. Due to the height of the surrounding water table, the pipe was experiencing a significant amount of infiltration, especially during high tide. Express Drain was contracted to solve the problem.

SOLUTION:

A conventional dig-and-replace solution just wasn't an option. The summer season was just beginning, and the store owners couldn't afford to close down for the several weeks required to carry out invasive repairs. To make matters worse, the faulty pipe ran through the parking lot of the mall complex, making it especially costly and time-intensive to repair using dig-and-replace methods. Express Drain's answer was to employ a noninvasive repair solution: **Trelleborg Pipe Seals' patch repair system.** The patch repair was quickly scheduled for low tide, which happened to be at 1 a.m.

Result: The speed and simplicity of applying the patch allowed the entire repair to be completed in just three hours. This meant the contractor could finish work and be offsite before the start of business the following day, avoiding any disruption to the shop owners. The solution is expected to keep the repaired sewer line watertight for many years to come, preventing future recurrences of the problem. **800-626-2180; www.frelleborg.com/pipe-seals**



LINER SYSTEM HELPS WASTEWATER PLANT WITH EXFILTRATION ISSUES



PROBLEM:

In 2015, Harris County Municipal Utility District No. 418 in Texas was constructing a new wastewater treatment plant that had a 260-foot section of concrete box culvert that could not pass the exfiltration test due to leaks in the joints. The contractor tried several times to make joint repairs with no success, and the project was behind schedule.

SOLUTION:

Brown & Gay Engineers was the design engineer and looked at a variety of methods to make the repair. Most were cost-prohibitive and time-consuming. The repairs needed to be made quickly in order to pass the exfiltration test and keep the project on track to meet the completion date. Brown & Gay Engineers called **SpectraShield Liner Systems** for a meeting and site visit to see if this was a project they could tackle. The system was used to line the culvert in a matter of days.

Result: Due to the fast and easy application, the box culvert was lined, passed the exfiltration test and got the project back on track. **800-284-2030; www.spectrashield.com**

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Superior Signal smoke testing systems help reduce wet-weather sanitary sewer overflows and surface inflow. Superior Smoke Candles, Fluid and Smoke Blowers are designed to smoke test sanitary sewers quickly, efficiently and economically. The blowers can be used with smoke candles or fluid to detect sources of inflow and other faults. Smoke candles provide a highly visible smoke to find more faults at a



longer distance. The Superior 3C Classic Smoke Candle produces a volume of 40,000 cubic feet of smoke in just three minutes. Multiple W3C Smoke Candles can be together to create larger volumes of smoke visible for longer periods of time. The company's fluid systems offer a liquid-based alternative for mainline sewer inspection and feature a stainless steel injector to maximize dry smoke output, producing a higher-quality, liquid-based smoke. Superior Smoke's testing techniques were developed over 60 years ago and are still made in the U.S.

800-945-8378; www.superiorsignal.com/ii

JOINT SEAL ENABLES EMERGENCY PIPE REPAIR AT TREATMENT PLANT



PROBLEM:

In February 2018, at a large Midwest wastewater treatment plant on the Great Lakes, operators noticed what appeared to be wastewater coming out of the ground near a high-level junction structure. The structure where the leaking was observed consists of 48-, 60-, 78and 90-inch inlet pipes and a 90-inch outlet to the plant. The plant declared an emergency and obtained the services of a local contractor to investigate the issue.

SOLUTION:

The contractor mobilized and began excavating around the inlet pipes and used pumps to control leakage during exploration. By Feb. 22, the site was stabilized with all high-level siphon inlet pipes exposed. The high-level siphon junction structure and piping consisted of a steel pipe connection into the structure itself and transition to a prestressed concrete cylinder pipe-slip joint outside of the structure. This slip joint was observed to be leaking on the 48-, 60- and 78-inch pipes. To stop the leakage, a **Cretex Specialty Products HydraTite Internal Joint Seal** was proposed to be installed from inside of the pipe. The seals can withstand up to 300 psi of internal pressure and completely span the leaking slip joint. By the end of February, a diversion plan was successfully tested prior to the seal installation.

Result: The first Cretex/HydraTite Internal Joint Seal was installed March 9 on the 60-inch inlet pipe joint. Once the seal had been installed, the leakage was completely stopped. On March 14 the 48-inch pipe was repaired, and on March 16 the 78-inch pipe was repaired. No further leaks were observed from any pipes. **800-345-3764; www.cretexseals.com**

(continued)



LINING CURES INFLOW AND INFILTRATION AND CLOGGING ISSUE

PROBLEM:

Dan Grossruck with The Pipe Guys in Tacoma, Washington, got a call to open a sewer lateral at a customer's home last spring.

Upon arrival, the crew inserted a CCTV camera into the line to see what they were dealing with. The video showed paper and other solids stuck on a broken pipe. Additionally, they saw water infiltrating into the pipe, and further inspection showed that the bottom of the pipe was missing, leaving sharp edges of the pipe exposed.

SOLUTION:

Grossruck, a member of a group sitting on the local sewer board to eliminate I&I issues, saw a clear case that he could mitigate. He showed the homeowner the issue and how he could kill two birds with one stone. By lining the pipe with a CIPP liner, they could restore the pipe to a new condition that wouldn't catch any solids and back up, and they would eliminate the I&I adding to the problem. The project used **Pipe Lining Supply's Quik-Pox Resin** and **Embossed Liner** to line the 62 feet of 4-inch pipe.

Result: With this approach, he delivered a win for his customer by permanently eliminating his backup issues and a win for the sewer district in eliminating I&I coming into the collections system. **888-354-6464**; www.pipeliningsupply.com



MILITARY RESERVATION REHABILITATES FOUR LARGE ROAD-SUPPORTING PARALLEL PIPES

PROBLEM:

Fort Drum, New York, a 25.4-square-mile U.S. military reservation and census-designated place, includes several towns and villages. Its aging infrastructure supporting military and residential activities requires ongoing maintenance and rehabilitation programs and projects. One such project focused on four large parallel 142-by-91-inch arched corrugated metal pipes, supporting a roadway over a trout stream, with a separation of 3 feet between each barrel for a total span of 56.3 feet. Meeting the existing structure's military loading classification for wheeled and tracked vehicle traffic was a project requirement. Two other complications applied: The buried bridge is set in the Black River, a recognized trout stream, and the military roadway needed to stay open. The structure couldn't be torn out and replaced, and river diversions had to be limited and carefully managed.

SOLUTION:

CentriPipe, a centrifugally cast concrete pipe solution from **AP/M Permaform,** was selected and designed for the key arc elements. The design intricacies and the material properties ensured a structurally sound, watertight, rehabilitated buried bridge structure that meets the military load classification. Following dewatering and pipe preparation, the spincaster was pulled through each pipe a total of nine passes to spray thin layers of Permacast PL-8000, a fine aggregate composite concrete. The total thickness applied to each pipe was a little more than 2 inches over the corrugations, resulting in smoothly finished rehabilitated concrete arch pipes that look brand new.

Result: Rehabilitation of all four pipes, plus the installation of a specified fish ladder was completed in a month and a half. **800-662-6465; www.permaform.net**



THE BARRIER WITH A DUAL PURPOSE DRIP EDGE.



DRIP EDGE BENEFITS:

- Maintains grade ring & manhole alignment during backfill.

- Keeps ground water away from the bottom seam.

RISERS KEEP MANHOLES AT GRADE

PROBLEM:

Fairhope is a small city of just 15,000 residents situated on the cliffs and shoreline of Mobile Bay in Alabama's Gulf Coast. Infrastructure maintenance can be a challenge here for all the usual reasons and one unusual one: The city has a history of devastation and flooding by hurricane, including Hurricane Frederic in 1979 and Hurricane Katrina in 2005. But the city doesn't have a problem keeping manholes at grade after roadway resurfacing projects, not in recent years anyway.

SOLUTION:

For 15 years, Fairhope has been specifying the **American Highway Products Pivoted Turnbuckle Manhole Riser.** The risers are sturdy, flexible rings made of galvanized steel, and they can be ordered in precise diameters to match any manhole and in precise thicknesses (with increments as fine as a quarter-inch) to precisely match paving lifts. The "pivoting turnbuckle" is an adjustable linkage that allows the risers to be set loosely in an original utility rim, then expanded with a Phillips screwdriver (used as a lever) to seat tightly and securely.

DRIP EDGE

Result: At-grade risers are better for roads in many ways, compared to concrete ring replacement. They don't set low, so water doesn't collect around the manhole lid causing excessive infiltration, and they don't set high, so vehicle tires don't jar the lid and rim continually. And since risers are usually set just before paving runs, the newly raised manhole is surrounded by new, contiguous pavement, and that prevents water and freeze/ thaw damage in the pavement around the manhole.

888-272-2397; www.ahpl.com I&I



PRODUCTS



City of Palm Coast Utility Department technician Don Abbott (right) and foreman Bryan Parreso work on a PEP tank installation at a new home site.



MANAGING EXCESS FLOW

Palm Coast prevents what it can and pumps the rest to save treatment costs

STORY Jim Force | PHOTOS Rob Herrera

epairing, replacing and rehabilitating your collections system to the point where it is completely free of inflow and infiltration is nearly impossible. Sometimes you have to find new ways to deal with the stormwater that your system simply can't handle.

The city of Palm Coast, Florida, is no stranger to stormwater. The wastewater collections department works tirelessly to keep it out of its collections system and remove it as quickly as possible when wet weather moves in.

The system consists of 600 miles of pipe and 159 pump stations. What's unusual in Palm Coast is the existence of over 14,000 Pretreatment Effluent Pumping units owned and maintained by the city, each one serving a household. They were installed as a less-costly alternative to gravity sewers during the development of Palm Coast.

The city has no stormwater sewers. Rather, stormwater is collected in 70 miles of freshwater and saltwater canals, more than 150 miles of interconnected ditches and more than 1,200 miles of roadside swales. The water is directed to the Intracoastal Waterway, which runs through the city.

Stormwater can also drain to the several lakes, tributaries and wetlands in the area, including Graham Swamp - a huge storm flow collection area.

I&I can overload the treatment facilities during unusually heavy wet weather. "It can inundate us at the treatment plant," says Danny Ashburn, wastewater operations manager, who has been with the city for more than 36 years.

MAINTENANCE PROGRAMS

The Palm Coast collections team strives to televise, clean and repair 20 percent of its system every year — covering the entire system every five years.

To accomplish that, the city uses its own Envirosight portable inspection system to identify areas that need attention. Any problems in the line are recorded and added to the repair list to be completed by the construction

"For one thing, we smoke test our sewer lines all year-round. That way when the rains hit, the infiltration is not as bad. We also shoot and coat our manholes."

Ralph Hand

crews. "We have two vacuum/jetting trucks. One is a Vac-Con, and the other is a Vactor," Ashburn says. "We use them for cleaning both the gravity mains and pump stations." The city also uses root cutters to clear lines. "We televise and clean almost every day. Rags can be a problem when we flush the lines."

A trio of 4,500-gallon capacity tanker trucks is another collections maintenance tool. "Whenever we have high flows, we use the trucks to help us keep up," Ashburn says. The trucks can be dispatched to manholes to pump excess water from the system and deliver it to the treatment plant.

Other maintenance programs include smoke testing of gravity sewers to identify infiltration sources, and repairs to failed gravity lines utilizing cured-in-place fiberglass liners. Ashburn's team is also responsible for grouting



Utility technician Dusty Holloway handles the spray gun while excavating a service lateral for replacement.

leaks in manholes and wet wells and addressing backups or power failures in pump stations.

EMERGENCY PROTOCOL

One good thing about wet weather: You can usually predict it and get ready for it.

That's exactly what Ashburn and his team do. Their emergency preparedness plan is not just a three-ring binder on the shelf; it's frequently put into practice, especially as each new hurricane season looms in the fall.

"We take special precautions," he says. "First we go out and

make sure everything works properly and everything is battened down at the sites. We get everyone prepared and make sure our tanker trucks are working properly and are fueled up and ready to go. We make sure we don't have any obstructions in the lines. If we have any new construction going on, we secure those sites."

Ralph Hand, utility supervisor, has special responsibility for wet-weather response and makes sure Palm Coast is ready for the worst. "For one thing," Hand says, "we smoke test our sewer lines all year-round. That way when the rains hit, the infiltration is not as bad. We also shoot and coat our manholes."

As a storm approaches, Hand and his team pump out as much as they can from the sewer system to increase capacity. In addition to the trio of tanker trucks the utility has on hand, Palm Coast has agreements with three outside contractors to supply additional tanker trucks if needed.

For hurricanes or severe storms, Palm Coast adjusts its staffing as well. "We go to two 12 1/2-hour shifts," Hand says of his team's wet-weather protocol. "We get set to handle the tank trucking stations and the PEP systems, help at the treatment plants and take calls. This isn't anything new to us. We'll stay on two shifts until we get caught up."

Emergency generators at the pump stations also play a role during storms. "We employ a seven-technician team and continue to make upgrades to our pump stations, based on what we experience during storms," Ashburn says.

MOVING FORWARD

Recently, the city received a Federal Emergency Management Agency

Utility technician Chris Driggers gives foreman David Cousin the OK to begin moving the crawler for inspection (Envirosight).

grant to purchase 35 additional emergency generators for areas where power outages occur frequently.

That will add to the city's current 19 standby generators located at critical sites, plus nine portable generators that can be moved around the system. Ashburn says the city typically uses Tradewinds; Caterpillar Inc., Electric Power Division; and Generac generators.

"Ultimately, we'd like to have standby generators at all key sites, including pump stations near environmentally sensitive bodies of water — freshwater lakes, canals and retention ponds that ultimately drain into the Intracoastal Waterway."

But the biggest step forward may be the new wastewater treatment plant Palm Coast is starting up on the city's north side. At 2.0 mgd at startup and expandable to 4.0 mgd in the future, the plant will be able to take the load off the existing plant and help keep it from becoming overloaded. "It will help us out a lot with storm flow," Ashburn says. "Instead of having everything end up at one place, we'll be able to divert flow to the new plant."

Startup of a new plant, increasing growth and development, hurricanes, I&I, PEP systems, storm runoff, power outages — you name it. "We get a little bit of everything in Palm Coast," Ashburn muses. **I&I**



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BECOME A PRIVATE DETECTIVE

Comparison study shows that private-side inflow is the biggest contributor to overall inflow and infiltration problems

By Jared Raney

f you want to effectively mitigate inflow and infiltration, you need to have a plan for the private side of your system.

Engineering firm CDM Smith has found across a number of I&I mitigation programs that private properties contribute an estimated 50 to 70 percent of total I&I for any given municipality. Their findings were confirmed during a comparison study in Revere, Massachusetts.

Following a consent decree negotiation in 2010, Revere set out to remove 40 to 50 percent of total I&I. CDM Smith was hired to analyze the 99 miles of sewer main supported by 12 pump stations. To develop a plan for the substantial I&I reduction, CDM Smith had to determine where the city would get the most bang for its buck: the private or public side.

In the end, to achieve their goals and complete the consent decree, they formulated a comprehensive mitigation plan to address both sides of the system, with a focus on cured-in-place pipe and service lateral connection lining, manhole rehabilitation and, most important, private inflow removal.

STUDYING THE PROBLEM

Before embarking on any mitigation efforts, the city had to assess the system and find out where the I&I was coming from.

"Because of the aggressive timeline and the magnitude of the work to be conducted, the city elected to perform flow isolation during the nighttime hours in dry-weather conditions to determine specific areas with infiltration rates in excess of 4,000 gallons per day per inch-diameter mile (GPD/IDM) to narrow down the scope of future investigations," according to the study.

Those isolated portions of the system were evaluated using CCTV inspection, smoke and dye testing, manhole inspections and house-to-house inspections.

Revere's collections system consists of predominantly 100-year-old sewers and service laterals, and their main interceptor is an egg-shaped brick sewer constructed in

1904. Finding areas of infiltration by targeting aging parts of the system would be ineffective.

Instead, they used the evaluations in conjunction with estimated flows by type of source with a computer-modeled simulation.



Flow metering locations.

Flowmeters and groundwater gauges were also used to determine the magnitude of wet-weather flows. With all this information, they developed a hydraulic model of the system, following a standard used by the Environmental Protection Agency.

After analyzing the results, they determined that 60 percent of the I&I in Revere was coming from private properties. Considering their goal to eliminate 40 to 50 percent of the city's I&I, they would have to address both sides in a comprehensive plan to complete their consent decree.



Infiltration removal comparison from comprehensive rehabilitation of the public wastewater system.

"The goal of 50 percent I&I removal could not be achieved by simply rehabilitating the

public sewer system."

Comparison study by CDM Smith

ADDRESSING PRIVATE INFLOW

Improper sump pump discharge was believed to be the biggest contributor to private inflow, and so the city initiated the Sump Pump Amnesty Program to encourage participation and identification of illegal discharges. The city also amended local ordinances, requiring building owners to redirect illicit sources discharging into the sewer system.

Outdated drainage systems such as roof, yard, driveway and patio drains were another issue and included in the amended ordinance.

As part of the amnesty program, residents were given until the end of the 2015 calendar year to notify city officials that there was an illegal sump pump or allow an inspection. If they did so, the city would redirect the discharge at no cost to the homeowners. Beyond that, once the program expired, property owners would be responsible for the full cost and subject to possible fines for ordinance violation.

"Gaining access to private properties is the single greatest challenge when conducting a private inflow removal program. As in any private inflow program, the success of the program is directly related to the success rate of entering the private homes/private property in order to perform an inspection," the study notes.

Using a low-lying area as a baseline for their study, CDM Smith found

that after inspecting 47 percent of properties in the area, approximately 30 percent of known private inflow sources were removed.

"Thus, through extrapolation, assuming all inflow sources identified to date are eventually removed, and the flow contributed from each of those removed remains the same, we could anticipate a total percent removal of inflow of approximately 43 percent," the study indicates.

KNOWLEDGE WINS

Discovering and acknowledging the role of privateside I&I in their system was key for the city of Revere in reaching its ambitious mitigation goals.

"The goal of 50 percent I&I removal could not be achieved by simply rehabilitating the public sewer system," the study says. "This did not come as a surprise to the city of Revere or CDM Smith; however, the amount of I&I attributed to private inflow was certainly more than originally anticipated and resulted in a need to focus intently on private inflow removal."

While public mitigation via CIPP lining, manhole rehabilitation and service lateral connection lining were also important in meeting the consent decree — removing as much as 22 percent from the test area — it was the cooperation with private landowners that made the difference.

The city is still working toward its consent decree,

but with the combination of these public and private programs, they estimate reaching 65 percent I&I removal — well over the consent decree requirements. **ISI**



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