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April 2010

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New Castle County
targets 100-year life for
rehabilitated sewers

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INSIDE:

PIPE LINING/RELINING



COVER:

A major sewer rehabilitation project in New Castle County, Del., aims to reduce wet-weather backups and CSOs. The county wants rehabilitated lines to have 100-years of life expectancy. Here, Pillari Brothers employees Manny Pereira (on excavator) and Tony Pereira place a section of 48-inch pipe. (Photography by Terence Roberts)



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COMING IN MAY 2010

Flow Control and Monitoring/Stormwater Treatment/Dewatering and Pretreatment

- ◆ Sewer: Collection system certification in Monroe County, N.Y.
- ◆ Sewer: Innovative "sewershed" modeling in Duluth, Minn.
- ◆ Storm: Enlisting the public in Kitsap County, Wash.
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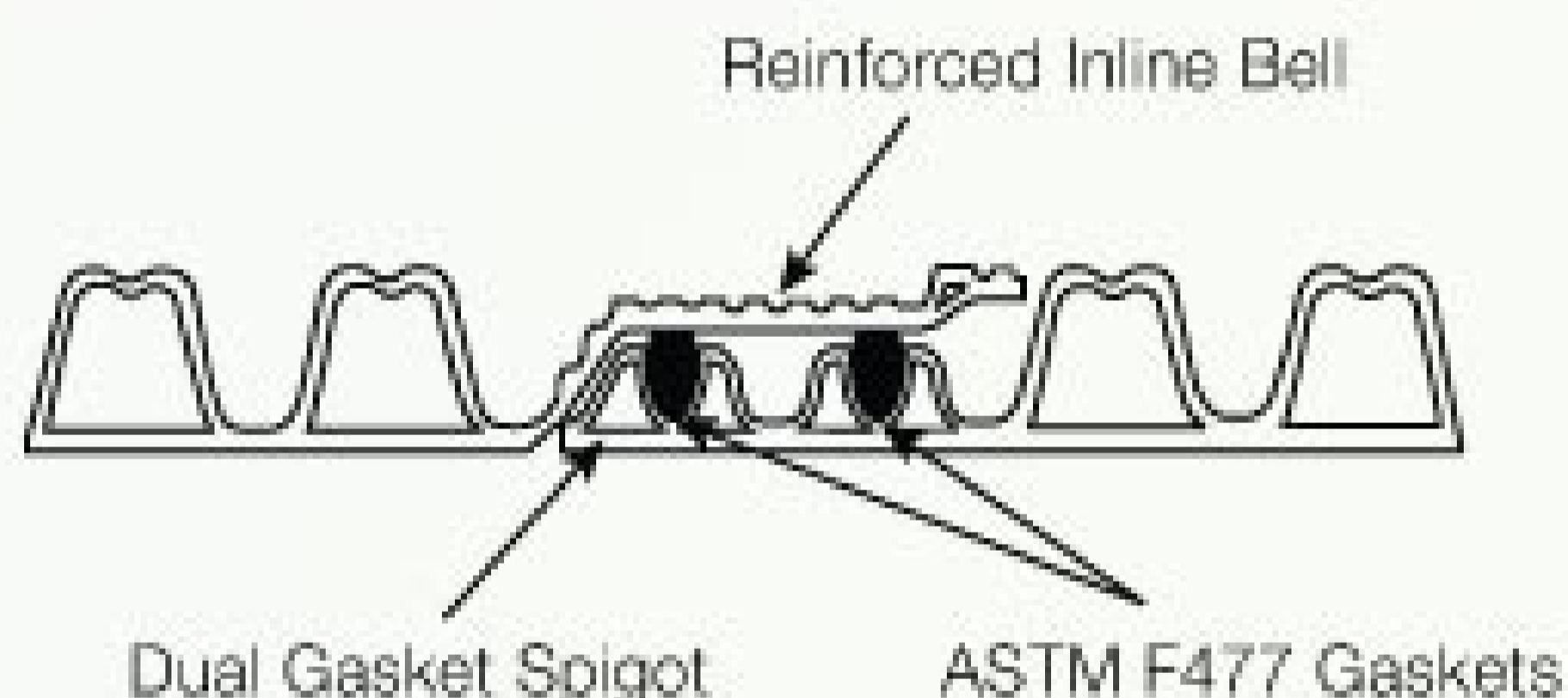
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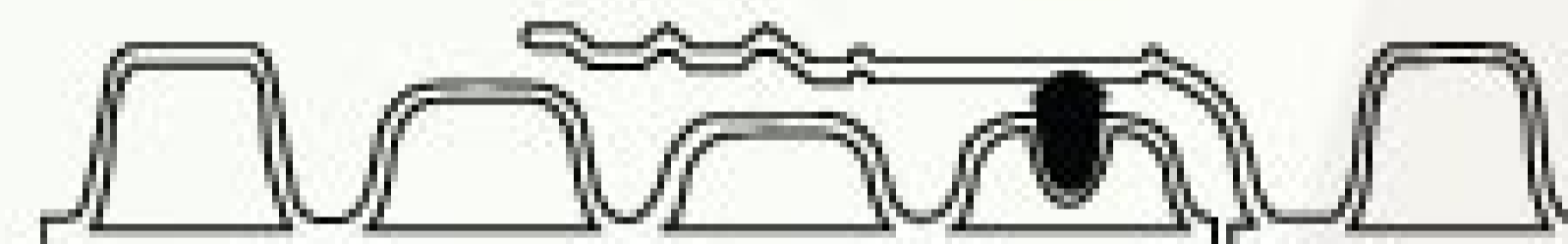
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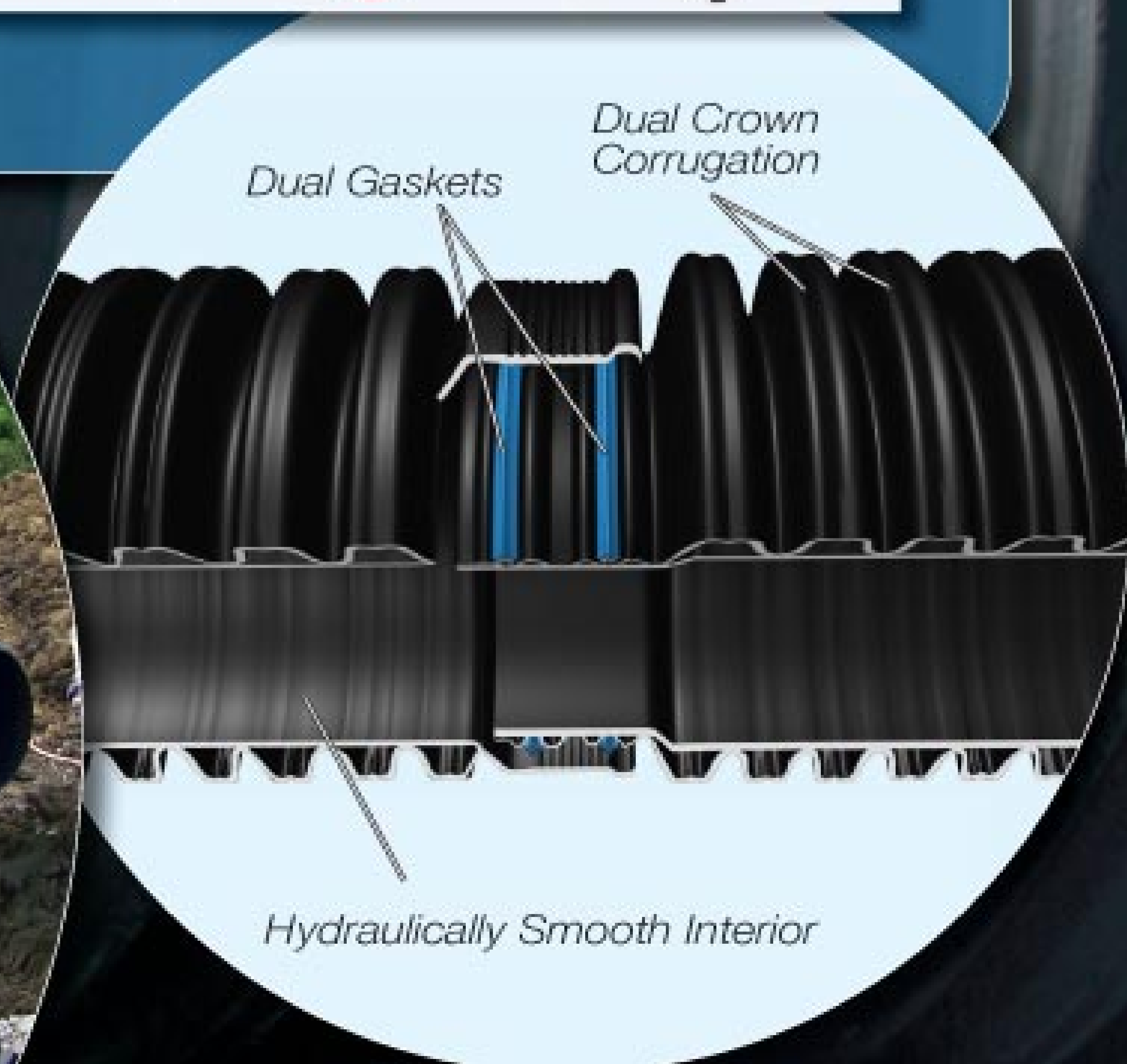
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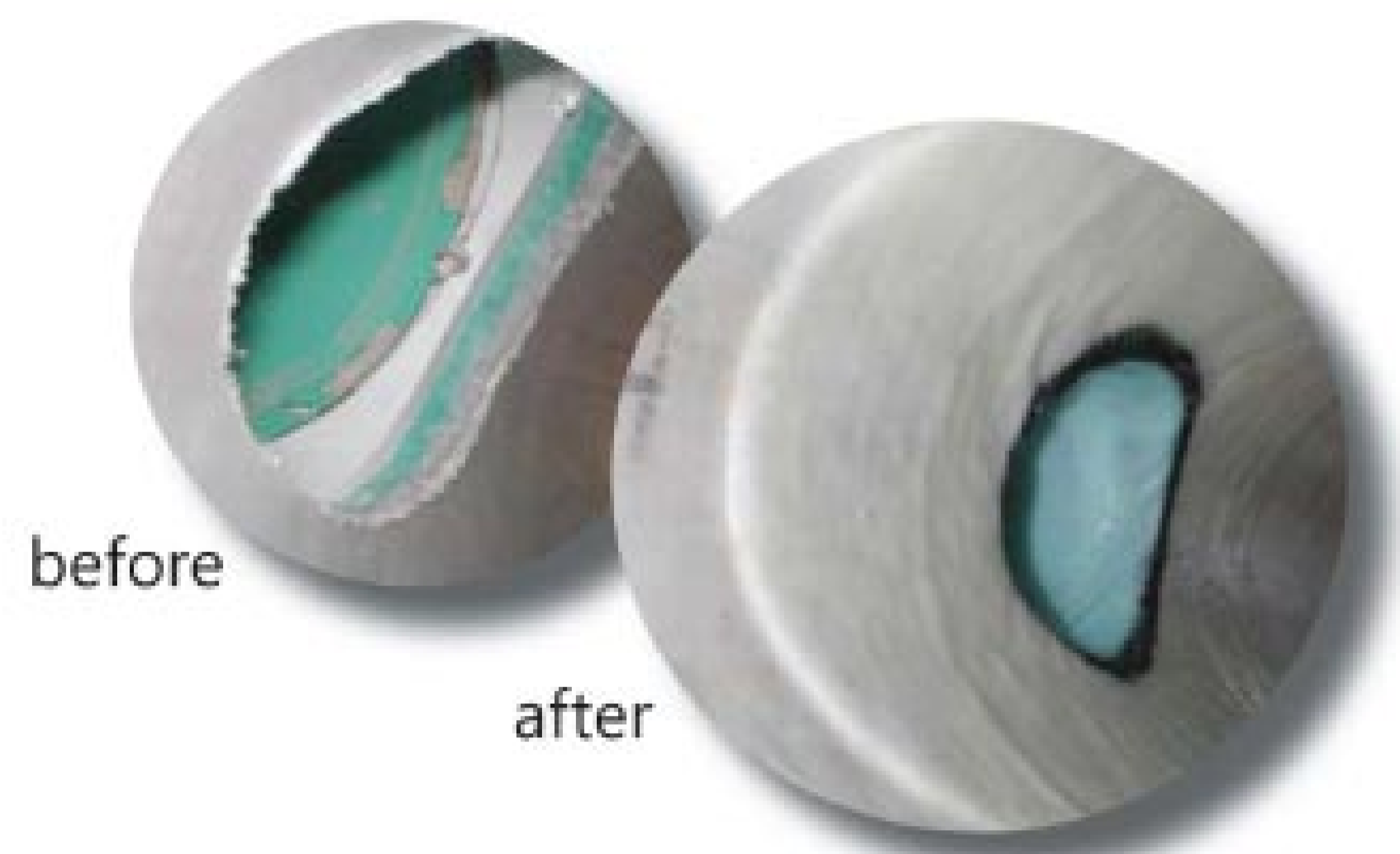
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MAKING IT LAST

The round of pipe rehabilitation projects now underway could result in critical infrastructure that lasts longer than the original installation

It's amazing sometimes to think of what used to get buried in the name of water and sewer piping (especially sewer) back in the old days as cities grew.

Clay and concrete piping with multiple joints. Wooden pipes. Brick sewers. Orangeburg. It makes you wonder if anyone back then thought about the long-term costs, let alone consequences, of using materials so obviously prone to degradation from all those forces underground: settling, heaving, freezing, thawing, erosion, decay, corrosion, root intrusion.

Now, as the nation's utilities and municipalities methodically go back over what was done 40, 60, 80, or 100 years ago, there's an opportunity to do it better the second time — to rehabilitate pipes in ways that make them last longer than the originals. And better yet, do it cost-effectively and with minimal disruption of property.

Many choices

It's hard to imagine, and impossible to guess, how much money gets wasted each year because of old, deteriorated, offset pipes that let clear water rush into sewer systems. Or how much damage is done when degraded water mains break,

or spring slow leaks that generate sinkholes.

Fortunately, modern technology offers numerous effective and long-lasting remedies. Just as car buyers can choose multiple models under the Ford and Chevrolet brands, utility managers can select a variety of options under the general categories of CIPP lining, slip-lining, spray-on lining, pipe bursting, and grouting.

We report on such techniques often in *Municipal Sewer & Water*, and the current issue contains two more examples of communities

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doing it the right way — with smart application of conventional trench-and-replace, with advanced trenchless methods, and even with older types of piping installed using better practices.

Thinking long-term

For an example of long-term thinking, consider New Castle County, Del. There, assistant county engineer Dave Hofer and his team look for rehabilitation solutions that will give new or renovated sewer pipe 100 years of service life.

When using CIPP lining, they write stringent specifications and hold contractors accountable for meeting them. But it's not all about using the latest materials and technologies. In rehabilitating sewer interceptors, New Castle



FROM THE EDITOR

Ted J. Rulseh

County relies in part on vitrified clay pipe (VCP), used as far back as the days of the Roman Empire.

The problem with VCP, Hofer says, was not with the material itself. The problem was less-than-ideal installation. The county makes sure the VCP interceptors it installs are properly bedded. Gaskets between sections ensure tight and lasting seals. And post-construction laser profile inspections ensure that the work is done to specifications before the county accepts it.

The 100-year service life standard even applies to sealants and mortars used in manhole rehabilitation projects.

Water mains, too

Another trendsetter is the City of Victoria, B.C., which is replacing 20- to 24-inch water mains in one of the biggest trenchless programs of its kind in Canada. As part of the project, the city used a modified slip-lining process with a folded, pulled-in-place HDPE liner system.

The city expects to complete some 90 percent of the three-phase project using trenchless technology. In areas where open-cut replacement was preferable, the city used ductile iron piping and installed a pressure-relief valve station to strengthen the integrity of the overall system.

Communities considering rehabilitation projects with trenchless technology have substantial investigating to do and difficult choices to make. One good place to start is with the Trenchless Assessment Guide for Rehabilitation (TAG-R) from NASSCO.

This software program enables the evaluation of more than 80 technologies for pipeline rehabilitation. It helps consulting and municipal engineers get comprehensive information they can use when choosing a technology for a specific application.

It's just one more step toward the goal of replacement or rehabilitated infrastructure that's not just "as good as" but "better than" the original. ♦

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Believer in Certification

To the editor:

I enjoyed reading "Thoughts on Certification" (From the Editor, MSW, February 2010). I am an advocate for certification in the water and wastewater industry. I personally hold wastewater treatment certifications in Maryland (5A) and through ABC (Level 4). In my present position as director of maintenance with the District of Columbia Water & Sewer Authority, I am no longer required to hold certifications, but I actively maintain them.

Our wastewater treatment operators are required to hold certifications from Maryland, Virginia, or ABC because the District of Columbia doesn't have a certifying body. On the maintenance side, I am involved in pushing maintenance certifications.

Our instrumentation technicians are required to be certified ISA, and high-voltage technicians require AVO certification. I started

implementing a general maintenance certification program with certification provided through International Maintenance Institute.

I agree with the others quoted in the column. I have found that even on the maintenance side, our technicians are more knowledgeable, more committed, more productive, and more motivated when they are certified.

The problem I have run into is funding. In the past year the economy has taken a toll on the continuation of voluntary certifications.

Thank you for the focus on certification. It is a topic that needs to be pushed in the statehouses across the country in those states that do not require certification for water and wastewater professionals.

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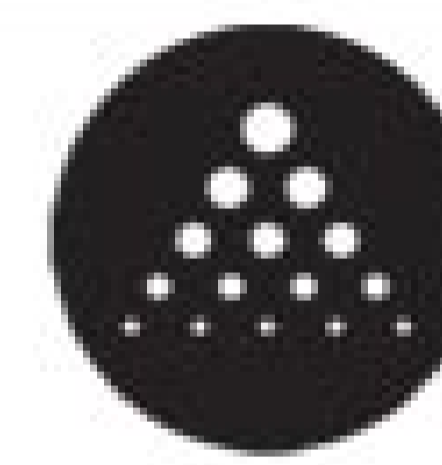
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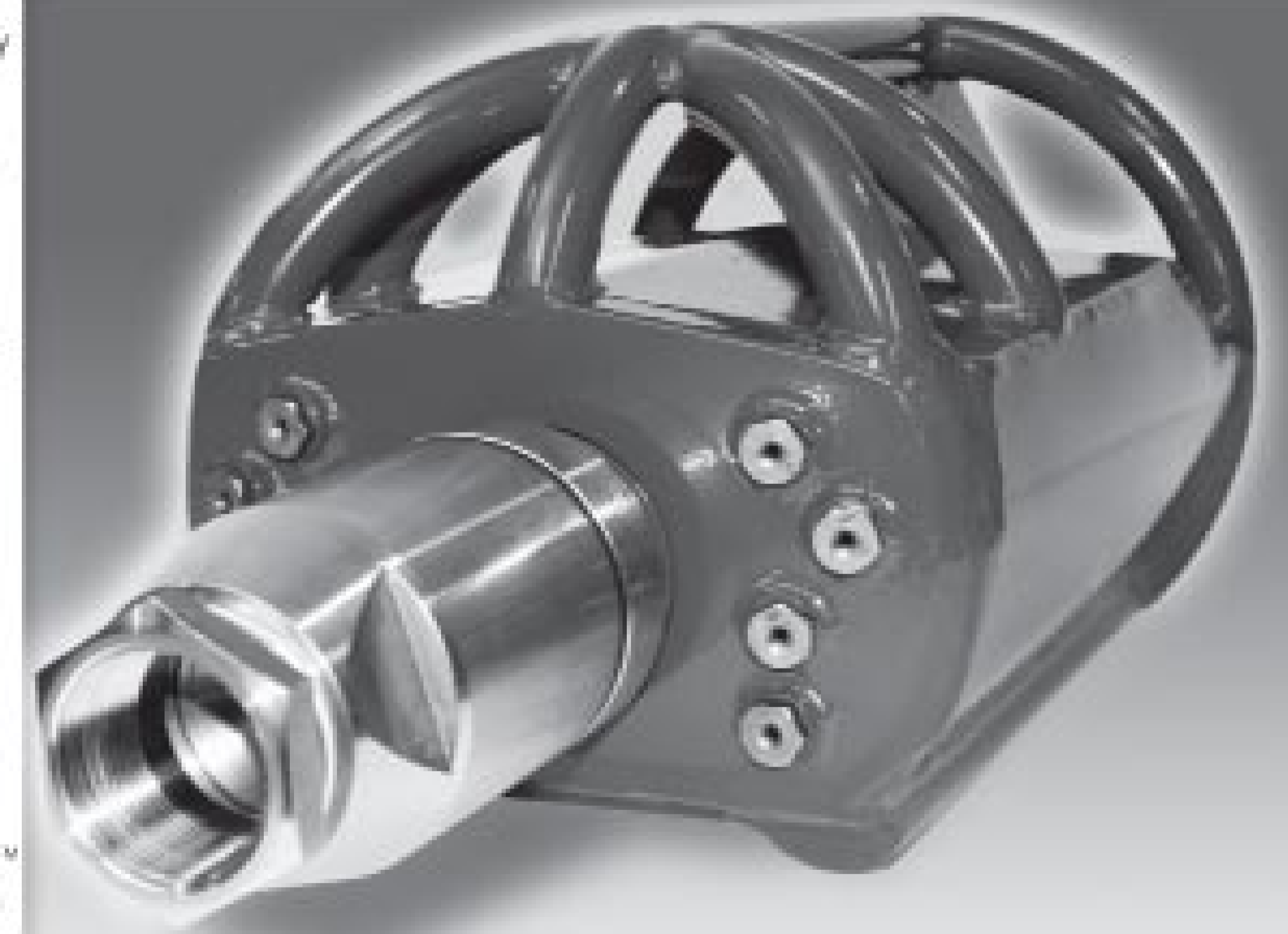


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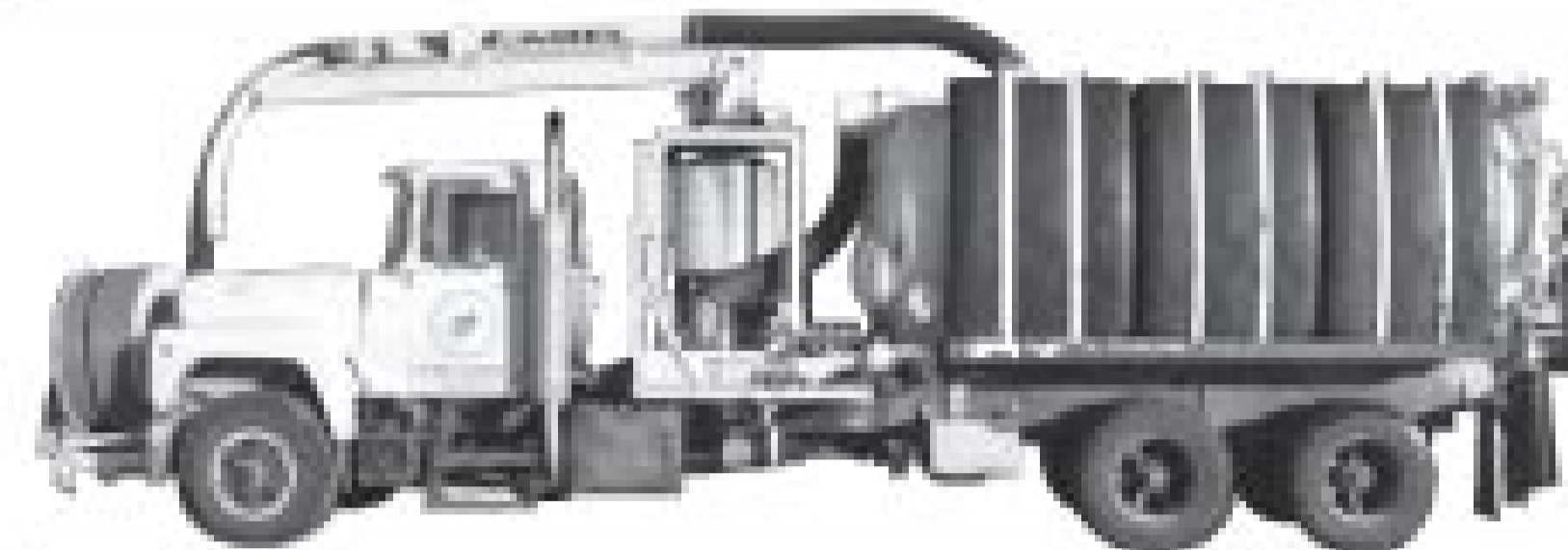
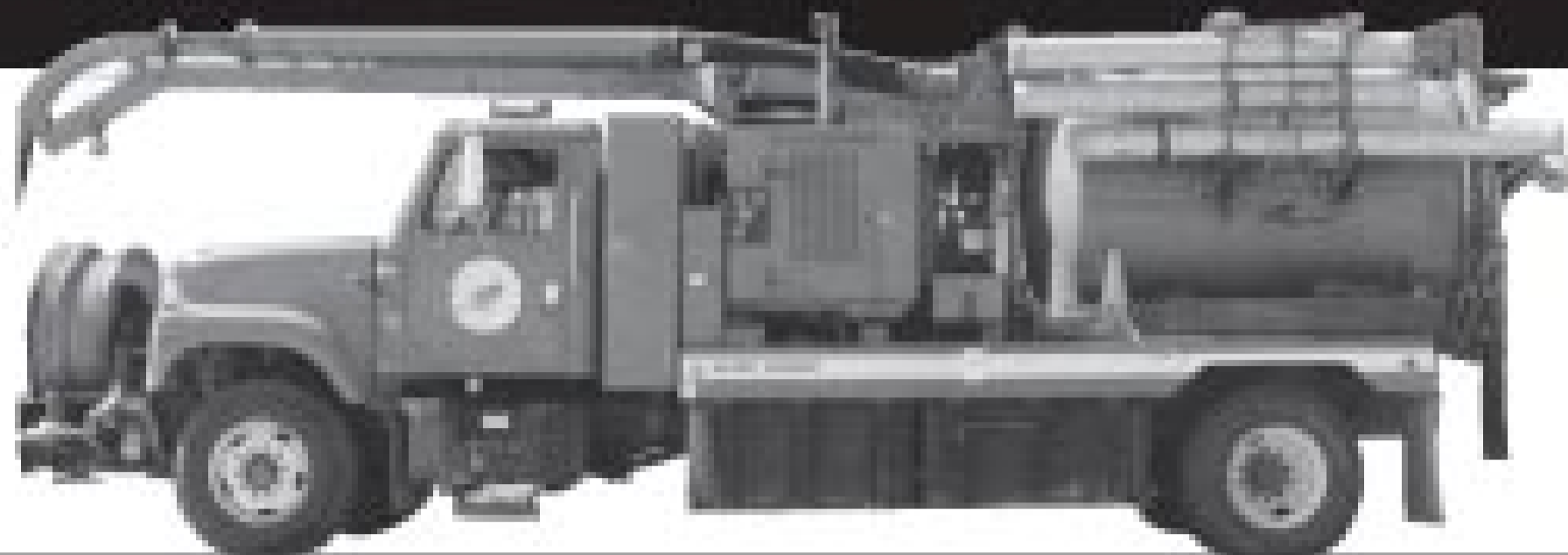
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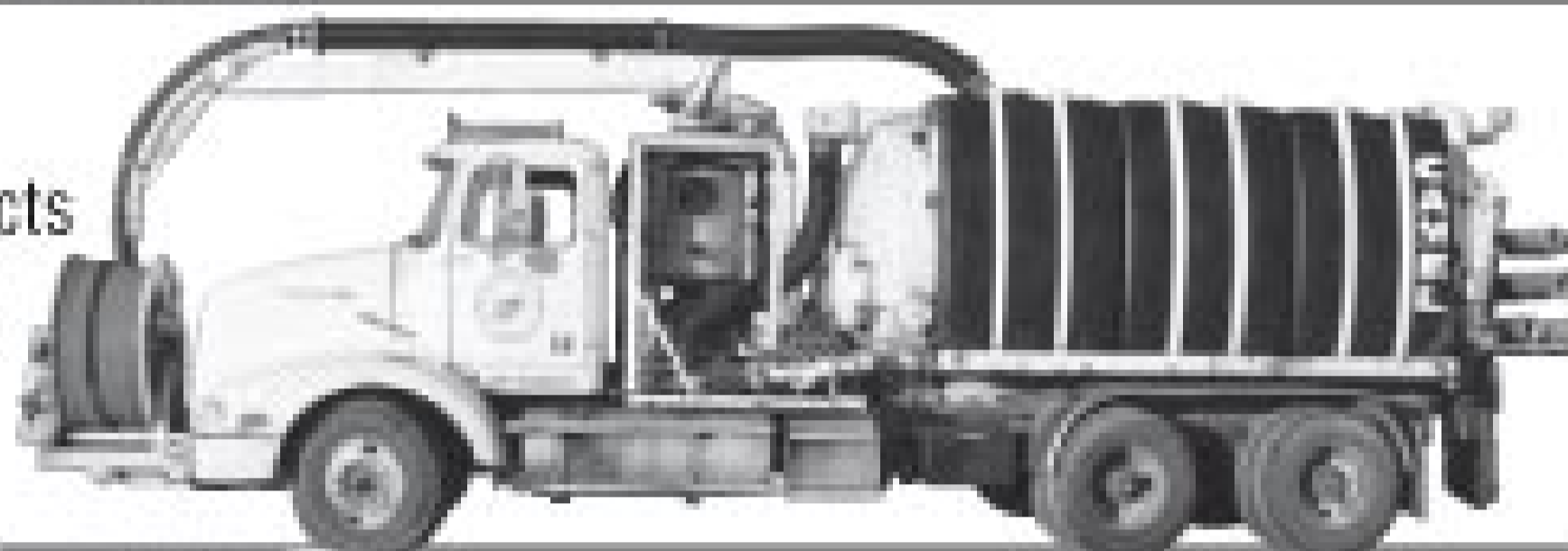
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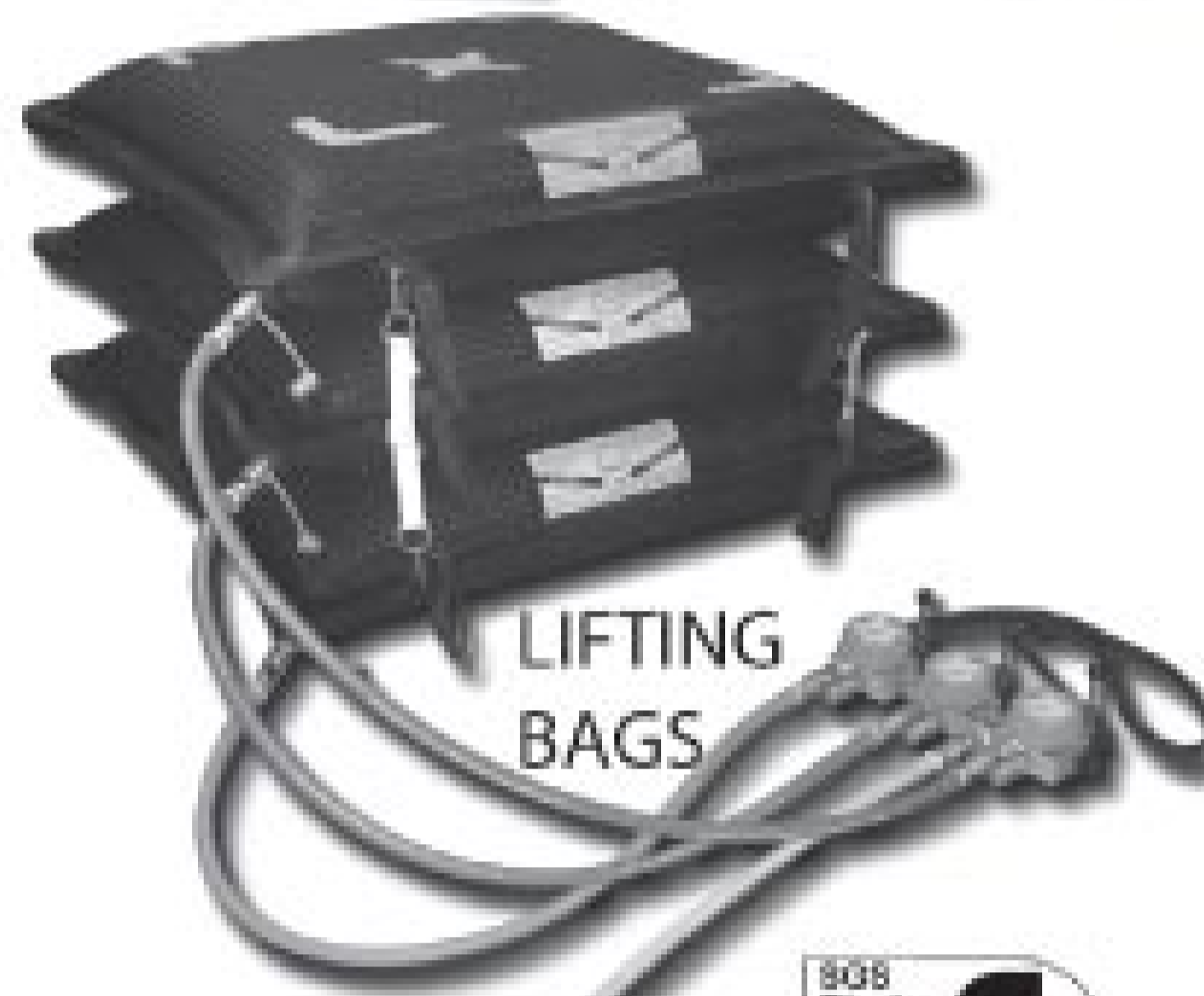


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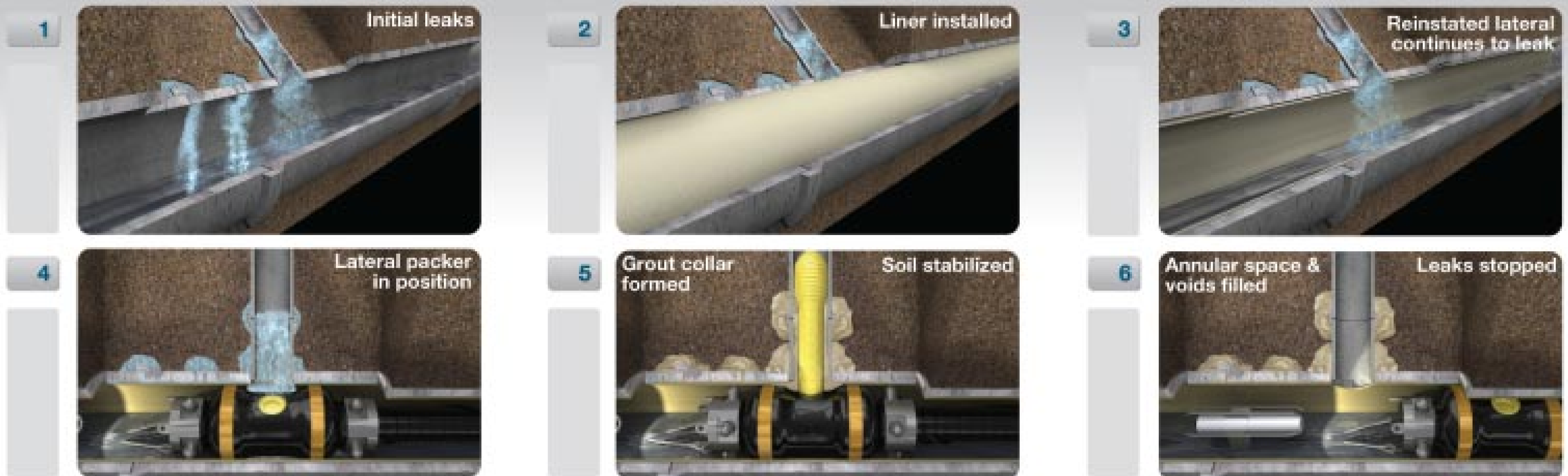
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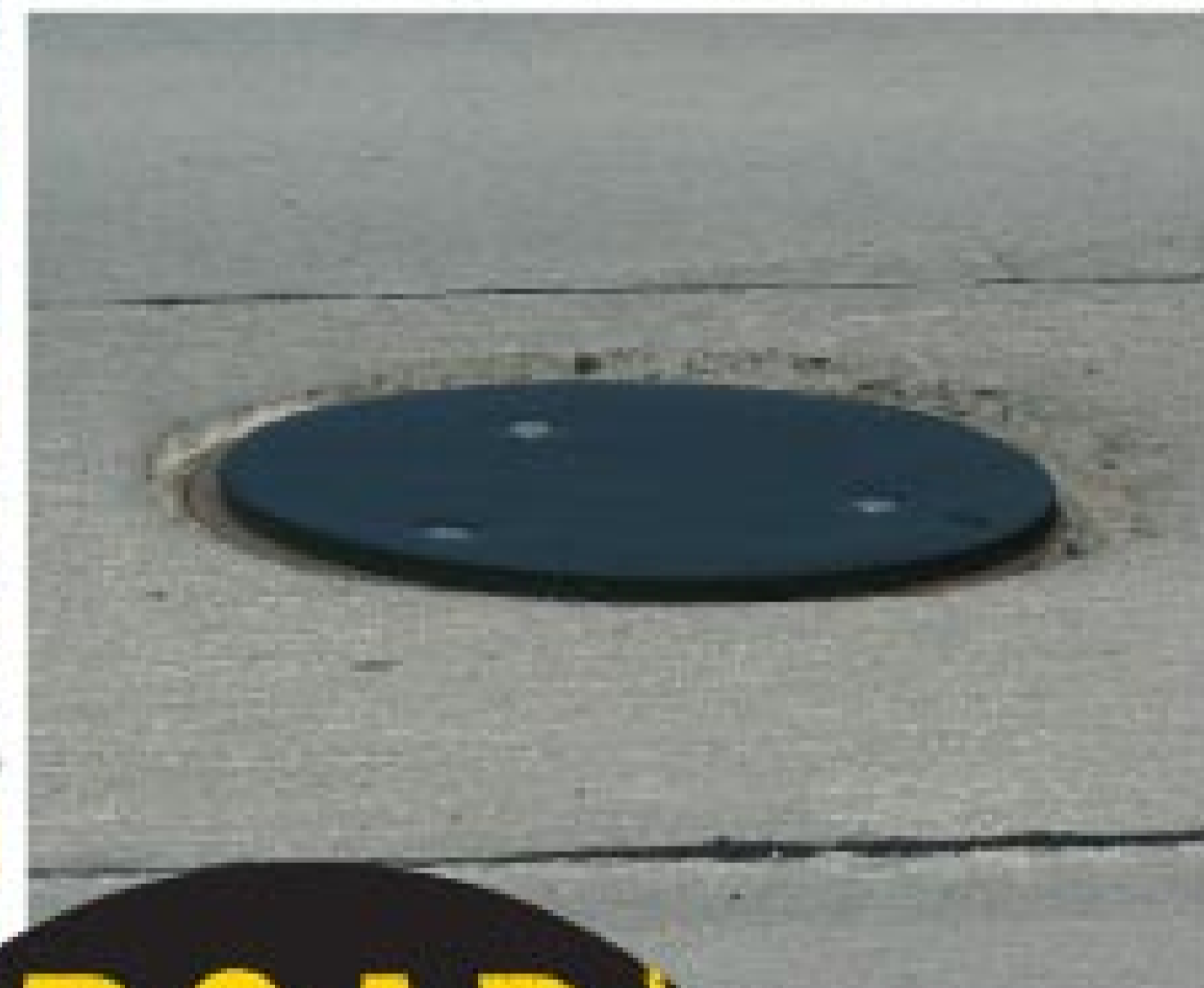
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FOCUS: SEWER

TIGHTENING UP

New Castle County takes an aggressive approach to sewer maintenance with an eye toward main rehabilitations that will last 100 years

By Scottie Dayton

Equipment operator Manny Pereira runs an excavator while foreman Tony Pereira directs the placement of 48-inch pipe from HOBAS Pipe USA. Both men work for contractor Pillari Brothers. (Photography by Terence Roberts)



PROFILE:
New Castle County
(Del.) Special Services
Department

FOUNDED:
1935

CUSTOMERS SERVED:
375,000

SERVICE AREA:
259 square miles

EMPLOYEES:
120

INFRASTRUCTURE:
1,700 miles of collection,
trunk lines, and force mains,
165 lift stations, 45,000
manholes

ANNUAL BUDGET:
\$40 million (wastewater
capital and operations)

WEB SITE:
www2.nccde.org/special-services/Sewers

Members of the New Castle County team: Standing from left, Rich Pulcan, chief construction inspector; Hap Ryan, civil engineer II; Jason Zern, operations engineer; Rob Roff, sewer operations manager; and Jim Shelton, Malcolm Pirnie Inc. consultant program manager; seated, Dave Hofer, assistant county engineer.



Clear water from illegally plumbed sump pumps, underdrains, and other sources posed a major problem for Dave Hofer, P.E., assistant county engineer for the Engineering Division of the New Castle (Del.) County Special Services Department.

A key contributor was Brandywine Hundred, a series of sprawling old suburban communities with 40,000 homes and just over 100,000 people. The gravity sewers there have a constructed overflow discharging to the Delaware River.

The overflow was built with federal funds in the 1960s when such practices were legal, but the state Department of Natural Resources and Environmental Control (DNREC) reclassified it as a combined sewer overflow (CSO) and demanded action.

In 2004, the DNREC and the county approved a plan to expedite and expand an existing sewer rehabilitation program. Over the past five years, extensive work in two of the county's worst areas

reduced wet-weather backups from six to 10 per year to one or two. Throughout the process, Hofer and his staff looked for solutions to give the sewer mains 100 years of service life.

Unique subdivision

Instead of townships or parishes, Delaware divides its counties into hundreds. Brandywine Hundred has 400 miles of 8- to 54-inch sewer pipes and three major pump stations with more than 10-mgd peak pumping capacities. The largest pump station in the hundred has a peak capacity of 70 mgd.

The New Castle County sewer

department has 112,000 connections generating 55 mgd. It treats 2 mgd at four small plants, and the remainder goes to the treatment plant at Wilmington, Del. The storm-water conveyance system is separate.

As the area grew, the sewer system expanded without adequate planning. Some pipes are undersized, and others do not meet modern standards. Mains and laterals ranged from Orangeburg and vitrified clay pipe to cement asbestos, concrete, and PVC.

In the late 1980s, the county launched a rehabilitation program, replacing the Orangeburg pipe. A maintenance program now covers

“We’re designing our improvements to withstand a three-year storm that lasts 24 hours and that coincides with the average annual high groundwater table.”

Dave Hofer

500 miles of pipe per year. The program reduced sewage backups from 500 to fewer than 50 per year.

In 2004, the county planned a three-phase program to eliminate all CSOs by December 2029. “We were to complete Phase 1, with an

MOTHER NECESSITY

If the Engineering Division of the New Castle County Special Services Department needs a product that does not exist, the team invents it or works with manufacturers to produce it.

For example, manhole covers were a major source of inflow. “We were using manhole inserts, but they were a high-maintenance product,” says Dave Hofer, P.E., assistant county engineer. “Crews kept repairing or replacing them because they were knocked out or broken, or homeowners punched holes in them to drain their driveways.”

Hofer envisioned a gasket in a manhole cover without pick holes. He went to manufacturers and tried some of their ideas, but they didn't work. He then assembled an in-house design team. Their concept press-fit an O-ring gasket into a dovetail groove in the cover's underside. A Wisconsin foundry made the prototype.

“The ironworkers had some ideas to refine the design, and so did we,”

says Hofer. “The new covers sealed the system so tightly that tremendous slime built up inside the manholes, forcing us to reinstate one pick hole for ventilation.” More than half the 45,000 manholes in the sewer system have the cover, and neighboring municipalities are beginning to use them.

The county also worked with the Infra-riser division of East Jordan Iron Works Inc. to create high-density rubber composite adjustment rings that are inserted under manhole frames. When vehicles drive over the cover, the ring affords some resilience, protecting the mortar from crushing.

“Our smaller collection manholes have Infra-riser seals, and they work terrifically,” says Hofer. “We wanted them on our interceptor projects so that truck traffic wouldn't beat the expensive polymer concrete manholes to death. However, the company didn't make one that fit a 40-inch opening with a 36-inch cover.” Hofer approached the manufacturer, who then made the mold, and Hofer got his seals.



The Brandywine Hundred project includes open-trench replacement of significant amounts of age-deteriorated sewer pipe.

estimated cost of \$149 million, by 2014," says Hofer. "At the same time, we began educating homeowners that sump pumps should empty onto the ground outside their houses."

Although work progressed on schedule, the pace was unsatisfactory to the EPA. In 2008, the agency, DNREC, and county agreed on a new plan. "We now must eliminate the last-constructed CSO and wet-weather-related SSOs in the Brandywine Hundred sewers by December 2018," says Hofer. "The new deadline is quite a change for us, and so is the price. Phases 1 and 2 are just over \$300 million."

Brandywine Hundred encompasses one-quarter of the sewer system. Laid in the 1930s, the lines show significant age-related deterioration. About 15 percent of the homes have illegally plumbed sump pumps and underdrains.

"DNREC, EPA, and the county want to see this job done, so we're

all working together harmoniously," says Hofer. The current system has no overflows until 2 inches of rain falls in 24 hours. While most communities consider that satisfactory, the county wanted better results — zero overflows.

"We're designing our improvements to withstand a three-year storm that lasts 24 hours and that coincides with the average annual high groundwater table," says Hofer. "This works out statistically to be an event that occurs once every six to 10 years. We set that return period as our performance goal, then worked backward to find out what storm and groundwater event return periods would combine to make it happen."

Working smart

To achieve its objective, the county hired Malcolm Pirnie, an environmental consulting firm in Wilmington. After modeling the Brandywine Hundred sewer system,



Assistant county engineer Dave Hofer shows sections of 48-inch fiberglass reinforced polymer mortar (FRPM) pipe from HOBAS Pipe USA that were used in the Brandywine Hundred project.

engineers determined that rehabilitation of deteriorated pipes would remove 35 percent of inflow and infiltration (I&I) during peak storm events, ending overflows. However, success depended on tightening and enforcing specifications on rehabilitation contracts.

"Malcolm Pirnie engineers said that most municipalities write in everything the manufacturers and vendors say belongs in the specifications, then tend not to enforce the tests prescribed by ASTM," says Hofer. "That causes problems."

For instance, CIPP liners are designed to ASTM standards, and some involve specialized tests. Hofer found that long-term strength tests were overlooked most often. "They measure how strong the liner is after aging 10,000 hours and are used to predict if the liner will last 50 years," he says. "We design our CIPP pipe projects to last at least that long, and new pipe projects to last 100 years. The tests for new pipe are similar."

The county now requires contractors or independent laboratories to do the ASTM tests. The county's performance testing, which looks for defects that were supposedly fixed, evaluates rehabilitated pipe 18 months after it is installed. The camera crew usually finds only a few defects, but occasionally they are major.

For instance, one problem was traced to an improperly manufactured liner that failed. "Had we not checked it, we would have closed out the contract and been left with a failed liner that we would have had to fix," says Hofer. "We use

similar testing on new pipe, plus laser profiling to measure its allowable deformation."

Performance testing also uncovered numerous CIPP defects from well-established contractors lining the mains. "We found pinhole leaks and deformations," says Hofer. "Holding the contractors accountable was a first for them. We had one contractor who did two jobs, then told us he wasn't returning because he could go to other cities that didn't enforce specifications or testing and make money. And that was Malcolm Pirnie's point. You're not working smart if you don't check the quality of contractual work. We're charged a bit more now, but we're getting what we paid for."

The county reduced I&I by lining with CIPP or chemical grouting. Laterals are lined as far into homeowners' properties as possible. "We could remove the equivalent flow from the mains, but it's cheaper to line part of the laterals," says Hofer. "It has reduced I&I a lot."

Longer life

The rehabilitation program includes upgrading 30- to 40-year-old interceptors that had failed prematurely. "We didn't believe it was proper to replace them with materials having equally short design lives," says Hofer. "We want new interceptors to last 100 years, and we are researching those products."

One long-lived material is vitrified clay pipe (VCP). "The Romans used it, and their lines are still operational," says Hofer. "When

municipalities first installed VCP, however, it didn't have good bedding or joint material."

Today's gaskets provide tight joint seals. Although many engineering and inspection firms state the manufacturer's specifications for the pipe bedding and haunching, municipalities rarely check them.

"Our project inspectors and engineers are down in the trenches making sure the proper depth of bedding is installed and compacted properly, and that the bedding under the haunch of the pipe is installed and compacted," says Hofer. "They follow up with a laser profiling test on flexible pipes, ensuring that they do not exceed the manufacturer's allowable 30-day deflection amount."

The biggest change in specifications is requiring warranty inspections 18 months after contractors complete the projects. The challenge was how to pay the contractors so they had an incentive to return, and how to handle any problems discovered. "Depending on the problem and its severity, we may simply accept a price reduc-

"We didn't believe it was proper to replace old interceptors with materials having equally short design lives. We want new interceptors to last 100 years, and we are researching those products."

Dave Hofer

tion," says Hofer. "The policy works well for us, and we still have the option of rejecting the work."

Innovative avenues

Because vitrified clay is available in sizes only up to 42 inches, the county is looking at HDPE and fiberglass-reinforced pipe for larger mains, and polymer concrete pipe for tunnels. All are impervious to corrosion, but polymer concrete is stronger. The county uses that pipe for manholes expected to have high levels of hydrogen sulfide.

The rehabilitation program includes upgrades to pump stations. As part of that initiative, an engineering firm designed a 45-mgd

station to replace a 20-mgd station. "We'll use the old one as a backup peak wet-weather station or reconfigure it as a 30-mgd peak station," says Hofer. "We're big on Plan B because Plan A doesn't always work."

To make manhole benches and channels impervious to corrosion, Hofer contacted Henkel Technologies Corrosion Engineering, a specialist in corrosion control for the chemical industry. "We're returning to brick benches, only gluing the bricks together with Furalac Green Panel mortar," he says. "Henkel makes acid storage tanks from Furalac, and they have a 30-year life. The furan resin-based mortar will easily stand up to anything in our sewer environment."

Although more costly than standard mortar, the Furalac joint is only 1/8-inch thick instead of the typical 3/8 inch. "Once it's in, we can forget about it," says Hofer. "I think we'll get our 100-year life expectancy."

Homeowners, who used to be upset by sewer backups, are now the biggest supporters of the rehabilitation and maintenance program. Most overflows had been caused by roots and debris, and by pipes that became overloaded during rainstorms.

"Homeowners like all the information we send on projects in their neighborhoods, and they can see a big reduction in backups," Hofer says. "Although the work isn't completed, they acknowledge that we've done a tremendous job." For his efforts, Hofer received the 2006 Collection System Award from the Water Environment Federation.

Phase 1 of the Brandywine Hundred project is on schedule and will conclude in December 2014. Phase 2 will meet the December 2018 deadline. The rehabilitation should survive into the 22nd Century. ♦

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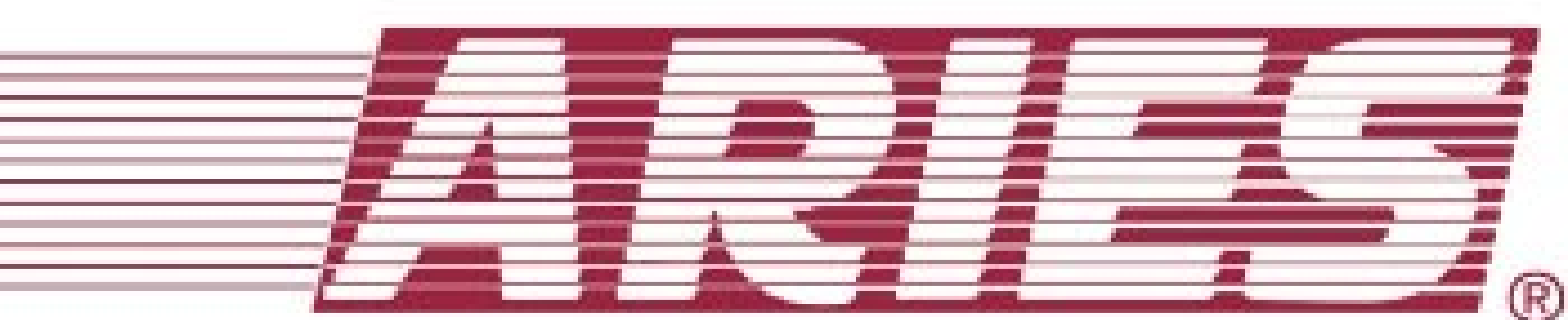


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2010 EXPO

Exhibit floor at the 2010 Pumper & Cleaner Environmental Expo International in Louisville.

INDUSTRY RISING

2010 Pumper & Cleaner Environmental Expo sees growth in attendance along with an abundance of new tools and technologies for municipal managers

By Ted J. Rulseh

The 30th Annual Pumper & Cleaner Environmental Expo International struck an optimistic note for the environmental service industry. Attendance reached 8,784 persons representing 3,921 companies and organizations, up 3.7 percent over 2009. The 493 exhibitors almost universally reported interested buyers and strong sales.

A cruise around the exhibit floor also showed continuing innovation in products and technologies that help municipal departments save labor, serve customers better, and stretch budgets. Here is a look at some of the innovations on display.



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The **HS-57** saw manhole repair and removal tool from **CONEQTEC Universal** can be used in raising manholes for overlays, replacing old manholes, or repairing dropped, raised or damaged manholes. The skid-steer-mounted unit uses a self-aligning hydraulic clamp mechanism to attach to the lip of the casing to ensure that the saw is centered and secure. The cutting is accomplished with hydraulics to apply downward pressure to the cutting drum. A cutting depth indicator tells the operator how deep the cut is progressing, and a clamp-on indicator signals that the clamp is locked in and ready. On completion of the cut, the clamp is used to lift the casing and surrounding paving material for disposal. Casings can be freed and reused. **Call 888/832-3462 or visit www.coneqtecuniversal.com.**



Lateral cutter

HydroCut lateral reinstatement cutters from **Envirosight** mill quickly and cleanly through CIPP lining materials. High-pressure water spins the cutter, cleans the onboard cameras, and cools the motor and bit for maximum life. The cutter moves under its own power. Its overhead outrigger and interchangeable wheels boost traction and maximize crawler range. A cutting bit lasts 90 hours. A stabilizing outrigger and high-speed motor minimize camera vibration. The systems are modular, enabling quick wheel and bit changes. Water recirculation is also available. **Call 973/252-6700 or visit www.envirosight.com.**



Mean Machine

The **MM-10 Mean Machine** wet/dry vacuum loader from **Hi-Vac** uses innovative design to enhance material separation. A cyclonic ring prefilter and 8-inch inlet hose work together to slow the material's inlet velocity. A 16-foot-long main payload further enhances material separation. Dual cylinders and baghouse provide more efficient airflow with less restriction, reducing pressure loss in the filtration system. Dual secondary cyclones provide fine-particle separation before the baghouse final filter. Total payload capacity is 18 cubic yards. The Roots trilobe blower is rated at 5,184 cfm and delivers 27-inches-Hg vacuum. **Call 740/374-2306 or visit www.hi-vac.com.**



Heat-reading camera

The **ThermaView II** pan-and-tilt camera from **Aries Industries** now enables users to see temperature differences in full color and so locate laterals within newly lined pipe and make reinstatement cuts accurately. The system offers double the resolution and digital zoom capabilities on the thermal imaging side and a new high-resolution camera module and high-intensity LED lighting on the video side. The thermal-imaging module lets users view any image in two full-color modes and two black-and-white modes. A visual thermometer enables users to pinpoint the temperature of any image on the screen to within ± 0.5 degree accuracy. Besides its use for lateral reinstatement, the system can be used to identify infiltration under water levels and for finding "hot spots" in conduits. Call 262/896-7205 or visit www.ariesindustries.com.



Lining installers

Sleeve installers from **Logiball Inc.** enable installation of cured-in-place sectional liners in bends of 4- and 6-inch pipe. The custom-made flexible installers are 2.625 inches in diameter and are available in lengths up to 50 feet. Call 800/246-5988 or visit www.logiball.com.



Packing down trenches

A skid-steer-mounted vibratory **compaction wheel** from **Trench Grader** compacts trenches for water lines and other utilities. The wheels, available in a variety of diameters and widths, attach easily to any skid-steer loader. Call 870/697-2226 or visit www.trenchgrader.com.

Oval-pipe skid

USB-Duesen GmbH, in conjunction with **USB-Sewer Equipment Corporation**, offers a continuously adjustable **guide skid** for tear-shaped sewer lines up to 48 inches. The guide skid can be equipped with sewer-cleaning nozzles and turbo chain cutters to remove roots and other obstructions. Call 770/984-8880 or visit www.usbsec.com.





Main-lateral connection

The **T-Liner Shorty** from **LMK Enterprises Inc.** is used to seal the main-lateral connection in sewer pipes. The system is a one-piece structural stand-alone connection liner that extends 3 feet into the lateral. It is designed for municipalities that want the main-lateral connection sealed with the cost of installing a cleanout. The system uses gasket sealing technology along with vacuum liner impregnation, inversion installation, full-circle main liner construction, tapered ends for a smooth transition, lateral identification, and a long-term sealed impervious coating. **Call 815/433-1275 or visit www.performanceliner.com.**



Tighter manholes

The **PRO-RING** system from **Cretex Specialty Products** is designed to eliminate infiltration at manholes and to leave a smooth street surface. Manhole repair sites can be opened, repaired and closed in one day, and no sand, mortar or bricks are required. The rings are made of expanded polypropylene with an extremely high strength-to-weight ratio, chemical resistance, and long service life. One worker can install an entire system in minutes. The rings nest together, are easily sealed, and fit to within one-quarter inch of grade. A 6-inch-thick ring weighs 14 pounds. **Call 800/345-3764 or visit www.cretexseals.com.**



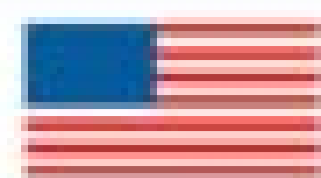
Automated root control

The **Jett Set Commander** series chemical root control foaming system from **Vaporoooter** automates treatments and eliminates manual mixing of chemicals. The user snaps in the container of liquid herbicide, drops in a water-soluble packet of growth inhibitor, and pushes a button on the touchscreen controller. The system lets operators simply jet up the line, push a button, and retrieve the hose. The system can be retrofitted to any existing sewer-cleaning jet truck and is available as an option from major sewer equipment manufacturers. **Call 800/841-1444 or visit www.vaporoooter.com.**



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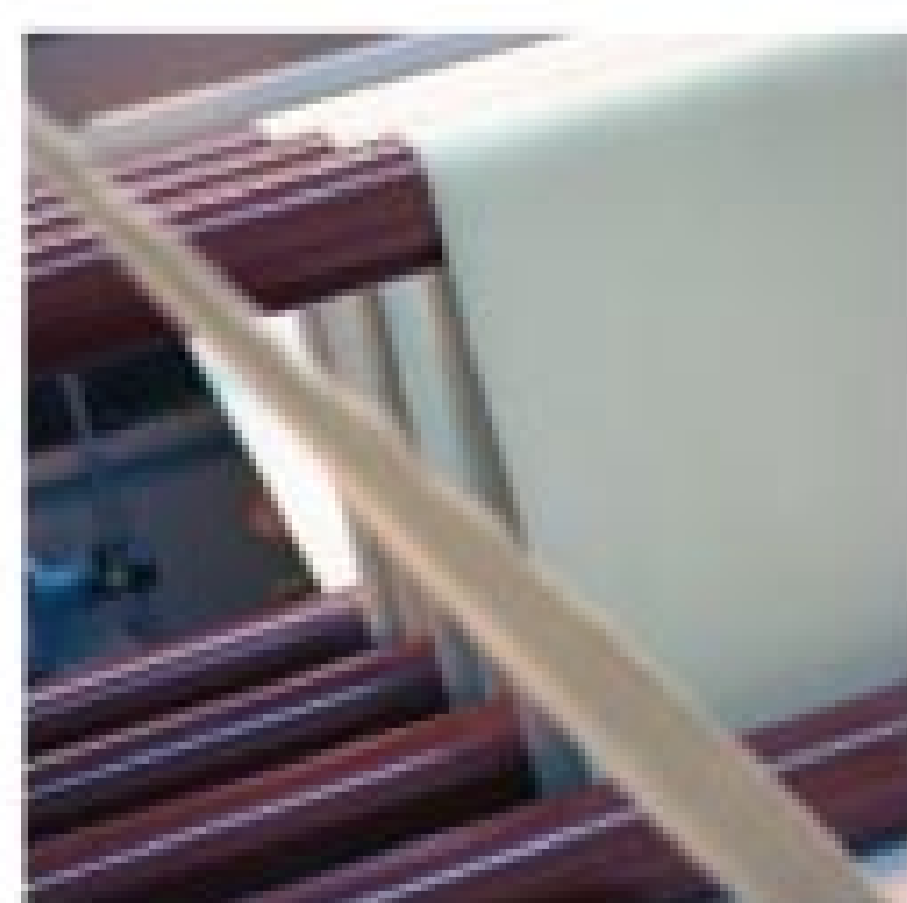


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FOCUS: WATER

JUMBO REPAIR

The City of Victoria finds a winning trenchless strategy for a major rehabilitation project on a critical 5-mile-long water transmission main

By Peter Kenter

The City of Victoria, B.C., is undertaking the replacement of a 5-mile stretch of 20- to 24-inch steel water main installed in the 1920s, 1930s and 1940s — believed to be the largest trenchless program of its kind in Canada.

The deteriorated condition of the main and the affected distribution lines convinced the city that only a rapid-fire program of trenchless rehabilitation and replace-



The pulling head for the modified slip-lining process is shown entering the receiving pit.

ment on a large section of line would serve city residents and businesses.

“Essentially, the process started in September 2001, when we had a geyser coming out of the road from one of the mains in the worst-affected areas,” says Bruce Kerr, project manager for underground utilities with the Engineering Department.

“When we dug down to see how bad the condition of the pipe was, visual inspection showed that the pipe had old welded-on patches. The engineering people started talking with the operations people, and we realized something had to be done.”

The city completed most of the repair with a modified slip-lining process using a folded, pulled-in-place HDPE liner system. The first phase of the repair is complete, and the second and final phase was to be finished in spring 2010.

Assessing the issues

Victoria is the capital of British Columbia, one of 13 municipali-



Repairs to the City of Victoria's steel water main included installation of branch valves. (Photos courtesy of the City of Victoria)



ties that comprise the province's Capital Region District, which in turn is responsible for the area's sewer and water supply. While the District oversees the supply and purification of water derived from nearby Sooke Lake Reservoir, distribution is the responsibility of each member city.

An extensive review by the Engineering Department from 2002 to 2003 showed that some areas of the city were built on corrosive soil with high acidity. “In those areas, pieces of the road were settling, and we could see water showing up on the surface,” says Kerr. “Often, where we were finding the ground was wet around the mains, there weren't any obvious leaks. The pipes were pitted like a soaker hose of pinhole leaks.”

In 2004, the Engineering Department retained Levelton Engineering Ltd. of Richmond, B.C. to prepare a report on the life expectancy of the mains. With few exceptions, the firm's recommendations involved replacement and

PROFILE:

City of Victoria, B.C., Engineering Department (Underground Utilities Engineering) and Public Works (Water Works Operations)

INCORPORATED:
1864

POPULATION SERVED:
79,000

AREA SERVED:
7.6 square miles

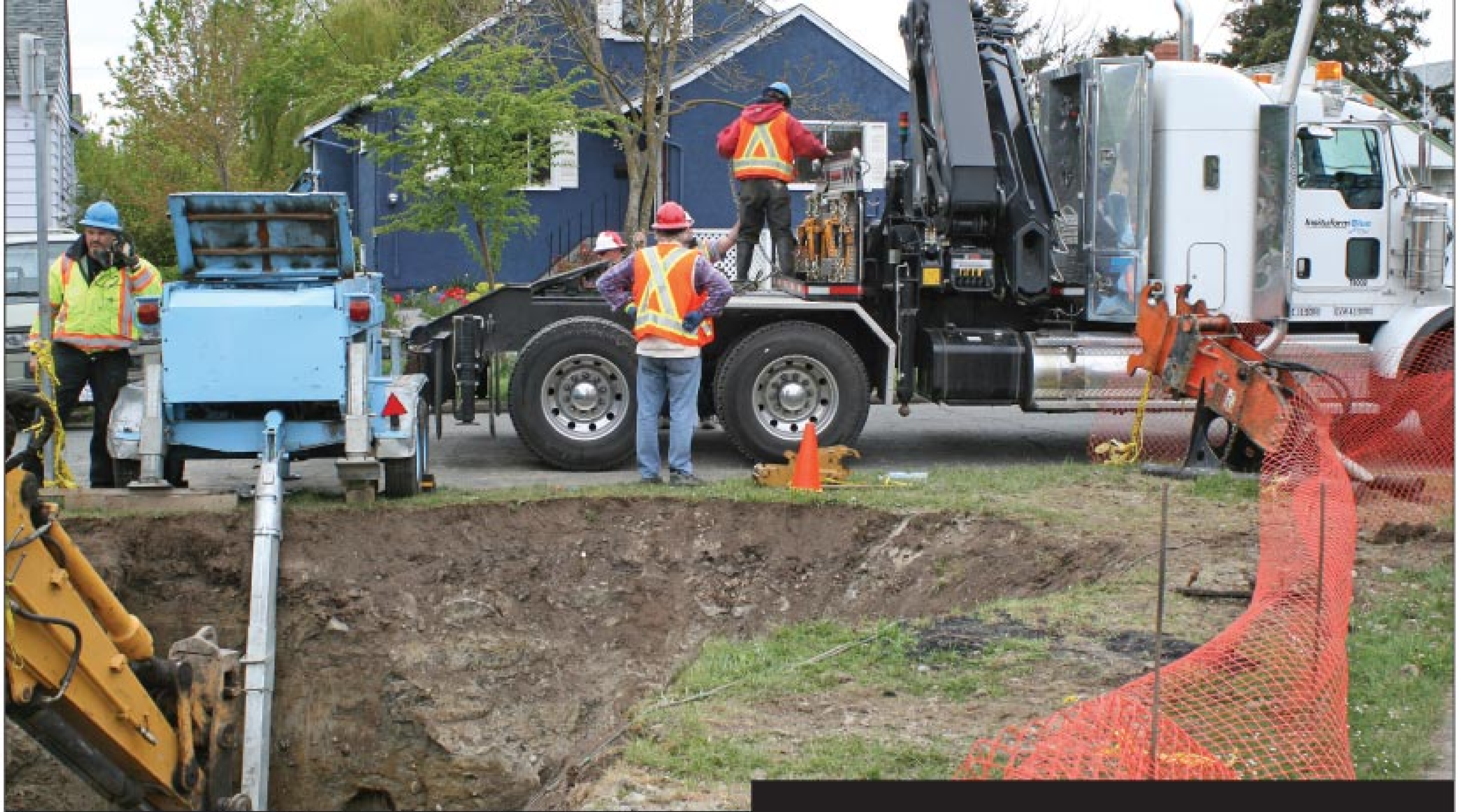
INFRASTRUCTURE:
202 miles of water mains

ANNUAL BUDGET:
\$4.3 million Canadian (capital)

WEB SITE:
www.victoria.ca

rehabilitation, ranging from immediate to within about five years.

A water-distribution system computer model prepared by the



Workers set up a receiving pit for the winch that will pull the slip-liner through the host pipe.

“We told the consultant that we favored the use of trenchless technology wherever possible, not only because it would save time and money and reduce traffic congestion, but because it would reduce the impact on the city’s tree canopy and reduce the total amount of carbon emissions when compared to open-cut.”

Bruce Kerr

Engineering Department found that the existing mains provided enough capacity to meet current and future needs. The city established a reserve fund in 2006 to finance construction in advance of the project start.

“We told the consultant that we favored the use of trenchless technology wherever possible, not only because it would save time and money and reduce traffic congestion, but because it would reduce the impact on the city’s tree canopy and reduce the total amount of carbon emissions when compared to open-cut,” says Kerr. The consultants reported that about 90 percent of the work could be done using trenchless technology.

Construction staging

Staging the repairs provided the next challenge. The targeted

area of the water system consists of a series of regulated and unregulated mains. Work had to be scheduled so as to provide a consistent water supply at adequate pressure during repairs.

“We split the project into two phases,” says Kerr. “We decided to work backwards from the source — the municipal boundary where the Capital Region District main supplying water enters Victoria. The plan was to get the lines downstream ready first so we would be in good shape to maintain flow as we worked upward to the source.”

The city chose the office of Insituform Technologies Inc., in Edmonton, Alta., to handle the trenchless rehabilitation. Burnell Contractors of Cobble Hill, B.C. took on the open-cut work as a subcontractor. A city arborist worked with the contractors to ensure

CRITICAL COMMUNICATION

The City of Victoria gave top priority to the maintenance of water service to its customers during the first phase of the city’s extensive steel water main upgrade project. Of critical importance: maintaining a water supply to Victoria General Hospital.

“The hospital performs a lot of surgery and dialysis and relies on a steady supply of water at a consistent pressure,” says Bruce Kerr, project manager for underground utilities with the city Engineering Department. “We were contacted by the hospital to ensure that there would be no noticeable pressure changes.”

Engineers accelerated the schedule for construction of a new pressure-relief valve west of the hospital so that water could be shut off to the project area without affecting the hospital water supply.

“One of the decisions we made during construction was to keep a redundant main operational,” says Kerr. “We used that main to provide water to the hospital during construction, but for the first time, that water was flowing through the main in reverse.”

Because Victoria relies on a nearby lake for its water supply, silt occasionally enters the water-distribution system. “We were concerned that the reversal of flow would cause accumulated silt to flow toward the hospital,” says Kerr. “Communication with clients is critical in times like these.

“When the flow was reversed, we called the hospital and advised them to continuously monitor their own filtration system to make sure they didn’t experience any additional silt flow that might plug their filters.”

The hospital reported no unusual water conditions, but city engineers considered the operation a success for more than one reason. “Engineers sometimes overlook the communication component of the projects they manage,” says Kerr. “Keeping in close contact with the customers affected by a project should be a priority, even if there’s only an outside chance that something will affect their water supply.”



The folded liner is inserted into the entry pit.

maximum health and survival of trees during construction.

Phase 1 of construction involved a 2.8-mile section between the city's Hillside Avenue and Pandora Avenue. "We were converting about 1.5 miles of the main from regulated to unregulated pressure," says Kerr. "The open-cut phase of the project began in November 2008. We had to make some system improvements, including the open-cut replacement of some sections of main with ductile iron, and the installation of a pressure-relief valve station to strengthen the integrity of the overall water-distribution system."

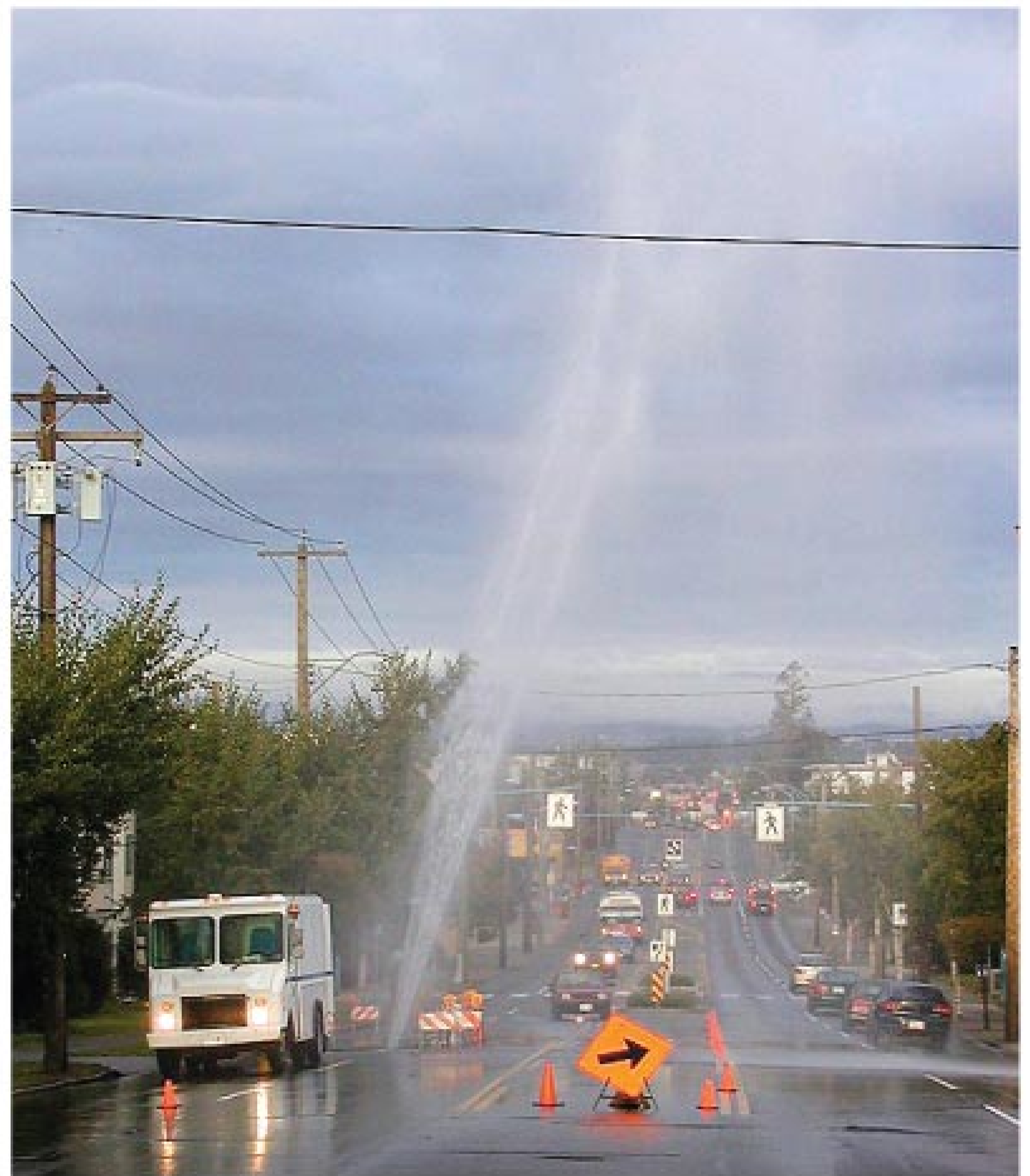
Redundant main retained

The first section slated for attention was a regulated main on Pandora, located farthest from the

water source. "Our computer model showed that the system derived no real advantage from that main, so we decided we would temporarily convert it to an unregulated main, so we could maintain water service during construction," says Kerr.

"When we found out that the main was actually in pretty good shape, we decided to leave it operating as a permanent unregulated main that would provide redundancy to the distribution system. It essentially turned the water system from a series of branches into a loop."

The city also had to examine one of the system's oldest components, a series of butterfly valves installed as long as 80 years ago. While some of the valves passed muster, the engineers decided to replace every valve along the route



The City of Victoria's main rehabilitation project was designed to prevent leaks like this one on a steel main in 2001.

before trenchless rehabilitation could begin.

Communication with the contractor was critical, says Kerr. Because the system was so complex, city engineers had to remain in constant contact with Insituform to ensure that the correct valves were being open and shut to isolate the target pipe segments and to maintain the city's water supply.

Modified slip-lining

Rehabilitation, which began in March 2009, used PolyFold, a close-fit, modified slip-lining process. Since the smallest internal diameter of the affected mains measured 500 mm, the liner was designed to a diameter of 494 mm, offering a 6-mm leeway.

Under the process, a cross-section of a circular HDPE liner is temporarily folded and lubricated with a bentonite slurry to permit insertion to the host pipe. Plastic bands maintain the folded profile of the liner while a winch pulls it into place. Exposed bands at both ends are then cut and Kevlar-reinforced air bags are

inserted to the liner to expand it to a round shape. Liner ends are then restrained and capped with flanges before the liner is pressurized to 160 psi to expand it to its full diameter.

Camera inspection showed that the steel main was coated on the inside with coal tar enamel. The mains were cleaned out using high-pressure jets, and a chain flail to remove encrustation at welded pipe joints. A robotic router was sent into the main to smooth out any imperfections that might damage the liner or cause it to hang up. "We also found a section of main that was finished with a cement-mortar lining," says Kerr. "Luckily, its thickness fell within the tolerances we required to insert the liner."

Smooth operation

Phase 1 of construction went off without a hitch, ending in December 2009. "The only delay we had was in getting a delivery of some Viking Johnson flange adapters that needed to be specially ordered from England," Kerr says.

“When we found out that the main was actually in pretty good shape, we decided to leave it operating as a permanent unregulated main that would provide redundancy to the distribution system. It essentially turned the water system from a series of branches into a loop.”

Bruce Kerr

“These were required to marry up the liner and the steel mains, but they took a few weeks longer to manufacture than we had anticipated. The contractor actually had to fly in a few of the units from England so we could get that part of the work started.”

Phase 2 of construction, scheduled to begin in spring 2010, couldn't have been staged more advantageously from a fiscal perspective. The Canadian government's Federal Provincial Infrastructure Grant program, launched as a stimulus measure in 2009, favored shovel-ready projects that could be completed by the spring of 2011.

Instead of shouldering the full budget of this phase of construction, the grant will allow the city to share the costs evenly with the

province and federal government. The project specified trenchless rehabilitation.

“On this 2.2-mile phase, there will be virtually no open-cut at all, although the line is largely regulated, so we'll need to dig a lot more holes to make service connections,” says Kerr. “Judging from our experience with the trenchless work in phase 1, we should be able to meet the government deadline for completion in 2011 without any problem.” ♦

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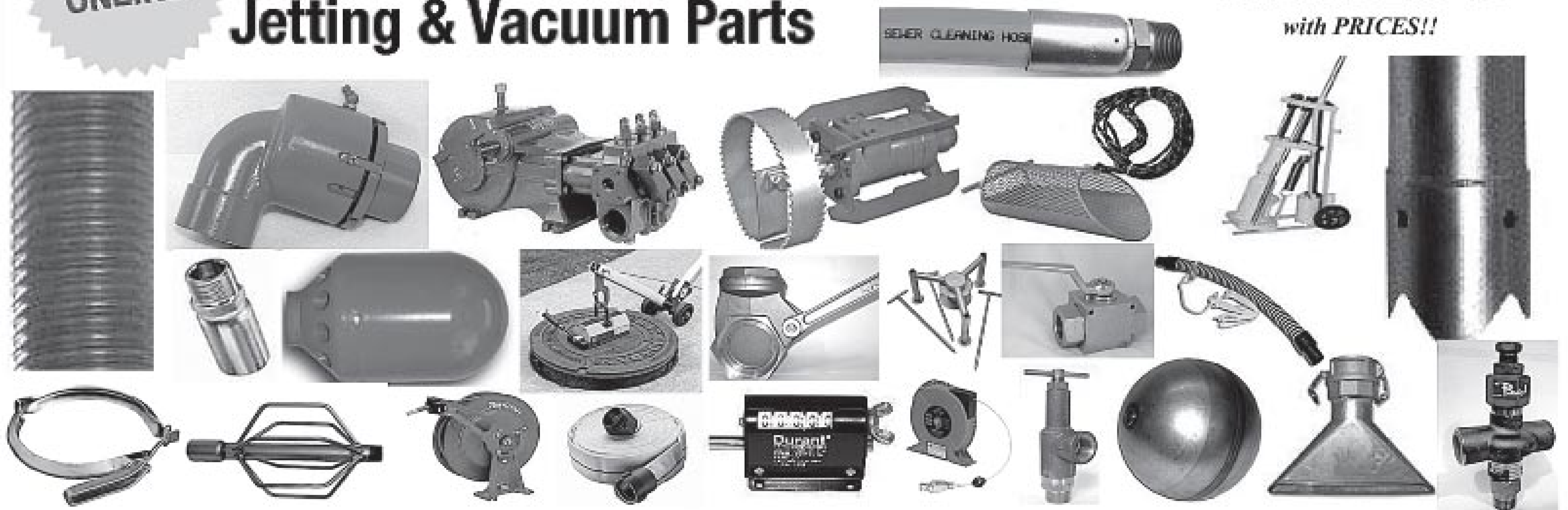


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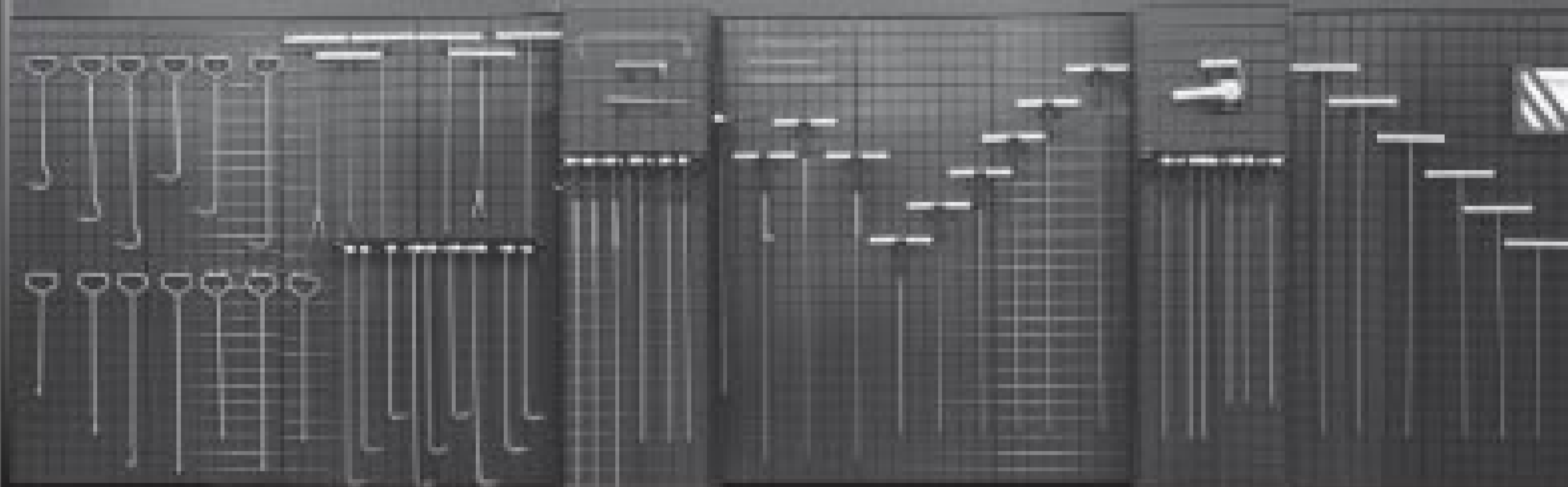


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COMMUNICATING THROUGH CONFLICT

Know the difference between false and real conflicts — and know how to act quickly to resolve the real ones

By *Ronnie Moore*

Where there are people, there is conflict. It affects us all. The failure to communicate effectively, or to communicate at all, is a leading cause of conflict's existence and escalation. If not confronted early and well, conflicts will escalate, negatively affecting your organization. We can't banish conflict from our lives, but we can communicate more effectively through it. It's a topic that can fill volumes, but you can get a handle on it by using these five tips:

1. Distinguish between true conflicts and false conflicts. Before you can think about how to communicate through a conflict, decide whether you need to communicate at all. Not all conflicts need to be resolved. Before you do or say anything, ask yourself: Is this a true conflict or a false conflict?

A true conflict has to be resolved — if not, it will get bigger and will have negative consequences. For example, you and your colleague must write a proposal. There is conflict about how to write it and how to allocate your time to it. As a result, there is a risk that the proposal will not be the best it can be, and might not be completed on time. Thus there is risk that your department will not get the grant. This is a true conflict.

False conflicts are differences that don't have to be resolved. For example, you and your colleague disagree about how smart your boss is. That does not have to be resolved for the two of you to be able to work, share a break, or

attend meetings together.

Be careful. Choose your battles. Let the false conflicts go. Refuse to engage in unnecessary arguments and debates. There's nothing wrong with a rousing political debate or a lively discussion containing different opinions. However, if you become known as someone who always argues everything, you will lose your credibility, and people around you will no longer listen, even when what you have to say matters.

2. Remember that confrontation is not a dirty word. Once you determine that you are dealing with a true conflict, you need to communicate. Often, we don't want to confront; we want to avoid — but true conflict cannot be avoided. We struggle with confrontation primarily because we confuse it with fighting, anger, and unpleasantness.

Confrontation is not a dirty word. It comes from Latin, meaning, "to face." Properly defined, to confront means to face an issue instead of avoiding it. Yet, we often use the word *confrontational* in a negative way. "She's so confrontational," we say, as if that's a bad thing. We often avoid conflicts that should be confronted, and the longer we wait, the harder it is to resolve them.

3. Get objectivity. If you've lost your objectivity about someone, try to get it back before you communicate. There are two parts of any conflict: the issue and the persons attached to the issue. Sometimes, when conflict has gone on for a

while without being confronted, we start liking the other person less and less, losing our objectivity. Once we can no longer be objective about the person, it is hard to communicate through the issue.

How do you regain objectivity about the person attached to your conflict? Observe him or her. Note competencies and positive attributes. Is he a good father? Does she donate time to charity? Try to get a more balanced view. If you only think negative thoughts, those thoughts will guide your communication. Even if you choose the right words, the communication will fail, if your face says, "You make me sick."

4. Start on a foundation of sameness. Instead of starting the communication with the conflict and why you're angry, start with something about which you do agree. Start with something you share:

- "We both have worked here a long time."
- "We both love our children."
- "Our friendship has helped us through some difficult times."

Then move to the issue causing the conflict. By talking about common interests and goals (such as wanting to resolve the conflict), you can stay away from how you feel about the other person. When you start communicating with a negative, you may ignite immediate defensiveness and leave no positive place for the communication to go. Start on a foundation of sameness, collaboration, and sincere desire to resolve the issue. You can do this with integrity, no matter

We invite readers to offer ideas for this regular column, designed to help municipal and utility managers deal with day-to-day people issues like motivation, team building, recognition and interpersonal relationships. Feel free to share your secrets for building and maintaining a cohesive, productive team. Or ask a question about a specific issue on which you would like advice. Call editor Ted Rulseh at 800/257-7222, or e-mail editor@mswmag.com.

how you feel about the person attached to the issue.

5. Beat up issues, not people. If your goal is to resolve a conflict and change another's behavior for the better, your communication has to address the behaviors. When we attack others, they generally attack back or retreat out of a real or perceived lack of power. Either way, the real issue will not be resolved because when we are attacked we cannot hear, nor do we focus on how we can change our behavior.

Calling someone lazy or a jerk or saying that he or she has a bad attitude will get you nowhere. Telling that person what he or she said or did that needs changing is the only chance you have to change that behavior. If your goal is to change behavior, communicate in behaviors.

Increasing the odds of resolving conflict requires good thinking and good communication. Think, confront true conflicts only, choose your battles, and focus on the behaviors that need changing, not on the people attached to those behaviors. ♦

Ronnie Moore is a speaker, trainer and national expert on spoken and written communication. She is the author of *Why Did I Say That? Communicating to Keep Your Credibility, Your Cool and Your Cash!*, of which the above article is an excerpt. She can be reached at Ronnie.moore@rmoorecommunications.com.

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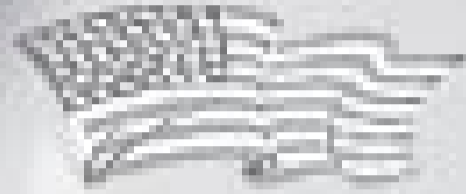
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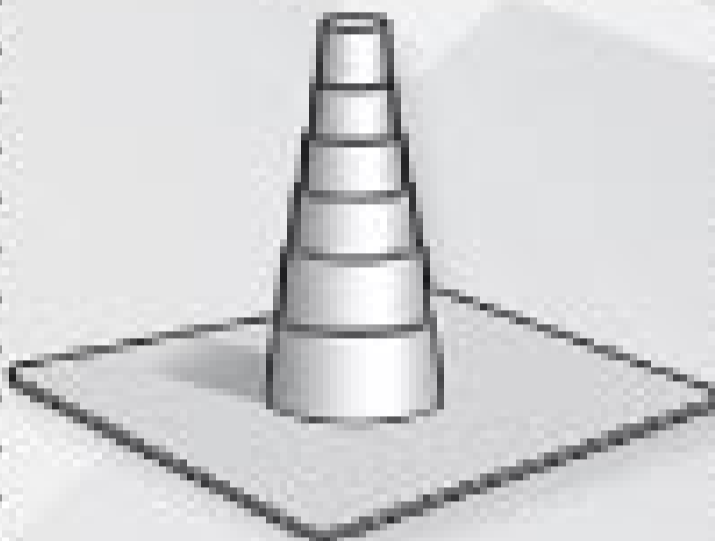
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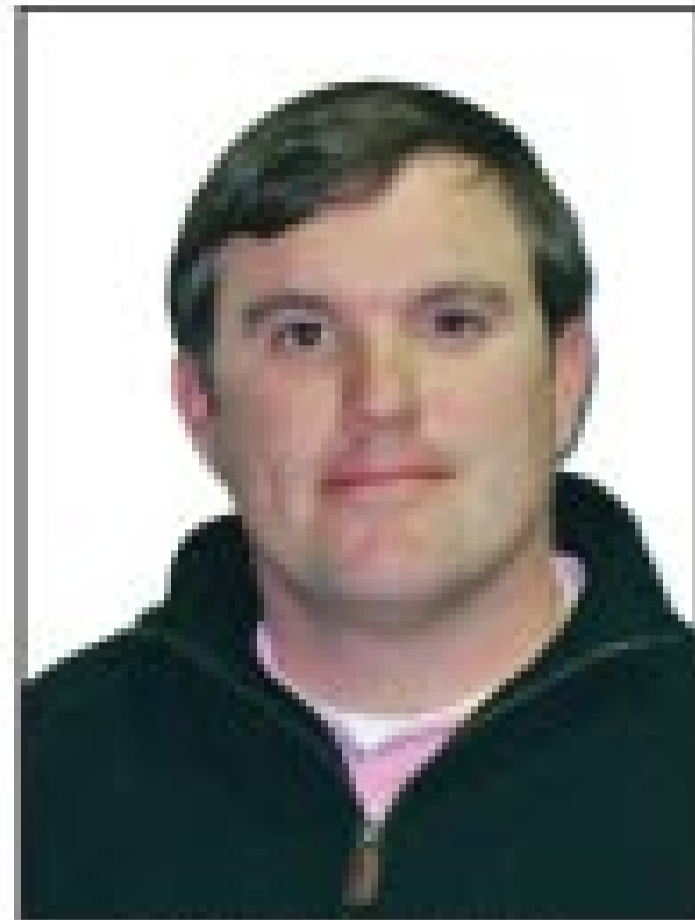
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Dresser Supplies Blower Packages for Egyptian Water Project

Dresser Inc., through its Egyptian distributor Tartoussieh Engineering of Cairo, supplied 249 small Roots Universal RAI blower packages to contractors selected to deploy portable, turnkey water treatment plants to rural villages in Upper Egypt to purify local water and prevent outbreaks of waterborne illnesses. The treatment plants are part of a \$240 million initiative by the Egyptian government to provide safe drinking water and expand the capacity of the country's sanitary sewage treatment infrastructure.

Godwin Pumps Names

Godwin Pumps has named Will Buddin branch manager for its Raleigh, N.C.-based rental office and Bill Price to the newly created position of Asset, Logistics and Transportation manager, based in Bridgeport, N.J. Buddin has seven years experience in the equipment industry and holds a bachelor's degree from The Citadel. Price has 20 years of industry experience.



Will Buddin



Bill Price

USB-Sewer Equipment Recognizes Top Distributors

WECO Industries, DW Inspection Systems LLC and Texas Municipal Equipment LLC were recognized for outstanding sales performance in 2009 by USB-Sewer Equipment Corp.

Vacall Forms Partnership, Names Dealer

Vacall Industries has partnered with Myers to offer an 85 gpm dry-run pump on AllJetVac sewer cleaners/hydroexcavators. The company also named Finkbiner Equipment, Burr Ridge, Ill., as a dealer for its AllJetVac machines.

Vanair Hires Director of Purchasing

Jeffrey T. Summerlin has joined Vanair Manufacturing Inc. as director of purchasing. Summerlin has a Bachelor of Science degree in business management from Indiana Wesleyan University. ♦

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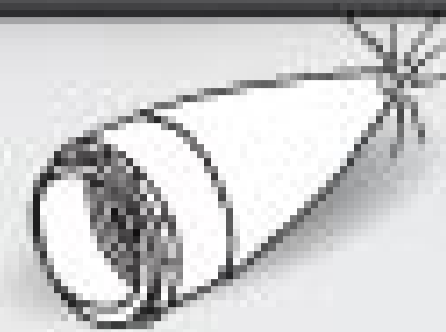




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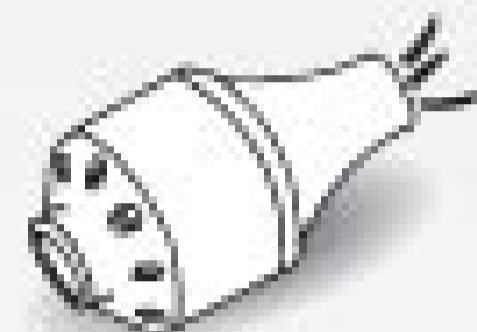


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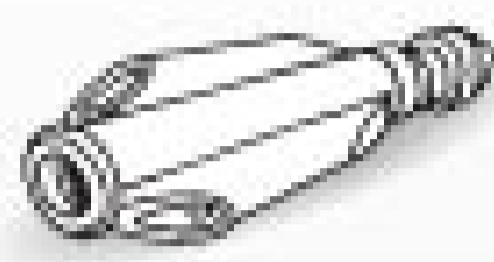
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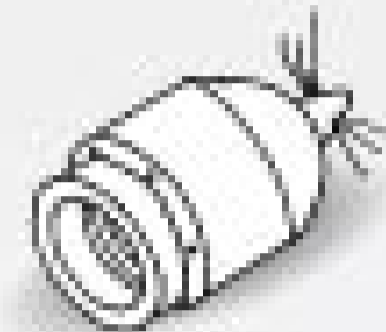
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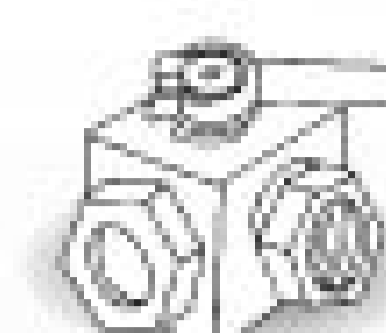
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DOWN TO A SCIENCE

Progressive stormwater management practices in Dane County, Wis., help protect the area's urban lakes as well as small trout streams

By *Scottie Dayton*

Extensive modeling for the Lake Mendota watershed in Dane County, Wis., revealed that 500 to 600 acres per year of urban development contributed 23 percent of all sediment and 20 percent of all phosphorus entering the lake. That acreage represents just 0.3 percent of the lake's watershed.

The five lakes in the chain in and around Madison, the state cap-

ital, are the county's crown jewels. However, sediment from runoff can cloud the water and fill in spaces around residential boat docks and piers. Phosphorus nutrients proliferate weeds and algae blooms, which consume dissolved oxygen, giving the water a foul odor.

County leaders and Jeremy Balousek, P.E., urban conservation engineer for the Department of Land and Water Resources, knew that effective erosion and storm-

water control would have a major effect on the pollutants entering the Madison Chain. They focused on a plan for Lake Mendota, the largest of the group.

From the Lake Mendota Priority Watershed Plan, the county adopted a performance-based erosion and stormwater ordinance that set standards limiting the amount of

sediment, oil, and grease runoff from urban developments, and specifying the temperature of stormwater runoff.

The program became the model for Wisconsin legislators and many communities across the country. In 2002, the program received the Minnesota Erosion Control Associ-

Bioretention basins, like this one under construction, are a key component of stormwater management in Dane County. Instead of using a sand storage layer, subcontractor Hammersley Stone used washed stone. A conveyor places the material, preventing compaction that would occur from excavating equipment. (Photos courtesy of Dane County Dept. of Land and Water Resources)



PROFILE:
Dane County (Wis.)
Department of Land
and Water Resources

FOUNDED:
1975

POPULATION:
482,700

SERVICE AREA:
1,201 square miles

EMPLOYEES:
14

ANNUAL RAINFALL:
33 inches

OPERATING BUDGET:
\$1.5 million (stormwater
and flood control)

WEB SITE:
www.countyofdane.com





This bioretention system, shown under construction at an early stage, was built on a retail property in the City of Madison.



Bioretention basins are 10- to 12-foot-deep excavations filled with sand and topped with 3 feet each of clear stone and engineered soil, and a mix of compost, sand, and a little topsoil. The county plants native prairie vegetation in the basins because their deep roots retain more runoff than turf grass would.

ation Stormwater and Erosion Control Achievement award.

Science-based standards

The shorelines of lakes Mendota and Monona define the isthmus on which the City of Madison is built. Mendota, covering 9,842 acres, has a maximum depth of 82 feet, and its watershed encompasses 217 square miles.

While most counties have jurisdiction only in unincorporated areas or townships, Dane County took erosion and stormwater jurisdiction over the entire county. The main reason for that was to level the playing field.

“Before we enacted the ordinance, communities played off each other’s stormwater requirements,” says Balousek. “Those with fewer restrictions had a better chance of attracting contractors.”

Science-based standards for

“Our stormwater standards require contractors to remove 80 percent of all sediment, and treat the first one-half inch of runoff for oil and grease through filtration.”

Jeremy Balousek, P.E.

erosion control drive the county’s program. Those standards set soil loss at a maximum of 7.5 tons per acre. “Developers must model the potential erosion that will leave their site and prove their construction will not exceed the standards,” says Balousek. “Our standards require contractors to remove 80 percent of all sediment, and to treat the first half-inch of runoff for oil and grease through filtration.”

The county does not specify which practices contractors must use to control runoff quality, peak flow, and water quality. Instead, an

erosion and stormwater management manual on the county Web site provides guidance.

“How they do it is up to them,” says Balousek. “We avoid the conventional cookie-cutter approach because one solution doesn’t fit every application, especially when the goals are infiltration and runoff volume control.”

Studies show that the lakes are improving. According to the University of Wisconsin Center for Limnology, the water quality in the middle of Lake Mendota is very good. However, an interesting phenomenon is occurring.

The Madison Chain was a seepage system, fed by groundwater. Because the Madison area pumps groundwater for drinking water, the water in Lake Mendota is flowing backward into the aquifer. However, the risk of the lake drying up is nonexistent. “The base flow of the streams entering Mendota beyond the metropolitan area will prevent that from happening,” says Balousek.

Thermal pollution

The stormwater program addresses more than just the lakes. Half the county has small, cold-water trout streams. Runoff from storms can elevate water temperatures in those streams, stressing or killing the fish and damaging the sensitive ecosystems. Therefore, the county stormwater ordinance sets temperature standards for runoff to reduce thermal pollution.

TENDING THEIR GARDENS

Based on the success of its first rain garden street, the City of Madison wanted another as part of its Eton Ridge neighborhood reconstruction. Adams Street, however, required an extensive stormwater pipe network because of the area’s topography. The design included underdrains and overflow pipes in each garden that meant excavations too deep to accommodate water entering from the catch basins.

To reduce costs, Greg Fries, P.E., principal engineer with the city’s Engineering Division, tried a different design that was also a better fit. He

replaced the underdrains and overflow pipes with modified curb cuts and situated gardens only where the overflow went to curb over-toppings (small broad-crested weirs) at the downstream end.

Fifteen households volunteered to receive the rain gardens, with a soil infiltration rate of 0.5 inches per hour and expected TSS removal efficiency of 22 percent. The addition of three catch basins increased the total expected TSS removal to 33 percent, or 2,350 pounds of sediment annually. Homeowners are responsible for planting and maintaining the gardens.



Bioretention basins in Dane County are part of a performance-based erosion and stormwater ordinance that sets standards limiting the amount of sediment, oil, and grease runoff from urban developments, and specifies the temperature of stormwater runoff.

“We require developers to model the impact of the runoff temperature to the streams,” says Balousek. “If it’s elevated, then they must implement practices to reduce the temperature.” The primary tool for that purpose is infiltration, via rain gardens, bioretention basins, and underground dispersal. “We don’t want wet stormwater ponds because the sun super-heats the water,” says Balousek. “Rainstorms then displace it to the streams.”

Ambient soil temperatures set stream temperatures. Since the trout streams average 58 degrees F, the temperature of the soil 2 feet below grade, the county adopted that temperature for its standard.

Bioretention basins are 10- to 12-foot-deep excavations filled with sand and topped with 3 feet each of clear stone and engineered soil, a mix of compost, sand, and a little topsoil. The compost removes heavy metals, oil and grease. All told, the basins remove more than 90 percent of sediment in runoff and cool the water.

The county plants native prairie plants in the bioretention basins

because their deep roots retain more runoff than turf grass. “However, the basins are dry until it rains, so our list of prairie plants that withstand dry and wet conditions is very narrow,” says Balousek. An under-drain system prevents the plants from drowning during wet periods.

Breaking the chain

Connected impervious areas drive runoff temperatures, so the county’s strategy is to disconnect them. For example, draining a roof onto a lawn instead of a parking lot not only keeps the water clean, but also cool. Besides natural porous structures, contractors also are using more porous asphalt, concrete, and paving blocks.

A constant concern is that the freeze-thaw cycle in the area’s cold climate blows out chunks of pavement each spring. To avoid potholes in porous asphalt, Balousek designs parking lots with a thick stone storage layer beneath them. Water ponds in the stone to a certain depth, then flows into drain tile systems, eliminating blowouts.

As part of its strategy to disconnect impervious areas, the county

“We avoid the conventional cookie-cutter approach because one solution doesn’t fit every application, especially when the goals are infiltration and runoff volume control.”

Jeremy Balousek, P.E.

also replaces conventional curbs with ribbon curbs that drain the sheet flow into boulevards sunken 6 to 12 inches deep, or into roadside channels. “The boulevards may not have an outlet until the water ponds to 6 inches, allowing for infiltration,” says Balousek.

Such practices enabled Dane County to surpass the state’s 2013 discharge limit of 40 percent TSS removal by 1 percent. Another contributing factor is its grant program. Dane shares county money with municipalities to install sediment-control devices in developments built before the 1970s. “It’s a very successful program,” says Balousek.

Sediment basins, the best sediment-control device, store water long enough for soil particles to fall out of suspension. Unlike detention ponds, the basins restrict flows during normal rainfalls, but release water during major storms. When land is unavailable for sediment basins, the county looks at underground proprietary devices from Baysaver Technologies Inc. (Advanced Drainage Systems Inc.), Storm-Tech LLC, and CONTECH Construction Products Inc.

Looking ahead

To identify critical sites for erosion and stormwater controls, the county is conducting innovative modeling projects, such as quantifying and locating hot spots for phosphorus loading to the Lake Mendota watershed. Studies include farm animal counts, tillage practices, surveys of crops grown, and land-use surveys.

“Rather than do these studies in all the tributaries entering the lake system, we’re hoping we can transfer the modeling information to them,” says Balousek. “We ultimately want to model farmland and urban areas throughout the Madison Chain to identify critical sites we can target for controls.”

The county also is buying and restoring drained wetlands to provide flood storage for the lakes.

During the state’s agricultural period, farmers drained 90 percent of the county’s wetlands. “We target \$2.25 million per year to buy wetlands,” says Balousek. “Since the property is undesirable for development, we can purchase hundreds of acres.”

Because Dane is one of the state’s fastest growing counties, Balousek sees volume control as the next decade’s biggest challenge. One strategy already in place is narrowing streets, the largest impervious areas in residential developments. Some roads are 48 feet wide, the width of interstate highways. While many municipalities have narrowed their streets to 32 feet, Balousek wants 28-foot-wide roads where feasible. He sees eliminating parking on one side as an option.

Retrofitting stormwater ponds to provide flood control and act as sediment basins is another strategy. By excavating the facilities, the county increases their volume and establishes permanent water for sediment storage. Workers also restrict the size of outlets to detain smaller storms.

Dane County continues to look beyond conventional practices to address its erosion and stormwater management issues. Balousek and his team treat every development site individually, designing better practices, better infiltration techniques, and better ways to limit runoff for now and far into the future. ♦

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Pipe fusion technician David Marcum from Ferguson Industrial Plastics hydraulically raises the jaws of a McElroy 1648 fusion machine used to fuse the pipe for the Lake Oswego sewer interceptor project. The jaws held and rerounded the pipe during the fusion process. (Photos courtesy of Tyler Henning, McElroy Manufacturing Inc.)

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WINDING UNDERWATER

High-density polyethylene pipe provides the answer to the challenge of replacing and upsizing a sewer interceptor beneath an Oregon lake

By *Scottie Dayton and Tyler Henning*

The 24,000-foot-long concrete and cast-iron Lake Oswego (Ore.) interceptor sewer (LOIS) had insufficient capacity to handle development and peak wet-weather flows, resulting in surcharged manholes.

Part of the gravity-flow system traverses Oswego Lake. The 9,700-foot-long buoyant middle section floats 14 to 21 feet below the surface. On either end of it are 5,200 feet of submerged pile-supported pipe. A modest earthquake could cause the corroded steel pilings

and hardware to fail, causing an ecological nightmare.

The City of Lake Oswego, under a state Department of Environmental Quality mandate to replace the interceptor by 2012, retained Brown and Caldwell Inc., an environmental engineering firm with a local office, to design a solution. Vice president Jon Holland recommended upsizing and replacing the interceptor with another in-lake gravity-flow system. With the emphasis on flexibility, buoyancy, and durability, high-density polyethylene pipe (HDPE) was the

only material to meet the project's goals.

Compound challenges

Constructed in the early 1960s, LOIS has 40 manholes and includes more than 5,000 feet of smaller tributary lines constructed through canals and bays. The system, designed to handle flows from 3,500 developed acres, serves more than half the city's businesses and residences, or nearly 4,500 developed acres. The interceptor increases from 16 to 36 inches along a 7-foot slope to the City of Portland's Tryon Creek

Wastewater Treatment Plant.

Part of the estimated \$110 million renovation is upsizing 18,868 feet of the interceptor to 42-inch pipe submerged 8 to 17 feet below the surface of the lake. Water temperatures varying up to 40 degrees F will lengthen and shorten the pipeline by 14 feet, so tethers anchored to the lake bottom restrain it from bowing up, the buoyant plastic restrains it from bowing down, and installation in an S-curve limits side-to-side movement.

"With up to 200 feet of soft sediment overlying bedrock, it was difficult and costly to install pilings in much of the lake, which is why buoyant HDPE was essential," says Holland. "The pipe and fused joints are corrosion- and impact-resistant, enabling them to take hits from recreational boat anchors, while being flexible enough to withstand seismic activity."

LOIS is designed to resist an earthquake with a 10 percent chance of happening in 100 years. The pipe walls are 1.75 inches

thick to withstand 2.5 times the maximum water pressure. Closely spaced rock anchors, tested to 150 percent of extreme load, control any upward movement of the pipe to one-quarter inch. Stainless steel wire rope tethers provide 30 percent more strength than needed.

"To enhance maintenance, the new system has a maximum manhole spacing of 1,600 feet," says Holland. "The existing system has a manhole every 2,700 feet and a joint every 32 feet. We specified a joint every 1,000 feet to reduce opportunities for failure."

Assembly logistics

Advanced American Construction Inc. (AAC), the general contractor from Portland, built a large L-shaped trestle dock, then set up a custom-fabricated winch and roller conveyor on the long leg. A Manitowoc crane, staged at the junction of both legs, moved 50-foot sticks of Driscoplex DR 32.5 PE 3408 pipe into position and took receipt of shipments as

they arrived.

Workers elevated a McElroy Manufacturing Inc. MegaMc 1648 fusion machine from Ferguson Industrial Plastics (FIP) in Washougal, Wash., to align with the winch, then used the winch to pull the fused pipe gently along the conveyor and into the water.

"The water's buoyancy often pulled in the pipe without much assistance from us," says David Marcum, FIP pipe fusion technician. "However, we had to build a tent over the fusion machine to protect it from the persistent rains, which would have contaminated and ruined the joints."

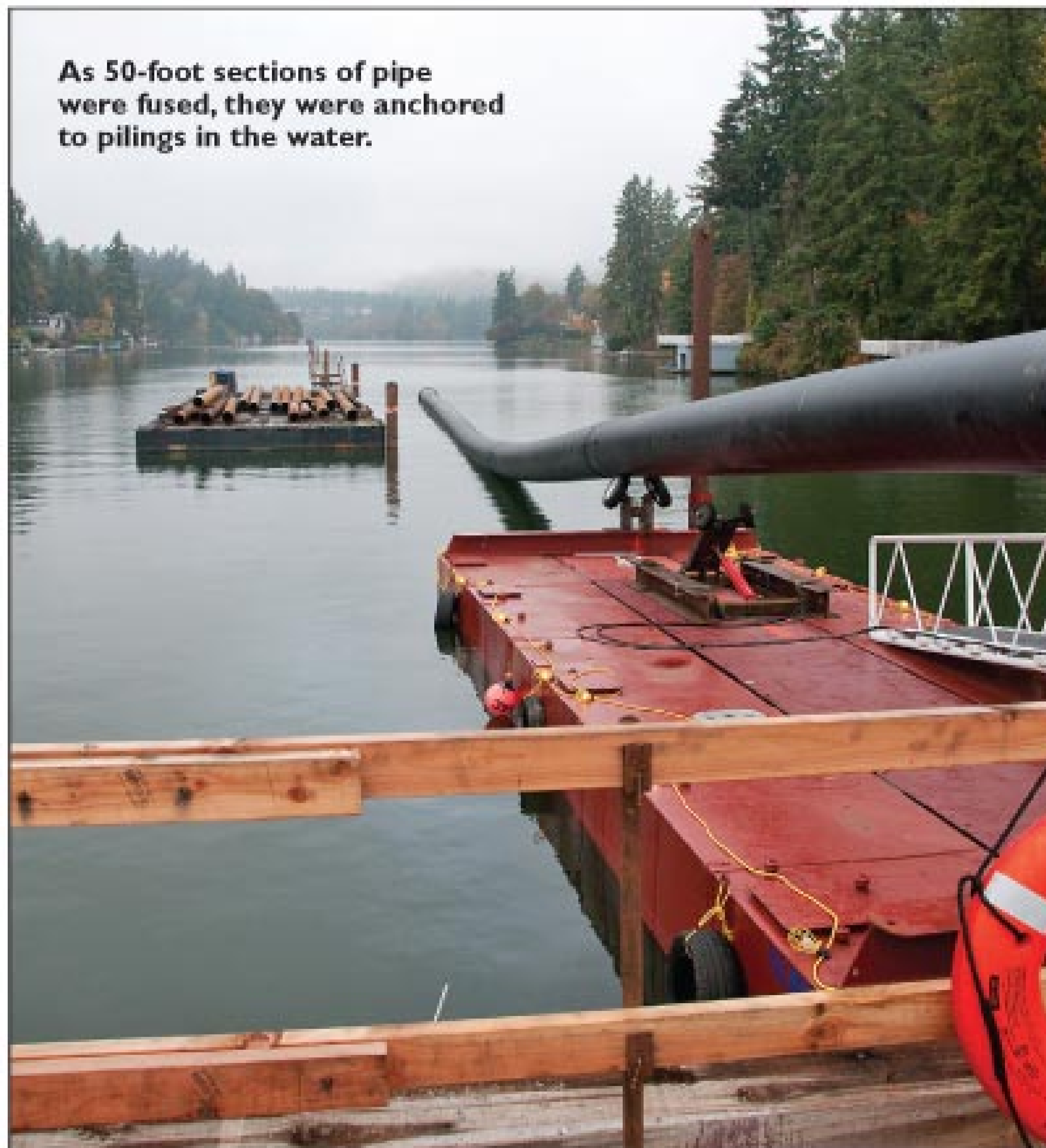
The FIP team used a wireless McElroy DataLogger to record and verify that they followed proper fusion procedures. The 1,000-foot lengths were anchored to piles near the shore until a tugboat towed the segments to their installation point.

Bending the pipe lengths into S-curves required a 40- by 10-foot barge and a 300- by 1,200-foot space on the lake. Using winches, the barge pulled the pipe into the first curve. Internodal cables kept the shape intact. The barge then repeated the process on the opposite side of the pipe. Seven AAC commercial divers attached the length to tethers, four dives per attachment.

Pile-supported pipe lengths will be installed during the Lake Down phase beginning in September 2010. The project's completion is scheduled for between the summer of 2011 and the end of the year. ♦

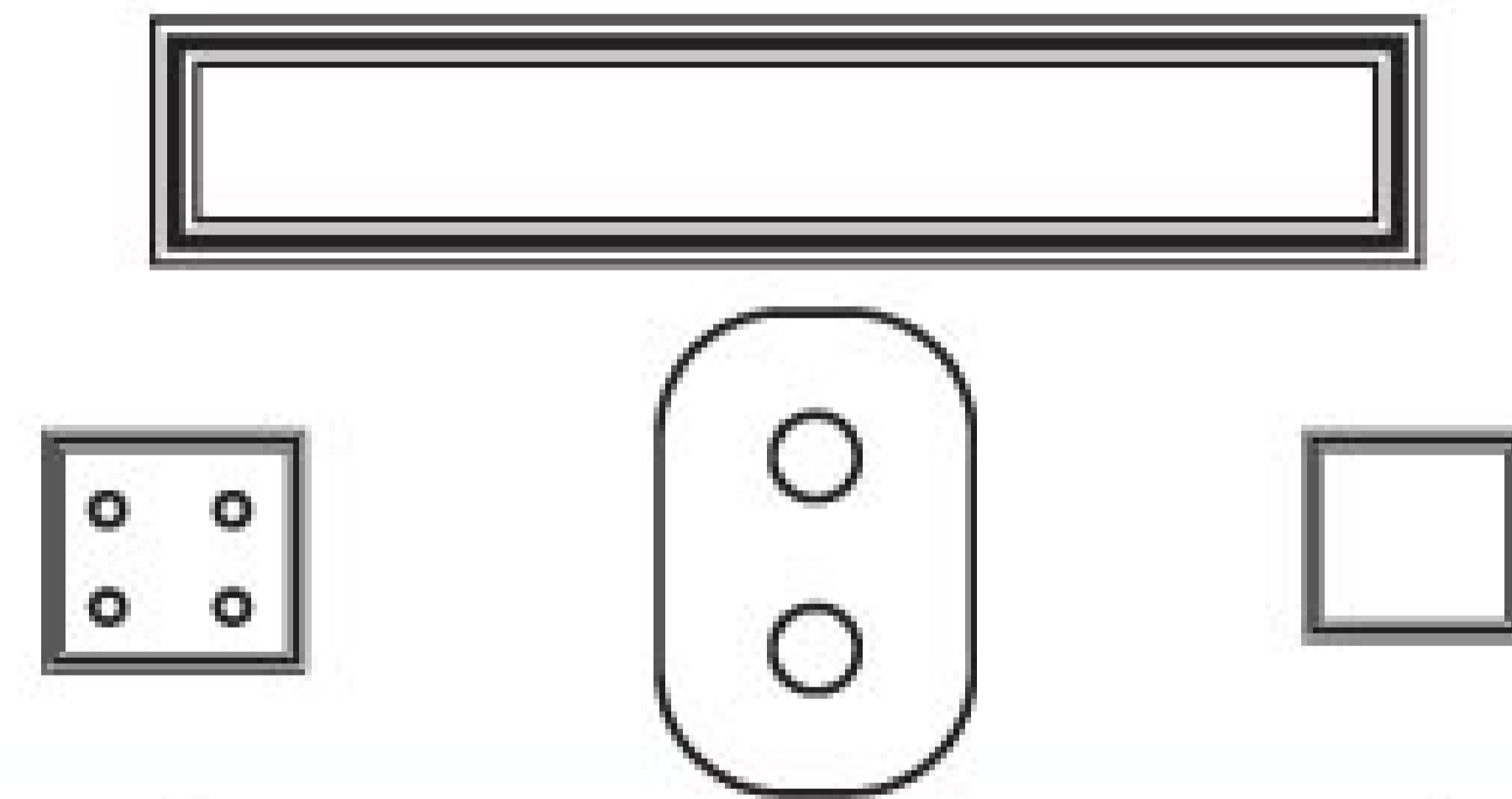
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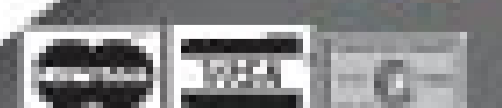
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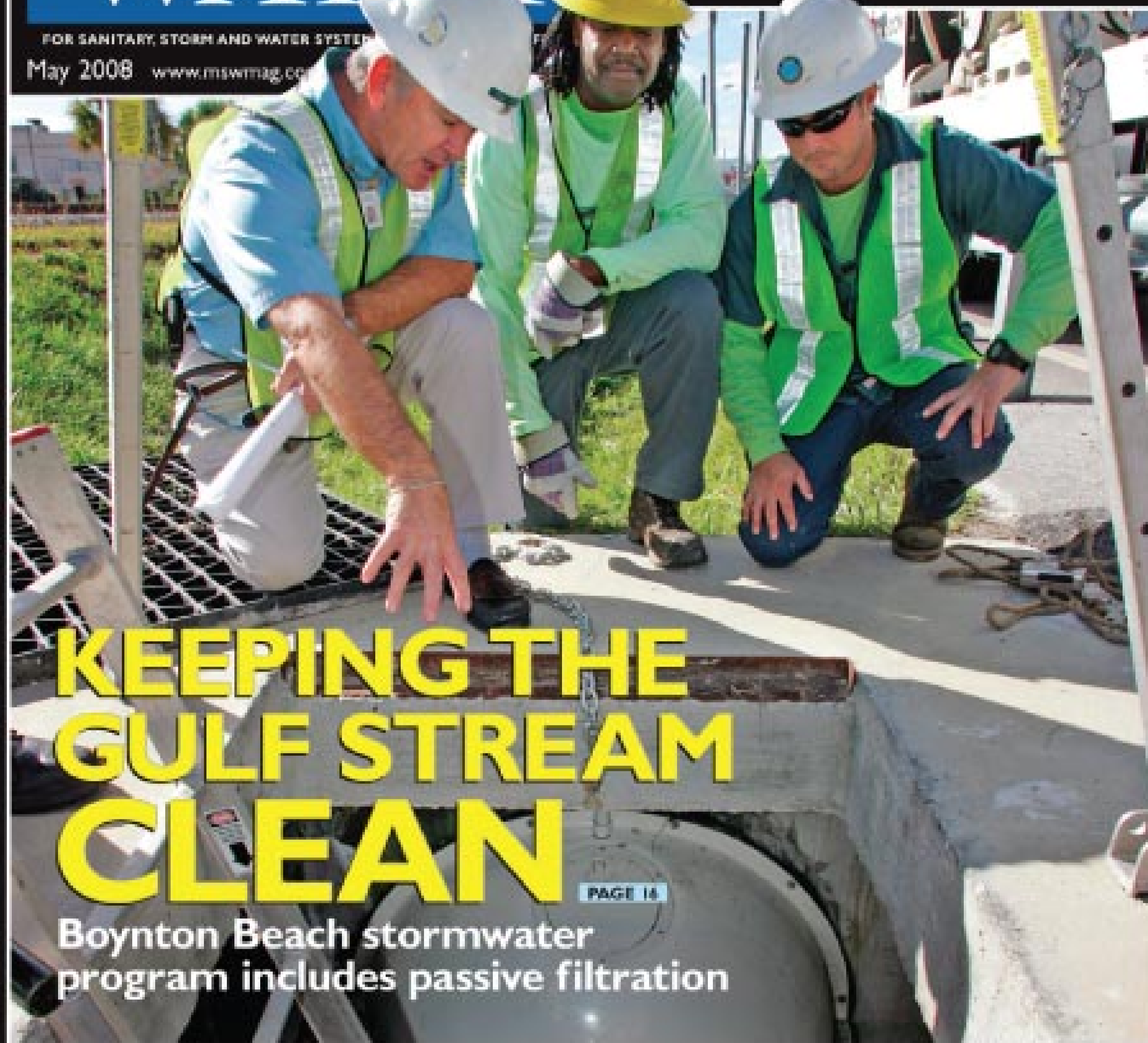
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KEEPING THE GULF STREAM CLEAN

PAGE 16

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INTELLIGENT LISTENING

ADS Environmental Services leak-detection technologies help water-utility professionals pinpoint trouble and make repairs efficiently

By Erik Gunn

Leak-detection technology continues to be refined. Various technologies have been used in equipment to detect leaks, each with strengths and weaknesses.

ADS Environmental Services, a division of ADS LLC, based in Huntsville, Ala., sells a series of high-technology leak-detection products that rely on acoustic-listening technology. The equipment is manufactured by Primayer Ltd., based in the United Kingdom. ADS is an IDEX Water & Wastewater Business, based in Northbrook, Ill.

A team from ADS and Primayer demonstrated two systems in a residential neighborhood in Chicago on Dec. 3, 2009:

- Mikron acoustic probe units, used to detect and pinpoint leak locations by listening in real time.
- The Eureka Digital system, used to monitor leaks in real time or to log leak activity at designated times to be analyzed later.

Conducting the demonstration were Steve France, global sales director with Primayer Ltd.; William

Doyle III, water loss control client services; Terry Keeling, field technician; and Steve Huggins, Midwest project manager, all of ADS Environmental Services.

Walk-around

The Mikron locating system can use either of two listening devices. The Gamma ground microphone unit is a cylinder about the size of a large coffee can that can be attached to a wand for easy operation. The Alpha handheld listening device, about the size of a coffee cup, also has a detachable wand, as well as a magnet on its face (the surface that receives sound) that can adhere to any iron or steel water main fixture, such as a fire hydrant.

The Mikron system comes with a handheld amplifier and display unit for operating the system and interpreting the findings. It has a simple control panel consisting of a small LCD screen and five control buttons to activate the system, set playback volume, and set parameters for leak detection. A high-impact carrying case is included.

The Eureka Digital locating sys-



Bill Doyle of ADS Environmental Services listens through headphones to the sound being picked up by a Mikron Alpha as it picks up noise from a nearby leak through the fire hydrant connected to the water system. (Photos by Erik Gunn)

tem consists of two wireless digital transmitter devices, one red and one blue for easy distinction, each equipped with a sound sensor or accelerometer. The devices are used to triangulate a leak location by correlating the differences in leak noise transmitted to two different locations.

A separate receiver module can also use a third sensor device for greater precision. Headphones and a carrying case and battery charger are included. Users can choose one of two tablet comput-

TECHNOLOGY TEST DRIVE

EQUIPMENT:

Mikron Alpha and Gamma leak-locating system; Eureka Digital leak-correlation system

MANUFACTURER:

Primayer Ltd., Hampshire, UK (distributed by ADS Environmental Services, Huntsville, Ala.)

LOCATION OF DEMO:

Chicago, Ill.

DEMONSTRATED BY:

Steve France, Primayer Ltd.; William Doyle, Steve Huggins, and Terry Keeling, ADS Environmental Services

LIST PRICE:

Mikron \$4,500
Eureka Digital \$20,000
Eureka 2R \$11,000



One of two Eureka Digital listening units, this one attached to a fire hydrant near the suspected leak location. A second unit was attached to another hydrant about 300 feet away.



The Eureka Digital carrying case. Atop it is the receiver that receives the signals from the two units.

“If the leak is in the middle, the noise will reach both sensors at the same time. But if it’s closer to one unit, it will reach that unit first and the second unit later. We’re looking for that time delay. Then, if we know exactly what that pipe length is, we can determine where the leak is.”

Steve France

ers for data analysis, or install software (included with the package) on their own laptop computer.

Operation

France joined three ADS representatives at the intersection of North Hoyne Avenue and West Iowa Street in Chicago, a residential neighborhood about 3.5 miles west of Lake Michigan.

The target leak was one ADS had detected previously as part of an ongoing project with the city. Keeling opened a manhole in the center of the intersection. Inside, water could be seen bubbling back from the water pipes, but the exact source of the leak was not visible.

“Leak detection is equated to a formula with about four unknowns,” France says. “You’re never quite sure what’s in the ground, where there have been repairs to the pipes, or whether the mapping has been updated after repairs — all things that can affect where that leak position is. So you need this logical process to try and eliminate the unknowns.”

Doyle began by demonstrating the Mikron system. He attached the smaller Alpha unit to a nearby hydrant, and the magnet on the unit’s base connected to the iron hydrant with a sharp click. He then plugged the unit into the control panel, turning on the top button to activate the headset circuit. Using the bottom button on the panel, he selected an appropriate sound filter for the pipe composition, in this case, a range of 75 to 750 Hz for cast iron.

“When water comes out of a pipe, there’s an energy transfer, and what you’re looking for is that

index is useful as an operator moves in the vicinity of a leak, such as along a pipeline, because it reports whether the noise of interest is getting louder or softer.

Doyle switched to the larger Gamma ground microphone, which he attached to a wand handle, then walked in the street, following the approximate path of the pipeline. The panel’s LCD screen displayed three boxes in a horizontal row, the right-hand one larger than the other two. The larger box

The Mikron Alpha listening device, seen from the underside. The metal disk on the face is magnetized so it will adhere to an iron fixture such as a fire hydrant.



The Mikron Alpha microphone unit.



displayed a series of increasing numbers: the index number for the level of the sound.

Doyle pressed the panel’s center button, and the index number at that moment was captured and displayed as a constant in the center box on the screen. Then, as he proceeded further, the real-time number continued to rise, while the center, unchanging number allowed him a quick comparison with the previous reading. By walking the path of the pipeline and observing the rising and then falling index number, Doyle approximated the location of the leak.

The team then demonstrated the Eureka Digital correlation system. France explained that correlation systems help pinpoint leaks by comparing the differences in the sounds the leak makes when heard from two or more points.

“If the leak is in the middle, the noise will reach both sensors at the same time,” France said. “But if it’s closer to one unit, it will reach that unit first and the second unit later. We’re looking for that time delay. Then, if we know exactly what that pipe length is, we can determine where the leak is.”



The Mikron control panel. The center box shows a number (9) that was captured at one point during the ground microphone’s use as the operator, Bill Doyle, walked it along the length of an underground pipe in search of the leak. The right box is the real-time index number, 17, at his current location, indicating he is now closer to the leak source.

Some correlation systems are used in real-time listening, and others can be set to record the sound remotely for later analysis. The Eureka Digital system can be used in either situation.

Doyle and Keeling set out two sensors/transmitters, one on the same nearby hydrant and the other on a hydrant about 300 feet away. When the system was turned on, the transmitters collected sounds that radiated through the pipe system and transmitted the data via radio signals back to a receiver connected to a laptop computer equipped with the appropriate software.

On the computer, the software displayed a series of screens. Two small displays on the right showed the signal from the blue and red transmitters. A large horizontal screen that dominated the display

showed a series of spikes along a horizontal graph. Within a few minutes the spikes coalesced and peaked at a single area of the graph. The resulting information allowed Doyle to establish the likely location of the leak along the pipeline.

Observer suggestions

Each of the units demonstrated quickly and clearly conveyed the expected information about water loss in a fashion that would be readily interpreted. The Mikron system's simple controls suggested it would be easy to learn to use, although experience would be required to make the most accurate interpretation of findings.

“The big thing is using the right tool for the right job. A lot of that comes down to the right tool for the right operator, because there are people who are new to leak detection, and there are people who are very experienced.”

Steve France

showed a series of spikes along a horizontal graph. Within a few minutes the spikes coalesced and peaked at a single area of the graph. The resulting information allowed Doyle to establish the likely location of the leak along the pipeline.

France explained that correlation systems take brief samples of

The Eureka Digital display was clear and easy to decipher. All the equipment appeared convenient for even a single operator to place and use.

Besides these two items, the team demonstrated two more Primayer systems that ADS is marketing. The Eureka 2R is a real-time correlation system that uses

Bill Doyle walks the Mikron Gamma ground microphone along the length of pipe where the leak is believed to be.

its own control panel to report findings. The Enigma is a recording correlation system with three to eight detection units that are synchronized, put out in secure locations such as in manholes surrounding a suspected leak, and timed to collect data at the most desirable time, such as at night, when traffic noise is less likely to confound the findings. The Enigma is used with software installed on a laptop computer to analyze the information.

Manufacturer comments

France pointed out that effective leak detection with any equipment benefits from training and experience, as well as time in the data-collection procedure. For instance, ordinary use of water services in a residential neighborhood — morning showers, dinner-time dishwashing, and so on — can get confused with leak-generated noise.

That makes it especially helpful to use logging-correlation equipment, which can be set to record data at times when there is no traffic and little other activity.

“The big thing is using the right tool for the right job,” said France. “A lot of that comes down to the right tool for the right operator, because there are people who are new to leak detection, and there are people who are very experienced. A small town that has 10 or 20 leaks a year will go with something quite simple. If they only have a few miles of pipe, they might use only one ground microphone. A big city like Chicago needs more sophisticated tools.”

France noted that the Mikron units have two key features that enhance their effectiveness. “First, the sensor is decoupled from the outside world as much as possible,” he said. “The biggest enemy of a ground microphone is wind noise — it masks the leak noise.” The



Mikron units' sensors are mounted on a rubber boot that helps isolate them from such noise.

Second, the circuitry is engineered to minimize electronic noise, which is like the hiss one hears when turning up a stereo system with no sound coming from it. “That hiss can also mask leak noise,” France said. ♦

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OUT OF SIGHT BECOMES TOP OF MIND

The tragic earthquake in Haiti sheds light on the importance of underground infrastructure for vital community services

By Irvin Gemora

While disaster-response teams raced against time in earthquake-ravaged Haiti, the time bomb of the outbreak of disease continued to tick. Setting the stage for this secondary crisis was Haiti's lack of a water and sewer infrastructure.

Despite the obvious need, it had been difficult for Haiti's government to complete infrastructure projects because residents resisted having their homes torn down or moved. When the massive quake struck, it ruptured the few existing water lines.

In many parts of Haiti there were open ditches of sewage, and people were having trouble getting fresh water. Further, rainfall caused these open sewage ditches to overflow into the streets. In short, it was the perfect formula for the spread of waterborne disease.

Vital assets

The scale of the disaster caused by the Haiti earthquake is beyond imagination. As I write this, more than 150,000 people have been buried. By the time you read this, that number will be much higher.

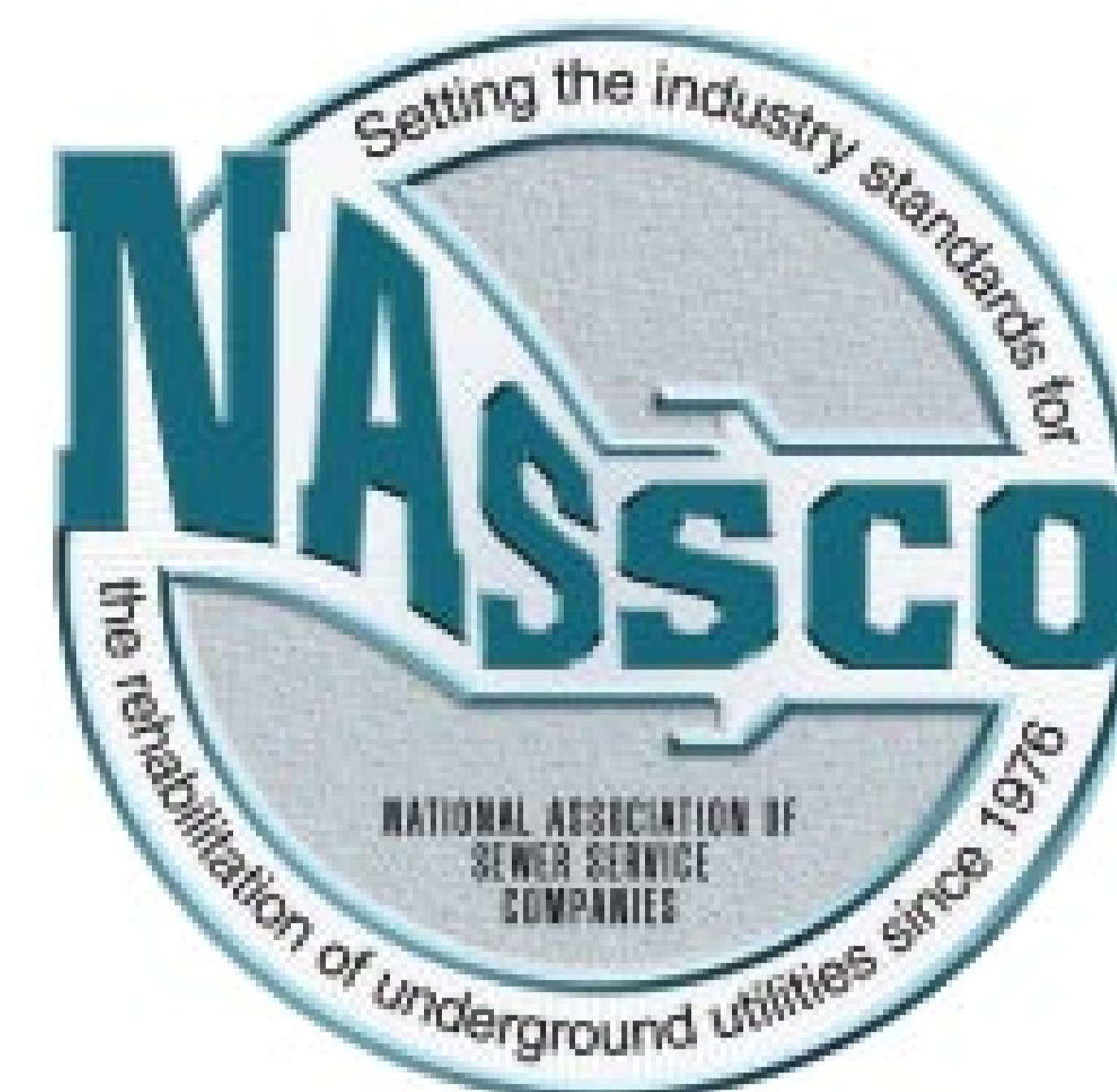
The earthquake showed the world how important underground infrastructure is to human life. Even before the quake, Haiti did not have an effective public sewer system. In fact, for many Haitians, even getting access to clean water was a challenge.

I say it often but it's worth repeating: Our public sewers are our nation's most vital public assets. Most Americans can't imagine their toilet not flushing regularly, let alone not having one. But as those in the industry know, our country's sewer pipes, many built more than a century ago, are deteriorating faster than they can be fixed. The

American Society of Civil Engineers (ASCE) raised the alarm in a recent report card, which assigned a grade of D+ to America's wastewater infrastructure.

In most cities, wastewater goes to treatment plants. Systems in hundreds of older cities, however, combine rainwater runoff with sewage, which means already overwhelmed sewers have to handle runoff from storms, as well.

Ongoing development worsens the problem. As cities grow rapidly, many neglect infrastructure projects and pave over green spaces that once absorbed rainwater. After moderate or heavy rains, sewer systems become overloaded, increasing the risk of flooding and contributing to backups that send raw sewage into homes, streets, rivers, and waterways. ASCE estimates that aging systems discharge six billion gal-



lons of untreated wastewater into surface waters each day.

Tough challenge

No easy solution exists, but our role is critical, not simply for Americans today but for future generations. While we don't face infrastructure problems as massive as in Haiti, we certainly face a situation that demands attention and that will require extensive spending, thoughtful planning, and careful budgeting.

The EPA estimates that the nation must invest \$390 billion over the next 20 years to update or replace existing systems or build new ones to meet increasing demand. The numbers sound overwhelming, but all of us in the trenchless technology industry should take pride in knowing we are part of the solution.

For many, our industry is out of sight and out of mind, but at NASSCO we know it's essential to bring important issues like these to the forefront. Increased awareness of quality and safety issues among government and the general public will elevate the importance of properly rehabilitated pipelines and, in the end, help us all.

The contractors, suppliers, engineers, public agencies, and others aligned to the trenchless technology field will continue to play a pivotal role in making a difference in the future and in the rehabilitation of America's underground infrastructure. ♦

Irvin Gemora is executive director of NASSCO. He can be reached at director@nassco.org. The NASSCO headquarters is at 11521 Cronridge Dr., Suite J, Owings Mills, MD 21117.

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PEOPLE

The National Utility Contractors Association elected officers for 2010-11:

- Chairman of the Board, Dan East, Reynolds Inc., Albuquerque, N.M.
- Chairman-elect, Ryan Schmitt, Petticoat-Schmitt Contracting, Jacksonville, Fla.
- Vice chairman, Alex Paris, Alex E. Paris Contracting Inc., Atlasburg, Pa.
- Treasurer, Jim Barron, Ronkin Construction Inc., Joppa, Md.
- Secretary, Florentino Gregorio, Anchor Construction Corporation, Washington, D.C.

Taylor J. Whittington, 66, director of the National Rural Water Association, died on Jan. 13, 2010.

LEARNING OPPORTUNITIES

American Public Works Association

APWA offers a course on Self-Assessment Using the Management Practices Manual in Rolling Meadows, Ill. April 20. Visit www.apwa.net.

American Water Works Association

The AWWA is offering a course on Financial Management: Cost of Service Rate-Making in Savannah, Ga. April 21-23. Visit www.awwa.org.

Kansas

The Kansas Water Environment Association is offering these courses:

- April 6-7 – Distribution, Russell or Hays
- April 13 – Safety, Kinsley
- April 13-14 – Cross Connection Control and Backflow Prevention Recertification, Wichita
- April 13-16 – Cross Connection Control and Backflow Prevention, Wichita
- April 21-22 – Utilities Management, Fort Scott
- May 11 – Safety, Syracuse
- May 13 – Small Water Systems, Liberal
- May 18-21 – Cross Connection Control and Backflow Prevention, Fort Scott
- May 25 – Special Environmental Topics, Kinsley

Visit www.kwea.net.

Wisconsin

The state Department of Natural Resources is offering these courses:

- April 13-14 – Iron, Zeolite & VOC, Green Bay
- April 14 – Distribution Seminar, Green Bay

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CALENDAR

April 8

Massachusetts Water Resources Conference, Campus Center, Amherst. Visit www.umass.edu.

April 11-14

American Water Works Association Sustainable Water Sources Conference, Albuquerque (N.M.) Convention Center. Visit www.awwa.org.

April 11-14

2010 International Low Impact Development Conference: Redefining Water In The City, Westin San Francisco Airport Hotel. Call 703/295-6300 or visit www.asce.org.

April 13-16

Texas Water 2010, American Bank Center, Corpus Christi. Visit www.texas-water.com.

April 18-21

2010 North American Snow Conference, Qwest Center, Omaha, Neb. Visit www.apwa.net.

April 25-29

National Water Quality Monitoring Conference, Sheraton Denver Downtown Hotel, Denver, Colo. Call 303/893-3333 or visit www.acwi.gov.

May 2-4

International Symposium on Waterborne Pathogens, Manhattan Beach (Calif.) Marriott Hotel. Call 800/926-7337 or visit www.awwa.org.

May 16-20

World Environment & Water Resources Congress 2010, Providence, R.I. Visit www.asce.org.

May 16-21

Association of State Floodplain Managers, Cox Business Services Convention Center, Oklahoma City, Okla. Visit www.floods.org.

May 17

National Utility Contractors Association 2010 Washington Summit, Hyatt Regency Capitol Hill, Washington, D.C. Call 703/358-9300 or visit www.nuca.com.

- April 14 – System Operations O&M, Ashland
 - April 15 – Distribution Seminar, Wisconsin Dells
 - April 15 – System Operations O&M, River Falls
 - April 20-22 – Surface Water, FVTC-Appleton
 - May 3-4 – Iron, Zeolite & VOC, MPTC-Fond du Lac
 - May 4 – System Operations O&M, Waupun
 - May 11-12 – Utility Management, Sun Prairie
 - May 19 – Confined Space Entry, Sun Prairie
- Visit www.dnr.state.wi.us/org/es/science/opcert/training.htm.

The University of Wisconsin Department of Engineering-Professional Development is offering these courses in Madison:

- April 6-7 – Municipal Engineering Fundamentals for Non-Engineers
 - April 19-20 – Meeting Stormwater Requirements: Using WinSLAMM to Assess Quality and Volume Controls
 - May 25-26 – Meeting Stormwater Requirements: Using WinSLAMM to Assess Quality and Volume Controls
- Visit <http://epdweb.engr.wisc.edu>. ♦

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- ▶ Business Opportunities
- ▶ Cable Machines
- ▶ Computer Software/Billing
- ▶ Consulting/Engineering
- ▶ Dewatering
- ▶ Drain/Sewer Cleaning Equipment
- ▶ Easement Sewer Flusher
- ▶ Excavating Equipment
- ▶ Gas Indicators & Detectors
- ▶ Hydroexcavating Equipment
- ▶ Jetters - Trailer
- ▶ Jetters - Truck
- ▶ Jet Vacs
- ▶ Leasing/Financing
- ▶ Locators
- ▶ Miscellaneous
- ▶ Padlocks
- ▶ Parts & Components
- ▶ Pipe Bursting Equipment
- ▶ Pipeline Rehabilitation
- ▶ Positions Available
- ▶ Pressure Washers
- ▶ Pumps - Submersible
- ▶ Pumps - Vacuum
- ▶ Safety Equipment
- ▶ Street Sweepers
- ▶ TV Inspection
- ▶ Septic Trucks
- ▶ Vacuum Loaders
- ▶ Wanted

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BUSINESSES

Philadelphia/Allentown Pennsylvania Area Sewer Business For Sale. Specializing in collection systems, video inspection, jetting, municipal work. Includes CUES TV & grout truck, Sewer Equipment Corporation jetter truck, Vactor 2100, RIDGID camera, confined space equipment and more! Good revenue history. Great opportunity to expand or start your own business. Current owner wants to retire. **Offered at \$330,000.** E-mail jeffb@colepublishing.com or call 800-257-7222 and ask for Jeff Bruss for more details. **A B2 Business Brokerage Listing.** (MBM)

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Northern California/Reno, Nevada Area Portable Restroom Service Business for Sale. Owner is motivated and inventory alone is worth the asking price. Includes 100+ restrooms, sinks, ADA units, holding tanks, 2 service trucks and a delivery trailer. Annual revenue in excess of \$100K each of the past 4 years. List of existing customers and contracts included. Owner is willing to train if needed. **Asking \$75,000 - REDUCED TO \$55,000.** E-mail jeffb@colepublishing.com or call 800-257-7222 and ask for Jeff Bruss for more details. **A B2 Business Brokerage Listing.** (M6)

Very successful established Midwest based full service Trenchless Sewer Company with municipal and industrial experience and contacts available for acquisition. Serious confidential inquiries only. Please respond to P.O. Box 154283, Irving, TX 75015-4283 or email: cippcompany@yahoo.com. (CM6)

BUSINESSES

ARIZONA BUSINESS WANTED: Qualified buyer looking to purchase existing industrial/municipal cleaning and inspection business in the Phoenix area. Will consider other areas in Arizona as well. If you are looking to sell, please call Jeff at 800-257-7222. (M6)

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Looking to sell your portable restroom business? We have buyers looking in the following areas: Florida, California, Virginia, Iowa, Kentucky, New York, Pennsylvania and more! Must have gross revenue in excess of \$250,000 in most cases. E-mail jeffb@colepublishing.com or call 800-257-7222 and ask for Jeff Bruss for more details. **A B2 Business Brokerage Listing.** (MBM)

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Looking to buy a business in the liquid waste, portable sanitation, or sewer & drain industries? Call B2 Business Brokers powered by Municipal Sewer & Water at 800-257-7222 and we can add you to our VIP buyer list. No obligation, no fees, no pressure. (MBM)

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2008 Sterling LT7501 with a VacAll AJV1015, 10-yd. debris body, 1500 gal. water, combination vacuum/jetting unit, preowned rental unit. **PRICED TO SELL!** (Stock #13366) www.VacuumSalesInc.com, (888) VAC-UNIT (822-8648). (M4)

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