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A proactive approach to
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helps a small Colorado utility
stay ahead of problems

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John Carrillo
Senior Maintenance Partner
Fruita (Colorado) Public Works

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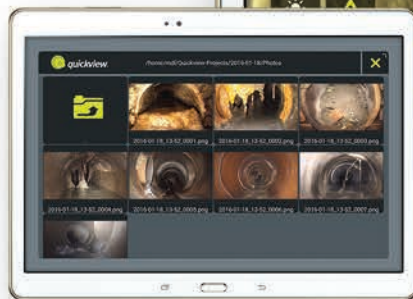
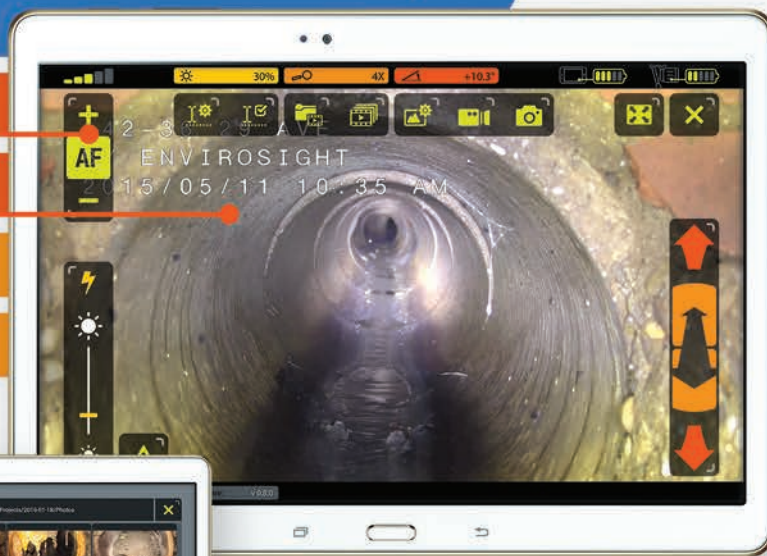
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FLOW CONTROL AND MONITORING



ON THE COVER: Fruita (Colorado) Public Works senior maintenance partner John Carrillo stands above ground at one of Fruita's eight lift stations. (Photography by Carl Scofield)



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MUNICIPAL SEWER & WATER

FOR SANITARY, STORM AND WATER SYSTEM MAINTENANCE PROFESSIONALS

Published monthly by:

 COLE publishing

1720 Maple Lake Dam Rd., PO Box 220,
Three Lakes WI 54562



www.mswmag.com

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Office hours Mon.-Fri., 7:30 a.m.-5 p.m. CST

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EDITORIAL CORRESPONDENCE: Send to Editor, *Municipal Sewer & Water*, PO. Box 220, Three Lakes, WI, 54562 or email editor@mswmag.com.

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CIRCULATION: 2015 average circulation was 37,623 copies per month (U.S. and international distribution).

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FOLLOWING THE FLOW

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FROM THE EDITOR

Luke Laggis

I was hanging out with family this past summer, sitting outside my brother's house along the Wisconsin River in Rhinelander, Wisconsin. The Olympic opening ceremonies were on TV inside. Water had been such a huge topic in the days leading up to the games, and our conversation eventually turned to the river flowing in front of us.

At one point someone asked about the longest river in the U.S. The majority of those who had given ear to the conversation immediately went for the obvious answer: the Mississippi. I was among the majority and was, of course, wrong. It's the Missouri. My dad had it right. The Mississippi is second, and no one could come up with the Yukon, which checks in at third.

The aquatic measuring stick then turned to the Great Lakes, which combined hold almost a fifth of the world's freshwater supply. They make up 90 percent of the United States' supply of freshwater. Our spot there along the

You're no doubt well aware of the water cycle and what it takes to protect this most critical resource, but most of your customers probably don't give it much thought. That's why outreach and education are so important.

Wisconsin was within two hours of both Lake Michigan and Lake Superior.

So from our location, we could have launched a boat on the Wisconsin River, floated down to the Mississippi and made our way south into the Gulf of Mexico, down around the tip of Florida and up the Atlantic Coast to the St. Lawrence Seaway, which would have allowed us to continue on through the Great Lakes and back to within a couple hours' drive (or a long portage) of our starting point.

It's amazing how connected it all is. On its way to the Gulf, the water we were swimming in will feed Wisconsin's paper mills, produce power, flow through the gills of monster channel cats on the Mississippi, move massive loads of cargo and support endless recreational opportunities.

It's easy in the course of day-to-day life to forget that the water in Wisconsin, or whatever state you live in, doesn't belong to you. It's constantly flowing through the cycle.

My brother lives in a small bay off the Wisconsin's main channel. The river makes a sharp bend away just past the bay, and all the debris that comes floating down seems to end up in front of his house. It's a beautiful spot on the river, but you're always aware of the sins of everyone upriver — lost bottles, bait containers, even the occasional beach ball make their way into the back corner of the bay. One of my nephews' friends pulled up a 5-gallon bucket and a drumstick-shaped plastic dog toy the next day.

It's not hard to move your mind downriver and think about how exponentially worse the problem gets as the water flows south.

You're no doubt well aware of the water cycle and what it takes to protect this most critical resource, but most of your customers probably don't give it much thought. That's why outreach and education are so important. Without the buy-in and understanding of the public, large-scale improvements in our water and wastewater systems are far more difficult.

Louisville Water, the San Francisco Public Utilities Commission, and the Madison (Wisconsin) Water Utility are great examples of utilities that have gained wide public support and flourished because of it. We've told their stories and the stories of so many other strong utilities in these pages. I hope you can learn from them and use their examples to raise the value of water in your own communities.

Enjoy this month's issue. ♦

Comments on this column or about any article in this publication may be directed to editor Luke Laggis, 800/257-7222; editor@mswmag.com.



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OVERHEARD ONLINE

“They’ll be our eyeballs on the ground. You can’t determine the source of runoff by standing on a bridge. We need to get out there during storms and see what’s happening, follow the mud back upstream.”

— *Ghostbusters? How About Mud Chasers?*
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ZIKA RESPONSE

Texas Utility Ups Its Mosquito Control

El Paso’s water utility has for years focused on mosquito control to prevent the spread of West Nile virus. The threat of the Zika virus has the utility taking its game to a new level. Out of nearly 400 stormwater ponds, it identified 45 that needed further attention to minimize the volume of standing water, which provides a prime breeding ground for mosquitoes. mswmag.com/featured



RHINELANDER PROJECT

City Keeps Traffic Moving Around Torn-Up Streets

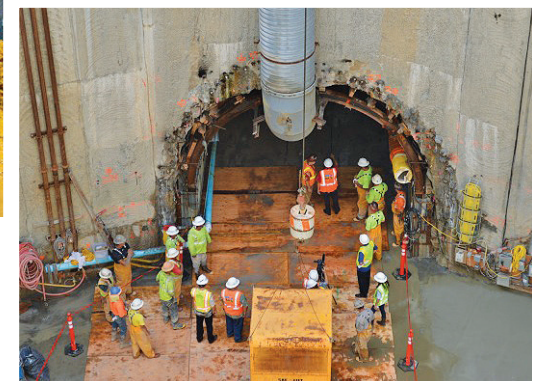
Our ongoing coverage of Rhinelander, Wisconsin’s Downtown Streetscape Project continues with a look at how officials handled traffic flow during the busy tourism season when the city’s main arteries were impassable. The challenge only intensified when tens of thousands of people began streaming in for the annual Hodag Country Music Festival. mswmag.com/Rhinelanders



TUNNELING IN PARADISE

Honolulu Progresses on Gravity Sewer Project

Earlier this summer, a tunnel-boring machine finished its 3-mile, 13-month-long journey beneath the Oneawa Hills on the Hawaiian island of Oahu. The tunnel connects a pretreatment facility to the Kailua Regional Wastewater Treat-



ment Plant, which serves the city and county of Honolulu. The gravity pipeline, scheduled for completion in 2018, is the largest sewer project in Hawaii’s history. mswmag.com/featured



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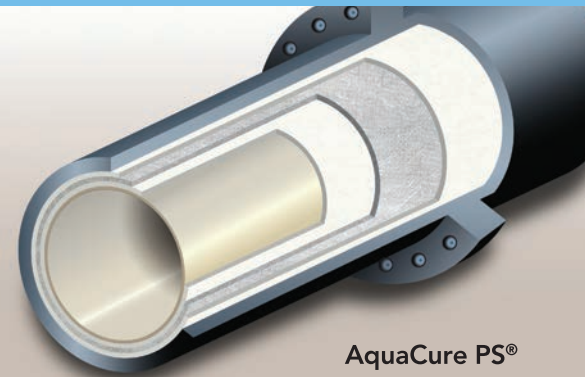


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WORKING FOR THE FUTURE

A proactive approach to maintenance and improvements helps a small Colorado utility stay ahead of problems

By Kyle Rogers

An ambitious staff of three has made once-frequent SSOs a thing of the past in Fruita, Colorado. The entire 74-mile collections system in the western Colorado city is maintained with a proactive approach and by making decisions with an eye on the future.

The city's Public Works Department implemented a systematic cleaning and inspection cycle in 2002, while also dealing with all the usual Public Works responsibilities, such as road and bridge work and building maintenance. That department is 13 people strong, only three of whom spend the majority of their time maintaining the collections system.

"We run into challenges, but I

think we do a great job considering the amount of staff we have," says John Carrillo, senior maintenance partner who heads up the collections system crew.

The cleaning and inspection program has gradually evolved and is paying dividends for Fruita. Beyond simply eliminating SSOs, the program has helped the city better manage funds and prepare for the future, says Carrillo.


"We're able to actually look at the conditions of our system, compare it against road overlay work and try to schedule work so we can do all the repairs at the same time," he says. "We're not 100 percent there yet, but we're moving in that direction of being more responsible to the citizens with the decisions we're making about road and utility maintenance."

Launching the program

Fruita has a population of 12,881, with a projected growth rate of 2.5 percent per year over the next 30 years. The collections system serving that population is a combination of new and old. About 86 percent of the 74 miles of sewer line is PVC. Older clay tile makes up about 9 percent of the system. Concrete accounts for 3 percent, 1 percent is sliplined, and another 1 percent is Orangeburg. Fruita maintains that system with an annual operating budget of \$360,000, about a quarter of the entire Public Works operations budget.

Carrillo has worked for the city for eight years, and for the past five he has focused on the collections system, overseeing maintenance for eight lift stations as well as the administrative side of collections. Two other Public Works employees

(continued)



The Fruita Public Works team includes (from left) senior maintenance partner John Carrillo, technicians Gary Link and Bill Wulff, crew leader Tony Cinquini and Public Works Superintendent John McBride. (Photography by Carl Scofield)

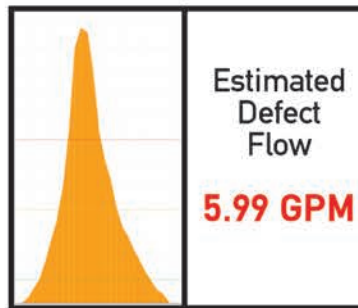
Too Much Rain, Not Enough Pipes?

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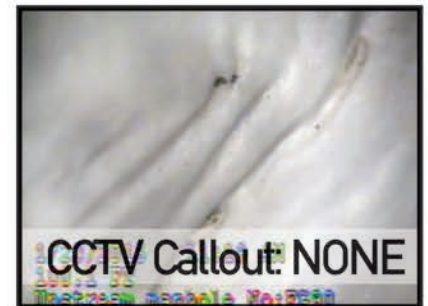
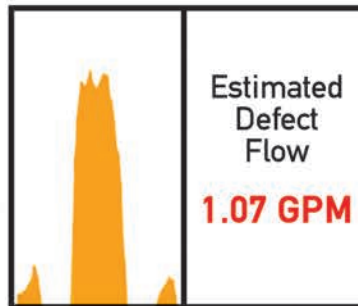
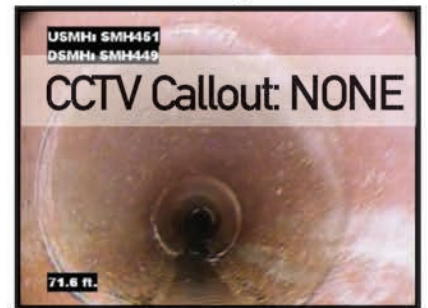
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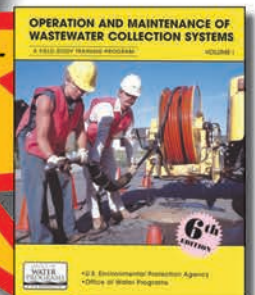
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“There was about an SSO a month on average at that time, and there was no way of removing anything from the collections system. They were just pushing debris down the line from manhole to manhole.”

- John Carrillo

assist him. Gary Link handles the cleaning work with a Vactor 2100. A smaller unit, a Vactor 2103, is used as a backup and also for working in more restrictive areas of the city. Bill Wulff inspects pipes using a RapidView IBAK system with two tractors and three cameras capable of handling pipe from 4 to 48 inches in diameter.

“It’s not full-time work,” says Carrillo. “With how small our staff is, we have to be ready to help out anywhere.”

But for a majority of the year, cleaning and inspecting the collections system is the primary task. The program started in 2002, prompted by an excessive number of sanitary sewer overflows.

“Prior to 2002, the city only had one outdated jetter truck without a vacuum system,” Carrillo says. “There was about an SSO a month on average at that time, and there was no way of removing anything from the collections system. They were just pushing debris down the line from manhole to manhole.”

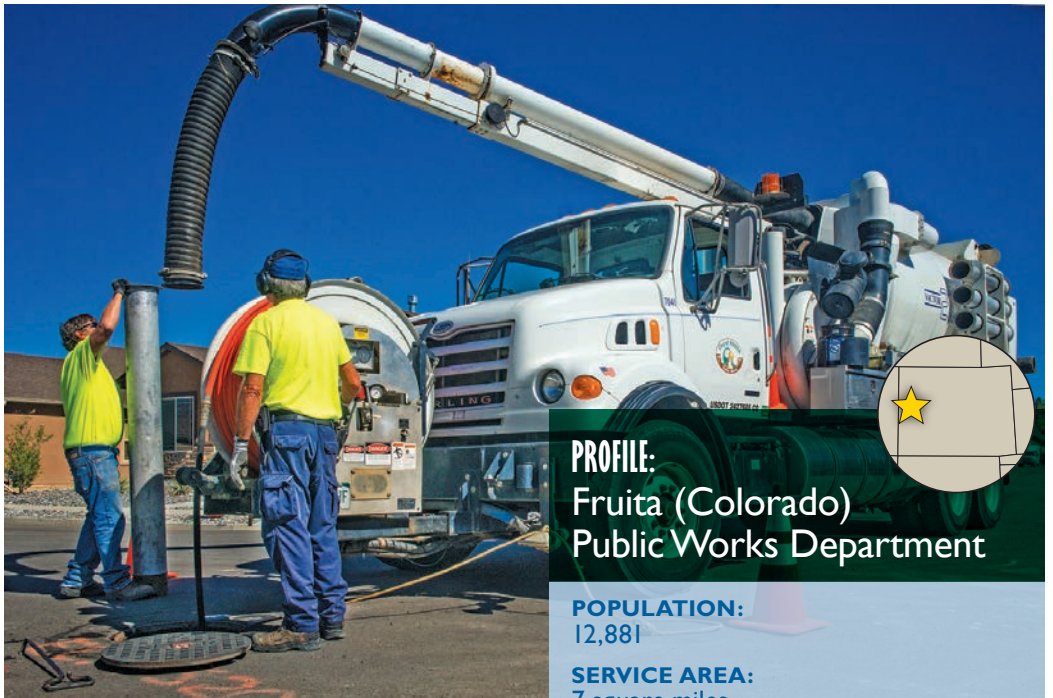
So the city purchased a Vactor 2100 and immediately went full bore into a cleaning program.

“At that point, between two and four full loads of sludge and grit were coming out of the collections system daily,” Carrillo says. “As this progressed, we were able to start identifying problem areas of the city. For example, if we started to pull out mud in a line it usually pointed to a broken or collapsed section of pipe.”

Problem areas were cataloged in hand-written reports. A year into the cleaning program, Fruita added the inspection component with the purchase of a camera van retrofitted with CUES equipment. At the same time, the city was making a move to a Microsoft Access database system to log every maintenance event or callout that occurred in the city, and the CCTV inspections became a part of that initiative. As problem areas were identified, funding was allocated to do spot repairs or minor capital projects. But all the inspections were on DVDs stored in filing cabinets.

“They were fairly well organized, but imagine 1,000 DVDs and you need to find a specific line. You’re pulling out every DVD trying to find it,” Carrillo says.

When the camera van was scheduled for replacement in 2012, Fruita made a technological upgrade. The city tested out equipment from several vendors and settled on a RapidView IBAK system using PipeLogix software.



Top: Bill Wulff sets up a RapidView IBAK T66 tractor and camera for a sewer line inspection. Above: Fruita Public Works employees Bill Wulff (left) and Gary Link attach extension tubes to a Vactor 2100 jet/vac truck while setting up to clean a sewer line.

“We were able to get away from DVDs and actually export the entire video inspection along with graphic reporting to a separate server,” Carrillo says. “Now anyone working for the city can get into our server file and see all the lines that have been inspected.”

(continued)

PROFILE:
Fruita (Colorado)
Public Works Department

POPULATION:
12,881

SERVICE AREA:
7 square miles,
city of Fruita in western Colorado

EMPLOYEES:
13

INFRASTRUCTURE:
74 miles of sewer lines made up of PVC,
clay tile, concrete and Orangeburg;
8 lift stations

ANNUAL BUDGET:
\$1.5 million for total Public Works operations
(\$360,000 for collections system);
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John Carrillo inspects Vaughan Chopper pumps belowground at one of Fruita's eight lift stations.

APPLYING THE SCORING SYSTEM

The city of Fruita, Colorado, has a simple system for assessing the condition of its collections system: a scale of 1 to 5, bad to good. The length of the pipe, its material and the number of defects all come into play. But applying that scoring system to what repair work is prioritized and completed is a little more involved. For example, take a 300-foot section of clay tile with no root problems but a large hole in one portion.

"That line would probably score a 1 right off the bat," says John Carrillo, senior maintenance partner with the city's Public Works Department and part of a three-person crew that oversees the collections system. "From there we would evaluate the cost of a repair against the result. If we dug up a 6-foot section of road and replaced that bad portion with two couplings and a section of PVC, does that turn it from a 1 to a 4? That's how we look at it."

Ease of maintenance is another factor that can come into play. For instance, Carrillo says there is a problem pipe in Fruita with a 60-foot-long sag where grease quickly accumulates and the line is on a four-month cleaning cycle to prevent blockages. Compare that against a line that hasn't yet had any major problems, but is only accessible through one manhole and only a portion of it can be cleaned and inspected. The latter would likely receive the lower score and have a higher replacement priority.

"We look at that situation and say, 'We're spending resources frequently to maintain this line with a 60-foot-long sag, but at least we are able to maintain it,'" Carrillo says. "Even though we're not getting callouts on the other line, we're unable to maintain it. If there is a problem, we have no way of taking care of it. So there's some of that factored into the scoring as well."



"We have a base amount of footage we need to do per month, but we're fairly lenient because we know the staff gets pulled in multiple directions all the time."

— John Carrillo

A simple scoring system on a 1 to 5 scale (bad to good) was established, taking into account the length of a pipe, its material and its condition. A score was tied into every event in the database and that information was used alongside the city's GIS and mapping system to create a more easily navigable format for identifying problem areas and prioritizing work.

"We can pull up a utility map of the collections system, click on a line, and see all the attributes of that line," Carrillo says. "And then there's a hyperlink you can select to see the actual video inspection, the score and any reports. There's also a secondary map that just has the numerical scores of the entire system and color coordinates our troubled areas. Once we started moving this way, we were able to start coordinating these inspections with other planned projects like road overlays and other utility repairs. That has really turned into a big win-win for us."

The challenges of a small staff

Growing the cleaning and inspection program

has not been without its challenges. One is maintaining such a proactive approach with a small staff, says Carrillo.

"We have a base amount of footage we need to do per month, but we're fairly lenient because we know the staff gets pulled in multiple directions all the time," he says.

For example, earlier in the summer Fruita had an opportunity to extend its money slotted for chipseal projects by working alongside the county. More Public Works staff was needed to help set up traffic control, haul gravel and run equipment, so the collections crew was called on to join the road crew for a solid month and put their cleaning and inspecting specialties on hold.

"With only 13 employees in Public Works, sometimes other things take priority," Carrillo says. "About seven months out of the year, we're focused on collections, but otherwise we're doing things like running dump trucks. We're small enough that we all kind of do everything all the time. So for cleaning and inspecting, what it really comes down to is what we do by the year. Some months are greater than others, but we really like to maintain a two-year schedule for cleaning and a three-year schedule for inspection. If we're a mile short, it's not the end of the world, but we try to stay as close as possible to that schedule."

Keeping that schedule means cleaning about 35 miles of sewer line every year and inspecting about 25 miles. Carrillo says Link and Wulff each keep their own schedule. On a typical day, they'll come in, prep their equipment, and go out in the field for eight hours. The

Factor will take about two loads to the treatment plant, and anywhere from five to 25 inspections will be done depending on the area and the length of the line. The next day, before heading out again, Link will enter all the previous day's events into the database — every line that was cleaned and any additional notes. After four full days of inspections, Wulff will usually spend a day exporting everything from the camera into the database, adding notes and scoring each line on the 1 to 5 scale. Any immediate concerns are dealt with along the way.

"There are interruptions during the day," Carrillo says. "If something needs immediate attention, like a collapsed pipe, it's brought to management and we are reactive to that while still staying proactive with our long-term assessments."

There are also a few chronic problem areas that are removed from the regular cleaning and inspection cycle and monitored more closely.

"We currently have three troubled sewers that are checked visually every other week and cleaned every three months," Carrillo says. "We run a

“You don’t have to blow your budget, but if you’re able to do something to reduce maintenance costs and treatment costs and increase the capacity of the collections system without actually expanding the system, that’s worthwhile.”

– John Carrillo

camera about every six months to make sure the problem is not worse, but it depends on the issue. If it’s just a grease issue without any real physical problems, we may not need to send a camera down there that often. But it’s normally a three-month cleaning cycle for a troubled area. We do that to limit the possibility of an SSO.”

tenance callouts a month on average because of debris, rags and grease coming into the lift stations. Now the city sometimes goes months without a single lift station issue, and when there is a problem, it’s typically a power outage or a mechanical or electrical failure — not anything collections system related.

Maximizing funds

Another challenge, especially being a smaller municipality, is funding the cleaning and inspection program, as well as the needed repairs and replacements it brings to light. Fruita is currently replacing about a 1/4 mile of pipe a year, an amount Carrillo says is acceptable considering the capital funds available, but he’d like to do more.

“You can’t raise rates all the time,” he says.

So Fruita tries to maximize value in all areas. Equipment is replaced or upgraded at certain intervals, but it’s well taken care of so that replacement doesn’t have to occur prematurely. The city maintains a replacement fund that takes into account the life of a vehicle or piece of equipment and the cost of replacement, and purchases are scheduled for the appropriate time.

“We’re still running the same Vactor purchased in 2002 and it’s been great,” Carrillo says. “But we’ve met the time frame now, so we’re in the process of getting a new one.”

And when it comes to maintenance, repairs and replacement, Carrillo says his advice to other small utilities is to look at it all with a long-term view.

“The biggest thing to remember is that everything costs money, but in the large spectrum you need to determine the long-term savings over the cost today,” he says.

For example, the money put into regularly cleaning and inspecting the system has cut down on Fruita’s lift station maintenance in the long term. Carrillo says there used to be up to 10 main-

“You don’t have to blow your budget, but if you’re able to do something to reduce maintenance costs and treatment costs and increase the capacity of the collections system without actually expanding the system, that’s worthwhile,” Carrillo says. “You’ll be money ahead in the end. The long-term investment in infrastructure always needs to be in the back of your head.”

Fruita’s cleaning and inspection program has helped a great deal in identifying where those long-term investments are best spent, he adds.

“Slowly but surely we’re taking care of issues.” ♦

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TO BE GREAT, COLLABORATE

Developing a workplace culture of collaboration is a complex endeavor, but the rewards are worth the effort

By *Ken Wysocky*

To many people, collaboration is one of those buzzwords — right up there with paradigm shift, core competencies and best practices — that's best suited for playing corporate bingo during boring meetings and presentations.

But it doesn't have to be that way. In fact, innovation, creativity and productivity are much more likely to thrive in organizations that ingrain collaboration into their workplace culture. Furthermore, these workplaces are more likely to foster high levels of employee morale and engagement, enjoy lower employee turnover and break down long-standing "silos" that crimp communication efforts, says Alan Schaefer, the founder and CEO of Banding People Together (www.bandingpeopletogether.com), a consulting firm that uses music to teach companies how to build collaborative environments.

"We serve up our collaborative methodology in music-infused fashion," Schaefer explains. "We're essentially transferring the wisdom and lessons learned from one of the most volatile collaborative environments on the planet — a band — and combining them with validated behavioral science to build a framework and methodology for effective collaboration."

So what exactly is collaboration, if not just a corporate bingo term? To fully understand what it is, it's critical to first know what it isn't. For starters, it's not cooperation or teamwork, which are often — and erroneously — used as synonyms for collaboration. Moreover, contrary to popular belief, true collaboration goes well beyond what employees do while they, for instance, work on a project together.

Instead, collaboration in its purest form is something much deeper and longer lasting. It's a process, not an activity, in which individuals agree to put aside personal goals for team achievement. Furthermore, collaboration can not only be taught, shared and developed, but measured, too, says Schaefer, whose innovative approach to teaching collaboration has earned the company high-profile clients such as NASA and Microsoft. Schaefer also helped write a white paper on the subject that was recently published by the University of North Carolina Kenan-Flagler Business School.

"True collaboration is a business process governed by an agreed-upon set of norms and behaviors that maximize individual contributions, create alignment and leverage the collective strengths of a group team or organization," Schaefer says.

It's complicated

Efforts to establish a collaborative environment often fail because it's a complex endeavor. "What's collaboration to you and to someone else rarely are the same thing," Schaefer notes. "And that creates this unhealthy dynamic that we call collaborative insanity."

As such, alignment is a critical component because everyone needs to understand what collaboration is and how company officials intend to achieve it. "Alignment is flow — everyone rowing in the same direction," he says. "If everyone is sitting in the same boat but has different ideas about how to paddle, it takes a lot longer to get where you want to go."

"You can't just tell people they should work better together and expect it to happen," Schaefer continues. "You need some rules of the road — some agreed-upon norms and behaviors. There are a lot of cooks in this

kitchen ... and everyone hears things and communicates differently, and their brains process things differently."

How to create those norms and behavior is complicated. But Schaefer and Kip Kelly, the director of executive development at Kenan-Flagler and co-author of the aforementioned white paper, explain that there are three basic build-

ing blocks needed in order to build a culture of collaboration: trust, communication and a shared vision/purpose.

Building trust means creating an environment where everyone feels they have a voice. Employees must believe that they can safely put themselves in a vulnerable position by expressing out-of-the-box ideas and opinions without fear of criticism or retribution. "Employees must be free to express ideas that are really out there without being marginalized," Schaefer emphasizes. "Sometimes people who come up with crazy ideas aren't invited to the next meeting. ... There can't be repercussions for throwing out crazy ideas." Moreover, if everyone feels they have an opportunity to contribute, innovation thrives, he adds.

Effective communication requires employees to attain a certain level of self-awareness — an understanding that everyone has different ways of communicating and collaborating. As such, that may require them to modify their communication methods to get their points across more effectively, Schaefer and Kelly write.

Last but not least, corporate leaders must develop a shared vision/

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 Luke Laggis at 800/257-7222, or email editor@mswmag.com.

"If everyone is sitting in the same boat but has different ideas about how to paddle, it takes a lot longer to get where you want to go."

— Alan Schaefer

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purpose. That ensures that everyone involved sees how their work contributes to achieving corporate goals — and how collaboration can play a key role in helping them do that, the duo explains.

Training required

The good news is that collaborative skills can be taught, Schaefer says. The skills that contribute to a collaborative workplace include the ability to embrace change, asking others for input, sharing information, providing constructive feedback, negotiating strategies, recognizing and rewarding employees, self-awareness, and reaching consensus, they write.

On the other hand, there are plenty of “sour notes” in the workplace that can hamper efforts to establish a collaborative culture. Examples include employees who only value other people’s opinions if they respect their expertise, don’t like to “share glory” with others, or never admit mistakes or take accountability for their actions. “These things can completely change a team dynamic,” Schaefer says, which is why collaborative training is so critical.

Naysayers may opine that collaboration is too time-consuming and will actually slow down projects and processes. That can happen, Schaefer concedes — if organizations don’t establish rules of the road. “When people are aligned, you’re actually speeding up the process because you’re establishing best practices — tapping into a group’s brainpower and shortening communication cycles,” he says. “You’re no longer just spinning your wheels because everyone is actually aligned. ... They’ve got a baseline understanding of what collaborative behavior looks like.” ♦

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TUNNEL VISION

The city of Greater Sudbury's unique sewer system includes miles of cost-effective, engineered hard-rock tunnels

By Peter Kenter

Dan Lamouthe of HD Industrial Services uses a Vactor HXX hydroexcavator to excavate a residential sewer lateral in Greater Sudbury, Ontario. (Photography by Bruce Bell)

Greater Sudbury Water and Wastewater Services has picked up a trick or two from the mining industry, substituting hard-rock tunnels for traditional trunk sewers along 13 miles of its system. Unique in the world, the system has proved to be both cost-effective and durable, requiring little to no maintenance over more than a half-century.

Greater Sudbury, Ontario, is located about 250 miles north of Toronto. The area has become famous for its mining operations, harvesting large deposits of nickel, copper and precious metals from the Canadian Shield. While resources continue to make a valuable contribution to the city, the economy is diversifying across a broad range of endeavors.

Sewer construction in the city had been historically problematic. The hilly terrain is underscored by bedrock, often located very close to the surface. That means excavating for sewer construction can be difficult, and lift stations are frequently required to bridge elevations.

Challenging topography

"We struggle with our topography and soil," says Wendi Mannerow, water/wastewater engineer with Water and Wastewater Services, city of Greater Sudbury. "We can go from sandy to swampy to gravel to solid bedrock depending on what part of town you're in, and sometimes depending on which side of the street you're on."

The city has 12 distinct wastewater systems, *(continued)*

PROFILE:

Water and Wastewater Services, city of Greater Sudbury, Ontario, Canada



YEAR ESTABLISHED:
2001, following amalgamation

POPULATION SERVED:
Approximately 145,000 customers

AREA SERVED:
48 square miles (sewer)

DEPARTMENT STAFF:
135

INFRASTRUCTURE:
485 miles (sewer)

ANNUAL DEPARTMENT BUDGET:
2016: Wastewater (\$22.2 million capital/\$34 million operating);
Water (\$15.3 million capital/
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“We struggle with our topography and soil. We can go from sandy to swampy to gravel to solid bedrock depending on what part of town you’re in, and sometimes depending on which side of the street you’re on.”

– Wendi Mannerow

some constructed originally by mining companies to support the housing built for employees. The regional towns were amalgamated in 2001. While a more holistic approach is being taken to city planning, wastewater is still conveyed to 10 treatment facilities and two lagoons, employing gravity and 69 lift stations.

The oldest pipes date back to the early 1900s. They vary from about 8 to 51 inches in diameter and are made of a range of materials. The oldest are vitrified clay with other pipes made of concrete and asbestos cement. PVC is used for most new installations.

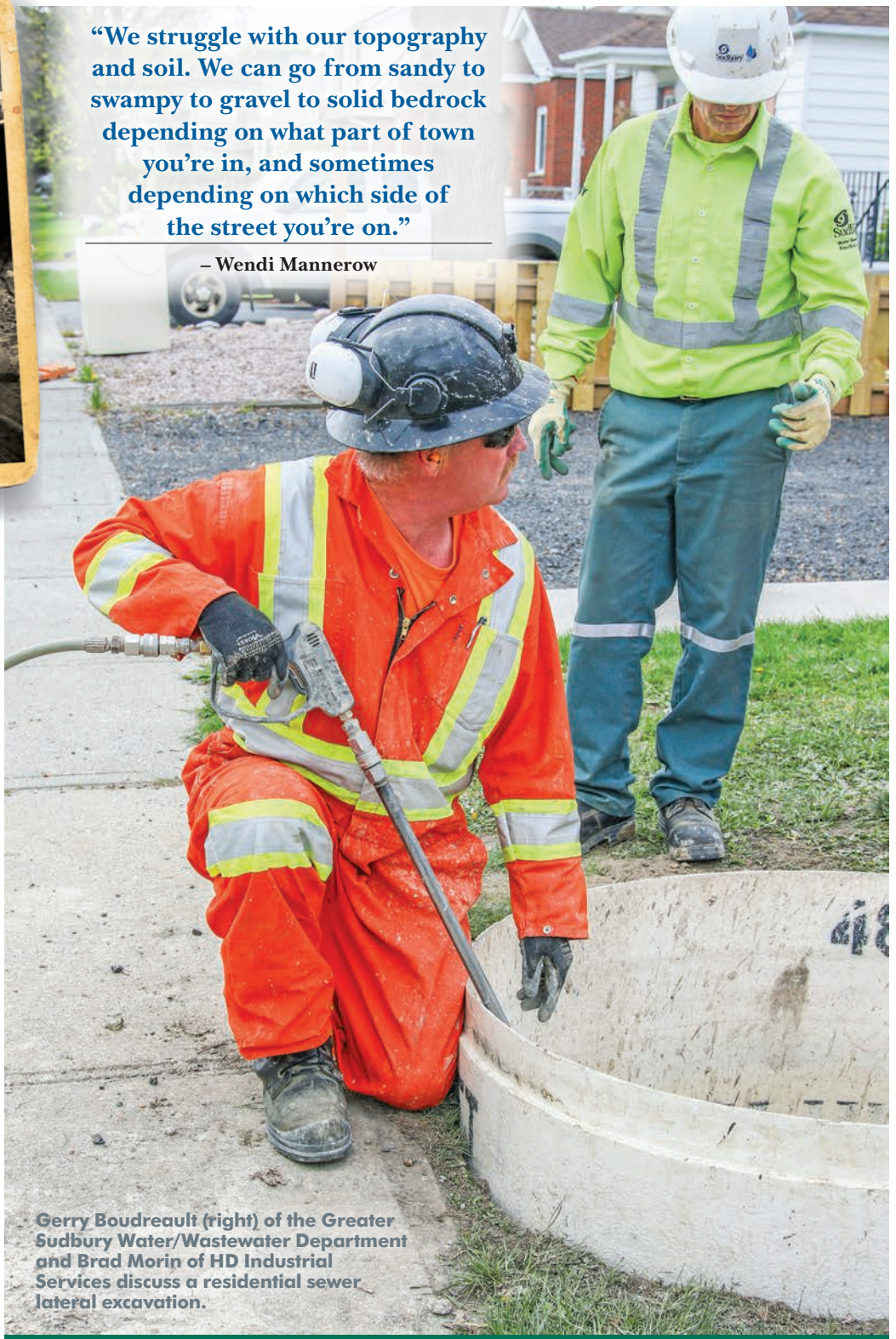
“The rock tunnel sewer system is located inside the original city of Sudbury,” says Mannerow. “Construction of the first length of about 5 miles — the Main Tunnel — was started in 1961 and completed in 1962. It was a huge decision for them to try this method of conveying wastewater, but the municipal engineers of the time recognized the opportunity that they had with the bedrock. They already had access to local mining contractors who could use traditional drill and blast methods to build the tunnels.”

Contractors worked at a rate of about 100 feet per week, removing broken rock by train. These were delivered to two of the six shafts drilled from the surface, which were designated for haulage.

Maximizing flow

The rough rock tunnels measure about 5 feet wide by 7 feet high. The tops of the tunnels are arched, while the broken rock base is lined with concrete in an invert the shape of a shallow “V.” Designed for a maximum flow of about two-thirds the height of the tunnel, the notched floor allows sewage to flow more freely during low-flow periods. Although concrete grouting is used to seal the tunnel against minor infiltration, no additional liner is required in solid rock.

“The tunnels avoid the need for lift stations,”



Gerry Boudreault (right) of the Greater Sudbury Water/Wastewater Department and Brad Morin of HD Industrial Services discuss a residential sewer lateral excavation.

Mannerow says. “They’re located between 75 and 100 feet deep and you just need to drop the tunnel to the right degree to employ gravity. Wastewater is simply dropped into the tunnel from collector pipes through drop shafts.”

The first tunnel provided value for the money, requiring no maintenance and performing as designed. A second tunnel followed in 1967. The Lockerby Tunnel was designed to connect the sewage system from the Lockerby area of the city

to the Main Tunnel. The Minnow Lake Tunnel was the third rock sewage tunnel built. Completed in 1974, it stretched 3 miles and eliminated nine lift stations along the way.

In 2001, the city conducted an environmental assessment for an additional sewer system expansion to permit new commercial and residential development.

“We were facing a potential development freeze without increased wastewater service,” Man-

(continued)



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DEEP INSPECTION

The city of Greater Sudbury's rock tunnel sewer system has proved an excellent capital investment, offering a low-maintenance conveyance for wastewater. While inspections over the years show that the tunnel system is robust, some maintenance will eventually be required.

A 2012 zoom camera inspection of the oldest section of the tunnel system, built in 1962, showed some significant groundwater infiltration that may eventually be rehabilitated using cured-in-place pipe lining.

The most recent inspection occurred in 2014. It included visual inspections through drop shafts and an automated inspection overseen by D.M. Robichaud Associates Ltd. of Toronto, using cameras supplied by RedZone Robotics. It's not a casual endeavor. Even lifting the lids of the sewer drop shafts to access the tunnels requires the use of a crane. Flow volumes through the tunnel can't be controlled, so the surveys are also weather dependent.

"The robot is tethered, so they got to the contracted point of just under 2 kilometers surveyed," says Wendi Mannerow, water/wastewater engineer with Water and Wastewater Services. "The structure looks good but there's a little bit of rock rubble on the floor and a little bit of buildup that could use cleaning. While the maintenance required is minor, simply going into the tunnels with people and equipment is always a major endeavor that requires significant planning for confined-space entry."

Mannerow says that a more thorough survey will be completed before any maintenance work occurs. The use of robotic assistants for maintenance will also be considered.

"We're saving up money in our capital budget to do a more thorough shaft-to-shaft survey that will show us exactly what needs to be done."



"To say the old tunnel served the city well is an understatement. The previous tunnels had served us so well that we were using the same design parameters and the same construction techniques."

— Wendi Mannerow

Gerry Boudreault (behind excavator), Aaron Pribe and Phil Gunthorpe of the Greater Sudbury Water/Wastewater Department set up an excavator while Dan Lamouthe and Brad Morin of HD Industrial Services work in the background.

nerow says. "We were experiencing lack of capacity, I&I, environmental spills, basement backups and other issues more and more often. In our environmental assessment, the socioeconomic costs of traditional sewer construction and upgrades through the city were astronomical."

The preferred alternative was construction

of the 4-mile South End Rock Tunnel. Unlike typical sewer construction, building the rock tunnel caused no traffic disruptions — only occasional ground vibration resulting from blasts.

"To say the old tunnel served the city well is an understatement," Mannerow says. "The previous tunnels had served us so well that we were

using the same design parameters and the same construction techniques."

Earning awards

Construction began in 2005 and was completed in 2010. It featured three access shafts and nine drop shafts, eliminating six existing lift stations.

“We take it for granted that these tunnels are part of our infrastructure. It’s only when you begin talking with colleagues in other districts that you recognize it as unique.”

– Nick Benkovich

The project won numerous awards, including the 2010 Ontario Public Works Association Public Works Project of the Year and the 2011 American Public Works Association Project of the Year Award–Environment (\$25 million to \$75 million).

Mannerow notes that sections of the rock tunnels were inspected in 1972 and 1980, with excellent results.

“However, when we say the tunnels require minor maintenance work, we don’t mean that no work is required,” she says. For example, a more detailed inspection of the Minnow Lake and Main Tunnels in 1997 and 1998 revealed minor debris and a little groundwater intrusion. Some drop shafts revealed solids buildup while sludge buildup in some tunnel sections demonstrated slightly reduced flow.

“Those later inspections involved sending people down fully covered and armed with video cameras and air packs,” says Mannerow. “Labor regulations for confined space access are far stricter today and robotics are now the way to go for detailed tunnel inspections.” (See sidebar.)

With rising energy costs, the tunnel system also provides convenient temporary wastewater storage, as waste flows are slowed down during the day so that the city can take advantage of nighttime electric rates to pump and process the bulk of the sewage. Tunnel monitor devices allow the utility to check the depth of wastewater to prevent overfilling the tunnels.

Still rocking

The city is currently planning a further extension to the rock tunnel, this time a little more than 2,000 feet with one drop shaft at a cost of about \$8 million.

“In 2007, the north bank of the city’s Junction Creek experienced a slope failure, causing failure of a portion of the Gatchell Outfall Sewer,” Mannerow says. “We completed temporary emergency repairs, but the sewer is still out of alignment horizontally and vertically. We were considering replacing the sewer in traditional fashion but the costs just to stabilize the banks would be in the millions of dollars. Following an environmental assessment, we’re again looking at a rock tunnel as the recommended solution. This leg will twin the last section of the original tunnel at the downstream end of the system where we collect the flow from all the sewers. If we want to divert some of the wastewater to the new tunnel to relieve the strain on the old tunnels, we’ll

have an opportunity to do that.”

In the conceptual planning stage, construction is scheduled for completion in 2019.

Nick Benkovich, director of water/wastewater with the city, says that, as far as he knows, the city’s rock tunnel sewage system is unique in the world.

“We take it for granted that these tunnels are part of our infrastructure,” he says. “It’s only when you begin talking with colleagues in other districts that you recognize it as unique. It’s a good fit for Sudbury because the bedrock is amenable

to tunneling and we have local contractors with tunneling expertise. From my perspective, you trade off the capital cost of installation of the rock for the reduced maintenance over the life cycle of the tunnel. Over the years, there’s been a huge cost advantage to the community.” ♦

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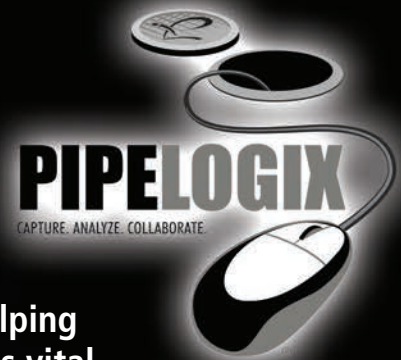


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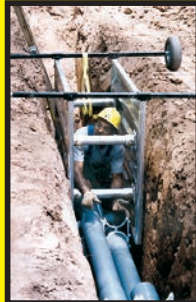
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WATER METERING: 4 TRENDS TO WATCH

Innovative technologies are opening new doors for water utilities looking to deploy metering automation on a budget

By Kristie Anderson

In today's water and wastewater industry, water metering technology is important. Recent years have brought many advances in metering that can help water utilities more efficiently measure, monitor and analyze their resources.

As utilities apply technology to their initiatives and improve operations, four key innovations stand out. A managed solution approach plays an integral role in making these technologies accessible, user-friendly and cost-effective.

1. Managed solutions

A study by Zpryme and the Smart Water Summit (2014 U.S. Smart Water Utility Report) surveying 75 U.S. utilities found that the most important technologies for smart water systems include smart meters (cited by 76 percent of respondents), data and analytics (69 percent) and meter data management systems (55 percent). As shown by this study, utilities continue to adopt advanced metering infrastructure and advanced metering analytics for improved, data-driven decision-making.

While this technology evolution can provide great benefits, it has typically presented new operational challenges, especially related to the management of AMI communications infrastructure and analytics software and hardware. Moreover, as documented in the Zpryme study, 56 percent of utilities did not plan to hire new technology personnel in the near future. To address technology skill gaps in these workforces, newer business models and more intuitive technologies are making the step to AMA far easier.

Seeing the need for better customer service, increased analytics reporting and more efficient operations, utilities are turning to end-to-end, managed solutions to help meet their MDM needs. Features of this approach include:

- Built-in infrastructure management services to keep pace with rapid



Cloud-based meter data management systems, such as the BEACON AMA managed solution, offer powerful yet intuitive software for water utilities.

changes in technology

- Hosted cloud-based software suites
- Built-in customer service tools

In a provider-managed, cloud-based system, the solutions provider takes charge of system operation and maintenance beyond the meters and meter communications endpoints. The managed solution model provides a flexible approach that reduces the resources needed to operate and maintain the meter reading system, freeing personnel to support other critical areas of operations. Furthermore, today's systems allow utilities to set alerts

that help monitor potential problems and determine, for example, when to roll a truck and when not to, thus optimizing staff time and saving money.

2. Cloud-based software

Web-based software services (cloud computing) are a key component of many managed solution models. Known for convenience and efficiency, cloud platforms are being applied globally by nearly all types of organizations, including water utilities. Cloud-based software can bring rapid and diverse changes in how utilities operate and use data. Cloud computing can be a viable alternative to investing in server-based MDM systems. Cloud-based platforms share several characteristics:

- Quick deployment
- Freedom from hardware purchases
- Automatically implemented software updates
- Rapid elasticity or expansion as needs change
- Subscription pricing, providing a pay-as-you-go option
- Expert maintenance of the system, allowing utilities to focus on their core competency

(continued)



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These characteristics allow organizations to build IT resources rapidly, making it easier and less costly to adapt to changing requirements. The software applications are hosted by the solutions vendor in secure data centers. The utility simply uses personal computers to access the software via the internet. Hosting software and data offsite also leaves critical metering data less susceptible to natural disasters.

Historically, MDM systems required software updates and, on occasion, completely new versions. With increased functionality, more users may require access, meaning more licenses to purchase. However, with cloud-based systems, software is automatically updated by the solutions provider, and the costs are included in the base subscription. This means the utility can enjoy the most advanced features without added cost or effort.

3. Cellular metering

Another advance in metering technology is the use of cellular metering endpoints for systemwide communications. The use of cellular technology for AMI isn't new, but is being used in a new way for water metering.

In the past, cellular was used to communicate small amounts of data within AMI systems, typically requiring gateways to communicate the data back to the hosted environment. Thus, if a utility wanted to deploy a system immediately, it would have to find locations for gateways, get approval to install them, run electricity to them and clear various other hurdles.

Cellular endpoints erase those concerns. Through reliance on existing cellular networks, cellular endpoints can minimize capital investments by reducing or eliminating reliance on traditional network infrastructure. Especially when included as part of a managed solution, cellular endpoints have become a cost-effective and easy way to take advantage of smart metering.

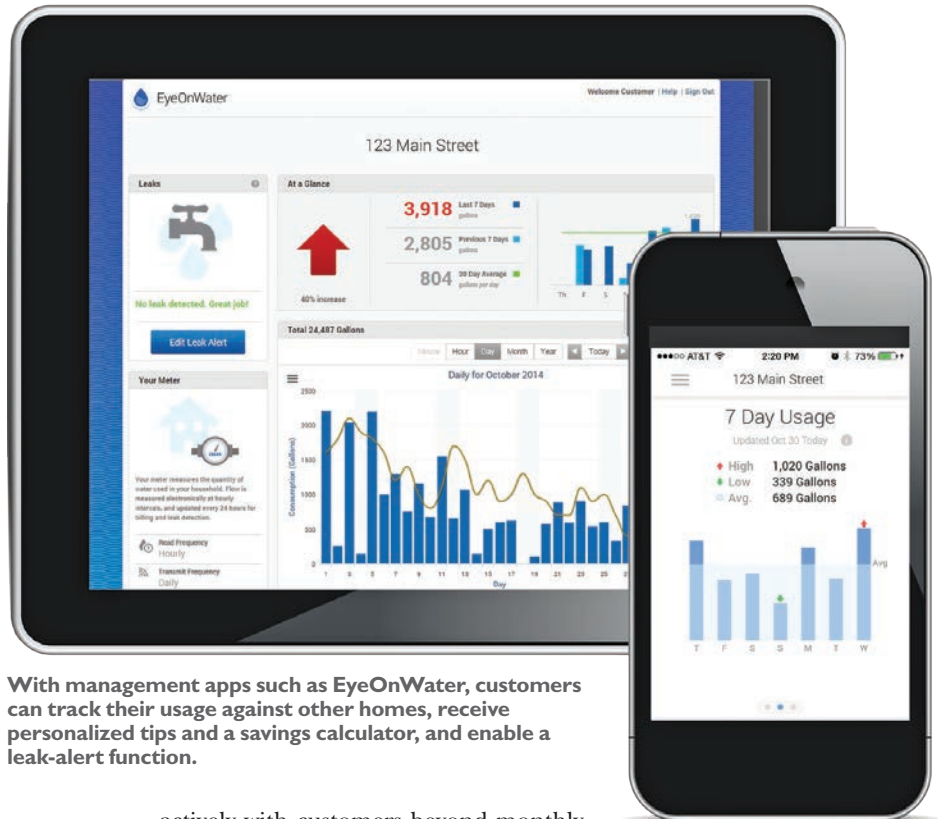
Because of their flexibility, installations using cellular endpoints can efficiently meet almost any application need, from quick deployment of targeted implementations to full-scale roll-outs. Cellular networks are also proven safe and secure. After a natural disaster, cellular networks are typically the first to be restored, especially because emergency services need to use them to coordinate responses.

With cost as a top concern, more utilities will capitalize on the benefits of new cellular technology. In fact, a recent IHS Technology report, *Water Meters Report – 2014*, forecasted that cellular-enabled water meter shipments would grow rapidly in North America as utilities look to minimize capital investments. In some cases, the most cost-effective solution is a utility-owned fixed network. In others, cellular endpoints help minimize communications infrastructure and enable the best, most cost-effective AMI solution.

4. Proactive consumer communications

Encouraged by an increased focus on customer service and efficiency, consumer engagement websites and smartphone/tablet apps continue to evolve. In today's on-demand world where consumers track nearly every aspect of their lives, water usage data available at the click of a button has proven appealing for customer-focused utilities looking to save money and resources.

In January 2014, one study estimated that 58 percent of American adults owned a smartphone and that 86 percent of the time spent on smartphones was spent on mobile apps. Seeing an opportunity to communicate pro-



With management apps such as EyeOnWater, customers can track their usage against other homes, receive personalized tips and a savings calculator, and enable a leak-alert function.

actively with customers beyond monthly statements, utilities are expected to explore these platforms. In the Zpryme study, 40 percent of respondents had plans to develop apps for residential and commercial customers. Features typically available through utility apps include:

- Graphics showing recent usage with a comparison against average usage
- Usage trends
- Detailed charting of historical usage
- A leak-alert function
- Recommendations to conserve water, with the ability to set up a customized profile to receive personalized tips and access to a savings calculator

Users can also set up profiles with specific criteria so that they can be alerted if they exceed their allotted monthly usage, or if the system detects a usage spike that could indicate a leak.

The future

Advances in technology mean water utilities can begin to enjoy all the benefits of AMI and AMA without previous operational and technology concerns. With implementation and management barriers removed, utilities can use these advances to provide greater visibility into water usage and better management of the water system, while improving customer service. Most important, today's solutions ensure that the decisions utilities make now will pay dividends well into the future. ♦

About the Author

Kristie Anderson is the product marketing manager for Badger Meter, based in Milwaukee, Wisconsin. She can be reached at KAnderson@badgermeter.com.

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Rogue Valley Sewer Services maintenance worker Matt Pierce removes an R.S. Technical Services camera and steerable tractor from a sewer line in Central Point, Oregon. (Photography by Amanda Loman)

A VALLEY OF INNOVATION AND INDEPENDENCE

Regional Sanitary District takes on challenges and more responsibility with custom tools and out-of-the-box thinking

By Suzan Marie Chin

Rogue Valley Sewer Services of Central Point, Oregon, has been able to steadily take on more responsibility and some unusual projects with innovative, out-of-the-box thinking, in-house specialty tool development and adopting an attitude of “go for it.” All of this has led to exceeding preventive maintenance goals, keeping rates at some of the lowest in their state

and creating amazing return on investment for their equipment purchases.

Starting small

Like most regional sewer authorities or districts, Rogue Valley Sewer Services is responsible for meeting the needs of several towns, including Shady Cove, Eagle Point, White City, South-

west Medford, Jacksonville, Phoenix, North Ashland, the unincorporated areas of Jackson County and other cities within Oregon’s Rogue River Valley region.

They serve a population of approximately 74,000 and maintain a highly diverse wastewater collections system composed of VCP, concrete, PVC and even Orangeburg ranging from 2-inch
(continued)

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Matt Pierce hoists a camera onto a retractable shelf under the inspection van.

pressure pipe up to 60-inch-diameter sanitary and storm sewer lines, some dating back to the early 1900s. They are also under contract to operate and manage the Shady Cove Wastewater Treatment Plant, which handles an average of 400,000 gpd.

Established in August 1966, Rogue Valley was originally known as Bear Creek Valley Sanitary Authority, and in its early days each of the cities in the area were responsible for their own collections system, but over time these cities approached the district requesting them to take over the responsibility of the sanitary systems in their jurisdiction. Rogue Valley did this starting out on a five-year contract, with the understanding that at the end of the time period, an annex station would be built and the district would assume ownership and full responsibility. Today, it cares for 400 miles of sanitary sewer, 100 miles of storm pipe, 8,000 manholes, 3,300 catch basins, 29 lift stations and a two-cell wastewater lagoon.

Ever-increasing responsibility

With more responsibility and a growing list of assets to protect and maintain, Shane Macuk, operations manager for Rogue Valley Sewer Services, knows that effective management requires good long-range planning, high expectations and a strategic plan of action.

The district's CCTV inspection and cleaning crews work in tandem with the goal of making their way through the entire system every five years. Recent equipment acquisitions as well as specialized tools developed in-house are now allowing them to achieve this every three to four years.

There are two CCTV crews, each operating a rig outfitted with an R.S. Technical Services TranSTAR Steerable Tractor with a TrakSTAR main-line pan-and-tilt camera. The trucks are also equipped with an RST storm drain tractor for larger-diameter inspection and a lateral launch system, which is utilized primarily to help local contractors pinpoint locations and determine exact causes of system issues for property owners.

The crews prefer to inspect the lines prior to cleaning in order to see the true health of the pipe. This is especially helpful in areas where there is heavy root intrusion. Rogue Valley fol-

lows up with thorough cleaning and flushing, and roots are removed with high-pressure jetting nozzles and flails.

Inspection findings are recorded and analyzed using PipeTech Software incorporating NASSCO PACP coding standards. That information is then tied into the district's Esri ArcView GIS system. A modeling application by Innovyze is also part of the mix, helping Macuk and his team comprehensively analyze their system.

"With all of the data we collect, we know where the deficiencies are in our system, especially capacity issues. Having this data helps us stay ahead of the game," Macuk says. "We know we'll be ready for any new subdivision, commercial business or any other development that would impact capacity and we won't have to say no because we will be prepared. This kind of information also helps us plan most effectively for our immediate and long-range capital improvement programs."

Do it yourself

Smaller projects within the district's capital improvement program are kept in-house, but anything with a financial value over \$50,000 is typically contracted out. On occasion, there have been

critical projects and no interested parties to do the work, creating an opportunity for Rogue Valley's team to dig deep and find a way to take care of it in-house.

One such project called for the installation of a new line running through a wetland area with vernal pools. Common in the Rogue Valley area, these natural depressions collect water in spring, creating critical fragile ecosystems that are protected by law. Any construction or development requires specific guidelines and permit adherence.

The district needed to eliminate a pump station and install a 2,000-foot section of 12-inch PVC to connect with an interceptor manhole that would have to traverse directly through these vernal pools. They were issued only the second permit of its kind in the United States to perform this type of work. The conditions of the permit called for the restoration of the original vernal pools and to actually increase the size area of the pool to a larger scale than when they began. To accomplish this, the district had to import clay soil, save the original first foot of vernal pool and upland material excavated as well as collect 40 pounds of seed from the native plants in the pool area.

(continued)



PROFILE:
Rogue Valley
Sewer Services,
Central Point, Oregon

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AREA SERVED:
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As the new pipe was being laid, they had to build clay check dams around it in order to mitigate any groundwater seepage and follow a specific trench line. The crew would dig down and lay the new pipe, and replace the excavated dirt up to about a 5-foot level with a layer of the imported clay soil. The clay soil had to be rolled in, compacted and tested to ensure it had 100 percent compaction before the balance of the site could be backfilled with either upland soil or the original vernal pool soil. This special restoration of the ground was required because there were concerns that once the pipe was laid, water would seep out into the natural trench line and drain the vernal pools.

An independent environmentalist inspected and oversaw the project, making sure that things were being constructed to the terms of the permit. At the conclusion, she told the project crew that it was the best vernal pool restoration she had seen to date.

In-house innovation

Rogue Valley approaches equipment and technology with the same sense of independence

as challenging projects like the vernal pool restoration. Macuk and video inspection crew lead Kevan Kerby share a common mindset: If you can't find what you need, build it, and even better if you can repurpose something. So when Macuk needed to replace his CCTV pipeline inspection equipment, he found a way to get two complete and fully compatible systems versus just one by retrofitting an existing inspection rig with relatively low mileage.

Their existing inspection camera systems had been problematic and servicing them had become somewhat challenging for the crew. "It was critical for us to have a different customer service experience with this new purchase and equipment," Macuk says. "We made it very clear to every vendor we looked at that we wanted to have a collaborative relationship. To be able to openly share pros and cons, ideas and innovations, tweaks for how their equipment could be made to better meet our applications and also for the industry in general, and to know that they'd actually listen and if it made sense, act upon it."

This straightforward approach and communication has fostered dynamic working relationships

with two leading industry manufacturers, Vactor and R.S. Technical Services.

"Now when our reps from these companies come to visit, they ask to see what we've been innovating and coming up with in our shop before showing us what's happening on their side," Macuk says. "They are excited to share the type



Flusher crew lead Tim Hammond (left) and maintenance worker Brent Jones clean a pump station with a Vactor 2100 Plus in Central Point, Oregon.



AN APPLE A DAY

Kevan Kerby, video inspection crew leader for Rogue Valley Sewer Services, has found a great way to use the Apple iPhone's built-in FaceTime feature to make short work of his district's pipe cleaning assignments.

The process is simple and quite ingenious. "When the flushing and TV crew are working in tandem, both the truck operator and I activate our iPhones and connect using FaceTime," Kerby explains. "I put my phone against the screen that is displaying what the mainline inspection camera is seeing and he places his phone in a holder on his end so he can view the effects of his cleaning process."

The use of the smartphones is a great improvement for the team over just a two-way radio to convey observations verbally, which leaves a lot to interpretation of the inspector and combo truck operator.

It may not be an application Steve Jobs ever imagined, but FaceTime has proven to be a cost-effective means for the cleaning crew to have eyes in the pipe.



The Rogue Valley Sewer Services team includes (from left) maintenance worker Brent Jones, video inspection crew lead Kevan Kerby, maintenance worker Matt Pierce, flusher crew lead Tim Hammond, and Operations Manager Shane Macuk.



it's all about improving the industry, so they were willing to share their knowledge and expertise by building and selling some specialized tools they've created.

Macuk and Kerby credit their district manager and board of directors for the big role they've played in making the district's accomplishments possible. "Management is very open," Macuk says. "They give us the thumbs up to try new things. I can walk into my manager's office and say 'Hey, we have this crazy idea that we'd like to try, what do you say?'" and he's always sup-

portive of us because he has the confidence that we've never steered him wrong. That type of support is priceless."

Supportive management, engaged vendors and a team that is always finding better ways to do its job has enabled Rogue Valley to thrive. "Don't tell us we can't do something; we'll prove you wrong," Macuk says. "We know if we keep thinking like Rosie the Riveter and holding on to that 'we can do it' attitude, nothing is outside the scope of reality." ♦

of ideas that we're developing in the real world and taking it back to their companies to help improve the next generation of products coming down the line. It's great and we really appreciate being able to have this type of relationship with our vendors."

Kerby has also developed some tools of his own in the district's shop. One such tool immediately began saving Rogue Valley thousands of dollars. Mounted under the RST TrakSTAR main-line camera, Kerby devised a robotic device to cut out intruding services in the main. Before the creation of the tool, the average cost to have the district's construction crew deployed to dig out an intruding lateral and repair it averaged \$3,200. The cutting unit cost approximately \$15,000 in parts and labor to assemble, and to date has been used to remove over 30 lateral intrusions. Some of the tools Kerby has built have been so effective and efficient that other cities have asked if he could build one for them. For Rogue Valley,

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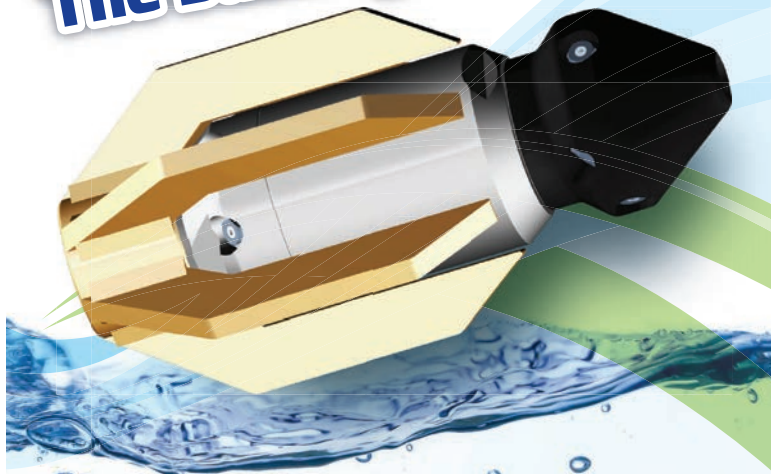


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MOVING BEYOND THE MAINS

Compact push camera from Aries gives technicians the angle for mainline and lateral work

By Craig Mandli

Efficiency in the sewer inspection industry is all about doing more with less. That's why Aries Industries went to work last year to design a camera that not only can take quality mainline inspection video, but also has the capability of inspecting narrower laterals.

That new camera, the LETS 6.0, garnered plenty of attention at the 2016 Water & Wastewater Equipment, Treatment & Transport Show, as a demo version of the camera gave potential customers the chance to test the system's capabilities right on the show floor.

"This is a unit that we've modified from the ground up," says Bruce Peight, a marketing specialist with Aries. "A new, contoured chute enables the lateral camera to be deployed with or against the flow with a 135-degree launch angle. That gives the technician so much more flexibility."

The LETS 6.0 Lateral Evaluation Television System operates efficiently in 6-inch and larger mainlines. A slim unibody tractor design reduces pipe interference to maneuver quickly through harsh mainline pipe conditions. A pan-and-tilt camera provides clear video to easily align and launch the camera, while a rear-facing camera monitors both push cables when in reverse and during retrieval. In-the-pipe lens cleaning reduces maintenance and increases time in the pipe. The system enables lateral inspection up to 150 feet.

"Having that pan-and-tilt camera available really adds to the usability of this system," says



John Kudis, right, a regional sales manager for Aries Industries, gives direction on the operation of the LETS 6.0 Lateral Evaluation Television System to a 2016 WWETT Show attendee trying it out in the company's booth. The camera is operated by the Aries Master Controller, which enables remote operation using a dual-joystick Xbox 360 control. (Photo by Craig Mandli)

Peight. "It works great for getting up a step, or going to another area of the pipe the crawler cannot reach."

The LETS 6.0 sets up quickly to match pipe contours. The basic six-wheel configuration operates in 6- to 12-inch mainlines, while a large-line kit with four-wheel configuration operates in pipe up to 30 inches in diameter. A telescoping chute facilitates easier lateral launching in larger pipe. A centered push cable on the underbody of the tractor maximizes cable bending for easier launching. The open drive system is self-cleaning, eliminating sludge buildup for maintenance-free operation.

The LETS 6.0 is operated by the Aries Master Controller, which enables remote operation using a dual-joystick Xbox 360 controller. Peight says that feature is very popular, especially among newer, younger operators.

"Certainly having a controller that most young operators are familiar with speeds up the learning curve," he says. "Most of the younger generation getting into the field is pretty tech-savvy, so the Master Controller is a great fit for

them. It is easy to learn, and puts all the power in the hands of the operator."

That functionality was on display on the show floor, as attendees were given the opportunity to pilot the system right in the Aries booth. Peight says the demo unit was a great way to introduce the camera system to potential new customers.

"This show is all about not only getting to see new equipment, but also getting the chance to try it out," he says. "It gives us the chance to show this system to contractors that may not be as familiar with us, too. The people who tried it out really like the system's control options."

Aries is a longtime exhibitor at WWETT, and uses every show to roll out at least one new innovation. Peight says they are already at work on updating their tractor system with the hope of rolling out a new model at WWETT 2017.

"We are building a system that raises the overall durability, and includes an improved drivetrain," he says. "We're excited to roll it out, and we think the attendees will be excited as well."

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FLOW CONTROL AND MONITORING

By Craig Mandli

AMI

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FLOW CONTROL/MONITORING EQUIPMENT

Blue-White Industries Sonic-Pro

Sonic-Pro ultrasonic flowmeters from **Blue-White Industries** can be used in Doppler or transit-time operation modes. They will measure fluid flow in virtually any fluid in which sound waves can travel. Because the ultrasonic sound transducers are clamped to the outside of the pipe wall, the unit can measure flow in both clean and dirty fluids. In addition, because the meter does not come in contact with the fluid being measured, it is well suited for use in applications where harsh chemicals and other abrasive fluids are being used. The meter can be equipped with a communications package for PC remote access, allowing for program editing and downloading of data logs. Additionally, a relay package is available for process control and alarm functions. The T-Track mounting system allows for easy and accurate installation of the clamp on transducers. It includes a 320- by 240-pixel QVGA backlit LCD display and a five-button, fully configurable, tactile-switch keypad interface. **714/893-8529; www.blue-white.com.**



FCI - Fluid Components International ST98 air/gas flowmeter

The **ST98 air/gas flowmeter** from **FCI - Fluid Components International** can reliably measure the blended waste gas and natural gas necessary to keep cogeneration electric power systems up and running. With its thermal mass flow sensor design, it provides direct mass flow measurement without the need for additional temperature or pressure sensors or density calculating devices. The meter's insertion-style configuration makes it simple to install in existing piping without cutting the pipe or welding, offering minimal interruption to plant operations. Accuracy is plus-or-minus 1 percent of reading, and plus-or-minus 1/2 percent of full scale. Its sensing element is constructed with two all-welded 316L stainless steel thermowells, protecting two matched platinum precision resistance temperature detectors. **760/744-6950; www.fluidcomponents.com.**



Greyline Instruments ISM 5.0

The **ISM 5.0** from **Greyline Instruments** accurately measures flow of conductive liquids in full pipes. It installs through a tap in the pipe wall and works on a wide range of pipe sizes. The dual-electrode sensor and continuous auto-zero function provides high accuracy — even at low flow rates. It is electromagnetic with no moving parts, with a simplified hot tap insertion design. It installs in 3- to 72-inch diameter pipes, and has selectable 4-20mA, 0- to 5-volt or 0- to 10-volt outputs, with a 0 to 500 Hz frequency output and scalable pulse output. It can



be easily installed in new pipe systems or by hot tap in pressurized pipes with flowing liquids. There are no moving parts, so obstruction to flow and pressure drop is minimal. Installation through a full port ball valve allows easy retraction and reinsertion without shutting down flow. **888/473-9546; www.greylines.com.**

Kessler-Ellis Products LDB

The **LDB (Large Display Batcher)** from **Kessler-Ellis Products** satisfies the instrument requirements for a variety of flowmeter types in liquid batching applications. Multiple flow equations and instrument functions are available with many advanced features. The large-digit alphanumeric display shows measured and calculated parameters within the instrument's wall-mount package. Single-key direct access to measurements and display scrolling is supported. The various hardware inputs and outputs can be "soft" assigned to meet a variety of common application needs. The user "soft selects" the usage of each input/output while configuring the instrument. The isolated analog output can be chosen to follow volume flow, corrected volume flow, mass flow, temperature or density by means of a menu selection. Most hardware features are menu selectable. The user can assign the standard RS-232 Serial Port for data logging, transaction printing or for connection to a modem for remote meter reading. Remote metering software is available. **800/631-2165; www.kep.com.**



Matchpoint Water Asset Management Hydreka HydrINS 2

The NSF 61-certified **Hydreka HydrINS 2** insertion flowmeter, distributed by **Matchpoint Water Asset Management**, helps to minimize nonrevenue water through providing bidirectional flow and pressure data for water distribution and raw water pipelines. The unit is available in various lengths to suit pipe diameter from 3 to 78 inches, and is easily deployed in permanent or temporary applications. Installation is simple, with no interruption to water supply. A data logger, complete with an LCD display, is connected to the flowmeter for an instantaneous reading of all flow data. The data is accessible through different sources, including AMR, 4-20mA, pulse output, manual download or daily GPRS communication. It can be used throughout the water distribution network, including metering at reservoirs, treatment plants, pumping stations, water pipes, for zoning and district metered areas, and night flow monitoring and source meter verification. **910/509-7225, www.matchpointinc.us.**



PRIMEX PC-3000X

The **PRIMEX PC-3000X** controller is designed to operate up to three pumps in pump-up or pump-down applications, and sequence pumps on and off in response to changes in level input. Intuitive menu navigation and quick setting adjustments are provided by a rotary selector wheel, and back and escape buttons. The blue OLED display offers easy-to-read level readout and fault annunciation. When controlling the level in a tank, the input is connected to a 4-20mA sensor. It is configurable with no programming software required.



A red LED indicates an active alarm, while green LEDs indicate pumps required, multiple alternation configurations, bar graph levels and constant or variable speed control. **844/477-4639; www.primexcontrols.com.**

Sensaphone Sentinel PRO

The **Sentinel PRO** from **Sensaphone** is a cloud-based, cellular system that provides remote monitoring of unattended equipment and environmental conditions in water and wastewater applications where internet or Ethernet connectivity is unavailable. The system supports the Modbus communications protocol and includes a second relay output to monitor and control complex networks. Only one unit is required to monitor up to 64 Modbus registers or 12 different digital or analog status conditions. Users can manage multiple devices from one account using web-based tools. The cellular system can be used for unattended pump stations, wells and tank farms because it can detect changes in conditions such as tank levels, flow rates, pump status, turbidity, power supply, temperature, equipment malfunction and security breach. When the system identifies an issue, it immediately sends alerts by phone, text or email over standard cellular networks provided by AT&T or Verizon. **877/373-2700; www.sensaphone.com.**



Singer Valve SCP-TP Controller

The **SCP-TP Controller** from **Singer Valve** is designed to complement a dual-solenoid control valve and can switch easily between settings for level control, upstream and downstream pressure management, flow control and position control. It offers ON/OFF control and can be configured with a 4-20mA control motor such as the Singer 420 DC pilot-mounted control motor. It has easy-to-use digital input controls and user-selectable digital output alarms, and data logging that logs all sensor feedback and setpoint data as well as trending graphs can be used for system analysis for water loss prevention and overall system pressure management. It has the capability to retransmit the process variable via a 4-20mA signal and comes with both serial and Ethernet Modbus capabilities for remote SCADA control and monitoring. **604/594-5404; www.singervalve.com.**



Telog Instruments RTU

The **RTU** from **Telog Instruments** can easily be connected to existing flowmeters, and supports multiple sensor interface options, including RS-232, RS-485, analog and digital inputs. For example, when connected to an open-channel flowmeter via RS-232 or RS-485, the RTU can interrogate the meter for its most recent level, flow velocity and battery voltage measurements. Alternatively, FloWav PSA-AV area-velocity flow sensors connect directly to the RTU for monitoring open-channel flow. Optional sensors are available that may be directly attached to the RTU, including ultrasonic and pressure level, water-quality sondes, temperature, level switches and a rain gauge. RTUs are battery powered, wireless, and built to withstand harsh sewer environments so they can be located virtually anywhere there is a flowmeter or A/V sensor for flow. **585/742-3000; www.telog.com.**



(continued)

METERS

Arizona Instrument Jerome J605

Designed to detect hydrogen sulfide at concentrations as low as 3 parts per billion with a resolution of 20 parts per trillion, the **Jerome J605** low-level, portable H₂S monitor from **Arizona Instrument** has a survey mode that allows the user to continuously draw in samples of air in order to sweep an area for hydrogen sulfide hot spots or leaks and enable corrective action to be taken. Its wide detection range makes it useful for multiple applications, including regulatory compliance and odor control at wastewater and landfill facilities, scrubber efficiency testing and monitoring corrosion in control rooms. **800/528-4711; www.azic.com.**



CHEMetrics V-3000 Multi-Analyte Photometer

The hand-held **V-3000 Multi-Analyte Photometer** from **CHEMetrics** can be used as a portable or bench-top water analyzer preprogrammed to test for over 40 calibrations using Vacu-vials self-filling reagent ampoules. V-3000, V-3000P (pH and ORP) and V-3000T (pH, ORP and turbidity) photometers offer simple menu-driven operation that guides the user through all measuring tasks with a large, easy-to-read LCD display. Its flexible design accepts 13, 16 and 28 mm cell sizes. Operator safety is ensured because there's no sample preparation, mixing or chemical contact. It can store up to 100 data points (1,000 data points for the V-3000P and V-3000T) with date/time tags for later download to a lab computer or direct printing. Web-based updates are available, and the unit is European CE mark certified. It's waterproof (IP67), lightweight and battery operated, with a rechargeable battery available. **800/356-3072; www.chemetrics.com.**



SENSORS

Electro Scan Multi-Sensor Leak Detection Probe

The **Multi-Sensor Water Leak Detection Probe** from **Electro Scan** combines low-voltage conductivity technology with a high-definition CCTV camera, pressure sensor, and acoustic hydrophone, to accurately measure location, size, and gpm of each water leak. It finds water losses in pressurized water mains by measuring variations of electric current flowing through cracks, pinholes, defective joints, and defective service connections, in accordance with ASTM F2550. Available exclusively as a professional service from the company, Electro Scan Services is able to find and measure leaks that may not be detected or correctly measured by other techniques. **916/779-0660; www.electroscan.com.**



Endress+Hauser Micropilot NMR81

The **Micropilot NMR81** radar level sensor from **Endress+Hauser** is designed for high-accuracy custody transfer applications and liquid level measurements in tanks with baffles. The instrument offers a transmission frequency of 79 GHz with a 3- or 4-degree microwave beam angle that ensures safe and reliable measurements in narrow tanks for up to 229 feet. **888/363-7377; www.us.endress.com.**



FLO-CORP Tracer Series Radar

Tracer Series Radar from **FLO-CORP** helps make a reliable and accurate level measurement within the confines of tight spaces, outdoor elements and remote locations, where the surface area is commonly filled with foam, logs and debris that often make floats and ultrasonic sensors ineffective in making a reliable measurement. It eliminates outside influences such as condensing humidity and unreliable surface areas to make a measurement of sump level that is reliable and accurate. It also eliminates pumps starting and stopping when they shouldn't, and calls in the middle of the night because a float has malfunctioned. It is precise, durable and dependable. **877/356-5463; www.flo-corp.com.**



Hawk Measurement Systems Centurion Guide Radar

The **Centurion Guide Radar** from **Hawk Measurement Systems** uses time-domain reflectometry, passing concentrated radar pulses through a rod or cable from the sensor to the material being measured. The dielectric constant of the measured material causes a change in impedance that in turn develops a wave reflection. That reflection is sent back up the probe to the sensor, where the transit time is translated into distance using time of flight and time expansion. It is able to measure extremely low dielectric (1.5) to provide precise and continuous measurement. Since pulses are directed via a guide, factors like surface turbulence, foams, pressure, dust, vacuum, vapors, temperature, dielectric constant or tank obstructions do not influence the measurement. It offers auto-calibration to any dielectric constant greater than or equal to 1.5, adjustable sensitivity and simple setup. **978/304-3000; www.hawkmeasure.com.**



SOFTWARE

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Software enables easier operations and asset management

Problem:

The city of Kimberley, British Columbia, Canada, has made significant investments in monitoring instrumentation for its water and wastewater systems, and was seeking a data management solution. The project identified the need to provide leakage control flow monitoring and solve the city's need to monitor and alarm other processes at its facilities. Data was collected manually and alarm notifications were done through a third-party auto-dialer system.



Solution:

In October 2013, the city implemented **FlowWorks** to monitor the operation of its water systems. Chris Mummery, the city of Kimberley utilities supervisor, stated how useful FlowWorks data processing tools are for making informed decisions. "With FlowWorks, we know what's actually going on in the field. Operations staff and management alike utilize FlowWorks on a daily basis. The first thing I do in the morning after checking my emails is go to FlowWorks and track trends. We have been able to pick up on leaks and issues at PRV stations much, much faster than in the past." The city no longer needs to manually record compliance monitoring data, and performance reporting is much easier, freeing up time for both operations and management personnel.

RESULT:

The city of Kimberley has expressed its intentions to expand its use of FlowWorks to include all of its water and wastewater sites, along with weather stations and temperature sensors on the road to the Kimberley Alpine Resort. **888/400-3288; www.flowworks.com.**

Program helps municipality build mobile interface

Problem:

Union Township in central Michigan provides water and sewer service for approximately 10,000 area residents. It used to be that staff members at Union Township's Water & Sewer Department had to drive to each equipment location in the township's 28-square-mile area. They'd read flow rates, tank levels, pump status and other data from wells, pumping stations and water treatment plants, then bring the data back to department headquarters. All this travel took a lot of time away from maintaining and improving existing systems.



Solution:

WWTP superintendent Michael Dearing and chief water operator Shaun McBride chose to leverage mobile technology for monitoring and controlling their systems and implemented **groov** from **Opto 22**. With its drag-and-drop construction, groov helped build their own mobile interface to their systems, without having to write any software code. "For wastewater we monitor flows, power consumption and tank levels," says Dearing, as well as key metrics like dissolved oxygen levels, pH and turbidity.

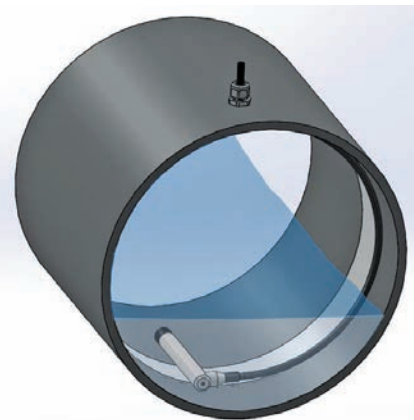
RESULT:

"We were surprised that we were up and running so quickly with a new product," McBride says. "The groov interfaces provide equipment status, process measurements and much more, right on our mobile phones." **800/321-6786; www.opto22.com.**

Custom product created for sewer flow measurement

Problem:

The wastewater department of a municipality near Wellington, New Zealand, needed to accurately monitor the flow through sewage pipes for both quantity and user profiling. The existing products, being somewhat bulky and cumbersome to install, resulted in clogs, which in turn led to inaccurate data. In addition, regular maintenance was required to keep the barometric reference (vent) from water/humidity ingress, resulting in product damage and measurement errors.



Solution:

The city selected the **VL4563** slimline pressure/level transmitter from **PMC Engineering**, which had been configured for a side-entry cable, providing a clean, low-profile installation. Both the transmitter and cable were attached to a 5-inch expandable band to suit the pipe size. The transmitter, being located at the bottom of the pipe, was able to measure the level in real time, monitoring flow. An MP-11 Moisture Protection Reference Volume protected the transmitter's atmospheric reference to avoid errors due to changes in barometric pressure. The MP-11 requires zero maintenance.

RESULT:

Due to the ease of installation, the low profile and small size of both the transmitter and cable with preassembly possible prior to installation, the city quickly adopted the solution. The use of the MP-11 was a major feature for ongoing time and cost savings. **203/792-8686; www.pmc1.com. ♦**

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Product Spotlight

A cost-effective solution for precipitation analyses

By Luke LeNoble

The RainAlert III wireless rainfall monitor from ADS provides rainfall data acquisition and intelligent alarming to support wastewater capital improvement, operations and maintenance, and regulatory programs. Applications include inflow and infiltration studies, hydraulic modeling, and overflow response and reporting.

“When we think about managing sewer systems, we often think about understanding the conditions that are happening within them,” says ADS region engineer Kevin Enfinger. “But you also need to understand the drivers that are causing them. Rainfall is one of the key drivers, so you have to be able to measure rainfall effectively.”

Designed for ground-level, pole-mount or rooftop installations, the monitors can be deployed as stand-alone units or part of a comprehensive flow and rain monitoring network. Monitors weigh about 10 pounds and connect to an ADS or customer-supplied tipping bucket.

“A mounting hardware kit allows you to install the device in one of three different configurations,” Enfinger says. “You want to put these in places that are both secure and accessible, while providing rainfall measurements that are representative of the surrounding area. The mounting hardware is meant to be flexible and facilitate those different options.”

Rainfall totals are time-stamped and stored at one-minute intervals or greater based on operator specifications. Data is delivered through established 3G/4G mobile communications. The monitors are configured and



managed using ADS Qstart software and are also compatible with ADS FlowView Operations, a web-based application that allows access to rainfall data and associated alarms.

Rainfall intensity alarming enables a faster response to wet weather overflows and alerts operators via text or email when rainfall exceeds a critical threshold. Automatic daily check-in messages provide battery status and other hardware alerts.

“It has some pretty diverse alarm capabilities,” Enfinger says. “You can set the alarm on various intensities of your choosing, and you can direct those alarms to several different people in several different ways. It will alarm up to five different people by text message and up to five different people by email.”

“Often, collections system operators and managers understand where the stress points in their system are located and about how much rainfall or rainfall intensity their system can handle before there are problems,” he says. “The ability to understand when that’s happening as soon as it happens can allow them to be more proactive. Monitoring rainfall is one of the ways in which utilities can gain the upper hand and be more aware of what’s happening — and when — in their system.”

Monitors have up to a six-year battery life depending on modem configuration. **800/633-7246; www.adsenv.com.**



Denso two-part epoxy pipeline coating cartridge

Protal 7900HT high-temperature, two-part epoxy pipeline coating from Denso North America is available in a 1,000 mL cartridge for air-cartridge guns. The abrasion-resistant coating can be hand- or spray-applied in one coat in the field or shop to girth welds, tie-ins, fittings and existing pipelines. The cartridge has a maximum operating temperature of 302 degrees F and can provide a continuous service temperature up to 250 degrees. **888/821-2300; www.densona.com.**



COXREELS exhaust hose reels

The 300 Series exhaust reels from COXREELS are designed to extract exhaust fumes directly from the source of emission and maintain safe workplace air quality. The spring-driven reels store large-diameter exhaust hose and mount to any wall, overhead and floor position. A heavy-duty frame provides stability, and reels are powder-coated for added durability. **800/269-7335; www.coxreels.com.**

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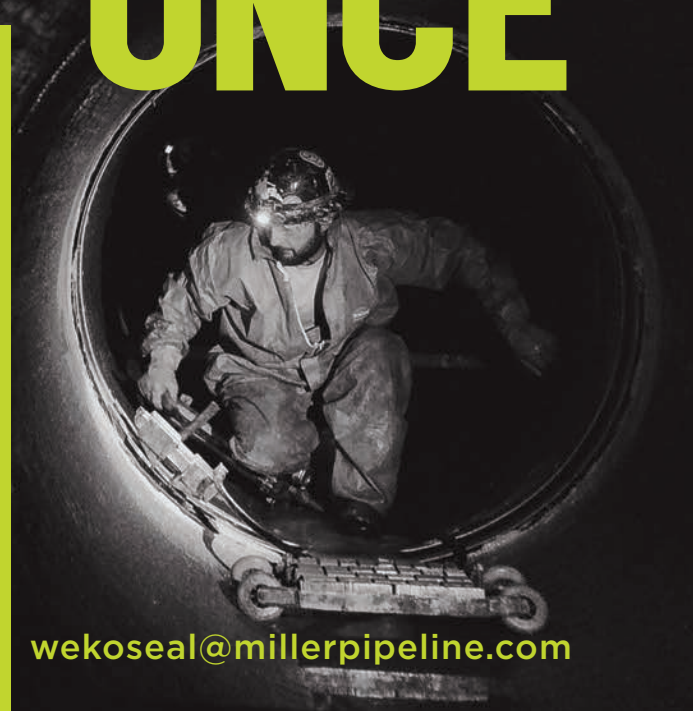
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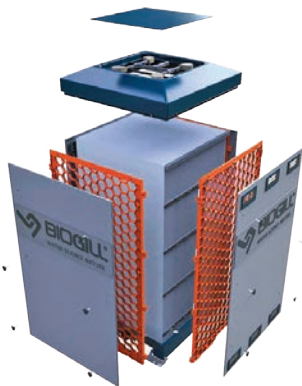
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RKI Instruments gas monitor

The GX-6000 gas monitor from RKI Instruments simultaneously monitors up to six gases, including combustibles, carbon monoxide and hydrogen sulfide. Two additional smart channels accept PIP, IR or other toxic gas sensors. Features include an internal sample pump, man-down and panic alarm, LED flashlight and auto-rotating LCD display. The monitor operates as a single-gas PID unit or utilizes all six channels. The PID sensor comes equipped with a library of over 600 VOC gases. 800/754-5165; www.rkiinstruments.com.

Bacterial Logistics wastewater treatment bioreactor



The modular BioGill Tower wastewater treatment bioreactor from Bacterial Logistics is designed to fit into any-size system and achieve aerobic and anaerobic processes at the same time in the same unit. Nano-ceramic media known as gills supply billions of attachment sites for the microbes. Arranged in suspended vertical loops, each gill is folded over a support, creating two distinct sides — one in contact with the water and the other in contact with the air. Wastewater is gravity-fed down and through the gills. Microbes populate the gills and colonize into a biofilm, feeding off nutrients in

the liquid stream on one side while drawing oxygen from the other. 802/735-2557; www.biogill.com. ♦

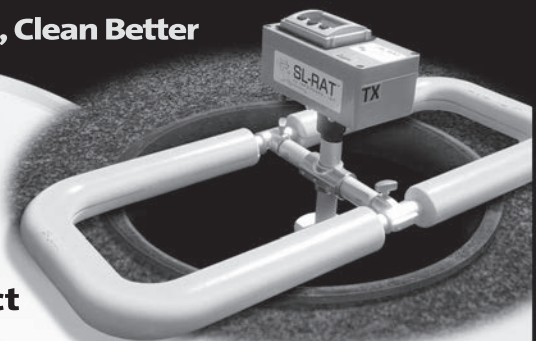
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McLaughlin names regional sales rep

Jake Jeffords was named regional sales representative for McLaughlin. Jeffords will be responsible for meeting the needs of customers in the Southeast, Mid-South and Eastern Canada.



Jake Jeffords

IPEX announces \$55 million expansion

IPEX unveiled its \$55 million Edmonton plant expansion to stakeholders and guests at a reception in June. The 17,245-square-foot expansion brings the production of large-diameter PVC and PVC pressure and sewer piping to the North American and Canadian markets.

JWC Environmental names business development manager

JWC Environmental named Jesus Rodriguez business development manager for Monster Screening Systems. Rodriguez will be responsible for expanding the company's wastewater screening products, including in-channel headworks screens, rotary drum screens, drum sludge thickeners and Screenings Washer Monsters.



Jesus Rodriguez

Cityworks employees earn asset management certifications

Becky Tamashasky, executive director of product roadmap for Cityworks, and Billy Lang, industry practices manager, earned certification from the Institute of Asset Management. IAM is the professional group for those involved in acquisition, operation and care of physical assets, including critical infrastructure, and helps experts expand their knowledge of asset management. ♦

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POSITIONS AVAILABLE

Johnson Service Company, a division of Midlands Contracting based in Kearney, NE, is now hiring for the position of Foreman-Sewer Cleaning & Inspection. Previous experience and a Class B CDL is required. This position requires the direct supervision of a 2-3 person crew. Strong mechanical aptitude and the ability to complete quality work in a timely fashion is a must. Position includes operating state-of-the-art cleaning & inspection equipment with a primary focus on the municipal market. \$20/hr. and up based on experience. Paid vacation time and holidays. Relocation package available. Go to www.midlandscontracting.com for more information on this position and to apply. Go to www.johnsonservicecompany.com for more information on Johnson Service Company. (M11)

GapVax, Inc., a nationally recognized manufacturing business, is seeking a talented, highly motivated individual to fill a full-time Sales Position in the Midwest (Iowa based preferred) region. GapVax is the leading manufacturer of industrial and municipal vacuum units and hydroexcavation units in the United States. We provide the most reliable, comprehensive, and efficient mobile vacuum units in the industrial and municipal markets. Specifications of the position are listed on our website, www.gapvax.com, click on the Now Hiring link in the left hand column. Send resumes to or betty@gapvax.com or 575 Central Avenue, Johnstown, PA 15902. (MBM)

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Honda horizontal GX engines, new in-the-box w/warranty. GX200QX - \$399; GX270QAG - \$579; GX390QA - \$599 delivered price. 800-363-9855 or GXParts.com (MBM)

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Dynamic Repairs - Inspection Camera Repairs: 48 hour turn-around time. General Wire, Ratech, RIDGID, Electric Eel Mfg., Gator Cams, Insight Vision, Vision Intruders. Quality service on all brands. **Rental equipment available.** For more info call Jack at 973-478-0893. Lodi, New Jersey. www.dynamicrepairs.biz (MBM)

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USED Envirosight ROVER System: Brand new RC90 camera. Cable reel (SN 360570) has new power supply, motor, clutch, cable (656') and winding rollers. 125 crawler (SN 0260768) has new top plate, side plates, axles and seals, plus new control board compatible with rear-view camera accessory (not included). CCU (SN 0160981) with new power card, new 56V card, new +/-26 card, and new card. Control pendant (SN 0492645) is compatible with RC90 camera and R225 crawler. \$27,500. Call 973-252-6700. (MBM)

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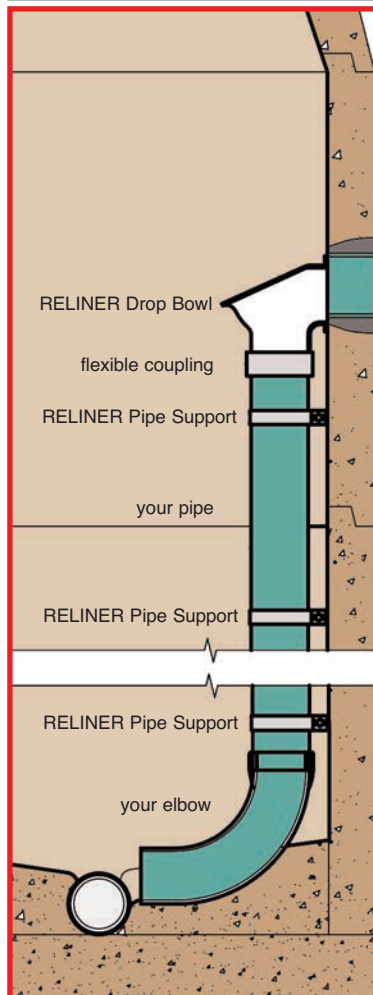


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PEOPLE/AWARDS

The **New Hampshire Department of Transportation** received the Best Use of Innovation Award (medium-sized category) from the Northeast Association of State Transportation Officials for its work protecting Canobie Lake and Cobbett's Pond while working on the Interstate 93 renovation project. New Hampshire Department of Environmental Services, the contractors and the designers were searching for solutions to provide as much protection as possible from erosion control and stormwater runoff.

Imbrium Systems received a 2016 Waters Next Award in the stormwater technology category for the Stormceptor MAX stormwater treatment system. Stormceptor MAX is a customized oil grit separator especially equipped to treat runoff from large areas due to its flexible modular pre-cast design that accommodates different site requirements.

The city of Burien, Washington, announced that **Mary Eidmann** was hired as its stormwater outreach specialist. The newly created position allows the city to increase its stormwater education and outreach throughout the community and fulfill state requirements for the city's National Pollutant Discharge Elimination System Permit.

Edward "Cody" Kent joined Otak's office in Vancouver, Washington, as an assistant stormwater planner. He has a bachelor's degree in geology from the University of Wyoming and a master's degree in climate and society from Columbia University. He also has a certificate in geographic information systems from Portland State University.

Gary Woodson was named the Public Works director for the city of Greenville, South Carolina.

Tyler Goodwyn was appointed as stormwater engineer for Greene County, Missouri.

The following people were among the Top Public Works Leaders honorees as selected by the **American Public Works Association**:

- **John Herzke**, vice president of Municipal Services, Clark Nexsen, Virginia Beach, Virginia
- **Dena Mezger**, director of Public Works, city of Lee's Summit, Missouri
- **James Neal**, Public Works director, Charleston County, North Charleston, South Carolina
- **Bob Patterson**, director of Public Works, city of Pendleton, Oregon
- **James Proce**, assistant city manager, city of Rowlett, Texas
- **Walter Veselka**, Public Works director, city of Bristol, Connecticut

LEARNING OPPORTUNITIES

American Water Works Association

AWWA is offering a webinar titled What You Need to Know About Climate Risks to Water Utility Infrastructure and Assets on Nov. 30. Visit www.awwa.org.

Wisconsin

The University of Wisconsin Department of Engineering-Professional Development is offering Using WinSLAMM v. 10.2: Meeting Urban Stormwater Management Goals R324 on Oct. 6-7 in Madison. Visit epdweb.engr.wisc.edu. ♦

CALENDAR

Oct. 11-13

National Utility and Excavation Contractors 2016 Fall Leadership Conference, Crowne Plaza Denver Downtown, Denver, Colorado. Visit www.nuca.com.

Nov. 2-3

WJTA-IMCA Conference & Expo, Ernest N. Morial Convention Center, New Orleans. Visit www.wjta.org.

Nov. 13-17

American Water Resources Association 2016 Annual Conference, Florida Hotel and Conference Center, Orlando, Florida. Visit www.awra.org.

April 23-26

American Public Works Association 2017 North American Snow Conference, Iowa Events Center, Des Moines, Iowa. Visit www.apwa.net.

April 30-May 2

American Water Resources Association 2017 Spring Specialty Conference, Snowbird Ski and Summer Resort, Snowbird, Utah. Visit www.awra.org.

June 25-28

American Water Resources Association 2017 Summer Conference: Climate Change Solutions, Sheraton Tysons Hotel, Tysons, Virginia. Visit www.awra.org.

July 16-19

American Society of Agricultural and Biological Engineers 2017 Annual International Meeting, Spokane, Washington. Visit www.asabe.org.

Municipal Sewer & Water invites your national, state or local association to post notices and news items in this column. Send contributions to editor@mswmag.com.

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