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February 2020

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ISSUE

Samantha Babb
Director of Sewer Services
Taylors, South Carolina

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PIPELINE AND INFRASTRUCTURE, HYDRANTS



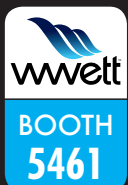
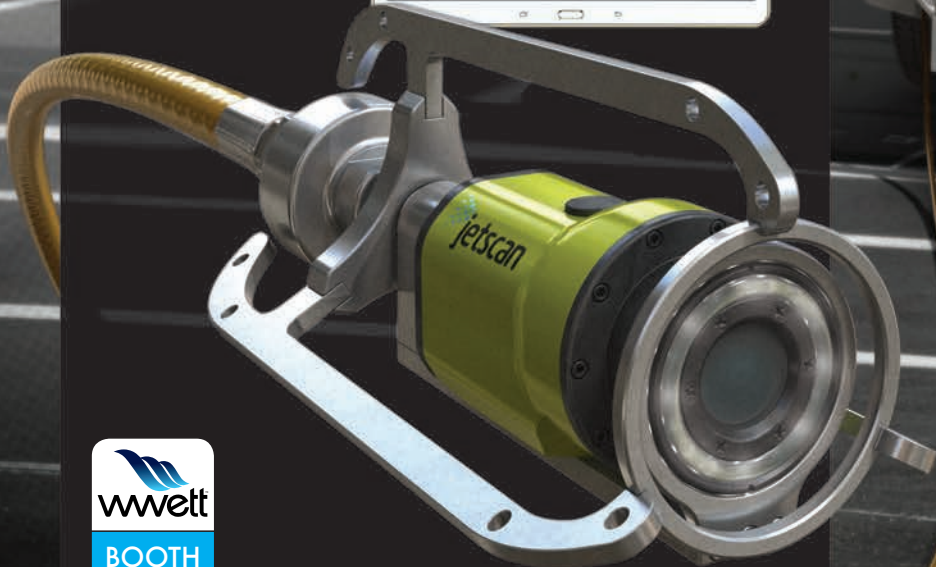


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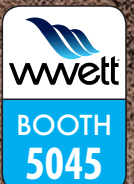
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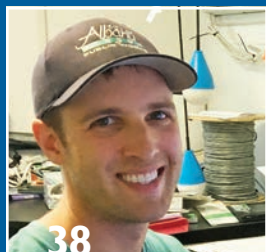
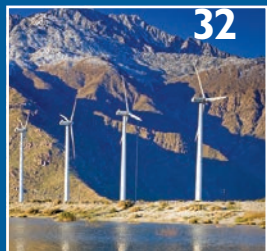
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ON THE COVER: Taylors (South Carolina) Fire and Sewer District Director of Sewer Services Samantha Babb with members of the construction crew locating utility lines on a job site. (Photography by Matthew Franklin Carter)



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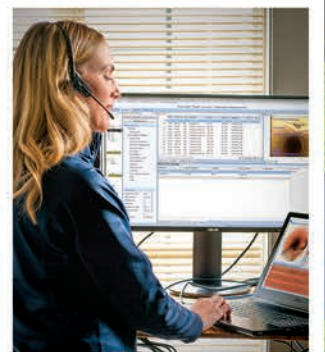
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FOR SANITARY, STORM AND WATER
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


Kayla Bisnette

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I&I MICRO DETECTION AT A FRACTION OF THE CURRENT COST

How is it possible that a simple level sensor can inexpensively locate I&I all the way down to a pair of adjacent manholes?

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THE BIG SECRET

Flow monitors require costly confined-space installation, continual sensor maintenance and are restricted to locating the entry point of I&I to somewhere within 2 to 4 linear miles of the piping system due to the performance limitations of their bottom-sitting sensors. iTracker® Level Sensors simply focus on quickly and inexpensively identifying the exact location where major volumes of I&I are entering the system without the requirement for confined-space installation and continual sensor maintenance.



By adding a series of powerful volumetric change algorithms to the I&I discovery process, iTracking® provides the ability for the subtraction of flows between neighboring mini and micro basins. This patented process allows iTracking to pinpoint I&I all the way down to a set of adjacent manholes...many times after only a single rain event.

The key lies in the ability of these patented algorithms to calculate volumetric changes between manhole segments, during both dry and wet weather. This ultimately determines the amounts of I&I residing within each micro basin as investigations proceed further and further upstream. As micro basins are isolated from one another and volumetrically analyzed for I&I contributions, the segments responsible for the highest influx of I&I are quickly uncovered and flagged for confirmation by CCTV camera surveillance. It is as simple as that.

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Luke Laggis

KEEP MOVING FORWARD

No matter how tough it seems, keep thinking ahead and preparing your systems for the future

Fifteen years can feel like both an eternity and a fleeting moment, depending on your frame of reference.

Much of February 2005 is a blur for me, but there are a few moments from that time, images and conversations that will be clear in my head for as long as I live. My mom passed away on Feb. 13, 2005. I was sitting beside her bed, holding her hand.

At the time, I couldn't imagine getting through the rest of the day, let alone the next 15 years. Her death wasn't a surprise. She'd been sick with cancer for a year and a half and was on hospice care at that point. But that moment, when you know you'll never get to say another word or ever again hear the voice of someone you love, is crushing. It's impossible to think forward.

I was running her business at the time. I'd work all day, go home for dinner in the evening and then go back and work until I was too tired to do anything but sleep. It's all I could do. I couldn't sit still or give my mind the time or space to roam. Constant work kept me going. The sadness never went away, but day by day, painfully slow, things got better.

A couple years later I sold out the inventory and closed the business. It was like saying goodbye all over again. But I needed to get back into journalism and return to the career I'd started before I moved home to take care of my mom.

I spent four years at a newspaper before coming to COLE Publishing. Those four years were constant work, whether I was home, at the office or on vacation. It was a job you couldn't clock out and forget about for the night or weekend. It wasn't until I started at COLE that I felt like I finally came up for air for the first time since my mom passed.

Dealing with a sanitary sewer overflow or broken water main isn't on the same level as losing a family member, but you can only lose someone once. That's not the case with overflows and broken mains, which get more frequent as infrastructure ages. They happen again and again. And like my newspaper days, worries about your system don't end when you clock out. You never know when an emergency is going to pull you away from dinner or out of bed.

Running water and wastewater systems is a commitment that goes way beyond the standard workday. You're not just earning a paycheck; you're taking care of your community. I know it's difficult to see the light some days, but if you keep looking forward, pushing rehabilitation and improvement initiatives, a few years down the road you might come up for air and realize you've made real progress.

Fifteen years from now you'll no doubt be wondering where all the time went. But if you focus on the right things now, you might just be amazed at how far your systems and communities have come.

So spend your time wisely, and don't stop moving forward.

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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KENTUCKY STORMWATER PROJECT

Design Feat of the Year

A Kentucky-based sewer collections system improvement project recently was heralded by the Design-Build Institute of America during its 2019 National Design-Build Project/Team Awards competition. The \$78 million Southwestern Parkway CSO Basin project is a component of a federal consent decree to mitigate CSO discharges to local waterways.

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UNDERGROUND UTILITIES

Mitigating Excavation Damage

With new utility projects on the rise, damage prevention continues to be a growing concern for the underground construction industry. Especially in developed urban areas, new utilities share the ground with other existing fiber, gas, electric, water and sewer lines. The congested underground space leaves little to no room for error.

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STUDENT COMPETITORS

Operations Challenge

Three students from Milwaukee Area Technical College recently made waves at the Wisconsin Wastewater Operators Association's annual conference in Green Bay as the only student team that competed in the 2019 Operator Competition event. Read about their experience in this online exclusive article. mswmag.com/featured

OVERHEARD ONLINE

“Leading a crew is a big responsibility and one that comes with a lot of time commitments. But it's critical that every crew leader take some time to invest in leadership skills.”

— 5 Tips for Effectively Leading a Crew
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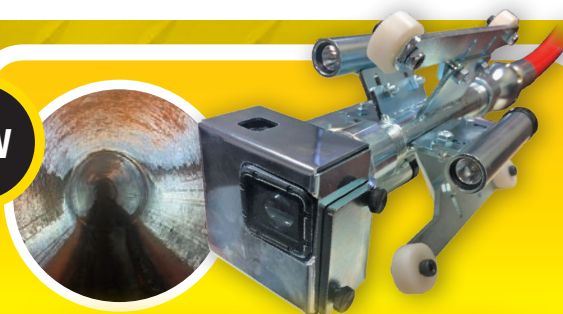


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BUILT FOR PEAK FLOW

Tennessee utility takes on consent decree and rebuilds its system to handle any weather

By Traci Browne

The wastewater system infrastructure in Chattanooga, Tennessee, is undergoing a massive makeover, mostly to boost the system's ability to handle a high volume of stormwater and wastewater during heavy rain events.

Sanitary sewer overflows caught the attention of the Environmental Protection Agency several years back, and Chattanooga is actively tackling that issue under the terms of a 2013 consent decree agreement with the EPA, Tennessee and the Tennessee Clean Water Network.

The agreement includes both a list of issues that must be addressed and penalties including \$800,000 to be spent on a supplemental environmental project, \$238,000 for a state environmental

“We want to make sure people hear what we’re doing with their money; it’s a lot of money.”

Jeffrey Rose

project and a \$238,000 civil penalty paid to the U.S.

This consent decree is not the city's first run-in with the EPA. Fifty years ago, Chattanooga had the distinction of having the worst air quality of any city in America. The town came together through public and private partnership to clean up the air, with great success.

In 2014 and 2015, *Outside* magazine named Chattanooga “Best Town” for its quantity and quality of adventure playgrounds and its vibrant neighborhoods. Today, the city hopes to accomplish the same turnaround with its water resources.

System snapshot

The Chattanooga wastewater collections system covers 505 square miles and serves approximately 400,000 people. It comprises 1,263 miles of gravity sewers, 26,000 manholes, 72 pump stations and one regional wastewater treatment plant.

The Moccasin Bend Wastewater Treatment Plant treats 140 mgd with a peak hydraulic capacity of 220 mgd, and it produces 70,000 wet tons

A Chattanooga Department of Public Works construction crew excavates a blocked sewer line for physical inspection and repair. (Photography by Martin Cherry)



PROFILE:

Chattanooga
(Tennessee) Department
of Public Works, Waste
Resources Division

ESTABLISHED:

City incorporated in 1839

SERVICE AREA:

505 square miles, 400,000 residents

INFRASTRUCTURE:

1,263 miles of sewer lines; 72 pump-
ing stations; 8 storm stations; 1 regional
treatment plant

WEBSITE:

www.chattanooga.gov



Crew members with the Chattanooga Department of Public Works get set up on a job site.



Public Works crew member
Steven Bach switches
Godwin pumps on-site
after an overnight overflow.

of biosolids per year.

Two projects tackled and completed at the treatment plant include the construction of two new secondary clarifiers and their associated piping, valves and instrumentation, as well as the rehabilitation and upgrade of influent grit detritors and related splitter box. Both projects will improve the capacity of the plant and help reduce SSOs.

Jeffrey Rose, director of the Waste Resources Division for the city of Chattanooga Department of Public Works, says many of the system's pump stations hadn't been rehabbed for decades. The consent decree turned out to be a good excuse to tackle so many of the much-needed upgrades.

For example, the Citico Pump Station received

an overhaul of its pumps, valves, electrical and instrumentation equipment while the Combined Sewer Overflow Treatment Facility got new pumps, piping, valves and instrumentation.

Along with improvements to the Citico Pump Station itself, there will also be a backup emergency submersible pump and a permanent emergency standby generator.

Getting to work

Like many cities, inflow and infiltration is an ongoing problem in Chattanooga, and it contributes to the SSO problem being addressed.

Some of the largest-diameter interceptor and main pipes are being rehabilitated using CIPP

trenchless technology. Rose says many of these pipes run along creeks and rivers, so they take in significant water.

To date, 1.1 million linear feet of pipe have been inspected, and 300,000 linear feet have been rehabilitated. Besides the pipe, 4,500 manholes have been inspected and 2,000 have been rehabbed. The total goal for rehabilitation is 500,000 linear feet of pipe and 2,400 manholes.

"Lining these pipes gives us a pretty good pay-back almost immediately," Rose says.

Chattanooga has an interjurisdictional agreement program with its municipal satellite sewer systems that require each satellite to do its own rehab, respond to I&I issues and meet a 3:1 peak



A Public Works crew installs a new storm drain in Chattanooga. Stormwater management has been a major initiative for the utility.

“It’s pretty cool. People see it and say, ‘Oh, I get it now.’”

Jeffrey Rose

flow rate. Rose says when they identify an issue or violation through smoke tests and CCTV inspections, the satellites address the problems promptly.

The utility also upgraded a series of equalization basins that hold about 70 million gallons. These basins were set up decades ago during a time when many industrial customers were dumping high-strength waste. Rose says many of those industries have gone away, and the ones that are left are controlling their wastewater better. As a result, the basins rarely have more than 5 feet of water in them.

The majority of these basins had blower lines and diffusers. They were swapped out with surface aerators, eliminating one of the highest uses of electricity the plant had.

Speaking of electricity, Chattanooga is also working to improve its solids quality and enhance methane production and capture. The plan is that the methane can be used one day as part of a yet-to-be-determined energy project. They will also start building a 10-acre solar farm they estimate will supply with 10% of their electrical demand.

Moving forward

The next step for Chattanooga is installing equalization stations to further reduce SSO events in specific locations. The aboveground stations have been a touchy point with the public, according to Rose.

While Chattanooga tries to locate the stations on out-of-the-way property owned by the city, sometimes they have to purchase land close to people’s homes or businesses. Even though the stations contain very diluted stormwater and wastewater and they drain out within 48 hours, it’s challenging to get people to approve an installation in their backyard, so to speak.

The utility is building new storage tanks that will handle 30 million gallons right near the plant, just 1/4 of a mile away. These tanks will eliminate the most significant overflow, the West Bank overflow, which the EPA specifically highlighted in the consent decree. Between the rehabilitation of pipes and manholes and those tanks, that overflow is expected to be eliminated.

While fixing problems to meet the consent decree is a high priority, Chattanooga has also been making safety improvements. One such improvement was a change at the treatment plant from chlorine gas for disinfection to bleach. Given the plant’s proximity to downtown Chattanooga, this change reduces the potential threat of an accident that would affect many residents.

Public communication

Primary funding for all projects has come from a series of loans through Tennessee’s State

PLANTING A PARTNERSHIP

The Chattanooga (Tennessee) Public Works Department is turning to the community for help soaking up some of the city’s stormwater runoff.

The RainSmart program encourages homeowners to install rain barrels, rain gardens and vegetated bioswales on their property to capture stormwater runoff. In return, the city will reimburse eligible projects up to \$1,000.

Once an interested homeowner fills out an application, the city will assess the property and advise where to place the garden and help calculate the appropriate size of the garden. They will also discuss planting options and give the property owner an estimation of their reimbursement amount.

Then, the property must pass a percolation test and the homeowner needs to submit plans to get the final go-ahead. Homeowners have the option to tackle the project themselves or work with a landscaper. For those going the DIY route, the city provides a guide and templates to help create the garden or bioswale plan.

Chattanooga is also using these installation projects as a water-quality teaching moment. Here, the homeowner can choose to co-host a “workshop” with the Public Works Department. Once the garden’s structural work is complete, workshop attendees help with the planting and mulching while water-quality specialists teach them about rain gardens, water quality and the RainSmart program.

There have been 15 rain gardens installed since the program’s inception four years ago, and 14 rain barrels received reimbursement since that option was offered in 2018. Of the 15 gardens installed, three have been used as workshops.



Chattanooga Department of Public Works team members (from left) Christopher Mills, Sandra Barbee, Lauren Cornelius and Jeffery Rose.

Revolving Fund Loan Program, which administers Tennessee's Clean Water State Revolving Fund Loan Program. Rose says they have been able to get more money than they originally asked for because they go to the SRF with shovel-ready projects and ask if there's any extra money not being used.

"If they do have it, they'll help us. We work together to make it happen," he says.

Chattanooga has also been raising sewer rates for the last six or seven years, yet Rose says the City Council and the public have been supportive. He attributes that support to a strong communication program.

Early in the process, the utility's main message to the City Council was that the work had to get done because the EPA was making them do it. However, communication is now also aimed at the people of Chattanooga and the message promotes a clean environment, eliminating sewer overflows and the overall benefit to the city.

They've branded the effort to comply with the consent decree Clear Chattanooga and now promote its 3R Approach, which stands for restore, repair and replace.

"It's given the public more visibility into what we're doing, which is always good," Rose says. "We want to make sure people hear what we're doing with their money; it's a lot of money."

As for that particularly touchy point of underground storage tanks, communication is vital. Rose says people simply want to be heard and they want to know why specific properties were selected. He and his team developed an animation to show precisely what those wet-weather storage facilities do and why they are needed in the neighborhood.

"It's pretty cool. People see it and say, 'Oh, I get it now,'" Rose says.

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UNDERGROUND

TAPPING INTROVERTS' POTENTIAL

Managers can adopt strategies to bring out the best in their quieter crew members

By Ken Wysocky

A flashy, bright-red Ferrari Portofino will attract a lot of attention in a parking lot. A shiny new Honda Accord? Probably not so much — even though it's a well-designed and reliable car that gets the job done.

The same dynamic exists in the workplace, as lively and outgoing extroverts often overshadow their quieter, introverted colleagues. While it's only human nature for people to notice extroverts more than introverts, managers who do so run the risk of overlooking the potential these lower-profile employees bring to the table, says Jennifer Kahnweiler, Ph.D., an internationally known speaker and executive coach.

“You don’t get the best ideas if only a few people dominate a meeting.”

Jennifer Kahnweiler

Kahnweiler is the author of *Creating Introvert-Friendly Workplaces*, set for publication in June 2020.

“It’s not unusual for introverts to get passed up for promotions, especially since

they’re not comfortable with self-promotion,” says Kahnweiler, a self-described extrovert who, ironically enough, has built a reputation as a champion of introverts. She’s also written two more books about introverts — *The Introverted Leader: Succeeding as a Leader in Today’s Extroverted Workplace* and *Quiet Influence: The Introvert’s Guide to Making a Difference*. “They could be good leaders but often get overlooked, although I don’t think managers set out to snub them intentionally.

“One big problem organizations face is a hidden bias against introverts, particularly in companies with cultures where employees are expected to be ‘on’ all the time,” she adds. “Introverts can create negative impressions — that they’re not friendly or not team players or don’t have a lot to add to the conversation.”

Quiet but effective

There’s no question that introverts can be effective leaders. A quick roll call of famous introverts attests to that fact: Albert Einstein, Abe Lincoln, Bill Gates, Mark Zuckerberg, Elon Musk and Warren Buffett, to name a few.

In fact, introverts — who make up an estimated 40% to 60% of the population — bring many talents to the workplace. They tend to be creative and self-aware; excel at research and preparation; enjoy serious, one-on-one interactions; are good at encouraging others and resolving conflicts; and are adept at developing well-planned arguments that can skillfully influence others, Kahnweiler notes.

So how do managers go about tapping the potential of introverts? It helps to first take time to understand introverts’ worldview.

For instance, keep in mind that introverts easily suffer from what’s called “people exhaustion,” in which too much outside stimulation leaves them drained and stressed out. So don’t take it the wrong way if an introvert seems unusually subdued after a lot of social interaction.

In addition, since introverts prefer to avoid confrontations, they often have a hard time saying no when asked to take on additional tasks. That, too, can lead to stress, Kahnweiler says.

“You need to educate yourself about introverts,” she observes. “Introversion is an element of diversity. We put so much emphasis on ethnicity, gender and cultural backgrounds in workplaces, but not as much on personality styles.”

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.



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Here's the plan

One thing managers can do — and it's good for introverts and extroverts alike — is provide detailed agendas for meetings. "I call it meeting hygiene," Kahnweiler says.

Why does this help? Because introverts typically are better at tackling problems if they have time to prepare, as opposed to unexpectedly being asked to come up with ideas. Giving introverts advance notice gives them time to think about things and also ensures everyone at a meeting is prepared to fully engage.

"You don't get the best ideas if only a few people dominate a meeting," she points out.

Furthermore, at the end of a meeting, managers should invite everyone to submit additional thoughts and comments by email — and to copy everyone else at the meeting. "This plays to the sweet spot of introverts, who prefer to take time for deeper reflection," Kahnweiler explains.

"It's a much more thoughtful process than standing at a flip chart with a marker and asking people to quickly brainstorm ideas, which usually results in the same people contributing (i.e., extroverts)," she says.

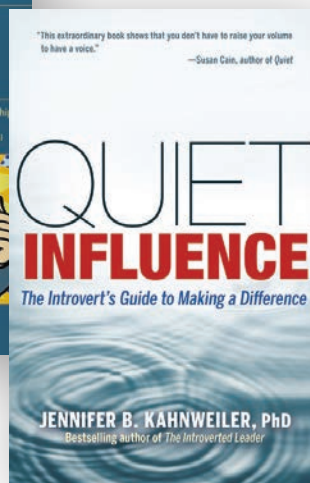
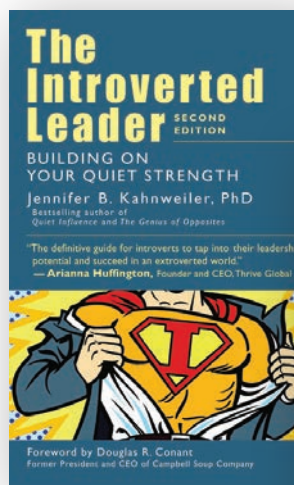
It also pays to make time for one-on-one meetings with employees, but especially with introverts. Introverts feel more comfortable in such settings and are more likely to freely express what motivates or frustrates them at work.

"One-on-ones cater to their sensibilities," Kahnweiler notes. "Because of time constraints, such meetings usually are one of the first things to go in terms of priorities, but they're actually one of the most important things a manager can do."

It's also important to create workplace spaces where introverts can feel comfortable working. While complete overhauls of workspaces usually aren't practical logistically or financially, organizations still should consider finding small spaces that introverts can use for focused work or recharging, she says.

"The good thing is none of this requires a lot of extra effort or money."

Jennifer Kahnweiler



"For input, you can ask introverts how effective they think their workplace is in terms of providing spaces for collaboration, socialization and focused work," Kahnweiler suggests. "We also now know that introverts are more sensitive to light and noise ... their dopamine is activated in different ways. So that needs to be taken into consideration, too."

"The good thing is none of this requires a lot of extra effort or money," she adds. "It's all about creating awareness and conditions where introverts can thrive like everyone else." ♦

COMMITTED TO COLLECTIONS EXCELLENCE

Small South Carolina district's highly trained staff keeps up with growth and change

By Giles Lambertson

Don't let the compact and pastoral nature of the Taylors Fire and Sewer District fool you. The district is driven by technology and run with award-winning efficiency.

"We have a combined 195.5 years of sewer experience on staff," says Samantha Babb, director of sewer services.

The special-purpose fire and sewer district in northeast South Carolina covers just 16 square miles — that is, roughly a 4-by-4-mile section. It is chiefly comprised of the unincorporated town of Taylors and surrounding Greenville County acreage, all of which is considered a suburb of two nearby county seats, Spartanburg and Greenville.

The district has evolved in significant ways since its creation by state legislators in 1958. In the beginning, it was a water and sewer district with additional fire protection responsibilities. The district divested itself of the water distribution component in 1966. Four years later, it sold its sewer treatment plant and trunk lines to a sewer authority now called Renewable Water Resources, thereby becoming solely a sewer collections system.

Even though it's called Taylors Fire and Sewer District, the district's fire protection services are operated separately. Nonetheless, the two departments work closely together. "Most people think we are one agency with two departments," Babb says. Her department and the fire department share four administrative employees and a mechanic. Babb and her co-workers keep busy maintaining the sewer collections system at a high level of efficiency.

(continued)

Sewer technician Jesse Evett keeps watch while construction crew leader Chris Powell excavates for placement of an 8-foot Speed Shore Hydraulic Ditch Box to repair a pipe. (Photography by Matthew Franklin Carter)



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“Certainly, a person can never train too much. We try to learn something every day.”

Samantha Babb



Above: Construction crew leader Chris Powell operates a track hoe while sewer technicians (from left) Scott Yarbrough, Philip Bourdess and Jesse Evett locate utility lines on a job site.

Left: Taylors Fire and Sewer District Director of Sewer Services Samantha Babb with members of the construction crew, including (from left) Operations Supervisor Gary Cantrell, sewer technician Evett, crew leader Powell, and sewer technicians Yarbrough and Bourdess.

“When everything is working well, people don’t realize how busy we are,” she says.

High bar

The agency has received multiple awards for its work. In 2019, for the third consecutive year, the district received a Facilities Excellence Award from the South Carolina Department of Health and Environmental Control, a citation for the district’s success in protecting the environment and water sources.

Last year, the Taylors district was awarded the Collection System Operations Award from the Water Environment Association of South Carolina. Only one small collections system and one large system are recognized by the state association each year. “We take our work seriously,” Babb said in accepting the award, “and will continue to set the bar high for our team.”

Her high bar includes public assurances that employees are certified to do the work they’re doing. That is, they have been trained and have tested out as experts in their respective areas.

Including testing sources such as the Manhole Assessment and Certification Program and the Pipeline Assessment and Certification Program through NASSCO, as well as the Municipal Association of South Carolina Trades Certification Program.

“People don’t realize that every employee in the collections system is certified,” Babb says. “We have a certified electrician on staff. We have a maintenance tech for pump stations who is highly certified. All are certified, including myself. Certainly, a person can never train too much. We try to learn something every day.”

The expertise begins with Babb herself, with 24 years as a sewer and water administrator including the last nine years at Taylors. Some other tenured employees at Taylors include Gary Cantrell (28 years), operations supervisor; Michael Townsend, a right-of-way crew leader with 26 years; and Trent Bowles, a pump station maintenance technician closing in on 20 years. It’s an understatement to say that the people monitoring and maintaining the district’s sewer collections system know their business.

The Taylors district team takes a forward-looking approach to growth and improvement, both with personnel and the collections system. A

(continued)

PROFILE:

Taylors (South Carolina) Fire and Sewer District

SERVICE AREA:
16 square miles

CUSTOMERS:
Approximately 11,400 parcels
Wastewater volume capacity: 1,200 gpm

WASTEWATER INFRASTRUCTURE:
134 miles of gravity line, 3,719 manholes,
3 pump stations

SEWER DISTRICT EMPLOYEES:
13 (plus 4 shared with fire department)
Annual budget: \$3.7 million

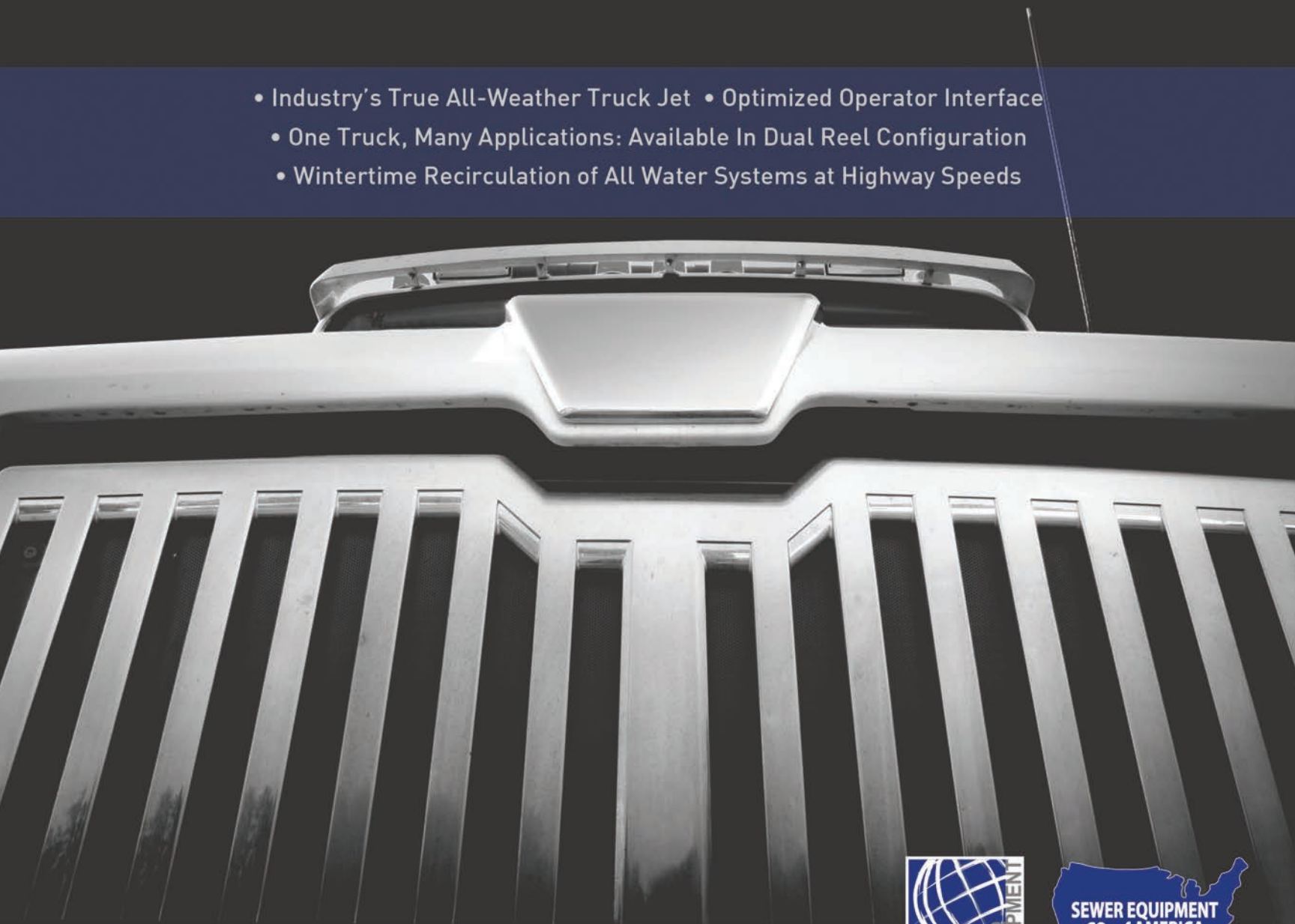
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“We are not afraid to try new and inventive ways to do things. If someone has a new idea, we are always open to having them come and show us.”

Samantha Babb



Above: The Taylors Fire and Sewer District CCTV crew includes (from left) Trent Bowles, Seth Townsend, Ray Childs and Michael Jones.

Left: Crew members say the Light Ring LED manhole light is an indispensable piece of equipment for inspection work.

decade ago, the district was faced with the task of aggressively addressing inflow and infiltration and realized that accomplishing this would require more than just rolling up its sleeves. The district had to go digital in a big way, and it did.

Today the district relies on a Cityworks GIS-centric public asset management system to assess, monitor, anticipate and resolve collections infrastructure issues. Data is compiled, viewed and utilized on desktop PCs and tablets in the field. Underground assets are inspected using CUES and RIDGID camera systems. The state's mandatory 811 excavation notifications, which are designed to protect pipes and lines from inadvertent incursion, are automatically processed by the district, freeing up staff for more important tasks.

“We are not afraid to try new and inventive ways to do things,” Babb says of the district's reliance

on digital solutions. “If someone has a new idea, we are always open to having them come and show us. We go to Cityworks conferences and to other conferences and places in search of new ideas to incorporate into our daily work.”

Connecting with customers

As in any commuting suburb, Taylors customers are mostly residential. The community of about 26,000 people is characterized by new subdivisions and some older developments with a few cow farms mixed in, according to Babb. “It is a little bit of a cultural mix.” The mix is growing more residential as housing developments sprout in pastures. “Right now, we have eight housing projects going on simultaneously. About 20 are in some stage of planning and development.” The largest new development ultimately will contain 158 houses.

Home connections are the source of most of the effluent being collected by the district. The only major industry in the community is a specialty chemicals plant, CPJ Technologies, which operates a 70,000-square-foot plant on a 12-acre property. Earlier this year, CPJ called on Taylors district employees for help when it experienced a flow issue.

“Some instruments broke down and this influenced some other stuff, and one problem led to another,” recalls Janneke Maas, CPJ's environment, health and safety analyst. “So I called Samantha. I asked her what we could do about it, what could she allow us to do. She listened and was very understanding. She asked the right questions, and it all worked out in the end.”

Maas suggested a more-than-pleasant conversation was involved. “Samantha knows quite a lot herself and surrounds herself with people who know a whole lot. She has all the technical knowledge she needs at her fingertips.”

Babb allowed the plant to continue production since the chemicals involved posed no environmental threat and soon the industrial flow returned to normal. Communication between the offices continued until normalcy was achieved.

The CPJ analyst notes wryly that she hasn't had a lot to do with the district administration but considers the district office to be an asset. “After all, if we have too much interaction with the district, it would mean we have problems. But I know that if we do have a problem, Samantha and her team are there for us.”

Facing challenges

The ongoing challenge for Taylors Fire and Sewer District is keeping sewage inside the collections lines and groundwater out. The district is nearing completion of a 15-year-long effort to cure I&I and to maintain the integrity of the lines moving forward. The mostly clay lines are under 50 years of age.

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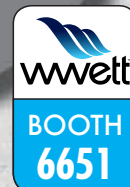
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Sewer technician Paul George retrieves an Enz Bulldog Antiblast nozzle to clean a manhole.

"I&I work never ends," Babb says. "We're always looking for something that might lead to inflow. And then there are the people out there running cable and phone lines and cutting into our sewer pipe."

"We do a lot of stuff in-house instead of contracting it out, so our money can go further."

Samantha Babb

Having gotten infiltration to an acceptable level, the district is systematically inspecting 9 miles of line per year and repairing it as needed. It has crews for each phase of this construction and maintenance — teams dedicated to certain tasks, but also cross-trained for emergency duty — and has the equipment for the crews to do the work.

A 2014 Ford van is home base for the district's CUES camera crew, which also employs RIDGID SeeSnake and other video equipment. The construction team can uncover infrastructure with a 100 hp John Deere 135G excavator, Kobelco SK80 mini-excavator, Caterpillar 289D track loader, and backhoe. The cleaning crew has a Vac-Con hydrovac rig with a 9-yard debris box, as well as a Bulldog trailer jetter (John Bean Jetters). The workers clearing rights-of-way can hop on a Deere 6415

tractor with a boom mower or hook up to an 8-foot Kodiak brush-clearing mower. There's no shortage of equipment.

On a typical workday, Cantrell says he might have a crew working on a point repair job, the CCTV crew out doing inspections, a right-of-way crew clearing property and a paint-and-seal team working on a manhole.

Measuring up

A small, special-purpose sewer district like Taylors doesn't necessarily have smaller challenges. A constant concern for Babb is managing the ad valorem tax and new construction revenue generated annually. She supplements that revenue with grants, which are harder to win for districts like Taylors that are situated adjacent to urban communities. "We do a lot of stuff in-house instead of contracting it out, so our money can go further," she says.

The fruit of Babb's administrative efforts and of dedicated crews in the field can be measured in sanitary sewer overflows. South Carolina health officials dictate that any spill of at least 500 gallons of untreated or partially treated sewage must be reported. If a utility has more than two "significant" spills (5,000 gallons or more) in the 12 months leading up to the new report, the entire system must be officially reevaluated.

By that score, Taylors Fire and Sewer District is doing just fine. Consulting company Blue Heron Engineering Services, which worked recently with the district, put it this way in a report: "With the number of sanitary sewer overflows per 100 miles as the benchmark that all utilities in the country are compared against, the typical well-performing system will see four to six overflows per year per 100 miles. Last year Taylors had three — two of which were attributable to issues in Renewable Water Resources trunk lines, not within Taylors' system — which is exceptional." ♦

MEETING COMMUNITY NEEDS

Taylors (South Carolina) Fire and Sewer District officials have been put on notice that providing timely and cost-efficient service may not be enough to justify the district's continued existence. Consequently, the officials are fighting back against dissolution of the district.

The challenge is coming from Greenville County Council, which is considering a proposal to combine special-purpose sewer districts with a wastewater treatment company, Renewable Water Resources. Sponsors of the legislation believe consolidation will lower bills, increase efficiency and provide funding for future sewer improvements.

Samantha Babb, district sewer services director, has an opposing view. "The community will neither be represented as well nor served as well by a consolidated system. The customers will lose their voice with an appointed commission board that has no oversight. Honestly, they answer to no one and can raise fees and rates as they feel necessary. When small systems are consolidated, people are lucky to get back a phone call when there's a problem. You become a number."

She cites a survey by a County Council

consultant that determined just 2% of residents have a problem with the sewer systems being operated by special-purpose districts. "Yet the consultant recommended that we be unified. They want our revenue." Most of the districts are governed by a locally elected commission, whereas the consolidated system would answer to an appointed board. Thus, local control would be lost. The Taylors district administrative office, for example, would be eliminated.

A *Greenville News* op-ed piece sums up local resistance this way: "Our special-purpose districts are meeting the specific needs of our community — uniquely — with the input of our citizens and with the level of personal service they expect. ... We do not believe that creating a single, consolidated, big-government approach to services is the answer to managing growth," co-wrote Jeff Hannah, a Taylors district commissioner.

The proposal has been referred to a public works committee for further study and public hearings, but Babb says the issue isn't overshadowing her work. "Operations are still going on every day just like they always have, but we're keeping our eyes on it."

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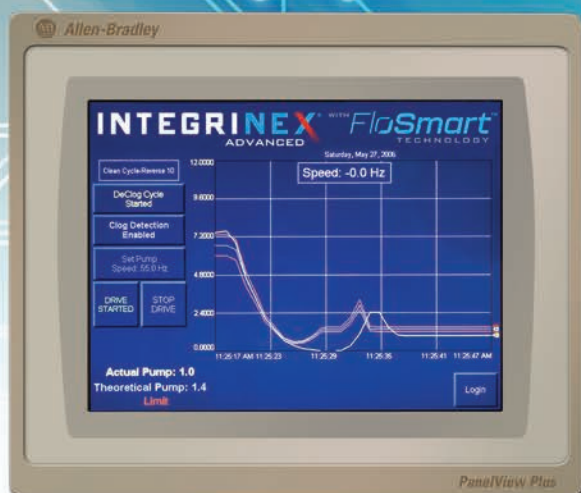
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Knowledge of soil classification and proper shoring techniques will help you and your crews remain safe in the trenches

By *Jared Raney*

Eight service workers died in trenching accidents last April. Staying safe requires more than following regulations: It takes a thorough understanding of the tools available.

“Not everything that these guys are confronted with is in the rulebooks,” says Jim Sullivan, president of Prospan Shoring. “They’re going to get into all different shapes and sizes; what they need to know is what’s in their arsenal when they pull out the door.”

There are three main types of trench collapse prevention methods: shoring, trench boxes and sloping. While there are some variations on these basic categories, the proper understanding and use of these three methods will ensure workers’ safety.

“Not everything that these guys are confronted with is in the rulebooks.”

Jim Sullivan

Anyone on an excavation site should be aware by now that any trench greater than 5 feet deep must have some type of collapse prevention. The method used for prevention depends on two factors: trench layout and soil conditions.

Assessing soil

OSHA rules break down soil conditions into several simple categories — A, B and C. Class A soil is so-called virgin soil, the most cohesive soil; on the other end of the spectrum, class C is soil with very poor compaction.

“Once you identify what soil you’re in, then you have to look at a couple other influencing factors. If the trench is dug adjacent to a roadway, where most city trenches are and utility company trenches are, that means there’s roadway traffic. And with that comes vibration,” Sullivan says. “So if your ground is subjected to vibration from planes, trains or automobiles, you’re required to downgrade your soil classification by one.”

There are three main types of trench collapse prevention methods: shoring, trench boxes and sloping. While there are some variations on these basic categories, the proper understanding and use of these three methods will ensure workers’ safety.



There are a few instruments and methods to test the soil compaction, but for the purposes of shoring options, everything's on the table until class C.

"So in other words, all these cities and utility companies declare themselves in class C soil. So you can imagine, if you're in real good A soil, we let you do more with a product," Sullivan says. "Most people want the standard to be as simple as possible, so they just say, 'We're in class C soil — get on with your day.'"

The problem with sloping

Once you're into C soil, there is a distinction in the engineering requirements between C-60 and C-80 soil. C-80 essentially means that there's no cohesion at all, and it's at that point that shoring is no longer an option, leaving just trench boxes and sloping.

Unfortunately, for most municipalities, sloping, which OSHA treats as essentially the ultimate fallback for collapse prevention, is all but impossible in urban settings.

"The reason people don't use sloping is because they'd have to remove the street on every dig, if they followed the OSHA formula," Sullivan says. "OSHA would say open up that trench. We don't care: The employee comes first. And I don't disagree with that. I'm just speaking to you from a reality standpoint: They're not going to remove the streets, they're not going to tear up somebody's front yard to the max, so really, people are out there using trench boxes or they're using shoring."

Shoring vs. boxes

So for practical purposes, what the vast majority of contractors and municipalities need to understand is the difference between shoring columns and trench boxes.

"There's a difference between shoring and trench boxes. Even though it all falls under one heading called 'shoring,' there's a distinct difference. Shoring pressurizes the trench walls so they can't cave in. They're designed to pressurize the trench wall and take away its ability to lean in," Sullivan says. "Trench boxes are designed strong enough to take on the collapsing soil."

In simpler terms, while a trench box is designed to hold back any soil that does collapse, shoring is meant to prevent a collapse in the first place.

Shoring functions via a principle called an "arch effect." Basically, at the point where the shoring contacts the soil, it compresses outward in an arching pattern. So from point of contact, there is a dome of protection in the arch wall, the size of which depends on soil type.

This means you must know the maximum allowable separation between each column of shoring,

"The reason people don't use sloping is because they'd have to remove the street on every dig, if they followed the OSHA formula."

Jim Sullivan

which is to say how far apart horizontally two shoring bars may be placed. Manufacturers must provide those distances for each soil type. For example, Prospan dictates a maximum of 6 feet for class C soil.

The manufacturer specifications, or "tabulated data," also tells users when plywood is required with shoring. While it's generally not needed due to the arch effect, sometimes it will be required to pre-



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Any trench greater than 5 feet deep must have some type of collapse prevention. The method used for prevention depends on two factors: trench layout and soil conditions.

“So anybody who’s attacking this the right way needs to have both shoring and trench boxes in their arsenal.”

Jim Sullivan

vent minor collapses from the arch wall surface soil.

Due to the relatively complex nature of shoring devices, it can be tempting to use only trench boxes, but you could be asking for trouble.

“With trench boxes, you would think, Oh, this is a no-brainer: If they’re strong enough to take the collapse, why wouldn’t you use a trench box every single time?” Sullivan says.

The simple answer is that they can be less convenient and less versatile depending on the situational factors of a given trench. If laterals or other utilities are a factor in digging the trench, it could limit the space for a bulky metal box.

Another factor is that different types of boxes have varying weight limits. Depth is the main factor here — weaker aluminum boxes, while often easier to maneuver, cannot be used past a certain depth because it cannot hold the weight of all the soil that could potentially cave in. Even the sturdiest steel construction boxes have limits, though they are in most



Trench boxes are designed to hold back any soil that collapses, while shoring is meant to prevent a collapse in the first place.

cases deeper than any realistic trench.

Boxes are also required to be stacked up to the top of the trench, so multiple boxes may be needed, which is a lot to haul or maneuver to and around a job site.

“You can’t rely on trench boxes all the time, because what if you can’t get the box in the hole?” Sullivan says. “And you can’t use shoring all the time because what if you’re in C-80 soil where shoring is not allowed. So anybody who’s attacking this the right way needs to have both shoring and trench boxes in their arsenal.”

Prepare for anything

The fact of the matter is that preventing trench collapses is not always a simple endeavor. OSHA regulations attempt to simplify it as much as possible, but if it were a piece of cake, workers wouldn’t be dying.

Keeping an equipment yard full of collapse prevention equipment may be a hassle, but supervisors at all levels don’t have the luxury of cutting corners — or fieldworkers will be those who pay, possibly with their lives.

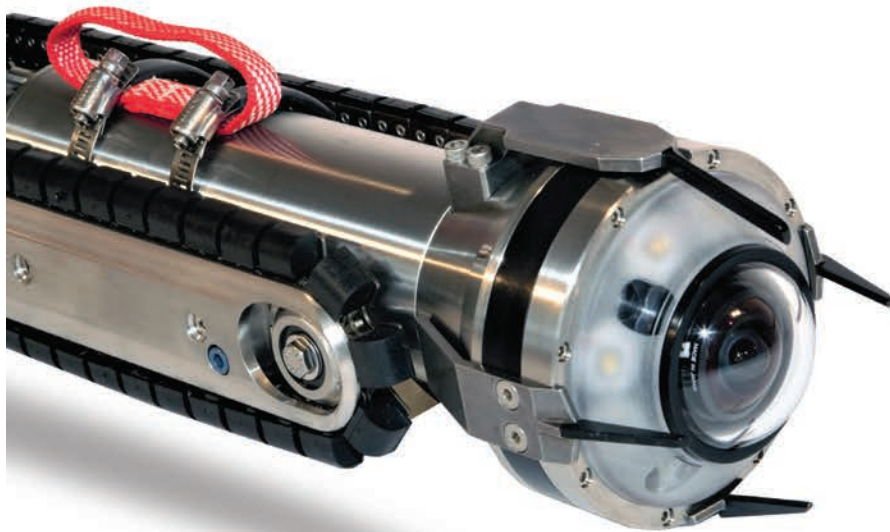
“Depending on the task at hand, sometimes it’s hard to be compliant. As simple as it seems, it isn’t. If they’re putting in a catch basin or a man-hole, or they’re doing something where their options are limited with the dimensions of that trench, it’s very difficult for them to stay protected,” Sullivan says. “Sometimes where they start to dig and where they finish can be two different animals altogether; they need to have trench boxes and shoring in their bag of tricks.” ♦



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BUILDING WATER SUPPLY RESILIENCE


Stanford University researchers discuss how a diversified water portfolio can meet California's needs heading into an uncertain future

By Michelle Horton





Intensified droughts and floods are demonstrating the limitations of traditional infrastructure such as dams and wastewater treatment plants. The shifting hydrological cycle is challenging the ways complex water systems are managed.



As with the stock market, climate change requires a diversified portfolio of solutions.

California Gov. Gavin Newsom recently signed an executive order to develop a comprehensive strategy for making the state's water system climate-resilient. The order calls for a broad portfolio of collaborative strategies to deal with outdated water infrastructure, unsafe drinking water, flood risks and depleted groundwater aquifers.

In a related study published earlier this year, Stanford researchers Newsha Ajami and Patricia (Gonzales) Whitby examined effective strategies to mitigate rising water-scarcity concerns. Ajami is director of Urban Water Policy at Stanford's Water in the West program and a hydrologist specializing in sustainable water resource management. Whitby is a recent Ph.D. graduate from Stanford's civil and environmental engineering department and currently a water engineer at environmental consulting firm Brown and Caldwell.

Ajami and Whitby took the time to discuss their research and how a diversified water portfolio can meet future water needs.

How does a diversified water portfolio reduce risks associated with water supply?

Ajami: Developing a water supply portfolio means moving away from dependence on one water source such as imported water or groundwater in order to develop a number of other water sources by incorporating local and regional solutions including conservation and efficiency, water recycling and reuse, rainwater and stormwater harvesting, and desalination.

The golden rule in an investment portfolio is to have diversification, which prevents short-term and long-term risks. The same rule applies

to a diversified water portfolio. In order to minimize the risk of short-term and long-term challenges and disruptions due to failing infrastructure or climate change impacts including intensified droughts and floods, it is important to rely on more than one supply source and develop a water portfolio that is comprised of multiple water options in order to increase systematic flexibility and resiliency.

In developing such a portfolio, utilities and regions should not only focus on the number

“Replacing and fixing our aging infrastructure requires a holistic approach, and it should also include changing and revamping our funding and financial model.”

Newsha Ajami

of sources, but also need to think about the capacity of each supply. Our team has developed a water reliance index that can help measure these goals at both the utility and regional level.

Whitby: A water supply portfolio is the combination of water supply sources available to a utility. Diversifying means we're not putting all of our eggs in one basket, so if something happens to one of the supplies, like a disruption to the physical infrastructure or a water-quality concern or a cutback due to drought, we still have a portfolio of other options available. Water supply diversification should pursue different types of water sources such that each supply has dif-

Incentives to diversify and strengthen water portfolios provide an opportunity to reinvent and fortify water systems for the next century.



Regions can benefit from identifying the value and risks of existing and potential water supply options and focusing on projects that enhance access to clean water while delivering broader environmental and societal benefits such as green infrastructure.

“Aging infrastructure is one of the risk factors affecting our water systems today. A fair amount of water is lost to system leaks before it even reaches customers.”

Patricia (Gonzales) Whitby

renewable energy portfolio comes to mind, where regional and a statewide water diversification portfolio goals are set and then incentivized. In a recent study, our team developed a cap-and-goal-based trading model that enables a region to reach their water diversification portfolio goals by working together and taking advantage of regional opportunities to develop a diverse set of water solutions. Such innovative system-level solutions can help water utilities coordinate their efforts, overcome fragmentation and share both financial and water resources while also gradually adjusting their business model.

What role does climate change play in future planning?

Ajami: Climate change is magnifying many of our current water challenges. Intensified droughts and floods are demonstrating the limitations of our traditional infrastructure model such as dams and wastewater treatment plants. The shift in our hydrological cycle means that the conventional ways we managed our complex water systems aren't working.

The new normal looks very different, as precipitation patterns have shifted and we are receiving more rain than snow. Also due to higher temperatures, snow melts earlier and faster than before, depriving us from our natural reservoir that used to hold much of our summer supply. Sea level rise is threatening our coastal groundwater basins and wastewater treatment plants. Increased wildfires especially in urban-wildland interface is affecting water quality.

Overall climate change is interrupting our water systems. This means climate change has to be front and center in every infrastructure planning process. Our 21st

century infrastructure model should look very different from our 20th century model, incorporating more nature-based solutions that can increase our system's resiliency and flexibility.

Can the executive order also help fix California's outdated drinking water infrastructure?

Ajami: Absolutely! Replacing and fixing our aging infrastructure requires a holistic approach, and it should also include changing and revamping our funding and financial model. If you look at your energy or telephone bill, there is a line item that provides funding to ensure access to telecommunication and energy infrastructure for rural and low-income communities. This model provides long-term sustainable and stable funding that is essential. This is exactly what we need in the water sector and what we do not have.

Gov. Newsom has certainly identified access to clean water as one of his administration's major issues. His team has certainly tried to find resources to make it happen — which is a great first step — but I believe a model similar to energy and telecommunications sectors is needed to guarantee long-term sustainable and resilient solutions for every community in California.

(continued)

ferent risks and also different strengths. For example, water reuse is typically considered a robust supply that is resilient to drought. Similarly, diversification means not only having many different water sources available, but also leveraging those sources to reduce stress on the more traditional supplies.

What key priorities would you expect California's water resilience portfolio to focus on?

Ajami: A water resilience portfolio can look different from region to region, as California faces different challenges, opportunities, risks and limitations across the state. It is important for regions to identify the value and risks of existing and potential water supply options and focus on projects that not only enhance access to clean water, but also deliver broader environmental and societal benefits such as green infrastructure.

In highly urbanized regions, solutions such as on-site reuse work well, while communities with lower densities may find a centralized recycling plant as a better solution. The state needs to recognize these parameters and provide regions with broad guidelines while enabling and encouraging development of collaborative regional strategies. A model similar to the



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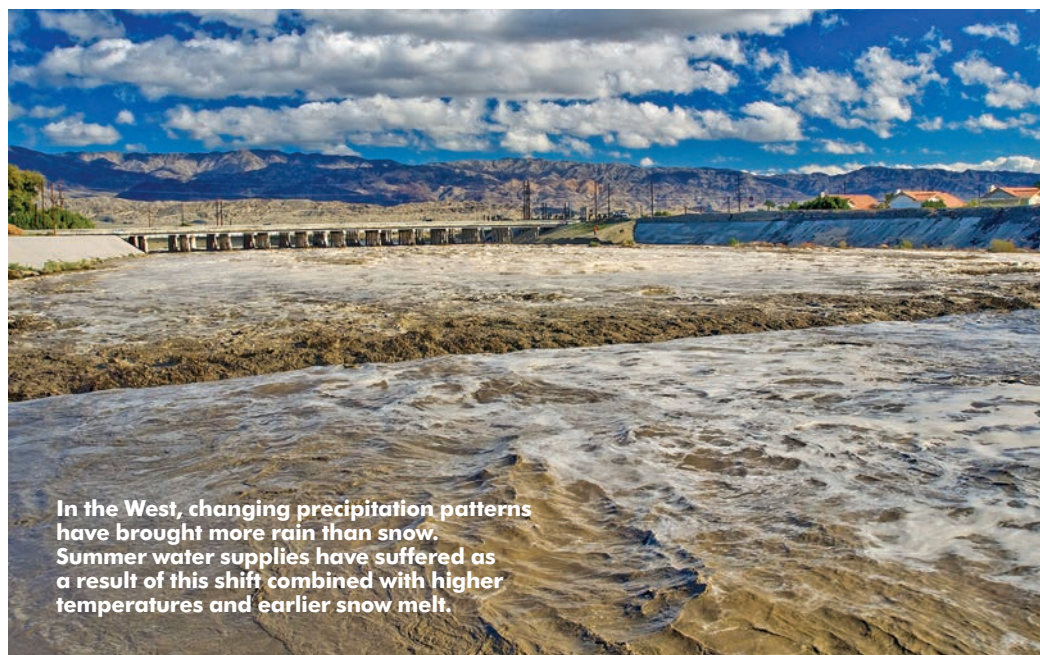


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In the West, changing precipitation patterns have brought more rain than snow. Summer water supplies have suffered as a result of this shift combined with higher temperatures and earlier snow melt.

Whitby: Definitely. Aging infrastructure is one of the risk factors affecting our water systems today. A fair amount of water is lost to system leaks before it even reaches customers. Incentives to diversify and strengthen our water portfolios provide an opportunity to not only retrofit and expand infrastructure, but also to reinvent and fortify our water system for the next century.

Based on your research what factors are necessary for successful implementation of a statewide portfolio?

Whitby: Collaboration and innovation. Collaboration because our water systems are inherently very fragmented with jurisdictions that don't always overlap with municipalities, counties or other agencies such as regulators and land-use plan-

ners. Working together can open doors to identify opportunities that are both locally minded and regionally relevant. Innovation needs to happen not only on the technology side, but also in the form of creative governance and financing mechanisms to make the necessary changes possible.

Ajami: Encouraging regional collaboration, system-level thinking and innovation especially in water governance and business models are essential elements of any statewide water strategy. In response to some of our statewide water challenges, communities around California have started embracing alternative water solutions and diversifying their water portfolio by introducing demand side management strategies such as water reuse, stormwater and rainwater harvesting, and desalinization, among others.

These new water sources are slowly disrupting the top-down model of the water sector and introducing more flexibility and resilience to local water systems, especially during droughts and other natural disasters. But these efforts are not often coordinated, and their implementation suffers from our outdated and fragmented governance models, which need to be disrupted and changed.

About the Author

Michelle Horton is the water communications manager at Stanford University's Woods Institute for the Environment.



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KEEPING TABS ON THE WEATHER

On-site meteorological stations can help utilities gather data to support sound operating decisions and public communication

By Nader Khoury

With the rise of data-driven decision-making, weather monitoring is increasingly important for water and wastewater utilities.

The Internet of Things movement is driving society toward smartphones, smart cities, smart utilities, smart everything. Within inter-operable citywide systems, smart water can play a significant role, and weather monitoring is a part of it.

Access to timely weather information can help empower staff to maximize operating efficiency and make timely decisions. An on-site weather station can help a utility stay on top of changing conditions and respond appropriately.

“We monitor air temperature, wind speed and water temperature. We know from experience what combination of these parameters will cause ice to form on our intake screens and when we need to open the bypass gates.”

Jonathon Sudar

itor air temperature, wind speed and water temperature. We know from experience what combination of these parameters will cause ice to form on our intake screens and when we need to open the bypass gates.”

Rainfall has a significant impact on water management. For example, sewer overflows can adversely affect systems and public health. Rainfall monitoring is key to helping manage flow conditions, whether that means diverting flows or chemically treating releases.

Some normal operations based on weather conditions can be automated with a weather station interfaced to SCADA or a PLC system. Weather monitoring can be used to activate alarms for notification and to exert control based on parameters such as precipitation accumulation, high or low temperatures and high wind speed.

In case of an emergency, such as a chlorine release or spill, the monitoring of temperature, wind speed and wind direction can support effective response, community notification and decisions about evacuation.

Supporting operations

Whether dealing with water supply or treatment, weather affects operations. Procedures are established, taking meteorological factors into consideration. Standard decisions can be automated for normal operations and planned and documented for special circumstances.

“Certain weather conditions trigger actions at our facilities,” says Jonathon Sudar of Central Utah Water Conservancy District. “We mon-



The water reclamation facility in Albany, Oregon, uses an Orion Weather Station all-in-one sensor from Columbia Weather Systems to monitor wind speed and direction with ultrasonic technology, as well as rainfall, temperature, humidity and barometric pressure.

Controlling odors

At facilities near commercial or residential areas, weather data can help forward-thinking plant managers be good neighbors and take steps to reduce odors.

If not dealt with, odor complaints can escalate, bringing negative media reports and pressure on public officials. Temperature, precipitation, wind speed and wind direction influence odor intensity and drift. For example,

(continued)



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Aaron Budiselich monitors Albany, Oregon's weather sensor data with Weather Master software from Columbia Weather Systems. The weather station automatically interfaces with the facility's PLC system.

research shows a positive correlation between hydrogen sulfide concentrations and rising temperature, which facilitates microbial growth.

Monitoring and documenting of weather parameters can help in addressing neighborhood concerns and planning for odor control and mitigation. It helps operators understand how weather affects odors and make sense of how an odor plume disperses.

The Los Angeles County Sanitation District uses weather stations at its water reclamation facilities to help manage odor. Weather stations with 4-20mA signal interface integrate with PLC systems that use FactoryTalk software (Rockwell Automation). Automated weather monitoring provides time-stamped data for documentation and analysis when addressing complaints, and in modeling and mitigation to prevent future odor issues.

Beyond odor issues, weather data can be an important part of a water utility's mission to serve the public and provide communication during extreme weather events that may affect service.

Reservoir conditions

Many water utilities open their reservoirs for public recreation, and these bodies of water are often in hilly terrain, subject to unique microclimates. Here, weather data can enable the utility to keep residents informed of the threats of unsafe conditions, such as rain, high winds and lightning. Weather stations are available with lightning detection in addition to monitoring of temperature, humidity, barometric pressure, wind speed and wind direction.

Believers in weather monitoring include the Jackson Bottom Wetlands Preserve in Oregon, owned by the city of Hillsboro and Clean Water Services. Created as a sewer farm to clean water polluted by canneries and lumbering, the preserve has become a regional draw for research and environmental education.

A weather station in place since 2002 is used for research and education and to provide weather data to the general public by way of Weather Underground, as well as widgets and buttons on the preserve website and city websites.

Promoting conservation

In home-based landscape watering and industrial irrigation, water conservation is based on factors such as rainfall, humidity and temperature.

Public acceptance and cooperation relies on persuasive messaging that can be substantiated with weather data. Whether automated or manual, smart water usage can be as simple as whether or not it is raining, or more complex based on rainfall accumulation or evapotranspiration.

Dealing with extremes

Events such as floods and droughts are occurring more often and with greater intensity. These, in addition to winter storms with ice and high winds, affect the capacity and operations of water infrastructure and services. Managing services around such events includes monitoring conditions for operational safety, recording data for analysis and using weather data to notify the public about service disruptions or contingencies.

Analyzing data

The concept of smart water includes the use of advanced technologies and data to improve efficiency and maintain quality of life for customers. Smart water utilities are adding IoT assets such as meteorological sensors in addition to traditional monitoring of flow, pressure, distribution and consumption.

Weather information can be automatically monitored and archived for periodic and incident reporting. Historical data can be analyzed for process optimization, modeling and planning. Adaptations can be automated based on weather parameters to make adjustments for minor fluctuations and to activate emergency measures based on extreme conditions.

Sudar, of the Central Utah district, observes, "Our weather data is collected through a PLC and stored in a historian program where it can be represented graphically and reviewed. Some of the data is exported and used for modeling for our reservoirs. One place where the data is used is in evaporation modeling."

Another example is handling of overflows. Given certain rainfall parameters, such as the accumulation and rate, combined sewer overflow programs can divert excess flow to storage facilities for processing once a wet-weather event has subsided.

At the Albany Water Reclamation Facility in Oregon, rainfall data is combined with values collected throughout the city to provide a basin profile for meeting regulatory requirements. The data is used to determine storm event ratings when high rainfall conditions result in discharges at permitted sanitary sewer overflow sites.

Putting it together

Weather monitoring can be an important part of smart water and integrated and interoperable citywide systems. Besides serving the utility itself, climate data can improve intelligence in other areas, such as public services and energy. Efficiency is enhanced when departments can share relevant, actionable information.

Facing challenges such as climate change, revenue fluctuation, staff turnover and tightening regulations, water utilities are recognizing advanced technology as a way to give staff the best possible access to information. The data can help empower sound and timely decision-making related to multiple operations: remote pumping stations, wastewater collection, water distribution, sewer diversion, irrigation and wet-weather flow management.

For managing water supply, wastewater or stormwater, weather instruments can provide data to make operations more effective. ♦

About the Author

Nader Khoury is president of Columbia Weather Systems. He can be reached at nkhoury@columbiaweather.com or 503-629-0887.



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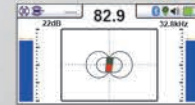
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SETTING GOALS

NASSCO is focused on being the industry source for education, technical resources and advocacy

By Sheila Joy

Last summer NASSCO's board of directors and staff came together for an intensive, two-day retreat in Washington, D.C., to create a strategic plan to guide NASSCO into the future.

The first day was spent identifying NASSCO's internal strengths and weaknesses, as well as external opportunities and threats. The interactive session resulted in a clear path that showed how NASSCO's strengths can be used to take advantage of opportunities, while weaknesses need to be addressed to avoid potential industry threats.

It was important that we clearly define the association's goal. We did so through the lens of the NASSCO mission to set standards for the assessment, maintenance and rehabilitation of underground infrastructure and to assure the continued acceptance and growth of trenchless technologies, as well as NASSCO's vision to increase awareness of aging underground infrastructure and provide viable solutions through education, technical resources and industry advocacy. Ultimately, the goal was identified: to become the industry source.

In order to achieve this long-term goal, NASSCO is committed to focusing on three main areas. The first, education, includes Pipeline Assessment and

Certification Program, Inspector Training and Certification Program and other training programs, as well as new initiatives such as our educational exchange events that are held in different regions around the country.

The second, technical resources, is achieved by NASSCO's highly active committees, which produce specification guidelines, manuals of practice and other important resources including safety videos.

The third, advocacy, is where NASSCO steps in to promote all trenchless technologies, protect them against external threats, and encourage Washington, D.C., and local governments to fund underground infrastructure to protect our communities.

In the coming months and years ahead, NASSCO will continue to support our entire industry with a clear focus on becoming the most trusted, objective and reliable source for education, technical resources and advocacy in the assessment, maintenance and rehabilitation of underground infrastructure.

If you are not yet a NASSCO member, please visit www.nassco.org/join. ♦

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Sheila Joy is executive director of NASSCO. She can be reached at director@nassco.org.

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443-739-9234 • rasiddiqi@gmail.com

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Trainer: Paul Booth
704-681-3989 • woodsidenenv@gmail.com

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Includes: PACP, MACP, LACP
Trainer: Brandon Conley
574-201-7704 • brandonconleypacp@gmail.com

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Trainer: Marilyn Shepard
916-899-8961 • mshepard1@hotmail.com

February 12

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Trainer: Bryan K. Ballard
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February 19

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Includes: LACP, PACP, MACP
Trainer: Jerry Weimer
513-659-5008 • jerryweimerconsulting@gmail.com

February 25

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Trainer: Marilyn Shepard
916-899-8961 • mshepard1@hotmail.com

February 25

Whitestown, ID

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Trainer: Brandon Conley
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Houston

Includes: ITCP - Manhole Rehabilitation
Trainer: Tim Back
513-253-8461 • timbacktwo@gmail.com

March 03

Santa Cruz, CA

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Trainer: Marilyn Shepard
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March 09

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Trainer: Rizwan Siddiqi
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March 11

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Includes: ITCP - CIPP
Trainer: Gerry Muenchmeyer
252-626-9930 • gerry@muenchmeyerassoc.com

March 11

Kansas City, MO

Includes: ITCP - Manhole Rehabilitation
Trainer: Tim Back
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March 12

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Includes: ITCP - Manhole Rehabilitation
Trainer: Tim Back
513-253-8461 • timbacktwo@gmail.com

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Includes: PACP, MACP, LACP
Trainer: Paul Booth
704-681-3989 • woodsidenenv@gmail.com

March 17

Lebanon, NH

Includes: LACP, PACP, MACP
Trainer: Lindsey Sylvester
603-606-4436 • lindsey.sylvester@wright-pierce.com

March 18

Frisco, TX

Includes: PACP, MACP, LACP
Trainer: Jerry Weimer
513-659-5008 • jerryweimerconsulting@gmail.com

March 19

Wichita Falls, TX

Includes: PACP, MACP, LACP
Trainer: Bryan K. Ballard
918-645-1748 • ballardbs@icloud.com

March 24

Durham, NC

Includes: PACP, MACP, LACP
Trainer: Paul Booth
704-681-3989 • woodsidenenv@gmail.com

April 2

Gainesville, FL

Includes: ITCP - Manhole Rehabilitation
Trainer: Tim Back
513-253-8461 • timbacktwo@gmail.com

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• 400' x 1/2" hose on DC Reel
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PIPELINE AND INFRASTRUCTURE, HYDRANTS

By Craig Mandli



COMPONENT

1. Parson Environmental Products GeoLiner

GeoLiner geopolymer mortar from **Parson Environmental Products** provides a suitable bond, corrosion resistance, high strength and low permeability. It is a suitable option for the protection and renewal of large-diameter pipelines and associated structures, tunnels and culverts. Its formulation is a low-carbon-emission, recycled material producing a green, eco-friendly infrastructure rehabilitation product. It is applied using the same tools and equipment the industry has been using for decades. **800-356-9023; www.parsonenvironmental.com.**

HYDRANT

2. EJ WaterMaster 350 fire hydrants

WaterMaster 350 fire hydrants from **EJ** are now available in 350 psi rated working pressure and pressure-tested to twice the rated working pressure (700 psi). They have a ductile iron body and have bolts below grade that are 304 stainless steel. They meet or exceed the requirements of ANSI/AWWA C502, UL 246, Factory Mutual 1510, and NSF/ANSI 61 and 372. Options include CD and BR designs; three-way, two-way or single nozzle configurations; variable nozzle sizes (2 1/2 to 5 inches); a 5 1/4- or 4 1/2-inch valve opening; operating nut (standard pentagon and square sizes, with custom options); color; dust cap; direction of opening (right or left); depth of bury (2 1/2 to 10 feet); shoe connection; and domestic stainless steel bolts. Extension, conversion, breakaway and flange kits are available. **800-626-4653; www.ejco.com.**

PIPE

3. Advanced Drainage Systems HP Storm

HP Storm from **Advanced Drainage Systems** is a high-performance polypropylene pipe for gravity-flow storm drainage applications. It couples advanced polypropylene resin technology with a dual-wall profile design for performance and durability. The smooth interior wall offers additional strength as well as smooth flow. It has an extended bell that adds an additional factor of safety within each joint. It meets or exceeds typical standards for pipe stiffness and joint integrity, and it meets ASTM F2881 and AASHTO M330 for the respective diameters. It is approved for use by the Army Corps of Engineers, Federal Aviation Administration, and American Railway Engineering and Maintenance-of-Way Association. **800-821-6710; www.ads-pipe.com.**

PUMPS

4. BBA Pumps BA150E Trailer Pump Package

The 6-inch **BA150E Trailer Pump Package** from **BBA Pumps** is a dewatering pump that provides a capacity up to 2,090 gpm. Due to the large solid passage of 3.15 inches, combined with a grinding wear plate, the pump is also suitable for sewer bypass projects. The completely galvanized trailer is equipped with a large composite fuel tank. The lifting device also serves as a protective cover for pump and engine. The height of the pintle hitch can be adjusted, and the trailer is fitted with all the necessary safety provisions. **843-849-3676; www.bbapumps.com/us.**

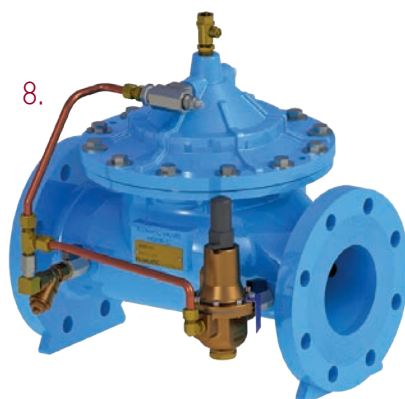
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6.



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5. Boerger BLUEline rotary lobe pump

The **BLUEline** rotary lobe pump from **Boerger** is a self-priming, valveless, positive displacement pump used to convey viscous and abrasive materials. There are 21 pump models in six series with pulsation-free operation, fully reversible rotation, dry-run capabilities and flow rates up to 7,500 gpm. The pumps are stable and wear resistant with a maintenance-in-place design that allows for all wetted parts to be easily replaced through the front cover without the removal of pipe or drive systems. **612-435-7300; www.boerger.com.**

6. Gorman-Rupp ReliaPrime

Designed to deliver the benefits of sound-attenuated silent pumps, the **ReliaPrime** emergency bypass station from **Gorman-Rupp** operates on natural gas. The engine-driven pump comes with autostart and level controls that allow it to start and stop in response to the liquid level. The unit includes a 3-inch Ultra V Series pump capable of passing a 3-inch spherical solid, and it offers a soundproof, lightweight aluminum enclosure with lockable door panels that can be removed for maintenance of the pump or engine. The unit is a complete backup package ready for hookup for primary pump repair and additional pumping capacity, or during emergencies and power outages. **419-755-1011; www.grpumps.com.**

7. Reed Pump Stick

The **Pump Stick** cordless water transfer pump from **Reed** provides a portable, job site-friendly way to remove water. Applications for the battery-operated liquid transfer pump are numerous. It can be used with the operator's own 18- to 20-volt battery by replacing the battery adapter plate with one designed for common, slide-style batteries. It has a hard shell, aluminum main body shaft; and to protect the impeller, choose from multiple screens, strainers and filters to find the right application. It comes with a 2-foot hose, with 4- and 7-foot hose extensions, plus a hose coupling available. Its long, slim design allows the operator to place the pump deep into small cavities. It can lift water up to 12 feet. A comfort grip handle at the top brings the pump to 4 feet for operational ease. **800-666-3691; www.reedmfgco.com.**

VALVES

8. Flomatic Valves Automatic Control Valves

Flomatic Valves Automatic Control Valves are designed for use with various types of pressure and electric controls to provide the desired control of pressure or flow for a variety of water system applications. Pilot-operated control valves are built in compliance with AWWA C530 standards. NSF/ANSI 61 approved, fusion-bonded, epoxy-coated ductile iron globe- or angle-style bodies are available standard in full- or reduced-port configuration. Valves are fitted with various pilot control systems to control conditions in pressurized pipeline systems. Automatic Control Valves are in full compliance with the American Iron & Steel provisions for affected Federal or State Revolving Fund projects. Available in sizes 1 1/4 through 36 inches, they are manufactured under a certified ISO 9001:2015 and ISO 14001:2015 quality and environmental system programs. **518-761-9797; www.flomatic.com.**

9. Smith & Loveless RapidJack

RapidJack clean check valves from **Smith & Loveless** eliminate the need for time-consuming valve disassembly and interim piping realignment. Technicians can quickly access the pipe by opening the valve's top and pulling the arm assembly up and out. This simple process consists of removing four bolts, detaching the spring and lifting it free from the check valve body. Once it is out, the technician can clear any obstructions and remove any stringy items from around the arm. After a quick clean, insert the top piece back into the body, replace the four bolts and put the pipe back in service. The entire process typically takes less than 15 minutes. **913-888-5201; www.smithandloveless.com. ♦**

Manhole riser prevents infiltration and improves public safety



Problem:

The St. Louis Water department raised manholes to grade by manually exposing and lifting concrete grade rings, a process that takes several hours and compromises new paving lifts. After jackhammering and raising, the newly raised rims have to be sealed in with new concrete, creating seams in the new pavement that wear faster than undamaged concrete. It was clearly a problem, so it made sense to do a pilot test with an adjustable riser.

Solution:

The **American Highway Products** riser relies on a pivoted turnbuckle that can be expanded with a screwdriver. The screwdriver, used as a lever, exerts thousands of pounds of mechanical force, seating the riser in the original rim solidly and securely. "For the pilot test, we put a riser in an intersection on Kingshighway Boulevard, one of our busiest downtown roads," says Vince Foggie, St. Louis Water department superintendent. "It was easy to install, stayed put and didn't cause any problems, and it didn't rattle. It was very encouraging, especially since we were getting behind on paving at the time."

RESULTS:

The at-grade risers were better for the roads in many ways. They didn't set low, so water didn't collect around the manhole lid, causing excessive infiltration. The city was able to save time and money, do more water department work and keep the public safer. **888-272-2397; www.ahpl.com.**

Historical knowledge makes valve replacement easier



Problem:

During a comprehensive inspection of Los Angeles' largest sewerage treatment facility, officials at the Hyperion Water Reclamation Plant discovered deterioration of its primary outfall pipeline, which wasn't unusual given that it was over 60 years old. The inspection also revealed that 10-year-old isolation butterfly valves on the suction and discharge sides of the vertical turbine effluent pumps needed to be refurbished or replaced. When tide and plant hydraulic conditions allow, plant effluent flows with gravity through a 120-inch-diameter butterfly valve to the plant's 5-mile outfall pipeline without the use of pumps. Failure of any of these valves could create a backflow event that would flood the plant.

Solution:

Fortunately, the city had documented that the five existing 60-inch butterfly valves and five 78-inch valves were Pratt-brand valves from **Mueller Water Products**, installed in the early 1970s. Knowing this information meant original project files, parts and replacement valves could be on hand before starting the work. This made the decision to refurbish or replace an easy one upon discovery of the extracted valves, saving valuable time. The critically important 120-inch butterfly valve needed to be replaced with a new actuation system. Moog Flo-Tork designed an actuator that required 13.9 gallons of hydraulic oil per stroke with a rated working oil pressure of 3,000 psi.

RESULT:

The new actuation system worked very well in tandem with the new butterfly valve. Since the installation, all 11 valves have operated flawlessly, giving plant managers and residents an upgraded level of safety and providing necessary protection of the Santa Monica Bay shoreline. **800-423-1323; www.muellerwaterproducts.com.**

CASE STUDIES

PIPELINE AND INFRASTRUCTURE, HYDRANTS

Chopper pump used to clear wet well of grease blanket



Problem:

The Otay River Pump Station, which pumps 7 to 9 mgd of raw sewage to the South Bay Water Reclamation Facility for water recovery in San Diego, had a problem in the 50-foot-long, 10-foot-wide, 30-foot-deep wet well. A floating blanket of grease and debris, sometimes as thick as 4 feet, would form regularly. The city was hiring two vacuum trucks to clean the station every three to four months at a cost of \$50,000 to \$100,000 per year.

Solution:

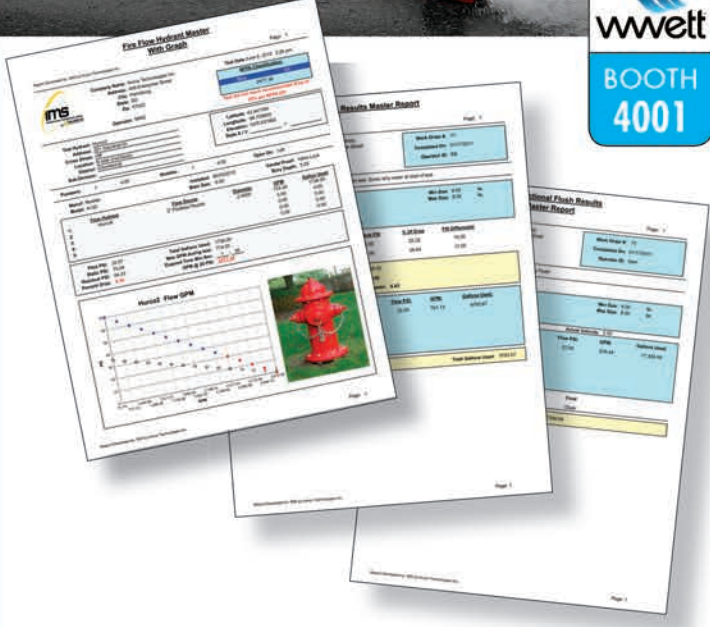
The city installed **Vaughan** chopper pumps, which are suitable for use in pump and lift stations as conditioning pumps when fitted with a nozzle to provide high-velocity mixing. They were placed in the problem wet well on a portable stand to recirculate and chop the contents. The company selected an 8-inch submersible chopper pump with a 25 hp, 1,200 rpm motor with mixing nozzle and portable stand.

RESULT:

In 18 months of use, the wet well has not required cleaning. The pump paid for itself in 2 1/2 months. 888-249-2467; www.chopperpumps.com.







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Product Spotlight

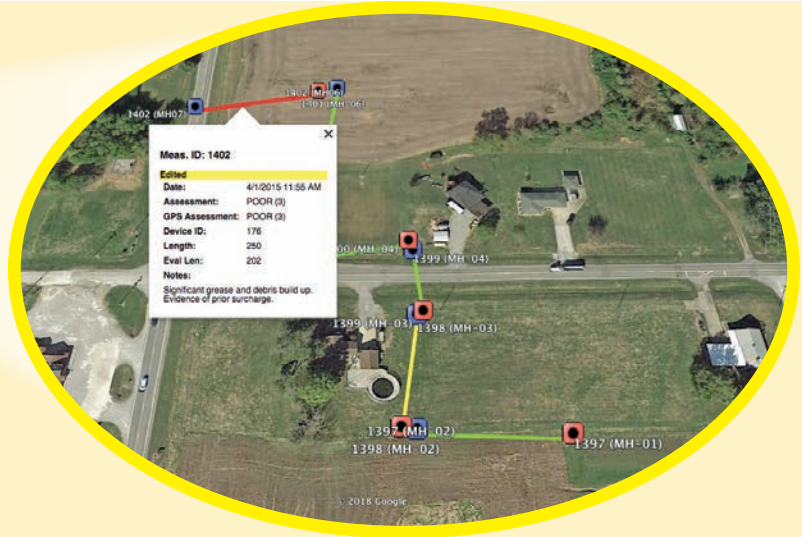
Program helps manage inspection data

By Craig Mandli

So you've used your new Sewer Line Rapid Assessment Tool, or SL-RAT, to inspect thousands of feet of your municipal pipeline. Now how are you going to organize that data?

The Sewer Line Data OrGanizer, or SL-DOG, is a secure, cloud-based web portal from InfoSense that complements the company's SL-RAT. As the only data management software specifically designed to work with SL-RAT's acoustic assessment data, it allows users to view their acoustic scores, add notes or edit a measurement's GPS coordinates. The data is archived in a secure cloud environment for continued access. Users can create reports and visualize their inspection data by exporting to industry standard programs such as ArcGIS, PDF, Excel or Google Earth. According to Diane Ryu, product and marketing manager for InfoSense, helping keep utilities organized and efficient is the end goal.

"Over 300 utilities are already using the SL-RAT to rapidly screen their system for blockages before deploying cleaning or CCTV resources. With so much data generated each day, users need ways to manage and understand their acoustic scores," she says. "Using SL-DOG to comprehend and visualize acoustic inspection data can help with the decision-making process for where cleaning and CCTV resources should be deployed. Furthermore, the acoustic scores are archived for future access, allowing users to improve asset management with historical data as their program matures."

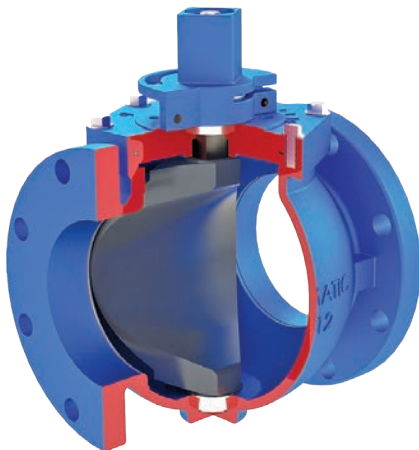


In the field, operators can use the SL-DOG mobile app to add notes to each measurement while conducting tests. Notes such as segment ID or basin ID can be meaningful when referencing the data at a later point. After testing is complete, users upload the assessment scores to the web portal. The comprehensive list of all measurements historically uploaded to the portal can generate useful reports and visualizations.

"Utilities today are looking for ways to optimize their resources to better tackle mounting challenges such as aging infrastructure or population growth," Ryu says. "Transitioning from a time-based cleaning program to one that factors in conditions of the pipe can significantly reduce unnecessary cleaning and allow resources to be focused on areas with the greatest identified need."

According to Ryu, that increased efficiency may be the program's most important feature.

"SL-RAT is already used by hundreds of utilities to rapidly inspect and understand pipe conditions," she says. "SL-DOG helps them optimize those acoustic inspections by facilitating data collection, management and data visualization." **877-747-3245; www.infosense.com.**



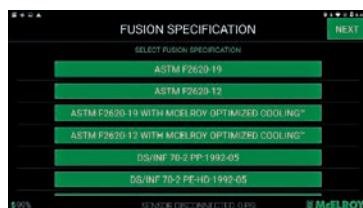
Flomatic Valves Model 5400 Flo-E-Centric plug valve

Flomatic Valves' Flo-E-Centric Model 5400 is an energy-efficient round-port eccentric plug valve designed in compliance with AWWA C517-16. The body, bonnet and NBR-encapsulated plug are constructed of ASTM A536 grade 65-45-12 ductile iron. The body and bonnet come standard with fusion-bonded NSF 61 epoxy powder-coated, inside and outside. The valve stem is equipped with V-type packing that is self-adjusting and replaceable while the valve is under pressure. Flomatic plug valves incorporate a nickel-welded seat for

long service life and are designed primarily for applications where slurries, solids or grit are present. Designed for both on-off function and process control in industrial and municipal applications, the Model 5400 is available in six different configurations in a size range from 2 through 24 inches. They are also available with a bare stem, operating nut, mechanical joint plug, electric actuator, gearbox and with standard ISO top-mounting flange. **800-833-2040; www.flomatic.com.**

McElroy DataLogger 6

The DataLogger 6 from McElroy brings productivity improvements and new features that allow users to document and analyze more of their job sites. These enhancements in Version 1.15 include Optimized Cooling, which reduces the minimum cool time based on a new formula that is compliant with ASTM F2620. The formula includes the ambient temperature, pipe temperature, weather conditions, heat soak time and pipe wall thickness for each joint. In addition, the update includes the ability to capture pressure tests in the field. **918-836-8611; www.mcelroy.com.**



Ditch Witch RT80 trencher

The RT80 trencher from Ditch Witch offers a narrower footprint and a modular design to fit and function in small, urban environments. The narrower, more modular design is ideal for heavy-duty trenching, vibratory plowing and microtrenching in confined urban and residential areas where larger machines cannot maneuver as freely. With the typical residential street lane having a width of 11 feet, the RT80's footprint of just over 6 1/2 feet gives operators plenty of room to work without disrupting the surrounding area. The trencher is powered by a 74.5 hp DEUTZ Tier 4 diesel engine. It delivers a static load rating of 35,407 pounds and a wide-axle rating of 39,000 pounds. **800-654-6481; www.ditchwitch.com.**



VMAC 6-in-1 multifunction power system

VMAC released its 6-in-1 multifunction power system with a Caterpillar engine, which is now available to Cat dealers and other customers across North America. The VMAC multifunction includes a rotary screw air compressor, generator, welder, battery booster/charger, PTO with optional hydraulic pump and integrated cold-climate kit. It has a C1.1 industrial diesel engine that utilizes lower engine speeds, reducing noise, and is easy to maintain due to single-side servicing. The C1.1 also requires less maintenance and only needs to be serviced every 500 hours. **800-738-8622; www.vmacair.com.**



Vanair Start-All Jump Pack portable jump starters

Vanair's Start-All Jump Pack portable jump starters are built to safely deliver fast starts to a wide variety of vehicles. A high-output premium lithium-ion battery provides maximum performance and longevity, while proprietary Protect-All technology enables the Start-All Jump Pack units to safely transfer instantaneous energy to the battery. The models provide safety features for worry-free jump starting, including reverse polarity, low-voltage protection, short circuit overheat protection and over-discharge protection. Integrated heavy-duty cables with large metal clamps for maximum safety and protection are included on all models. **800-526-8817; www.vanair.com.** ♦



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USL Group acquires Logiball

USL Group announced that it acquired Logiball, headquartered in Québec. Terms of the transaction were not disclosed. Logiball's main product range is test-and-seal injection packers, which are used to confine and apply grouts for the repair of points of water ingress and egress from pipes, such as leaking joints or cracks.

Jack Doheny Cos. changes its name

Jack Doheny Cos. changed its name to Jack Doheny Co. to reflect a single, uniform, standard experience. The company stated that, no matter what location you use, a standard, premium experience will be provided. The company also updated its website to include a modern design, mobile-friendly features and a nationwide parts, tools and accessories store.

WWETT Show slated for Indianapolis

From Feb. 17 to 20, the Water & Wastewater Equipment, Treatment & Transport Show will take place at the Indiana Convention Center. With new dates for 2020, the four-day trade show has over 100 education sessions and also offers business opportunities, collaboration with industry professionals, a slate of live demonstrations, exposure to cutting-edge technology trends, and the latest product launches across multiple industry segments.

The Strong Co. completes ISO certification

Upon completion of an extensive quality system evaluation, The Strong Co. announced receipt of its ISO 9001:2015 certification. This certification of quality management system standards reflects the company's commitment to creating and maintaining quality processes that ensure consistency, visibility and accountability across its business operations to provide a total system of engineered products, specialized equipment and complete customer service.

CUES opens new sales and service center in Estacada, Oregon

CUES announced the grand opening of its new, larger sales and service center in Estacada, Oregon, just outside of Portland. The factory-certified center will provide CUES customers with direct access to all levels of customer service, loaner equipment support and new equipment sales. It features over 6,000 square feet of offices, inventory, shop and service space.

AEM Hall of Fame inducts Andringa of Vermeer

The Association of Equipment Manufacturers announced the newest inductee to the AEM Hall of Fame, Mary Andringa of Vermeer. The AEM Hall of Fame recognizes individuals whose innovations, ideas and leadership have advanced the off-road equipment manufacturing industry and contributed to its success in the past and into tomorrow. She is chair of the board at Vermeer after filling roles as CEO, co-CEO, president and chief operating officer. Her level of passion and commitment have made her a voice of change and innovation not only at Vermeer, but in the industry and community.

MAB-PPI HDPE repair guide available

Published by the Municipal Advisory Board with assistance from the Plastics Pipe Institute, the "MAB Basic HDPE Repair Options," MAB-4, details the various methods and steps for repairing a HDPE pipeline in the field. The document is available online free of charge at www.plasticpipe.org/pdf/mab-basic-hdpe-repair-options-mab4.pdf.

Crescent adding Crescent APEX brand

Crescent Tools announced that Apex Tool Group is bringing the APEX Industrial Fastening brand under the Crescent umbrella as Crescent APEX. The new Crescent APEX brand will offer power tool accessories used by industrial and construction tradesmen, including their professional line of u-GUARD nonmarring covered tools. Crescent APEX becomes the sixth brand under the Crescent name, joining Crescent Wiss, Crescent Lufkin, Crescent Nicholson, Crescent H.K. Porter and Crescent JOBOX.

VMAC welcomes back Schaum

VMAC announced it welcomed back Mike Schaum to its outside sales team, serving VMAC dealers and end users in the Southern U.S. territory, which includes Texas, New Mexico, Kansas, Oklahoma, Missouri, Arkansas, Louisiana and Mississippi. He will be supporting and growing the VMAC dealer network and meeting with end users to learn about their specific needs and find solutions to overcome their challenges. ♦



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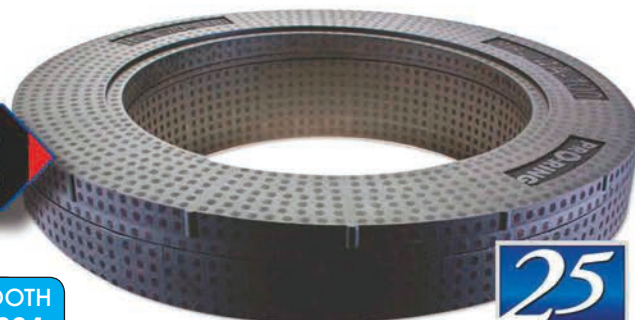
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PEOPLE/AWARDS

Chris Bird retired after serving for 25 years as director of the Alachua County (Florida) Environmental Protection Department. Handling stormwater issues was among his duties.

Chad Polsky was hired as the public works superintendent for the Village of Thomasboro (Illinois).

Wightman, an architecture, engineering, environmental and surveying company, received a Michigan Award from Keep Michigan Beautiful for its rain garden beautification project, which collects and filters pollutants from stormwater runoff before the water enters the Ox Creek watershed.

The **town of Newmarket** (Ontario) received a Healthy Water Award at the Lake Simcoe Region Conservation Authority's 2019 Conservation Awards ceremony. The town was honored for its commitment to more environmentally friendly winter maintenance practices, which resulted in smaller amounts of harmful stormwater runoff going into stormwater ponds, wetlands, lakes and streams.

Korey Barnes was hired by Georgia's DeKalb-Peachtree Airport as its environmental analyst. Among his responsibilities is managing environmental events for stormwater compliance.

The **Anne Arundel County (Maryland) Department of Public Works Watershed Protection and Restoration Program** received a National Municipal Stormwater and Green Infrastructure Award from the Water Environment Federation.

The **city of Columbia** and **Woolpert** were honored by the South Carolina American Public Works Association with its Project of the Year award in the category of structures/historical restoration for their Martin Luther King Jr. Park Detention and Water Quality Project. The collaboration resulted in an offline dry detention area to assist with stormwater attenuation, as well as increased overall stormwater storage capacity.

Fort Wayne (Indiana) City Utilities received a Sustainable Water Utility Management Award from the Association of Metropolitan Water Agencies. It was honored for several reasons, including consistent stewardship to protect the environment through projects that reduce pollution in stormwater runoff. ♦

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CALENDAR

Feb. 17-20

Water & Wastewater Equipment, Treatment & Transport Show, Indiana Convention Center, Indianapolis. Visit www.wwettshow.com.

Feb. 18-20

Illinois Rural Water Association Conference, Holiday Inn, Effingham, Illinois. Visit www.ilrwa.org.

Feb. 25-28

Utility Management Conference, presented by the Water Environment Federation and American Water Works Association, Hyatt Regency Orange County, Garden Grove, California. Visit www.awwa.org.

March 23-26

American Water Resources Association Geospatial Water Technology Conference, DoubleTree by Hilton, Austin, Texas. Visit www.awra.org.

March 29-April 1

American Water Works Association Sustainable Water Management Conference, Hyatt Regency, Minneapolis. Visit www.awwa.org.

April 14-17

Center for Watershed Protection National Watershed and Stormwater Conference, Renaissance Austin Hotel, Austin, Texas. Visit www.cwp.org.

April 19-22

American Public Works Association North American Snow Conference, Cleveland (site TBA). Visit www.apwa.net.

May 17-21

World Environmental & Water Resources Congress, presented by the Environmental & Water Resources Institute of the American Society of Civil Engineers, Green Valley Ranch Resort, Spa and Casino hotel, Henderson, Nevada. Visit www.ewricongress.org.

May 20-21

American Society of Civil Engineers Watershed Management Conference, Green Valley Ranch Resort, Spa and Casino Hotel, Henderson, Nevada. Visit www.asce.org.

July 12-15

American Society of Agricultural and Biological Engineers Annual International Meeting, CHI Health Center, Omaha, Nebraska. Visit www.asabe.org.

Aug. 9-12

American Society of Civil Engineers Pipelines Conference 2020, San Antonio Marriott Rivercenter, San Antonio. Visit www.asce.org.

Aug. 18-22

StormCon, Hyatt Regency, Atlanta. Visit www.stormcon.com.

Aug. 30-Sept. 2

American Public Works Association Public Works Expo (PWX 2020), New Orleans (site TBA). Visit www.apwa.net.

Sept. 14-16

National Rural Water Association WaterPro Conference, Phoenix (site TBA). Visit www.nrwa.org.

Oct. 28-31

American Society of Civil Engineers 2020 Convention, Disneyland Hotel, Anaheim, California. Visit www.asce.org.

Nov. 9-12

American Water Resources Association Annual Conference, Embassy Suites by Hilton Orlando Lake Buena Vista South, Kissimmee, Florida. Visit www.awra.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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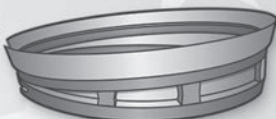
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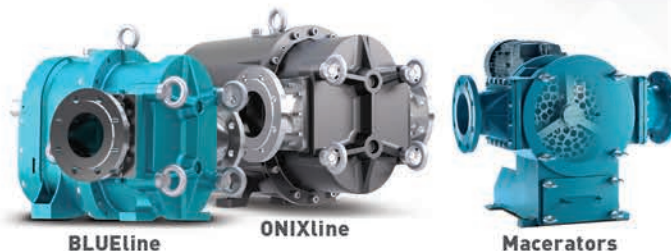
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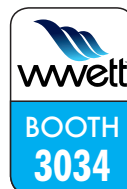
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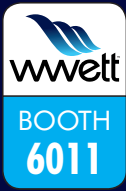
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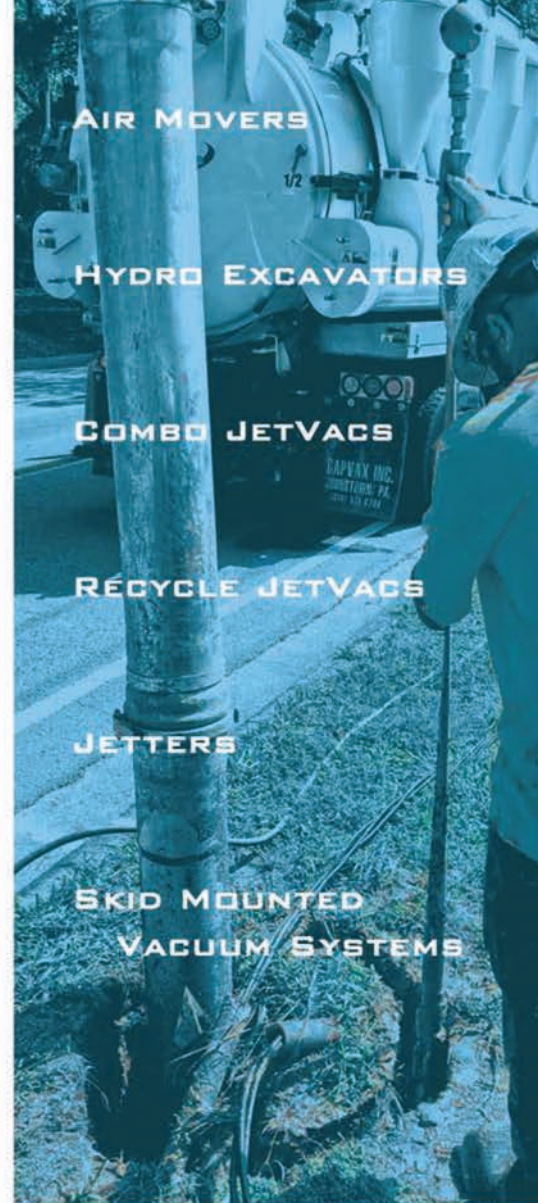
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