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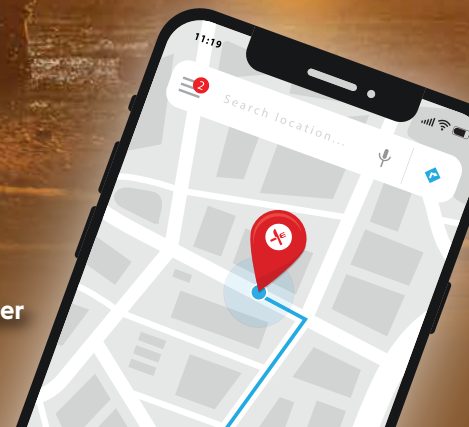
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Nazario Prieto, the assistant water services director with the Phoenix Water Services Department, stands at the 23rd Avenue Wastewater Treatment Plant in Phoenix. The utility is working toward developing a more sustainable water supply through advanced water purification. (Photography by Mark Henle)



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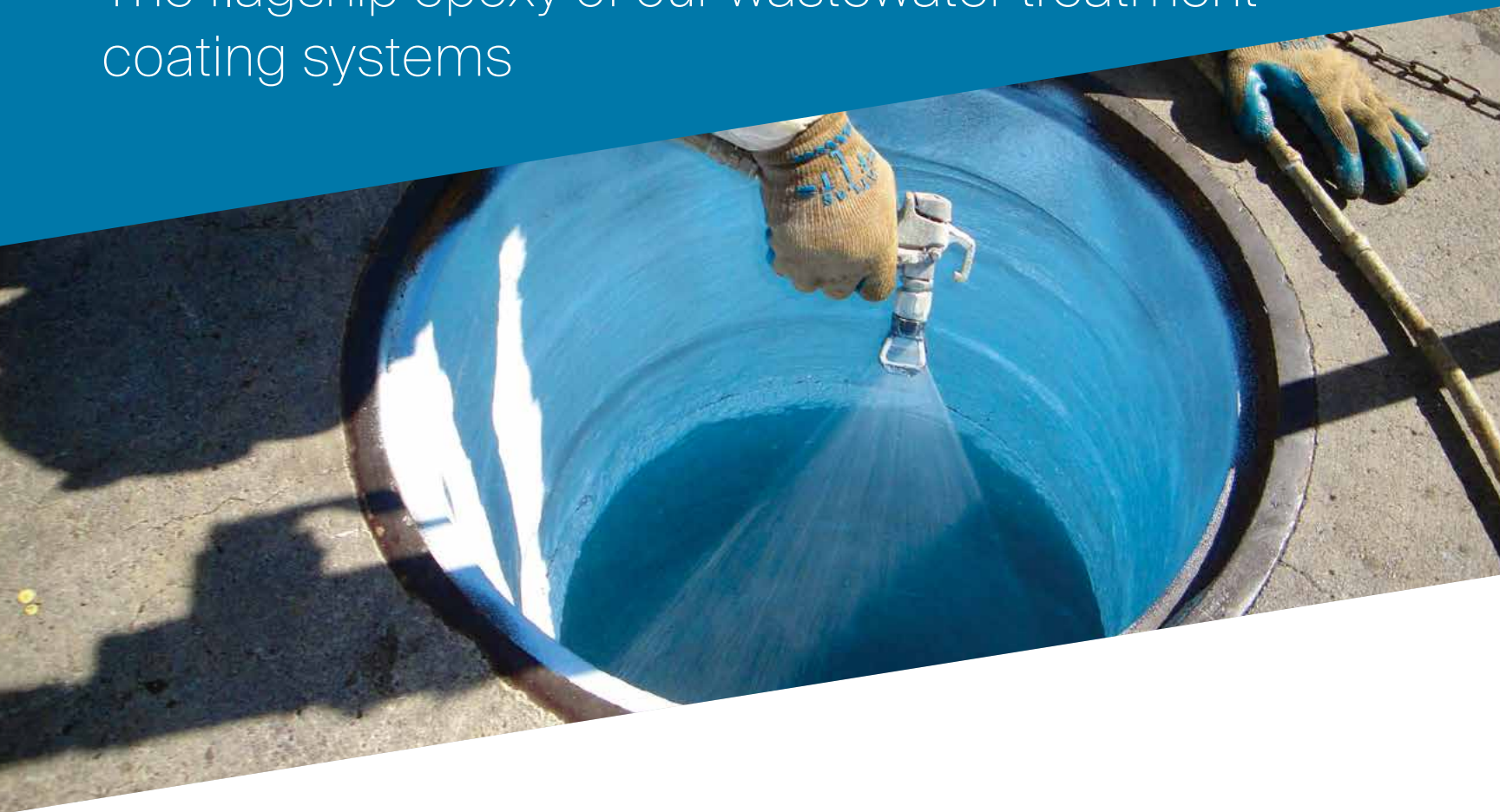
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Luke Laggis

LOG IN OR DRINK?

The modern world operates online, but humans have greater needs

The internet has changed our lives in countless ways, many for the better and some not so much. But good or bad, it has reached into every corner of modern life.

Want to convert imperial measurements to metric? Look up the track listing for “Dark Side of the Moon?” Find out how to rewire the lights on a utility trailer? It’s all there — more information that one person could ever take in.

We feel crippled now when there’s no Wi-Fi or — gasp — no cell coverage. The internet has in so many cases become our physical, mental and spiritual guide. Still, when it comes to the basic, essential needs of humans, it is inconsequential. I assure you, being able to look up the best method for hard-boiling eggs doesn’t compare to the importance of access to clean, safe drinking water.

I recently read a story about the Broadband Equity Access and Deployment Program, announced last summer, that quoted President Biden saying universal internet access is “just as important as electricity or water.” The comparison struck me.

You can give me the best internet connection known to man, Wi-Fi boosters in every room and a monitor on every wall, but I’ll still be dead in a few days if I

don’t have any water.

While I did have to google “how long can I live without water” before I wrote that sentence, I don’t need to do any research to know water is more important than internet service. It’s a laughable statement.

As I mentioned in this column back in February, the Los Angeles-based non-profit DigDeep estimates that more than 2 million people in the U.S. live without running water or basic indoor plumbing. An additional 44 million Americans live with water systems that have been in violation of the Safe Water Drinking Act. And 43 million more Americans rely on water from wells that are threatened. DigDeep says the economic impact of this water gap is measured in billions of dollars annually.

Contrast that with these numbers from the National Telecommunications and Information Administration: 24 million U.S. households are offline, and 58% of those express no interest or need to be online.

Imagine expressing no interest or need for safe drinking water.

I’m a proponent of infrastructure investment in general, be it for water systems, roads, the power grid or internet service. These are all things that build a better base for our future. It just seems like priorities aren’t necessarily in order when we’re focused on making sure everyone has high-speed internet when some don’t even have water. And while that may be an oversimplification of the issue, no one is going to get sick or die because they lack broadband service.

The work you do is critical. It’s far more important than many of the other services we depend on daily. I could write this column on a typewriter, but I couldn’t do it without water.

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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RENEW BREW

The Carolinas' First Reuse Beer

Charlotte Water, Town Brewing and Xylem recently announced Renew Brew, the first beer in the Carolinas brewed with QC Water, a sustainable recycled water. Renew Brew is a limited-edition pale ale and first debuted at the Queen City Brewers Festival where it won Best in Show.

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PUBLIC OUTREACH

Taking Treatment Plants to the Classroom

After facing increasing demand for student tours, WSSC Water, Maryland's largest water and sewer utility, created its award-winning Introduction to Wastewater Treatment Virtual Unit for educators. The unit highlights two of its treatment plants with a virtual tour and a curriculum guide. mswmag.com/featured

OVERHEARD ONLINE

“As we have seen in recent months, threat actors are attacking physically and especially via the internet, the operations of utilities of all kinds around the country.”

—NRWA and WaterISAC to Collaborate on Cybersecurity Guidance for Rural Utilities
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MEETING WATER CHALLENGES

University Unveils New Institute

Rice University recently unveiled its new WaTER Institute, which seeks to address the widespread lack of access to clean municipal drinking water in America, along with other complex water-related challenges. The initiative aims to improve public health, energy efficiency and infrastructure resilience.

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CONVERTING WASTEWATER TO TAPWATER

Phoenix utility aims to turn wastewater into high-quality drinking water

By Ken Wysocky

For years, proposals have been floated for what some might consider the Holy Grail of the water industry, especially in drought-stricken regions: converting wastewater into high-quality drinking water.

But if everything goes according to plan — albeit on a small scale initially — that long-standing dream will become a reality in Phoenix by 2028, says Nazario Prieto, assistant water services director at the Phoenix Water Services Department.

To accomplish this, the city plans to rehabilitate its Cave Creek Water Reclamation Plant, located on the city's far north side. The facility was built in 2000, then mothballed in 2009 due to lower-than-expected population growth, he says.

If the Phoenix City Council approves the proposed \$300 million project, the facility will initially supply recycled water to existing reuse customers and for groundwater recharge. If it then becomes the city's first facility to use an advanced water-purification system to convert wastewater into high-quality drinking water, it could initially produce 5 to 6 million gallons per day.

But that can't happen until state officials finish drafting rules governing this process.

"We always thought that someday, the Cave Creek facility could house Phoenix's first advanced water-purification system,"



PHOTOGRAPHY BY MARK HENLE

Prieto says. “Now it’s finally close to becoming a reality.

“We believe it’s a great first step toward developing a more sustainable source of water supply,” he says.

“This absolutely represents the future of water,” Prieto adds, noting that Phoenix already treats around 132 million gallons of wastewater per day, so there’s plenty of wastewater available for recycling.

Precarious water supply

Phoenix obtains about 60% of its water from the Salt and Verde rivers, which are fed by snowmelt from mountains north of Phoenix. The Colorado River contributes roughly another 40% of the city’s water supply. Underground aquifers also supply a small amount.

Two primary factors have pushed adoption of advanced water purification technology, which has been available for years, to the forefront. The first factor is the prolonged mega-drought in the Southwest, which over the years has resulted in lower and lower water allocations from the Colorado River, even as the state’s population continues to surge, Prieto explains.

“For us, it’s a matter of diminishing water resources,” he says. “We need to supplement water shortages stemming from reductions in Colorado River allocations.

“We know further reductions are coming, so we’re trying to look ahead to ensure we have the right water portfolio for now and in the future,” he continues. “And advanced water purification is one piece of the puzzle.”

Furthermore, prior to 2018, the state didn’t allow cities to use recycled water for direct potable reuse; it only allowed indirect potable reuse, Prieto points out.

Rigorous purification process

The advanced water purification process involves taking treated effluent and running it through additional treatment processes to remove everything from bacteria, pathogens and viruses to chemicals and heavy metals. The end product is high-quality drinking water that meets or exceeds all state and federal regulatory standards and that draws taste comparisons to bottled water.

The first step in the purification process is microfiltration, which uses membrane bioreactors to remove solids and create effluent. This system will be housed inside the Cave Creek facility. The equipment for the other processes will be located in a roughly 44,000-square-foot addition to the facility; construc-



PROFILE:

Phoenix Water Services
Department, Phoenix, Arizona

POPULATION SERVED:
About 1.7 million people

WATER SERVICE AREA:
About 540 square miles

WATER CUSTOMER BASE:
Roughly 465,000 accounts

WATER INFRASTRUCTURE:
5 treatment plants, about 7,100 miles of water mains, 70 reservoirs, 110 booster pumping stations, around 56,000 fire hydrants

CAPACITY OF WATER TREATMENT PLANTS:
Up to 660 mgd

AVERAGE DAILY USE:
Approximately 246 mgd

WASTEWATER INFRASTRUCTURE:
2 active treatment plants, around 5,017 miles of sewer mains, approximately 100,223 manholes, 28 lift stations

SEWER CUSTOMERS:
About 2.1 million

WASTEWATER TREATMENT CAPACITY:
Roughly 293 mgd

AVERAGE DAILY TREATMENT:
About 132 mgd

EMPLOYEES:
About 1,500

WEBSITE:
phoenix.gov/water



The Cave Creek facility could be operational by 2026 and could start supplying Phoenix residents with drinking water in 2028.

“We believe it’s a great first step toward developing a more sustainable source of water supply.”

Nazario Prieto

ologies, depending on what state regulations will require,” he says. “We may even need additional treatment after the advanced purification.”

The Arizona Department of Environmental Quality is developing those water quality regulations, which should be finalized by the end of 2024, he says.

“What we’re planning to do so far is in line with the roadmap under development by the ADEQ. We’re basically making an educated guess about what processes will get us there.

“If our processes are too good, we’ll live with it,” Prieto adds. “And if they’re not good enough,

tion is expected to start in early 2024.

The series of purification steps will include reverse osmosis, ultrafiltration, an ultraviolet advanced oxidation process (which destroys chemicals and pathogens) and chlorination. A granular activated carbon filtration system could also be installed, Prieto says.

“We will use a combination of these technol-

COMBATTING THE ‘YUCK’ FACTOR

Aside from the tremendous cost, one of the biggest challenges of implementing a direct potable reuse program is the so-called “yuck” factor — the public’s perception that drinking wastewater that’s converted to potable water through an advanced water purification system is just flat-out gross.

This perception persists despite the fact that advanced water purification processes produce water that meets or exceeds state and federal water quality standards. In fact, studies have found that treated water is less likely to have contaminants than untreated river or lake water.

Some utility customers aren’t convinced. In 2019, for instance, a proposal to convert wastewater into potable water in Tampa was shot down by staunchly opposed residents. And several similar project proposals in California reportedly were scuttled in the 1990s.

While this mindset may still prevail in some areas, there’s little evidence of it in Phoenix, where the city’s Water Services Department is planning for two advanced water purification systems after rules governing them are finalized by state officials, says Nazario Prieto, the utility’s assistant water services director.

The utility’s Cave Creek Water Reclamation Plant, which could soon be rehabilitated pending a city council vote, could be the city’s first facility to use recycled water for drinking purposes in the future. It could initially produce about 5 to 6 million gallons of potable water a day.

“We haven’t seen too much opposition,” Prieto says. “We’ve found that, for the most part, people are very positive about this — they understand that we live in a desert and water supplies are diminishing.

“Some people still may not like the idea, but we have to keep working on educating them.”

The utility is developing a public relations campaign aimed at winning over doubters.

“We plan to put out enough information and talk to our customers as we go through this process,” he explains. “We need to keep explaining that what we’re doing is good for Phoenix and produces safe, high-quality water — not toilet water.”

The campaign will include a mobile trailer the utility will take to public events that will feature displays explaining how the purification process works.

“People will even be able to taste the recycled water,” Prieto adds.

Prieto also points out that anyone who lives in an area that obtains its drinking water from a river or other large bodies of surface water is, in effect, drinking water that includes discharged treated effluent.

“If you live along the Missouri or Mississippi rivers and many other rivers, communities upstream from you are discharging treated effluent into them,” he says. “This happens all over the place. There’s no such thing as ‘new’ water.”

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“We’re always looking at ways to expand our portfolio of water resources and operate in a responsible way.”

Nazario Prieto

plying some Phoenix residents with drinking water in 2028, following a two-year pilot program in which the utility will fine-tune the facility’s operations, train operators, collect data and demonstrate to regulators and customers that it can produce safe and healthy water.

A handful of innovators

Phoenix is not the only city in the United States either considering or moving forward with so-called “direct potable reuse” projects. They offer the promise of more sustainable water supplies for large cities because the amount of wastewater they produce typically represents 50 to 60% of the total water supplied, according to the U.S. Environmental Protection Agency.

California regulators approved new rules in December 2023 that allow water utilities to proceed with such projects. According to published reports, several large California water agencies in the state subsequently have announced plans for direct potable reuse projects, including the Metropolitan Water District of Southern California, which serves 19 million people; the San Jose-based Santa Clara Valley Water District; the San Diego Public Utilities Department; and the Los Angeles Department of Water and Power.

Similar efforts also are underway in cities in Arizona, Colorado, Florida and Texas, including El Paso.

Furthermore, other water agencies nationwide — such as the Orange County Water District — already use recycled wastewater to replenish aquifers that supply drinking water, a practice known as indirect potable reuse.

Prieto says implementation of a direct potable reuse program is not a new concept in Phoenix.

“We’ve been thinking about doing this for a very long time — ever since the early 2000s, or maybe even earlier than that.

“Throughout its history, Phoenix Water has been a pioneer,” he continues. “It’s just part of the culture here. We’re always looking at ways to expand our portfolio of water resources and operate in a responsible way.”

As another example of that innovative mindset, Prieto notes that the city also is planning for a proposed multibillion-dollar regional advanced water-purification project that could serve Phoenix and five other local municipalities. The proposed facility would be built adjacent to the utility’s existing 91st Avenue Wastewater Treatment Plant, co-owned by Phoenix and the cities of Mesa, Scottsdale, Glendale and Tempe and operated by Phoenix Water Services.

Treated effluent from the 91st Avenue plant currently is used to cool the reactors in a nearby nuclear power plant and for agricultural irrigation. The utility would maintain those commitments, which would leave an average of approximately 60 mgd a day for direct potable reuse, Prieto says.

“It’s very exciting to think about how advanced water purification will help Phoenix create a sustainable water source in the years ahead.” ♦

Assistant Water Services Director Nazario Prieto and the Phoenix Water Services team are working to supplement water shortages stemming from reductions in Colorado River allocations.

we’ll add processes.

“In the long run, we think it will save ratepayers money by installing the processes now. We’ve seen what’s happened during the last two years with inflation and high project costs, so it makes sense to implement all of these processes now.”

The Cave Creek facility could be operational by 2026 and could start sup-

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ANALYZING LEAD SERVICE LINES

Operators should consider several approaches in creating accurate inventories

By Laura Sproule



This is a snapshot of the pipe and is not always representative of the primary material of the supply line.

The deadline for the EPA's Lead and Copper Rule Revisions is fast approaching. To be compliant, all public water systems have to meet a list of requirements, including the creation of a lead service line inventory by Oct. 16 of this year.

With limited time remaining to create your lead service line inventories, taking the right approach and working efficiently is a must. There are several different methods a utility can implement in creating accurate inventories.

Preliminary records review

A review of municipal and plumbing codes, construction specifications, historical community records and interviews with water distribution staff and plumbers can help determine when lead service pipes were most likely installed and where they may still exist.

A records review provides a utility with a broad picture of their network without having to dig up any pipes or put any equipment inside the pota-

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ble water piping. However, utility records can be unreliable or have gaps in data and you can't always be sure if or when a customer has replaced their own supply pipes.

Visual examination

Using a noninvasive method like visual, scratch or magnet tests allows a utility to verify the material of the service line, only requiring entry into the home or to engage residents to provide the data themselves.

While utility staff often perform this service, residents can identify private side service pipe materials by performing a scratch and/or magnet tests on the pipe entering the homes or building. A magnet will not stick to a lead or copper pipe but will stick to galvanized steel.

There is a risk that the visible portion of the pipe has been replaced with a different material than what is buried between the property and the external curb stop. Further, residents may not be properly trained in collecting data themselves, which may result in errors in records.

Water analysis

Water-quality testing and sampling programs are well studied and are reasonably reliable at identifying hazardous levels of lead at the point of consumption along with other parameters that indicate corrosion or presence of lead materials. Testing for the presence of lead in the water is ultimately the largest indicator of potential health concerns.

Several sampling techniques have been developed to determine the presence and concentration of lead in drinking water. Many factors, including corrosion control practices, must be considered when developing a sampling program. Corrosion control practices that are intended to prevent lead leaching will adversely impact a utility's ability to use this technique. Furthermore, basic water sampling techniques do not provide enough data to confidently identify the source of the lead. Sequential sampling attempts to localize the source through a series of water samples; however, the time and resources required to execute it may not be suitable at scale.

Mechanical excavation or vacuum excavation

Excavation exposes the surface of a buried portion of the pipe, providing high confidence of the material at the point of excavation. With mechan-

ical excavation, the material of the entire length of pipe can be determined with high confidence. Vacuum excavation exposes 6 to 12 inches of the service line for further visual inspection.

Excavation or potholing is costly and a major disruption to customers, as reinstating driveways or landscaping can be onerous and expensive. Furthermore, in the case of vacuum excavation, this is a snapshot of the pipe and is not always representative of the primary material of the supply line.

Modeling

Models are able to consume large amounts of data in a relatively short amount of time, improving the speed of records review tasks. The model data sources (utility records, public data and proprietary data sources) leverage several parameters such as property age, demographics, etc., as well as in-field validations and machine learning algorithms to provide water companies with an estimate as to which supply lines likely contain lead. Further, modeling can provide the utility with information about the probability of whether a pipe they do not have information on is lead or not with no disruption to customers.

on is lead or not with no disruption to customers.

However, modeling is still an estimate of the probability of lead being present. It can direct utilities where to test for lead, but it is not a substitute for the actual in-field validation. Inspection will still be required when modeling is incorporated in a lead service line inventory verification program. The inspections provide feedback on the accuracy of the model. One or more inspection methods may be required when using modeling.

Acoustic wave analysis

Acoustic wave analysis is simple, nonintrusive (nothing in the service line), easy to deploy and can inspect the pipe within minutes without disrupting service. Two acoustic sensors are used to "bracket" the portion of the supply line to be screened for lead, with one placed on the external curb stop or meter box and another sensor placed on the internal shut-off valve. In some cases, the second sensor can be placed outside a customer's residence, such as on an external customer meter near the dwelling wall or hose bib, eliminating the need for operators to enter the home. An acoustic signal is sent through the pipe and recorded and analyzed by commercial software and analytics, such as Echologics' PipeScreen Service Line Analyzer. The examination of multiple acoustic properties ensures the robustness of acoustic wave analysis.

While advanced acoustic digital signal processing is a proven technology used in the field for over a decade, the application of this technique in determining pipe material is still relatively new.

Water utilities can reference the EPA's guidance for developing and maintaining a service line inventory. ♦

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UNDERSTANDING GROWS

Arlington's native plant and pollinator garden serves as an educational venue and a gathering place for community activities

By Steve Lund

The city of Arlington Water Utilities planted the Lake Arlington Native Plant and Pollinator Garden in 2022. The demonstration garden has since become a tool for teaching the community about water conservation and drought-resistant plants, as well as a gathering place for a variety of activities.

"Most of the people who have come to the site have been working there and helping with planting, and most have been volunteers," says Traci Peterson, communications coordinator for the utility. "After our first year, we tried some things that weren't necessarily about volunteers. We had a yoga class at the garden and the people who came out had a great time."

The city also sponsored a photography class with a teacher from The Arlington Museum of Art.

"The morning they had the class, we went out there at 7:30 in the morning and there were all these bunnies in the garden," says Peterson. "The 20 photographers in the class were just so excited to go out and take pictures of those bunnies."

While yoga and photography classes don't focus on water conservation, just bringing people to the garden helps: "That gets people out there who might not be interested in volunteering, but they can still see the plants, and we talk to them about what the garden is." There are ID tags on the plants and QR codes in the beds linking to a website that explains more about the plants.

The garden won the Texas AWWA Water Conservation and Reuse Award in the Large Utility-Indirect category. The garden was built on three acres of the emergency spillway site near the Lake Arlington dam.

Focus on pollinators

Craig Cummings, Arlington Water Utilities director, knowing the city takes part in the Bee City USA program and the National Wildlife Federation's Mayor's Monarch Pledge, thought the spillway would be a good site for a pollinator garden. The area is a park-like setting but can't be used for buildings or permanent playground equipment.

"He had heard about the things other city departments were doing for pollinators and thought we could do something, too," says Peterson. "He thought that would be a great place to have not only a pollinator garden, but a place to teach people about drought-resistant plants."

In addition to wildflowers and native grasses, the site has demonstration plots that exhibit different styles of gardens such as a cottage garden, a rain garden, a traditional garden, a wild-life garden and a xeriscape garden. All gardens have plants suit-

able to the Texas climate.

"All of the plants are drought-resistant, because we're trying to show people that you don't have to put plants in your yard that need a lot of watering during the summer," says Peterson. "I love it when people come out, especially in spring when it's looking so beautiful, and they see that they don't have to sacrifice beauty to have plants adapted to this area."

Effective for teaching

The utility used volunteers to do the planting, often high school and college students who needed community service work. There are volunteer days twice a month when people come in to spread mulch or to do other maintenance.

"We've had classes where people come to the library and watch slideshows about drip irrigation or planting drought-resistant plants, but there's really no substitute for them actually getting their hands in the dirt and seeing how it works," Peterson says.

The drip irrigation system is supplied by a line installed by the utility's operations team. A 60-inch pipe that supplies the water treatment plant from the lake runs under the spillway. A 1-inch water line was connected at a blind flange on that large line to feed raw water to a tank for the drip system.

Peterson says the site shows the value of drip irrigation for keeping the water where it is needed: "Right there by the lakeshore sometimes it's very windy. I just can't imagine what it would be like if we were just trying to water it with traditional sprinklers."

Funds and technical support for the project came from a Conservation Treasures grant from Tarrant Regional Water District, the area's wholesale water supplier. The grants have helped build numerous outdoor water-conserving features for cities, schools and nonprofit organizations to educate residents in the primary service area.

Other conservation

Arlington Utilities has more than 4,000 customers signed up for high-bill or high-use alerts, which sometimes call attention to leaks or over-watering with irrigation systems. Residents whose homes show continuous usage for a 48-hour period also receive proactive email alerts.

The utility also has a leak repair program for low-income residents. If they qualify, residents can ask for help dealing with a leaky faucet or similar problem. The utility then sends a licensed plumber to the house to evaluate the problem and inspect for





Students from the University of Texas-Arlington helped plant drought-resistant plants in the Lake Arlington Native Plant and Pollinator Garden.



The chair of Arlington's Bee City USA committee talks to volunteers about gardening for pollinators at the pollinator garden.

“More than 30% of the water used annually by single-family residences is spent watering lawns and ornamental plants outdoors.”

Betsy Marsh

other issues.

“We basically have the plumber go through the entire home, because usually if there’s one thing wrong, there’s a few things wrong,” Peterson says. “They send us an evaluation of what we can do to help this person save water. Then we sign off on it, the plumber does the repairs and we pay the plumber.”

Arlington Water works with the Tarrant district on other conservation programs. One sends weekly emails to residents telling how much water their turf grass will need in the coming week based on local weather station and rainfall data. More than 1,600 Arlington customers get



Yoga classes are among the activities held at the demonstration garden built on the emergency spillway of the Lake Arlington Dam.

the emails.

Betsy Marsh, conservation education supervisor for the regional district, says the emails help people avoid over-watering: “More than 30% of the water used annually by single-family residences is spent watering lawns and ornamental plants outdoors. We want people to make smart choices and reduce water use where they can. The weekly advice is really helpful. It’s local and it says specifically how much water they need to keep their turf grass healthy.”

Working cooperatively

TRWD also has a free program to send a licensed irrigator to evaluate sprinkler systems for homeowners. The district makes significant investments in water conservation through grants to municipal utilities and through programs for residents who are customers of the various utilities.

“It’s in everyone’s best interest if we work together to educate people about how to use water wisely,” Marsh says. “If we can protect our supply and conserve as much as possible, when we experience droughts our water supply will last much longer. Conservation delays the need to search for additional sources.”



Peterson says the Lake Arlington Pollinator Garden could ultimately be part of school field trips that include the water treatment plant, the lake and the pump station, all of which are near the garden. It would be a good way to demonstrate to students where their water comes from.

“If we could connect all of that together for kids, that would be a great thing to do,” she says. “And then show them how to save water with the native plants.” ♦

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FORMULA FOR SUCCESS

Sprayed solution for water pipeline rehab benefits millions in Southern California

By *Dan Zavesky*

Los Angeles residents and neighboring communities rely on a complex network of reservoirs, canals and pipelines that bring water from the wetter parts of Northern California to the parched basins and valleys of the south.

Protecting any water distribution infrastructure from corrosion is essential to its performance. But the stakes are that much higher when the basic habitability of an entire region depends on California-built infrastructure for a reliable water supply.

The Metropolitan Water District of Southern California's Etiwanda Pipeline is one piece of the region's water puzzle. The 12-foot-diameter pipeline stretches 10 miles beneath the communities of Fontana and Rancho Cucamonga north of Los Angeles.

Inside the pipeline, a serious problem had emerged: The original cement mortar lining, applied when the pipeline was first built in the 1990s, had begun falling apart. And though the start of pipeline rehabilitation in autumn 2022 was welcome news, it took the pipeline out of service. Existing redundancies meant that water would still flow for customers, but relying on backups for primary supply is riskier the longer it persists.

MWD was clear that the work needed to be fast and efficient. And that was before it started raining.

Drought leads to mortar lining failure

The Etiwanda Pipeline's original cement mortar lining was a perfectly adequate corrosion protection solution for its time. But times have changed.

Mortar linings must remain damp for optimal performance, and for most water pipelines, that's not a problem. But more frequent and more severe droughts across California left the Etiwanda Pipeline dry at times. In periods of no water, the mortar dried out and began to crack. When water again filled the pipeline, the force caused chunks of weakened mortar to break free, which resulted in unimpeded corrosion of newly exposed steel.

During an initial phase of the rehab project, MWD did trials of various lining products from a host of manufacturers. Carboline's Polyclad 767, a rigid polyurethane formula designed for water and wastewater pipeline and water tank lining applications, performed best and was specified for the remainder of the work.

A firm 10-month timeline for the reline was established.

But before the new protective lining could go on, the old cement mortar needed to come off. This was as tedious as it was complex because the only way to remove it was by breaking it up into pieces small enough to lift out of manholes.

Crews from project contractor F.D. Thomas started by breaking the mortar off the pipeline with jackhammers and loading the waste into a motorized carrier. The carrier, which looks like a cross between a forklift and a tiny dump truck,

would then make its way to the nearest manhole where the mortar pieces were transferred to a conveyor and hoisted out of the pipeline piece by piece.

Surface preparation and lining application followed. Specialized rotary spray equipment would assure consistent application of the lining.

Crews moved methodically along the pipeline, manhole by manhole, mile by mile, 24 hours a day and five days a week.

Too much rain

The first months of 2023 were marked by atmospheric rivers that dumped intense rains across California and the Western U.S. The storms brought with them severe floods and landslides, but they also eased what had been a deep drought.

With its reservoirs replenished, California authorities announced in the spring that water districts served by the State Water Project would be allocated 100% of the water they had asked for.

A 100% allocation is rare, so no water district in its right mind would turn it down. That included the MWD, even as its crucial Etiwanda Pipeline was out of service and would remain so for months.

The district had planned to return the Etiwanda Pipeline to service in October 2023, but in June they informed F.D. Thomas that they needed to press hard to finish as quickly as they could.

Now, spray crews were working nonstop seven days a week, knowing that the moment they finished, MWD would open the gates to more water than it had seen in years.

Quick curing proves critical to success

It's challenging enough to staff spray crews on short notice to deliver a project ahead of schedule. But adding to the challenge is that a crew must confront certain inherent limitations of the products they're working with — limitations that can put a project's desired schedule at odds with what's possible on the ground.

In this instance, the limitations were cure time and recoat window. For the new polyurethane lining to perform as intended, two coats were needed. Polyclad 767 ended up being the perfect choice because its cure time is short enough that the crew applying the second coat could safely guide the rotary spray equipment over the first coat after a very short wait, and its recoat window is long enough that the crew wouldn't need to wipe down or abrade the first coat to ensure the second coat would adhere properly.

F.D. Thomas crews' blitz — made possible partly due to the characteristics of Polyclad 767 — paid off. Lining application wrapped up a staggering two months ahead of the initial schedule.

MWD placed the Etiwanda Pipeline back in service in August 2023, in time to receive the water that millions in the region needed so badly. ♦

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PROBLEM:

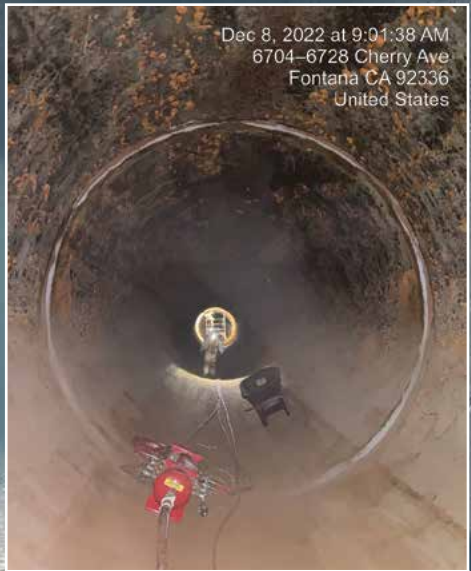
The original cement mortar lining in the Metropolitan Water District of Southern California's 12-foot-diameter Etiwanda Pipeline was falling apart.

SOLUTION:

After trials of various lining products from a host of manufacturers, MWD chose Carboline's Polyclad 767, a rigid polyurethane formula designed for water and wastewater pipeline and water tank lining applications.

RESULT:

MWD placed the rehabilitated Etiwanda Pipeline back in service in August 2023, two months ahead of schedule.






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2024 SEWER NOZZLES DIRECTORY




MANUFACTURERS



MANUFACTURERS	NAME OF NOZZLE	APPLICATION	PIPE DIAMETER	FLOW RATE (GPM)	MAX OPERATING PRESSURE (PSI)	WEIGHT	NUMBER OF FRONT JETS	NUMBER OF BACK JETS	HOSE SIZE/CONNECTING THREAD
 Envirosight 111 Canfield Ave., Unit B3 Randolph, NJ 07869 866-936-8476 973-252-6700 (f) 973-252-1176 www.envirosight.com office@envirosight.com See ad on page 2	Jetscan	Mainline Sewers	6" - 24"		160	2.6 lb		2 - 4	
 General Pipe Cleaners 1101 Thompson Ave. McKees Rocks, PA 15136 800-245-6200 412-771-6300 www.drainbrain.com info@drainbrain.com	Chisel Point Nozzle	Penetrating, breaking up debris	4" - 10"	12	2,500	4 oz.	4	6	1/2"
	Traction Nozzle	Sand and mud removal	4" - 10"	12	2,500	8 oz.	1	6	1/2"
	Cleaning Nozzle	Maintenance Cleaning	4" - 10"	12	2,500	12 oz.		8	1/2"
	Spring Leader Nozzle	Guiding hose around tight bends	2" - 10"	1.5 - 8	1,500 - 3,000	4 oz.		3 - 4	1/8", 1/4", 3/8"
	Downhead Nozzle	Dropping down T's	2" - 4"	1.5 - 4	1,500 - 3,000	2 oz.		3	1/8"
	Chain Saw Nozzle	Cutting roots	4" - 10"	4 - 12	2,500 - 3,000	2 lbs.		2 - 4	3/8" and 1/2"
	Rotary Nozzle	Scour pipe walls clean	2" - 10"	1.5 - 12	1,500 - 3,000	2 oz. to 10 oz.		2 - 4	1/8", 1/4", 3/8", 1/2"
 Hydra-Flex, Inc. 8401 Eagle Creek Pkwy. Savage, MN 55378 952-808-3640 www.hydrflexinc.com hello@hydrflexinc.com	Reaper	Sewer Jetting	2" - 18"		1,500 - 3,000	Varies	1	3, 4 or 8	1/4", 3/8", 1/2", 1"
	Revolution by Reaper	Sewer Jetting	6" - 36"		1,000 - 2,500	15 lbs.	1 front, 2 center rotating	8	1"
Root Rat PO Box 740 Bolivar, OH 44612 800-288-7873 330-874-4300 (f) 330-874-4448 www.rootrat.net kelly@chempure.com See ad on page 49	Root Rat	Root & Encrustations	2" - 30"	4 - 150		0.5 lbs. - 5 lbs.			

MANUFACTURERS	NAME OF NOZZLE	APPLICATION	PIPE DIAMETER	FLOW RATE (GPM)	MAX OPERATING PRESSURE (PSI)	WEIGHT	NUMBER OF FRONT JETS	NUMBER OF BACK JETS	HOSE SIZE/CONNECTING THREAD
 <p>SewerProShop, LLC 3939 Royal Dr., Ste. 125 Kennesaw, GA 30144 877-864-9394 470-592-1717 (f) 770-984-2802 www.sewerproshop.com info@sewerproshop.com</p>	Viper Chain Cutter	Roots, Grease, Scaling	10" - 48"	40 - 100	2,000 - 4,000	45 to 70 lbs.		8	1", 1 1/4"
	Power Pull Nozzle	Mud, Sand, Silt	4" - 12"	18 - 80	2,000 - 4,000	1.5 to 9 lbs.		8	1/2", 1 1/4"
	Spear Nozzle	Penetration of Clogs, Root Masses, Frozen Pipes	8" - 24"	50 - 80	2,000 - 4,000	6.2 lbs.	4	6	
	Emperor Nozzle	Flushing heavy debris from large lines	12" - 32"	80 - 120	2,000 - 2,500	19.8 lbs.		12	
	Penetrator Nozzle	Flushing heavy debris in lines with offsets.	6" - 16"	50 - 80	2,000 - 4,000	15.4 lbs.	1	8	
	Stealth Nozzle	Flushing heavy debris	8" - 24"	60 - 80	2,000 - 4,000	17.6 lbs.		8	
	Raptor Nozzle	Penetration of clogs, Root/Grease Masses, Frozen Pipes	4" - 24"		2,000 - 4,000	2.4 to 5.5 lbs.	3	3 (1/2") 6 (1")	
	Big Foot Nozzle	Flushing debris from the floor of large pipes	16" - 48"	40 - 120	2,000 - 3,600	33 to 56 lbs.		6 - 14	
	Twister Nozzle	Cleaning grease, roots, mineral deposits, etc.	4" - 24"	18 - 120	2,000 - 4,000	3 to 15.4 lbs.	5	4	
	Milling Cutter	Removal of concrete, tuberculation failed liners	4" - 20"	60 - 120	2,000 - 2,500	18 to 44 lbs.	4	4	1", 1 1/4"
 <p>Spartan Tool 1618 Terminal Rd. Niles, MI 49120 800-435-3866 sales@spartantool.com www.spartantool.com See ad on page 21</p>	Warthog	Roots, Grease	2" - 18"	12 - 35	2,000 - 4,000	1 - 5 lbs.			3/8", 1/2"
	Sandshoe	San, Dirt and Rocks	4" - 18"	12 - 18	2,000 - 4,000	7 lbs			3/8", 1/2"
	Rotating	Scrubbing Pipe Walls	2" - 12"	4 - 18	2,000 - 4,000	1 - 3 lbs			1/4", 3/16", 3/8", 1/2"
	Q Nozzle	Downstream Jetting	4" - 12"	12 - 18	2,000 - 4,000	1 - 2 lbs			3/8", 1/2"
	Rocket Nozzle	Long Distance Jetting	4" - 12"	12 - 18	2,000 - 4,000	2 lbs			3/8", 1/2"
	Closed Nozzle	Standard Jetting	2" - 12"	4 - 18	2,000 - 4,000	1 lb			3/8", 1/2"
	Open Nozzle	Standard Jetting	2" - 12"	4 - 18	2,000 - 4,000	1 lb			3/8", 1/2"
	Brass Ball	Stainless Steel Hose Jetting	2" - 8"	4 - 18	2,000 - 4,000	1 lb			3/16"
	Chain Scraper	Roots, hard grease, scale	2" - 8"	8 - 50	5,075				3/8", 1/2", 3/4"
 <p>Triton HydroTools 11210 S Choctaw Dr. Baton Rouge, LA 70815 800-633-7696 225-308-2649 sales@tritonhydrotools.com www.shamrocktools.com</p>	Ultimate Penetrator	High Performance Double Duty - Clears Blockages and Flushes	4" - 30"		1,000 - 4,000+	5 lbs - 31 lbs	0 or 1	3, 5, 8, or 10	1/2", 3/4", 1", 1-1/4", 1-1/2"
	Super Grenade	High Performance Heavy Duty Mainline Cleaning - Fast and Easy	2" - 30"		1,000 - 6,000+	11 lbs - 7 lbs	0 or 1	3, 5, 6, or 8	1/2", 3/4", 1", 1-1/4"
	TriStar Chisel	High Performance Front-Boring Penetrator for Stubborn Blockage	2" - 30"		1,000 - 4,000+	1 lb - 4 lbs	3 or 4	3, 5, or 6	1/2", 3/4", 1"
	Shamrock-et	High Performance Penetrating and Sweeping	6" - 18"		1,000 - 3,000+	12 lbs	0 or 1	3	3/4", 1", 1-1/4"
	Boat Nozzle	Heavy Duty Flat Bottom Sweeper for Sand, Silt, Gravel, and Large/Heavy Debris	24" - 60"		1,200 - 3,000+	51 lbs	0	11	1", 1-1/4", 1-1/2"
	Cobia	Heavy Duty Multipurpose - Efficiently Clears Sludge, Mud, and Debris	6" - 36"		1,000 - 4,000+	3 lbs - 10 lbs	0 or 1	6 or 10	1/2", 3/4", 1", 1-1/4"
	Rotating Nozzles-Blaster (Fast Rotating) and Hurricane (Slow Rotating)	Removing Residue and Sidewall Buildup/Deposits	2" - 24"		1,000 - 6,000+	0.2 lbs - 10.9 lbs	0, 1, 2, or 4	3, 4, 6, or 8	1/4", 3/8", 1/2", 3/4", 1", 1-1/4"
	Mini-Tadpole / Tadpole / Little Shamrock	Steel Skid Nozzles with Long Service Life for Sweeping Medium to Large Lines	6" - 60"		1,000 - 3,000+	9 lbs - 27 lbs	0 or 1	9 or 12	3/4", 1", 1-1/4"
	Sand & Sludge Nozzle / Contractor Special	Aluminum Alloy - Glides Over Sand and Sludge to Quickly Sweep Lines	6" - 18"		1,000 - 4,000+	3 lbs	0 or 1	8 or 12	3/4", 1"
	Grease Nozzle	Aluminum Alloy - Smooth and Streamlined to Penetrate Grease and Ice Blockages: Great for Inclines	4" - 18"		1,000 - 4,000+	2 lbs	0 or 1	5 or 6	1/2", 3/4", 1"

2024 SEWER NOZZLES DIRECTORY CONTINUED

MANUFACTURERS	NAME OF NOZZLE	APPLICATION	PIPE DIAMETER	FLOW RATE (GPM)	MAX. OPERATING PRESSURE (PSI)	WEIGHT	NUMBER OF FRONT JETS	NUMBER OF BACK JETS	HOSE SIZE/CONNECTING THREAD
 <p>USB-USA USB-USA LLC 7565 Owl Creek Dr. Douglasville, GA 30134 844-285-5770 www.usb-usa.com usb-usa-llc@gmail.com See ad on page 43</p>	Primus 3D	Grease, Crusts, Light Roots	4" - 24"	18 - 120	2000 - 4,000	2.6/7.0/8.3/20.1	1	3/4/5/6	1/2", 3/4", 1", 1 1/4"
	Rocket 3D	Sand, Silt, Large Debris	4" - 24"	12 - 120	2,000 - 4,000	.6/2.6/4.85/11.4/44		6/8/10/12	1/2", 3/4", 1", 1 1/4", 1 1/2"
	Pipe Wolf 3D	Total Blockages from Roots, Grease & other Organic Matter	4" - 24"	14 - 120	2,000 - 4,000	2.4/5.7/11.9		6	1/2", 3/4", 1", 1 1/4"
	Bagger Max 3D	Sand, Silt, Solids, Sludge & other Heavy Debris	18" - 96"	50 - 120	2,000 - 3,000	33/53/66/114.5	5	6/8/10/12	3/4", 1", 1 1/4", 1 1/2"
	Chisel	Total Blockages from Roots, Grease, etc.	2" - 15"	8 - 120	2,000 - 4,000	22/33/66/154	4		1/4", 3/8", 1/2", 3/4", 1", 1 1/4"
	FS 3D	Total Blockages from Roots, Grease & other Obstructions	2" - 15"	8 - 80	2,000 - 4,000	22/44/66/154/37	4	6/5/6/8	1/4", 3/8", 1/2", 3/4", 1"
	Tri-Jet 3D	Mud, Sand, Silt - Everyday Cleaning	4" - 48"	60 - 120	2,000	4.8/12.1/17.6/23.1/44		12 - 15	1", 1 1/4"
	FD 2 3D	Half-Open or Complete Open Drains - Mud, Sand, Silt	4" - 12"	14 - 120	2,000 - 4,000	2.6/4/8.3/14.3		6 - 8	1/2", 3/4", 1", 1 1/4"
	3D Extreme	Mud, Sand, Silt	6" - 15"	40 - 120	2,000 - 3,000	9.4	1	8	3/4", 1", 1 1/4"
	3D Cleaning	Everyday Cleaning - Sand, Mud, Silt, Grease	4" - 15"	14 - 80	2,000 - 4,000	.6/12.1/17.6/23.1	1	6/8/10/12	1/2", 3/4", 1", 1 1/4"

DEALERS/DISTRIBUTORS

DEALERS/DISTRIBUTORS	AD PAGE #	NOZZLE LINES
 <p>66908 Pine Grove Rd., Knoxville, TN 37914 866-944-3569 • 865-524-4647 • (f) 865-247-5101 www.americanjetter.com</p>	See ad on page 49	Aqua Mole, StoneAge, Warthog
 <p>575 Central Ave., Johnstown, PA 15902 888-442-7829 • 814-535-6766 • (f) 814-539-3617 www.gapvax.com • scott@gapvax.com</p>	See ad on page 51	Sewer Pro Shop - Blue Star Nozzles, StoneAge - Classic, ENZ USA

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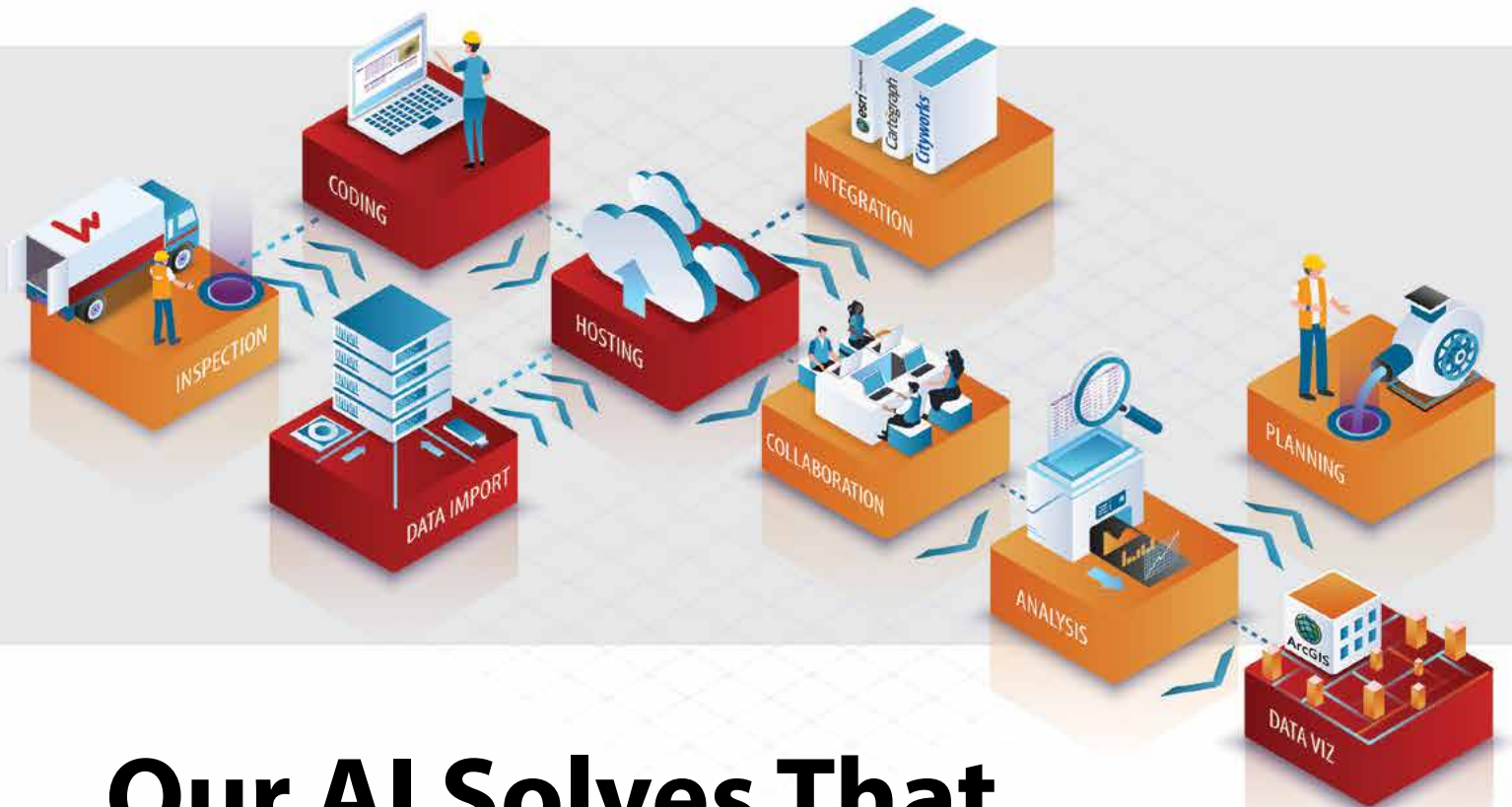
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FOUL-WEATHER FALL PREVENTION

Bad weather brings up a host of factors that increase the odds of slips, trips and falls

By *Ronnie Freeman*

One of the hazards of colder months and wintry weather is the increased chance of slip-and-fall incidents. Rain, sleet, ice and snow can make walking and working surfaces extremely slippery. It can also make outdoor stationary ladders, scaffolding, tanks, stairways and other areas hazardous.

According to the Bureau of Labor Statistics, more than 20,000 workplace injuries are caused by snow and ice every year. Many of these injuries can be severe enough to require weeks to months off from work. Regardless of the season or the weather slip, trip and fall injuries can be severe.

Besides the injury in and of itself, there are other complications that can come from a fall. For starters, there's the employee's lost productivity and possible overtime costs to make up for that lost productivity. Workers compensation insurance can increase as well due to lost workdays. And what are the costs if multiple employees suffer a fall due to slippery conditions brought on by winter weather? Then there are costs to the employee or employees and their families that often get overlooked.

Besides slippery conditions, there are some other factors that can increase the odds of a slip or fall. Depending on the employee's age, their flexibility and

stability could make things worse. If an employee is working in snowy, rainy or even foggy conditions, poor visibility could become an issue. Wintertime is also cold and flu season so some employees might be taking medications that can cause drowsiness or dizziness, compounding the risk.

Typical injuries from falls of this nature are usually related to the wrists and hands, back, hip and shoulders. Head injuries and concussions aren't uncommon either.

When the weather gets bad in some areas, it might be bad for weeks or months, employers can help the situation by making sure that snow and ice are cleared as soon as possible. Placing good, slip-resistant mats immediately

inside doors can help reduce the slip hazards once employees are inside. The following are some tips to follow to avoid those nasty falls due to bad weather.

- Wear the proper footwear for the conditions.
- Pay attention when you are walking — don't let distractions become a hazard.
- Be aware of your surroundings, know what type of surface you are walking on and step carefully.
- Avoid icy patches, especially on pavement.
- Use a slower and wider pace when walking.
- Keep your hands free instead of in your pockets if possible.
- Use handrails when going up and down stairways.
- Dress to stay warm, in layers, because the cold can make joints and muscles stiffen which increases the likelihood of a slip.

If you do happen to fall, take your time getting up. Moving too quickly can cause another fall. And take a moment to make sure you're not severely injured. Once you know you're OK, get up slowly using your knees and hands to brace yourself. Lastly, notify your employer or supervisor that you fell. This will give them the opportunity to correct the fall hazards and make sure you are truly OK.

Bad weather increases the chances of slipping, tripping and falling. But if you stay alert and move cautiously, you'll get through the weather unscathed. ♦



When the weather gets bad in some areas, it might be bad for weeks or months.





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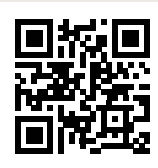
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PROMOTING TAP WATER

California utility demonstrates the high quality of tap water with bottle fill stations in local schools and community centers

By *Sandra Buettner*

Eastern Municipal Water District created water bottle fill stations for its schools and community gathering places to promote its tap water.

The staff, with support from the board of directors for the utility in Perris, California, came up with the idea in 2014 because some residents had negative perceptions of tap water versus bottled water.

“A lot of people are not educated on where their water is coming from,” says Amanda Fine, public affairs manager. “They assume bottled water is better when in reality many bottled water producers get their water from entities like us.”

The district provides drinking water, wastewater treatment and recycled water to nearly 1 million people within a 558-square-mile service area in western Riverside County. In addition to water filtration, the utility treats 43 mgd of wastewater per day arriving through more than 1,800 miles of sewer pipeline.

Students and staff at schools can stay hydrated with cold tap water from newly installed water bottle filling stations like this one provided by Eastern Municipal Water District.



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.

Rules of engagement

The bottle fill station program was promoted through flyers, park districts and the utility’s website, but mostly through word of mouth. On the website during late summer, the district sends a notice that school will soon start and that parents are reminded to pack their children’s reusable water bottles.

The fill stations help promote tap water quality, environmental stewardship and reusable water bottles. There are 126 water fill stations in the community, 115 of them at schools. Other locations include libraries, park departments, community centers and county agencies. The recipients are encouraged to place them in highly visible spots protected from the elements.

ble spots protected from the elements.

“Our mission is to serve our community today and tomorrow,” says Fine. “What a better way to promote accessibility and availability of clean, reliable tap water than to support our schools and public community centers by placing fill stations at these sites?”

Only one unit is supplied and installed free of charge. If a school or community center wants another unit, the utility delivers it, but the recipient must install and maintain it.

To qualify for a unit, the site must be located within the utility’s service area. The recipient must agree to a co-branded sign with its own and the utility’s logo and must maintain the unit and signage for at least five years. The sign contains the words “Quality, Reliability and Value,” with an icon representing each word.

Fill facts

The units come in single or bi-level configurations. A counter on the unit ticks higher to indicate how many plastic bottles are saved. Every time a user fills up with 16.9 ounces (the amount in a half-liter disposable bottle), the counter goes up one tick.

Traffic to the units ebbs and flows depending on whether school is in session. As of 2019, the 126 units had kept 500,000 plastic water bottles from going to landfills. The units contain a chiller to dispense cold tap water. They are compliant with the Americans with

“Our mission is to serve our community today and tomorrow.”

Amanda Fine

Disabilities Act. They have a rapid fill rate of 1 to 1.5 gpm, and their stainless steel exteriors are easy to clean. The utility website shows the locations of all the fill stations.

Mobile hydration

Besides the fill stations, the district has a water fill van known as the Hydration Station. It started as a multifaucet fill station deployed at exhibit booths. Later it became a van that pulls up to events within the eight cities and the unincorporated areas in the service territory.

The van is deployed at events including Library Day, grand openings, spring and fall festivals, and other community events. It has a chiller and a water tank but also can be connected to a tap water source to maximize the supply. The van has its own generator that charges a battery bank, which runs all van’s accessories.

District workers staff the unit and provide literature and information to attendees about tap water and how the van and water fill stations are saving disposable bottles from being landfilled. Most attendees bring reusable bottles and fill up at the events, but for those who don’t have one, the utility provides paper cups made of material that can be composted or recycled.

Once the van started going to multiple events, people began asking if their pets could get water. Some bring collapsible water bowls clipped to dogs’ leashes; if they don’t have one, the utility supplies them.

“The Hydration Station and the water fill stations are increasingly popular with the public and our residents,” says Fine. “They are becoming educated on how great our tap water is.” ♦



The Eastern Municipal Water District’s Hydration Station van shows up to provide water at public events.

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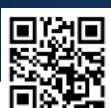


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Sheila Joy is executive director of NASSCO. She can be reached at director@nassco.org.

LEARNING MORE ABOUT STYRENE

NASSCO launches Phase 4 styrene emissions study

By Sheila Joy

Since the question of styrene safety first came to NASSCO's attention nearly 10 years ago, NASSCO has been at the forefront of learning everything possible to keep workers and communities safe. Since that time, we have funded three independent studies (Phases 1-3) and are now preparing for Phase 4.

Phase 1, conducted by the Center for Underground Infrastructure Research and Education at the University of Texas, Arlington, focused on a thorough publication review of articles and papers on the topic of styrene used in the CIPP emissions process. This study resulted in a report from CUIRE stating that previously published reports were inconclusive.

Phase 2 then commenced. The Trenchless Technology Center at Louisiana Tech University conducted field studies in various locations to evaluate air emissions from polyester resin CIPP with steam cure. Based on the data collected, TTC made several recommendations including wearing personal protective equipment at the time of the initial opening of the liner transport truck; performing active air monitoring when entering manholes (which is already an industry practice); and maintaining a 15-foot perimeter around the exhaust manholes, with emission stacks being a minimum of six feet in height.

Phase 3 continued the investigation with a study by TTC titled "Evaluation of Styrene Emissions Associated with Various CIPP Coatings in Refrigerated Storage." TTC recommendations included safely entering a refrigerated truck with minimal PPC only after doors are opened and styrene thresholds decline to below regulatory agencies' limits for the planned exposure of workers.

NASSCO believes there is still more to learn, and it is therefore funding a Phase 4 Study in partnership with Dr. Tom Iseley and his team at Purdue University. This research initiative focuses on establishing the styrene discharge concentration in cure water that may create bio-inhibition at publicly owned treatment plants. With a goal of completing this by the end of 2024, the study will include a literature review of peer-reviewed research; establishing laboratory inhibition standards; and refining recommendations from NASSCO's guideline titled "The Safe Use and Handling of Styrenated Resins in the CIPP Process."

To read the full reports, Phase 2 and 3 recommendations, and learn more about styrene and other safety topics including PFAS and so much more, please visit nassco.org/safety. ♦

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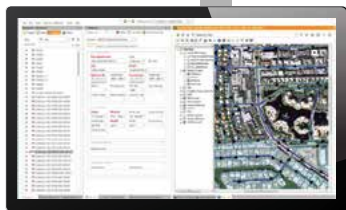
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Enz USA Hydro X

The **Hydro X** nozzle from **Enz USA** is available in 3/8-inch NPT or 1/2-inch connecting threads, and it can function at up to 5,000 psi with flow as low as 8 gpm. It combines a powerful, oscillating water jet with a high debris removal rate. A tungsten carbide front jet ensures a longer life than ceramic jets can offer. For quick and easy maintenance, a repair kit is available. Due to the nozzle's simplicity, repairs can be made quickly and efficiently in the field with little downtime. For the operator's safety, a plastic cover provides protection against harsh and sensitive environments. **888-369-8721; www.enz.com**



Hydra-Flex Ripsaw HD

The **Ripsaw HD** from **Hydra-Flex** is designed for the hydroexcavation industry to make potholing and digging easy. The 0-degree front stream rotates at an 18-degree cone of coverage, creating optimal angles to get jobs done quicker while using less water. It utilizes flow-straightening technology to ensure all water particles flow along one smooth path to create an efficient and powerful impact force. Built with heavy-duty coating, stainless steel housing, and tungsten carbide wear surfaces, its long-lasting, premium components stand tall against frost, shale, rocky soil and more. Its coating is nonconductive, which provides extra safety for both users and underground utilities. It is designed to be repairable — not replaceable — to extend the nozzle's life so you're back up and running in just 10 minutes. **952-808-3640; www.hydraflexinc.com**



RNV Hydrovac2

The **RNV Hydrovac2** can be placed on an RNV-approved 6-cubic-foot steel construction-grade wheelbarrow to create a portable hydrovac. It can vacuum down vertically to 12 feet to convey effluent sludge, sand and small aggregate. It can be combined with a pressure washer or air spade for another excavation solution. The unit weighs 42 pounds, requires a 120-vac 15-amp power outlet and will run on a 2,200-watt generator or inverter. **607-786-2139; www.rnvac.com**



Hydroexcavation Trucks/Trailers

Ditch Witch Warlock W12

The **Warlock W12** from **Ditch Witch** is a PTO-driven vacuum excavator that offers dual 600-gallon saddle tanks and a 12-cubic-yard debris tank, bringing increased capacity and performance to the job site. Available with a 5,000 cfm blower and 27 inches Hg of vacuum power, it helps operators take on bigger jobs and maximize job site uptime. **580-336-4402; www.ditchwitch.com**



GapVax HV33

Designed to safely transport water and debris in urban areas, the **GapVax HV33** is shorter, smaller and more compact than its predecessor. It is 30 feet long overall on a medium-duty chassis and includes a 600-gallon water tank, 6-cubic-yard debris body, 6- or 8-inch top-mounted telescoping boom with a 14- to 17.5-foot reach, 4,000 cfm power and an inverted, full-opening tailgate. **888-442-7829; www.gapvax.com**



Haaker Equipment TRUVAC Paradigm

The **TRUVAC Paradigm** subcompact vacuum excavator, distributed by **Haaker Equipment**, lets you excavate around utilities with the utmost safety and efficiency. It boasts unmatched versatility with its compact design for easy maneuverability and Park-N-Dig quick setup design that allows operators to flip a single switch to begin operations. Operational accessibility features include a 675-gallon spoils tank. No CDL is required to operate this hydroexcavation truck. The extendable boom reaches to 14 feet, 6 inches and offers 210-degree rotation for easy positioning in any conditions. It seamlessly integrates hydroexcavation with vacuum technology so that you can protect your underground utilities while digging effectively. **800-200-3432; www.haakerunderground.com**



Hi-Vac X-13

Contractors, municipalities and utility service providers depend on **Hi-Vac X-13** hydroexcavators to safely and efficiently trench for new sewer and wastewater lines with minimal disturbance to surrounding areas. They combine surgically precise hydroexcavating power with low-maintenance components that help minimize downtime. Simple, intuitive controls and quick access to all critical systems mean jobs get done faster. A 13-cubic-yard debris tank, up to 24,500-pound payload capacity and 1,140-gallon freshwater capacity help reduce the number of costly job site returns. Power is provided by a 5,800 cfm, 27-inch Hg high-performance blower and a run-dry water pump that delivers 20 gpm at 2,500 psi. The 360-degree, top-mounted boom provides full accessibility in every direction, and a heavy-duty hydraulic vibrator provides fast and



efficient unloading of the debris body. Designed for safe and easy operation, it only requires a short learning curve. **800-752-2400; www.x-vac.com**

HotJet USA Vac'n Jet Series

The **HotJet USA Vac'n Jet Series** of vacuum trailer jetters are compact and specially engineered to haul equipment and the spoils load, perform hydroexcavation, and clean valve boxes, storm drains and drain/sewer lines. They feature hot and/or cold water operation with a choice of engine options ranging from 23 to 70 hp and gas or diesel operation. They are equipped with premium triplex pumps, a 500-gallon spoils tank, up to 440-gallon water tanks, Gardner/Denver vac/blowers, a 4-ton hydraulic dump and a dual filter centri-clean filter system. They can also be custom engineered and designed to meet specifications. **800-624-8186; www.hotjetusa.com**



Rival Hydrovac T7 Tandem and T10

The **T7 Tandem** from **Rival Hydrovac** was designed primarily to be loaded with debris and drive within legislated road limits with most types of debris on board. The unit comes standard with a scale that reads real-time weights in the cab and on the wireless remote. The T10 is built with the same features and operating system, but with larger capacities and components. It is for both utility and industrial work and is available in three chassis layouts to meet weight restrictions in a given area. An air compressor option allows for excavating with air when required, while a truck-mounted coring system allows for removal of hard surfaces prior to nondestructive excavating. **403-550-7997; www.rivalhydrovac.com**



Presvac Systems Hydrovac

The **Presvac Systems Hydrovac** is designed for versatility and cold-weather operation with optional full compliance with U.S. Department of Transportation specifications for collection or transportation of hazardous materials. The high-vacuum blower allows extraction of all types of soils, gravel, rock, clay, water and silt material, with knockout features in the debris tank to minimize carryover. Modular filtration configured to blower size provides blower protection and minimal maintenance. It comes with a heavy-duty, 8-inch boom that extends up to 25 feet with six-way hydraulic power and wireless controls for all boom functions, a soft-start water pump, vacuum breaker and truck engine speed. **800-387-7763; www.presvac.com**



Super Products Mud Dog 700

Mud Dog 700 vacuum excavators from **Super Products** are designed to meet the challenges of compact, urban projects as well as large-scale excavation projects. They offer a compact footprint for excavation in urban environments while maximizing payload and maintaining the power and precision that larger units offer. The unit features a 7-yard debris body and 600-gallon water tank. This model comes standard as a dump body with an electric vibrator offering a 50-degree dump angle with the capability of dumping into a 48-inch container. Additionally, it is equipped with a rear-mounted, extendable, 8-inch-diameter boom that reaches 18 feet, has 270-degree rotation and pivots 10 degrees downward, which minimizes job site restoration and eliminates traffic congestion near roads. **800-837-9711; www.superproducts.com**



Transway Systems Terra-Vex HV65

The **Transway Systems Terra-Vex HV65** is a single-operator unit capable of performing all functions from a single remote control. The blower, water tank, boiler, jetter system and wands are housed in an insulated, sound-dampening enclosure with thermostat-controlled heater. It includes large, winter-friendly roll-up doors with ample storage. An onboard air compressor is available. **800-263-4508; www.transwaysystems.com**



TRUVAC APXX

The **TRUVAC APXX** hydroexcavator is built with a variety of standard features to work reliably in rugged climates and environments. It is positioned to maximize payload and make time on the job more profitable. Operator comfort is addressed with a standard double-walled storage cabinet that also shelters operators from the weather in cold climates. The quiet operation of the venturi injection system on the Hibon blower provides sound reduction technology for operators as they perform vacuum excavation applications. The 50-degree dumping debris body has a fully opening rear door and tank vibrator for more efficient offloading. It is available in multiple sizes and is designed for municipal, commercial and residential applications. **815-672-3171; www.truvac.com**



Vac-Con X-Cavator

The **X-Cavator** hydrovac from **Vac-Con** includes a cold-weather enclosure for the water systems and control panel as well as an interior area for operator seating and workspace. Unit filtration is based on the Titan combination machine, with a single-cyclone design and final cartridge-style filter. The redesigned boom is lightweight and flexible, rotating 310 degrees around the unit and moving plus 45 degrees and minus 22 degrees vertically. The durable rubber hose material can withstand harsh environments, according to the maker, and has a reach of 26 feet. **904-284-4200; www.vac-con.com**



Industrial Vacuum Trucks

Guzzler Guzzcavator

The **Guzzler Guzzcavator** combines the capabilities of an industrial vacuum loader and a hydroexcavator, eliminating the need for two separate machines. This multipurpose machine boasts powerful hydroexcavation with extended operation time, a multiflow water system for precise control, and a telescoping boom for greater reach. It's easy to operate and maintain, saving time and money. **815-672-3171; www.guzzler.com**



RAMVAC Vacuum Excavators by Sewer Equipment Tempest

The Tempest industrial air mover from **RAMVAC Vacuum Excavators by Sewer Equipment** is capable of removing dry and liquid materials over a long distance and from great depths. This unit delivers maximum vacuum efficiency even in the toughest working conditions. While utilizing high suction from a 28 inches Hg, 5,500 cfm positive-displacement blower



PRODUCT FOCUS

through an 8-inch system, this unit offers a self-discharging filter system that provides automatic interval cleaning of the filter house during vacuum operations. This system significantly reduces the downtime associated with premature cleaning of the baghouse when the debris box is not full. It allows operators to keep working, while recognizing maximum debris capacity. Additionally, its hydraulically powered articulating extendable knuckleboom is exclusive in the marketplace. With 270-degree range of motion and 16-foot working length, this boom hinges back and forth, providing maximum support of the vacuum tube for increased operator ergonomics as well as cleaning efficiency.
888-477-7638; www.sewerequipment.com

Jet/Vac Combination Trucks/Trailers

Aryan Pumps combination machines

Combination sewer cleaning trucks from **Aryan Pumps** include a hose cassette apparatus with a combined arm to simplify hose storage. It holds continuous lengths of 65 feet of suction hose, so there is no need to couple hose extensions for deep suction. It includes easy in-and-out functionality and comfortable handling of the hose through the telescopic design of the arm. It includes a roller track for smooth operation, and the wide reach of the telescopic extension helps operators with vehicle parking flexibility. The unit offers single-person suction and jetting operation from the rear side of the vehicle. **248-464-8853; www.aryanpumps.com**



Bucher Municipal North America FlexLine

FlexLine C120 and C60 combination sewer cleaners from **Bucher Municipal North America** are used for preventive cleaning, emergency cleaning of mains, septic and collection tanks, and hydroexcavation. They offer 8- and 15-cubic-yard capacities, 7.2 and 14.5 psi, a jetting hose reel with more than 492 feet of capacity, a 5-inch suction hose with 7-foot extension, a hydraulic end cover that opens upward to minimize obstructions on roads and sidewalks, two control panels placed for easy operation, and a 5,100 psi at 5 gpm hydroexcavation pump.
704-658-1333; www.buchermunicipal.com



Vactor 2100i catch basin

The **Vactor 2100i** catch basin provides all of the advantages of the traditional 2100i, but with an improved air-routing system that provides an efficient air-flow path for both the single-stage and dual-stage fan or a positive-displacement blower configuration for maximum productivity. Ergonomic controls make it easy to operate and maintain. For those who want to expand capabilities beyond catch basin cleaning and into vacuum excavation, a hydroexcavation package can be selected. Water system and water heater options are available to enhance the hydroexcavation performance. Features include Intuitouch one-touch controls, a Jet Rodder water pump, a high-strength aluminum water tank, a quieter engine design and high ground clearance. Options include water heaters and cold-weather features.
815-672-3171; www.vactor.com ♦



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Product Spotlight

Glass-body sensors a strong fit for municipal applications

By **Craig Mandli**

Choosing a sensor that is well-suited for your application can improve measurement accuracy and extend sensor lifetime. That's what makes glass-body sensors such a strong fit for municipal water and wastewater applications. They are designed to perform well in those unpredictable chemical environments due to the naturally inert properties of glass.

Sensorex's GT-Series glass-body PTFE-junction pH electrodes offer that sought-after reliable performance in unpredictable chemical environments. The inert properties of the glass bodies and PTFE junctions resist clogging and coating for stable readings and minimal cleaning in most applications. According to Dominic O'Donnell, marketing director for Sensorex, models are available with DIN or VarioPin connectors.

"The GT-Series will work well in drinking water or wastewater applications, but also can be utilized in applications such as hydroponics, or industrial water treatment," he says. "Sensorex has over 50 years of experience in the design and manufacture of pH electrodes, so you know you are getting time-tested quality."

The basic GT100 models feature 120 mm insertion length and are available in single- or double-junction reference. They are designed to be easy to use and perform reliably in applications such as hydroponics, gardening and



education, with temperature ranges from 23 to 212 degrees F.

The advanced GT200 (120 mm insertion length) and GT300 (225 mm insertion length) feature a double-junction, salt ring reference for enhanced stability over time. They can be supplied with built-in temperature elements, and are designed for use at temperatures from 23 to 266 degrees F and pressures from 0 to 6 bar. They are ideal for testing samples with high temperatures such as those found in industrial wastewater. A double salt ring reference design ensures constant reference concentration for increased stability over time.

"Having models available with built-in temperature sensors ensures the temperature compensation required for accurate measurements in changing conditions," O'Donnell says. "In addition, having detachable cables with either S8 or VarioPin connectors ensures broad compatibility with existing installations."

All models offer accurate and reliable measurements across the full pH scale (0-14). They serve as an instantly ready, drop-in replacement for common 12 mm installations. **714-895-4344; www.sensorex.com**

SPECIAL REPORT



Superior Signal 5E FLEX battery-powered smoke blower

Superior Signal's 5E FLEX battery-powered smoke blower is designed for smoke-testing building plumbing and laterals to quickly find faults, odors, leaks and inflow. The 5E FLEX is compatible with leading 18- to 20-volt tool batteries utilizing a high-quality power adapter. The 5E FLEX smoke

blower integrates with existing electric toolsets or can run off any 12- to 24-volt DC power source. Smoke-testing is a cost-effective solution ideal for hard-to-find faults in commercial, residential and municipal facilities. While the 5E blower is popular for a variety of plumbing applications, it is also particularly useful in testing sewer laterals, showing where a fault or leak may occur on private property. Made in the USA, the 5E FLEX comes with an 8-foot industrial-grade hose. Used with 1A or 2B Superior smoke candles, it creates 4,000 or 8,000 cubic feet of smoke respectively. Superior Smoke candles are also sold in convenient SealPac cans that extend shelf life. **732-251-0800; www.superiorsignal.com/msflex**

Pulsafeeder PulaPro7440 chemical pump

When chemical injection processes demand dependable and accurate delivery where space is limited and reliability and convenience are required, Pulsafeeder's PulaPro 7440 has the compact size and features to make operation and maintenance easier and faster. The large, easy-to-view hydraulic diagnostic window provides observation of oil condition and proper pump operation saving time troubleshooting. Externally adjustable bypass valves protect the pump from system over-pressurization and quickly adapt to changing process conditions. The push-to-purge button allows for on-demand removal of air from pump hydraulics to avoid wasting energy from inefficient pump operation. When precise and accurate chemical delivery matters the PulaPro 7440 provides dosing accuracy of plus/minus 0.5% across its operating range, whether the stroke length is set at full capacity or 10% of maximum. It is available with flows up to 1,098 gph and pressures up to 3,200 psig. **585-292-8000; www.pulsafeeder.com**



StoneAge Sentinel OS2 technology controller

The Sentinel OS2 can lessen the burden of training new operators with its user-friendly setup and enhanced user interface. And it takes fewer technicians on the job with Sentinel OS2's automated features like boundary clean and obstacle avoidance. The latest operating system comes installed on all new Sentinel-enabled systems, like the AutoBox 1L and AutoBox 3L. Along with the simplified user interface, OS2 uses machine learning to become more intelligent and accurate as it goes, so you can swap your setup time for cleaning time. The controller now displays a real-time visual diagram of the tube sheet, enabling efficient cleaning without requiring a direct line of sight. The OS2 can automatically steer around plugged tubes and other obstructions during cleaning, preventing equipment damage. **866-795-1586; www.stoneagetools.com**



Asahi/America J-Switch manual ball valve limit switch

Asahi/America introduced the new J-Switch manual limit switch compatible with Asahi/America's Type-21/21a ball valves and Type-23 Multiport ball valves. The new limit switch is a low-cost manual valve position indication solution. Available in 1/2-, 3/4-, 1-, 1 1/2- and 2-inch sizes, the J-Switch features a compact profile, direct mount, glass-filled polypropylene enclosure that requires no tools for simple field installation. The J-Switch also features up to 180 AC/DC multivoltage capabilities, a corrosion-resistant, NEMA 4X enclosure and a cable gland with 2-meter flying leads. It operates at up to 150 degrees F. **800-343-3618; www.asahi-america.com** ♦



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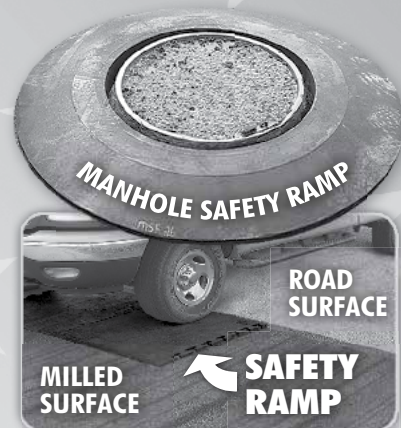
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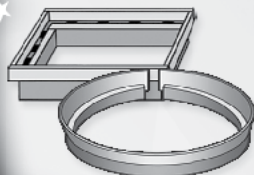
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Matt Timberlake to lead United Felts after Vortex acquisition

Matt Timberlake will assume the role of president at United Felts following its acquisition by Vortex Companies. With over 30 years' experience in the underground utility sector, Timberlake brings extensive experience and strategic acumen to lead United Felts, including Max-Liner and FerraTex Solutions, into a future marked by growth and success. He joined the Vortex executive team in 2019 after the acquisition of Ted Berry Co., his family business. Timberlake previously served as the senior vice president of shared services, and played a crucial role in enhancing efficiency and transparency across product and service divisions.



Matt Timberlake

OBIC announces new promotions and new hire

Dustin Schlachter, CEO and chief visionary officer of OBIC, announced several staff updates. Michael Hoffmaster was promoted to vice president of business development. He previously served as director of business development. Trey Hesselschwardt was also promoted to director of corporate training. Hesselschwardt previously shared his responsibilities between OBIC and Advanced Rehabilitation Technology overseeing safety and certified installer training for many years. He will report directly to Dustin Schlachter.



Michael Hoffmaster



Trey Hesselschwardt

Reline America launches new website, look and logo

Reline America launched its new website and updates to its branding and product line. The new website features a user-friendly interface and provides visitors with easy access to information about Reline America's products and services. In addition, the website also includes an educational blog section where visitors can learn more about the latest trends and advancements in the trenchless pipe rehabilitation industry. The blog will be regularly updated with informative articles and resources to help customers make informed decisions about their pipe rehabilitation needs. Along with the new website, the company is also unveiling a fresh new look and logo. The updated branding reflects the company's commitment to innovation and excellence in the industry.

Vanair strengthens product lineup with Grip Idle Management acquisition

Vanair announced the successful acquisition of Grip Idle Management, a company recognized for its technology in advanced vehicle engine idle reduction. Vanair will integrate Grip Idle Management's systems into its comprehensive range of vehicle solutions, offering customers a broader array of innovative products and features to improve efficiency and reduce operational costs. Grip Idle Management, presently based in Ontario, Canada, will be relocated to Vanair's headquarters in Michigan City, Indiana.

ADS partners with Rainwater Management Systems

Advanced Drainage Systems has partnered with Rainwater Management Systems to bring end-to-end stormwater treatment system solutions for commercial and residential customers. ADS and RMS will use each other's products for designing specialized solutions for customers across commercial, residential, agricultural and infrastructure markets. Rainwater Management Solutions, based in Roanoke, Virginia, is an industry-leading supplier, system integrator and professional services firm, specializing in turnkey solutions for water harvesting, management and reuse applications.

McElroy names Michael Grant new VP of operations

McElroy has hired Michael Grant as the company's new vice president of operations. He began his career with Texas Instruments, developing CNC programs for Department of Defense machined components. From there, he branched into design, prototype and manufacturing engineering roles, where he took on various leadership positions, including in aircraft manufacturing, consumer home goods, and construction equipment. MicGrant spent the last eight years with the Toro Co., formerly known as Ditch Witch/The Charles Machine Works, in Perry, Oklahoma. ♦



Michael Grant



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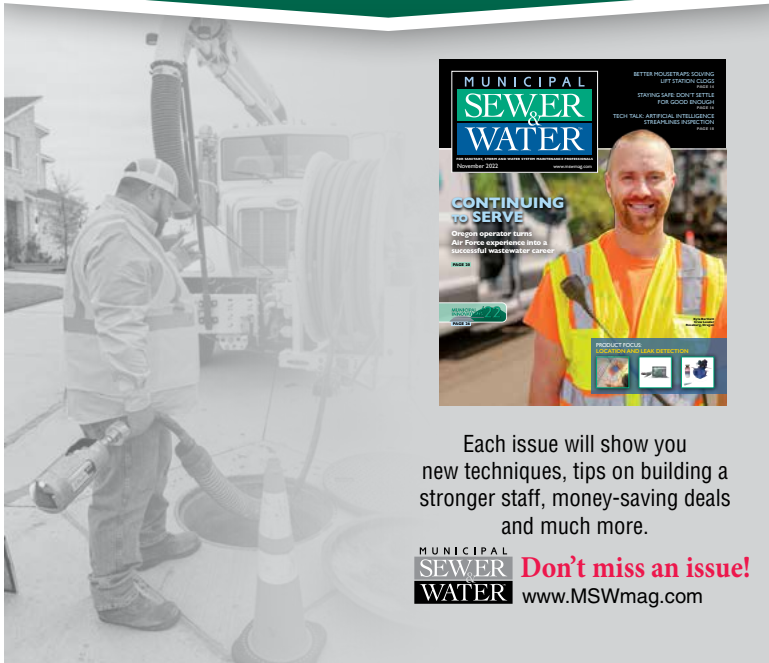


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WORTH NOTING

PEOPLE/AWARDS

Wes Minder was hired as the county administrator for Platte County, Missouri. Stormwater projects are among his many levels of experience in government roles.

Stuart Dykstra was promoted to water strategy leader for V3 Companies, a multidisciplinary consulting firm in Illinois. Dykstra has led numerous stormwater projects across the United States and internationally.

RainGrid Inc. (Ontario) and its founder, Kevin Mercer, received the Global Model Green Technology Award at the Global Forum on Human Settlements. Rain-Grid offers cities the technology, called Intelligent Rain Retention and Reuse, to divert stormwater from a sewer system.

The **Commonwealth Finance Authority** awarded **Tredyffrin Township** (Pennsylvania) \$2.2 million to address stormwater drainage issues along Trout Creek.



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What services does your company provide (categories)?

- Inspection n Infrastructure Trucks n Rehab/Relining Manholes Flow Control
 Location/Detection Cleaning Stormwater Education/Training Safety

Other _____

Which types of sewer, storm & water repair, maintenance & inspection do you perform monthly?

- Jetting n Manhole Rehabilitation Treatment Pipeline Rehabilitation & Relining
 TV Inspection Repair/Replace Excavating Vacuum Truck Service

What is approximate population of the area in which you provide service?

- 1-10,000 10,001-50,000 50,001-100,000 100,001-200,000
 200,001-500,000 500,001+

How many vehicles do you currently have in service?

- 1-5 6-10 11-15 16-20 21+

What is your annual equipment budget?

- Under \$50K \$51K-\$100K \$101K-\$200K \$201K-\$300K \$301K-\$400K
 \$401K-\$500K \$500K +

If municipal, what percentage of your sewer and/or water work is done by private contractor?

- None 1-20% 21-40% 41-60% 61-80% 80%+

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