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August 2008

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# IT'S UP TO EVERYONE

Public education boosts stormwater management in Brewer, Maine

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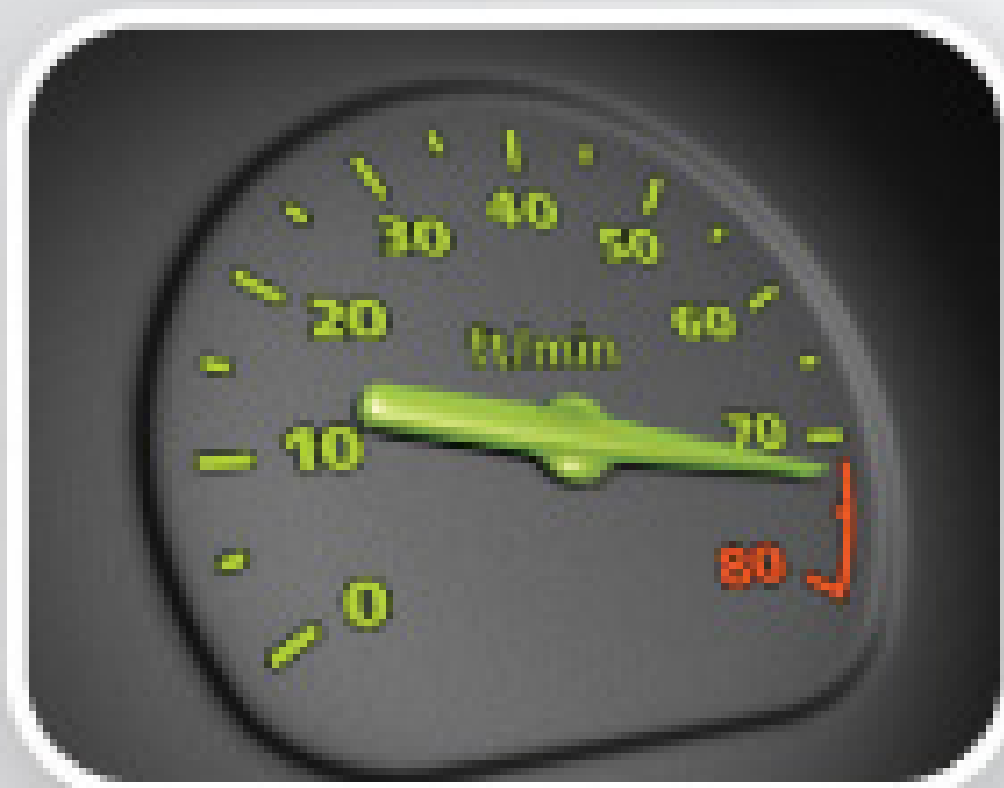
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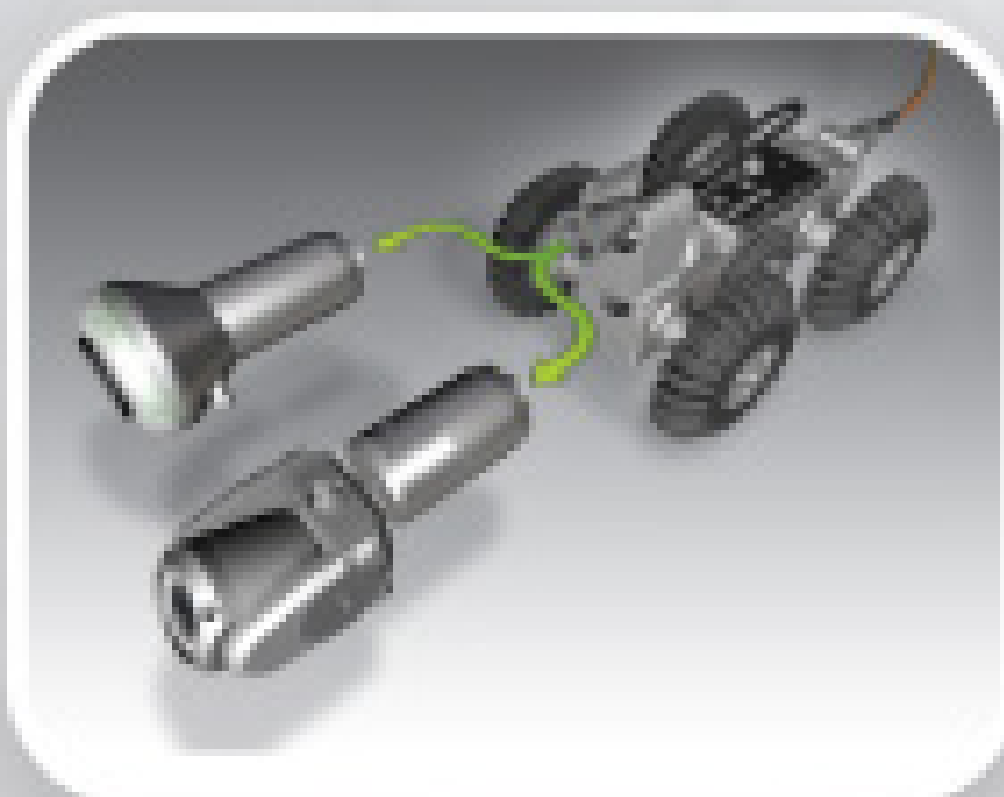
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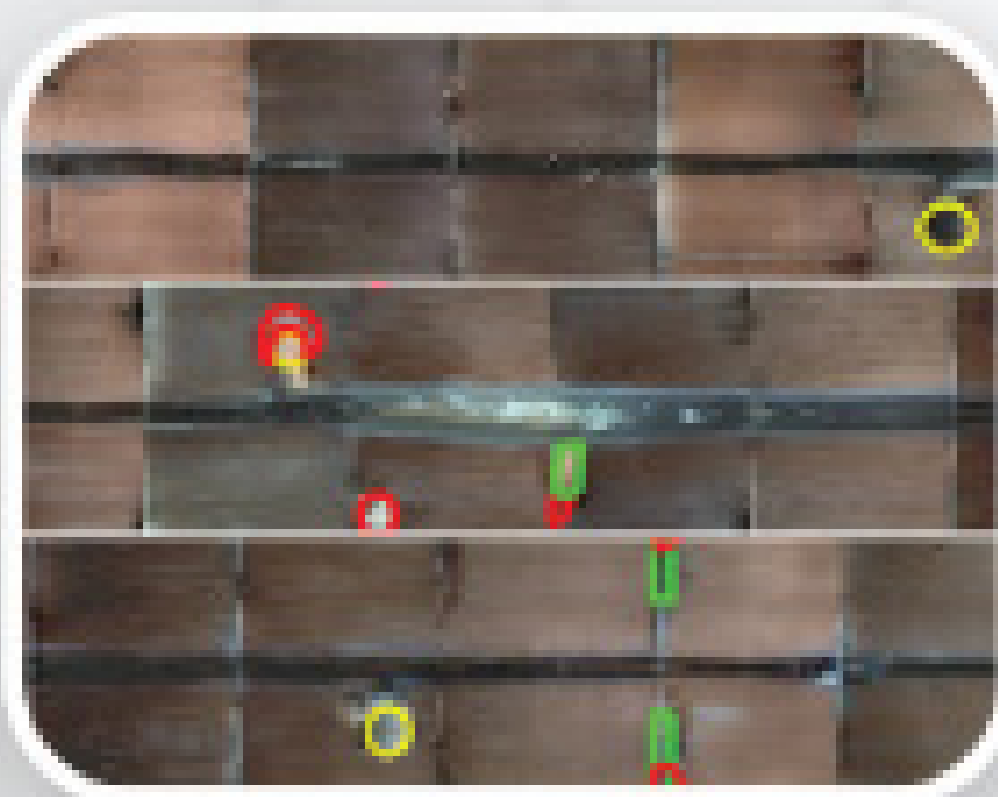
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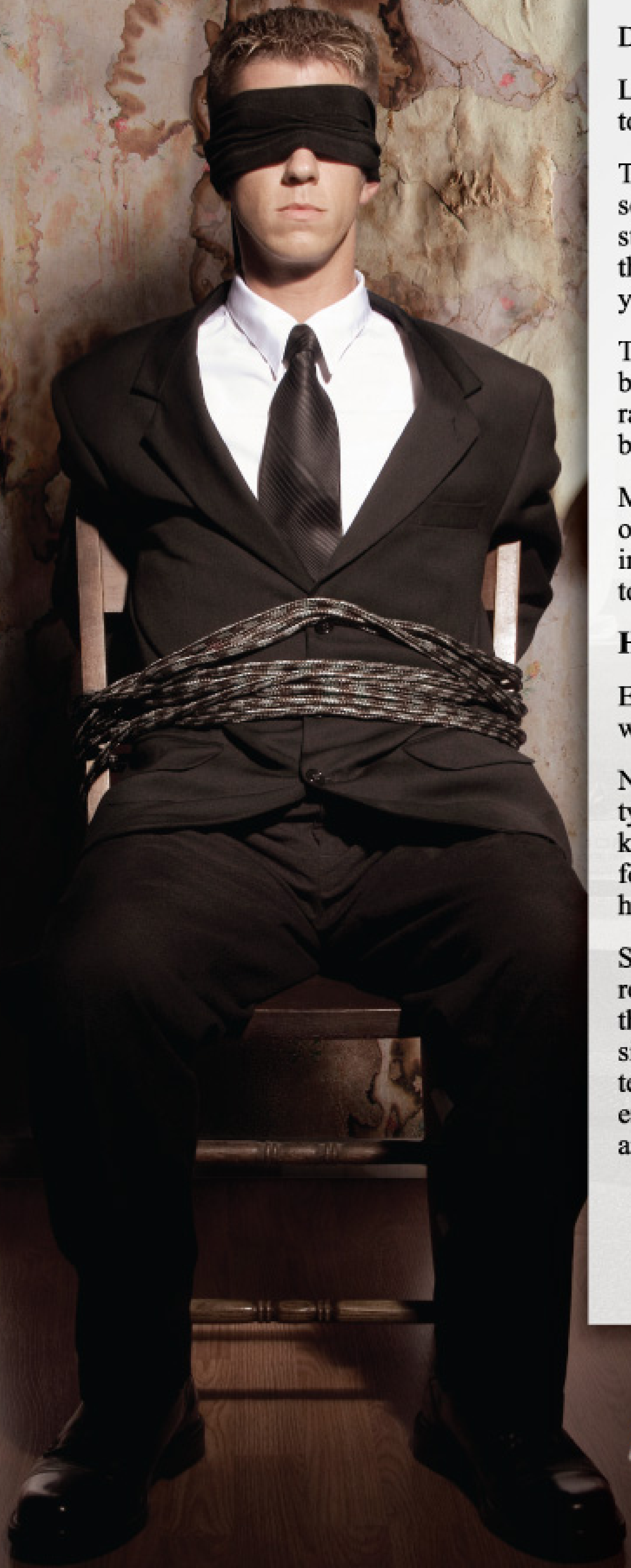


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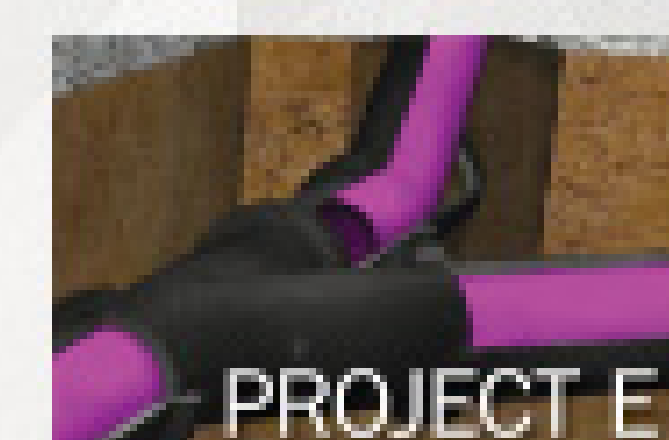
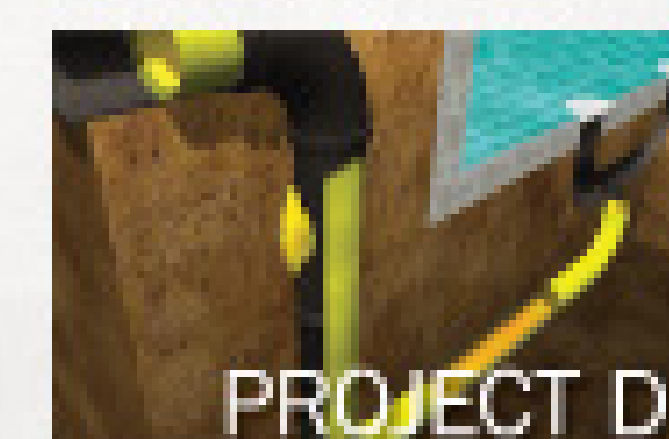
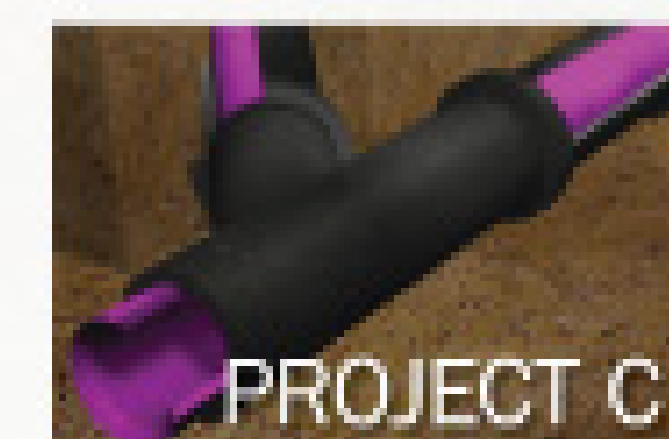
Mathematically it is virtually impossible for any one system to deal with all the variables, resulting in potentially specing a job that no one is able to complete.

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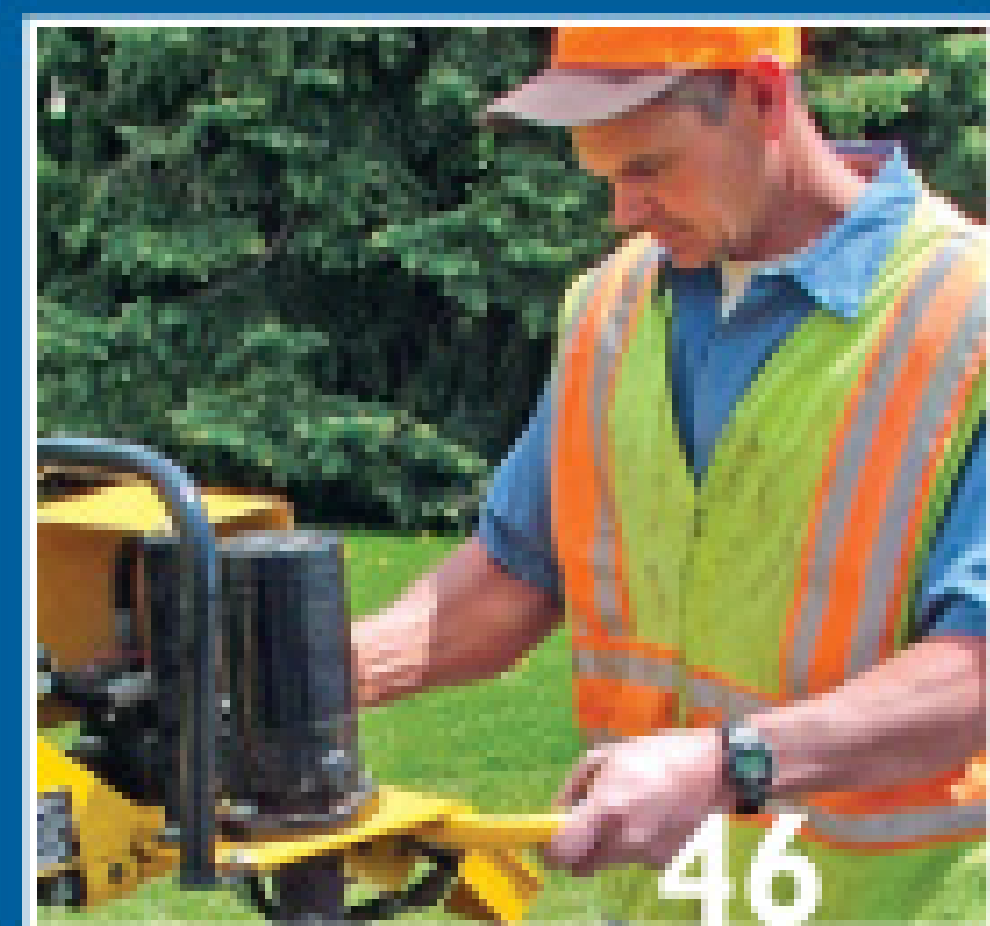


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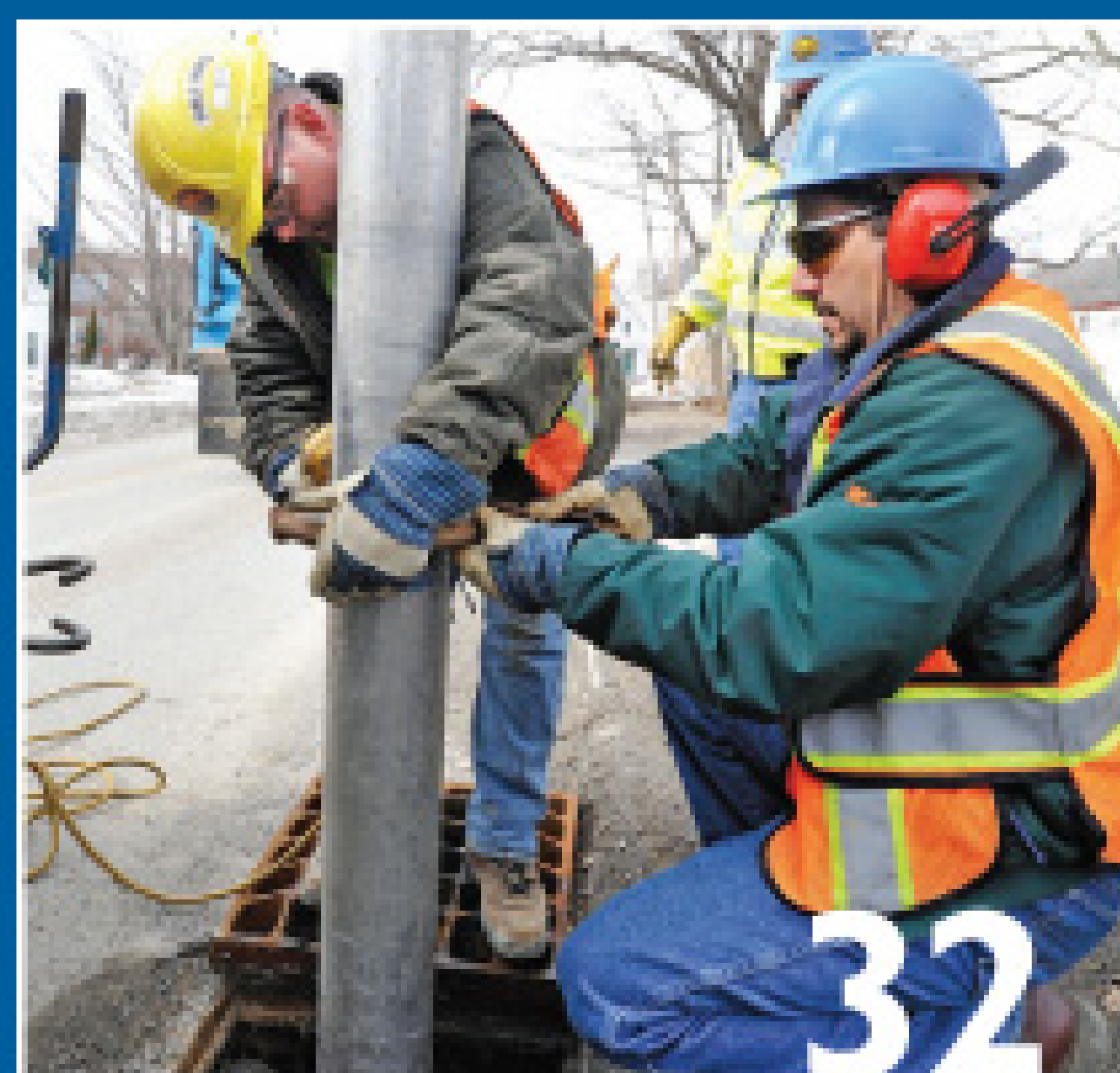
# INSIDE:

## CHEMICAL AND MECHANICAL ROOT CONTROL



### COVER:

City of Brewer (Maine) crew members Craig Lilley (left) and Mark McVey set up a vacuum truck suction hose for a catch basin cleaning job. The city combines effective maintenance with public education and involvement to manage stormwater effectively. (Photo by Michael C. York)



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- ◆ Technology Test Drive: Warrior waterjetter from Spartan Tool LLC

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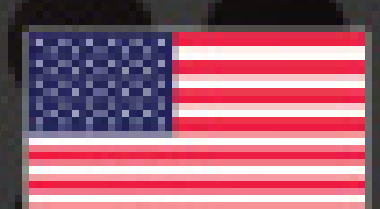
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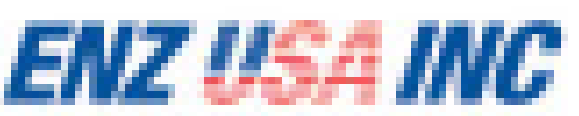
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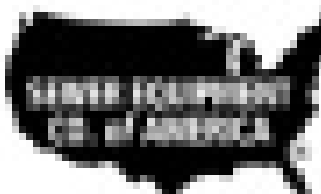



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## MUNICIPAL SEWER & WATER

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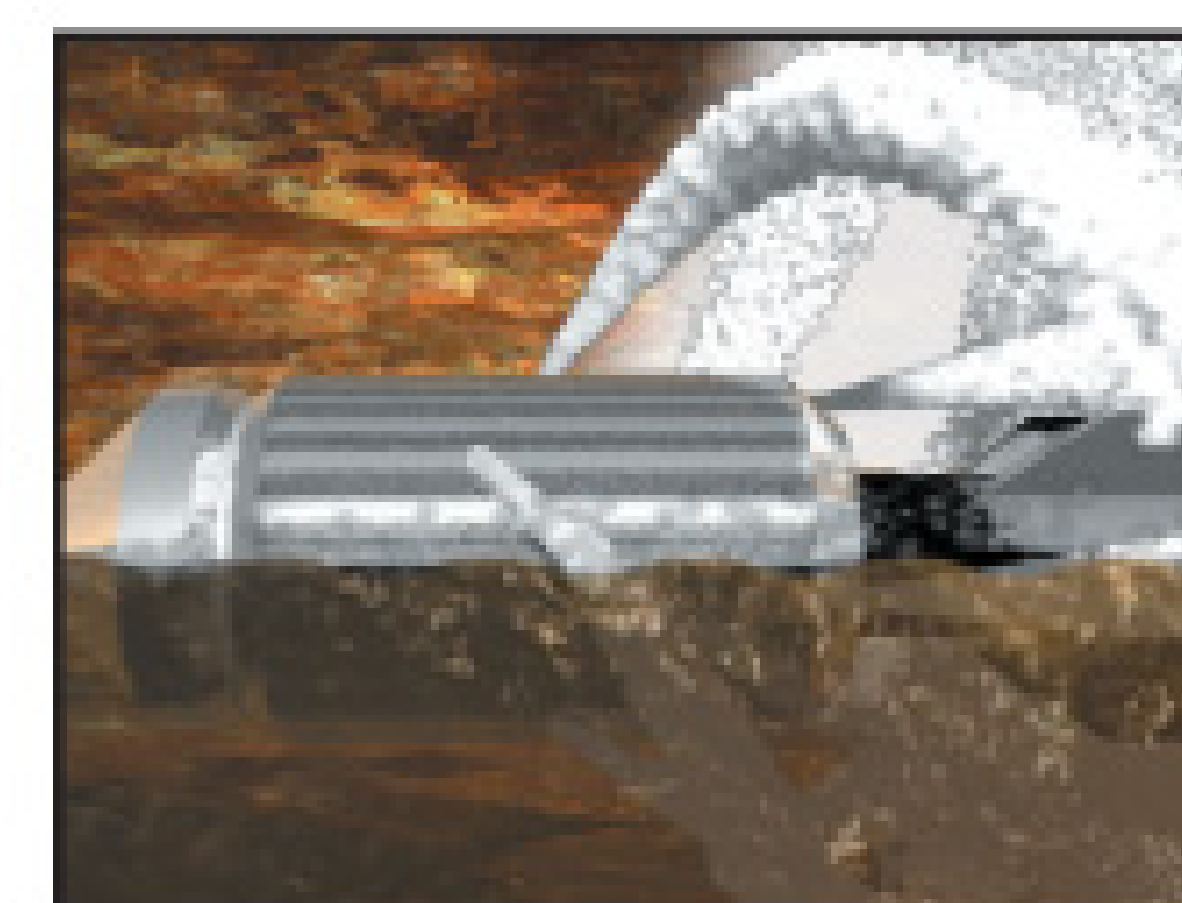
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# IN PRAISE OF SMALL

It's not only big cities that innovate with infrastructure upkeep. Midsize and smaller communities and utilities show a great deal of resourcefulness.

**W**hen I started working on this magazine some 32 months ago, I expected to deal with many big-city water, sewer and storm-water departments, reporting on their infrastructure management and maintenance programs.

That has happened to a degree, but what surprises me is the number of midsize and smaller communities we feature on these pages. There are various reasons for that. One is that smaller cities and utilities seem more eager to work with us — they are more likely to raise their hands and invite us to look at what they're doing.

Another is that smaller communities (as a rule) seem more comfortable dealing with the media. I guess when it comes to cities, the bigger you are, the bigger the target you provide for those who want to criticize and rake the muck.

Some big-city departments have been burned by negative publicity and hesitate to work even with a magazine like this one, focused on positive stories about worthy achievements.

One big city told us we could write a story about them provided:

1. We would send them a list of questions.
2. They would provide written answers and get them reviewed by their attorney.
3. We would publish those answers verbatim. That's what I call skittish. Of course, we never did the article.

## Source of innovation

The other and most important reason we write often about smaller entities is that many of them are just as innovative as their bigger cousins.

I mean no disrespect to big cities. We've published articles about such great accomplishments as St. Petersburg's 25-year water pipe rehabilitation program, Atlanta's exemplary

**It wouldn't surprise me if midsize and smaller cities are proving grounds for a number of the new inspection, cleaning, and rehabilitation technologies that emerge every year. They seem unafraid to be, if not outright trendsetters, at least early adopters.**

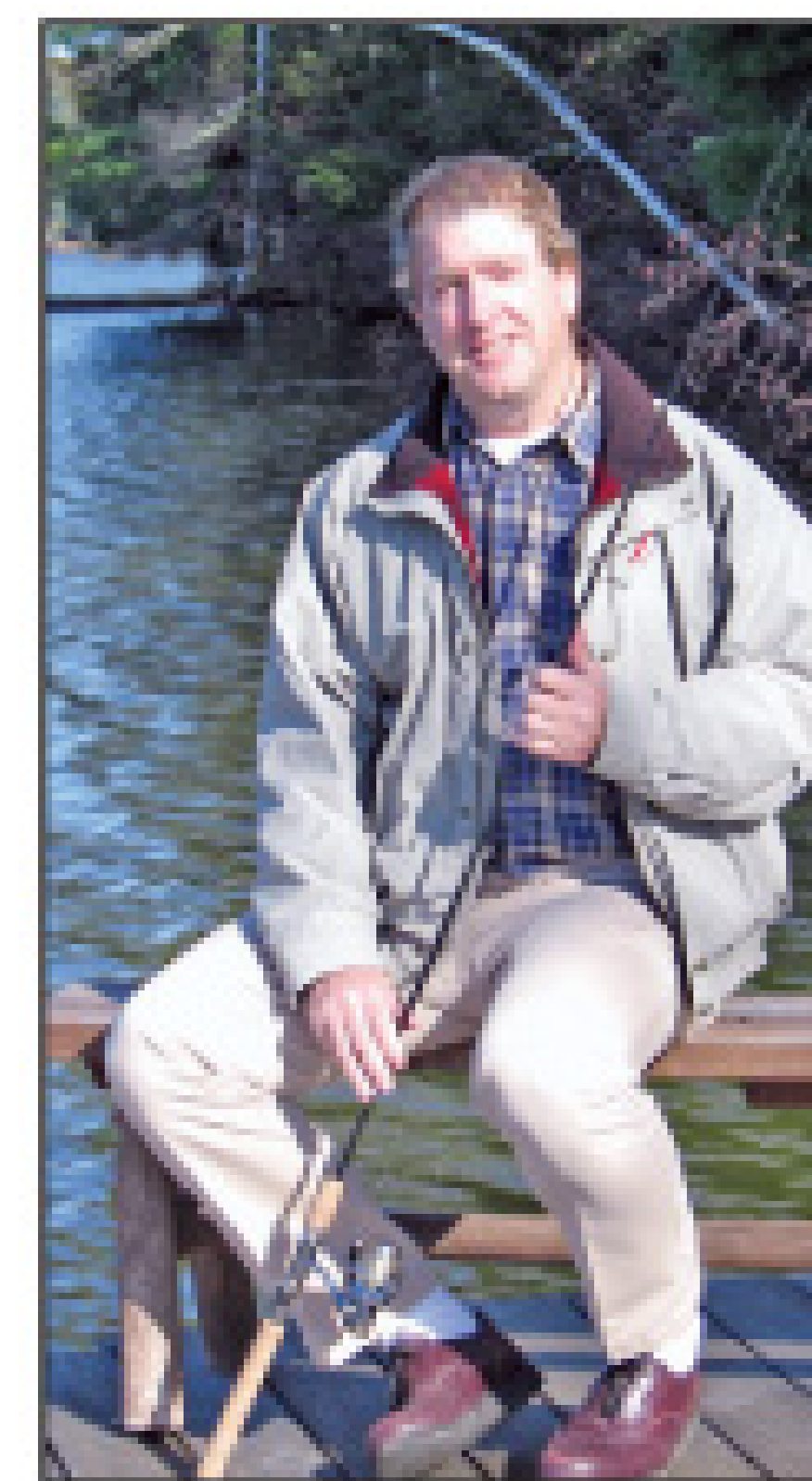
community relations initiatives surrounding sewer system upgrades, San Diego's comprehensive wastewater flow monitoring, Honolulu's root-intrusion control program, and lots of others.

But we find many smaller communities and their utilities have great stories to tell, and they aren't shy about seeking publicity.

What is it about smaller towns? Midsize communities in particular seem to have a knack for

devising their own solutions to infrastructure problems. Perhaps it's because they are big enough to have challenges that demand unique solutions, big enough to have the resources they need to do the job, and bold enough to take a measure of risk to try a new technology or a new application of an old one.

It wouldn't surprise



## FROM THE EDITOR

Ted J. Rulseh

me if midsize and smaller cities are proving grounds for a number of the new inspection, cleaning, and rehabilitation technologies that emerge every year. They seem unafraid to be, if not outright trendsetters, at least early adopters.

## Sharing innovation

This magazine is all about sharing ideas that work for one community with others that might benefit from it. The great thing about the public sector is that there really is no such thing as competition, or at least there doesn't need to be.

Trade magazines that service private-sector industries often find businesses reluctant to share their successes in print, because by doing so they would tip their hand to competitors. In the municipal and utility environment, one city puts nothing at risk by telling others how it increased pipe inspection efficiency, or streamlined its planned maintenance program, or saved millions by intelligently applying trenchless repair.

Of course, cities that share their successes on our pages benefit from a morale boost for the team members involved. We often hear reports about how happy a mayor or city manager was to see a *Municipal Sewer & Water* story about his or her city.

So here's an invitation. Whether you're a major metropolis, a growing suburb, or a small city or village, the good work you do on your sanitary sewer, water, and storm sewer infrastructure is of interest to others in the field. If you have a good story about how you do it better, more efficiently, more safely, more cleanly, or for less money, this magazine would be glad to tell it for you.

Send your idea to me at [editor@mswmag.com](mailto:editor@mswmag.com), or call me at 877/953-3301. We'll discuss your idea here at COLE Publishing and consider doing a report in a future issue. Remember, talking about the things you do well can help many others in the business. ♦

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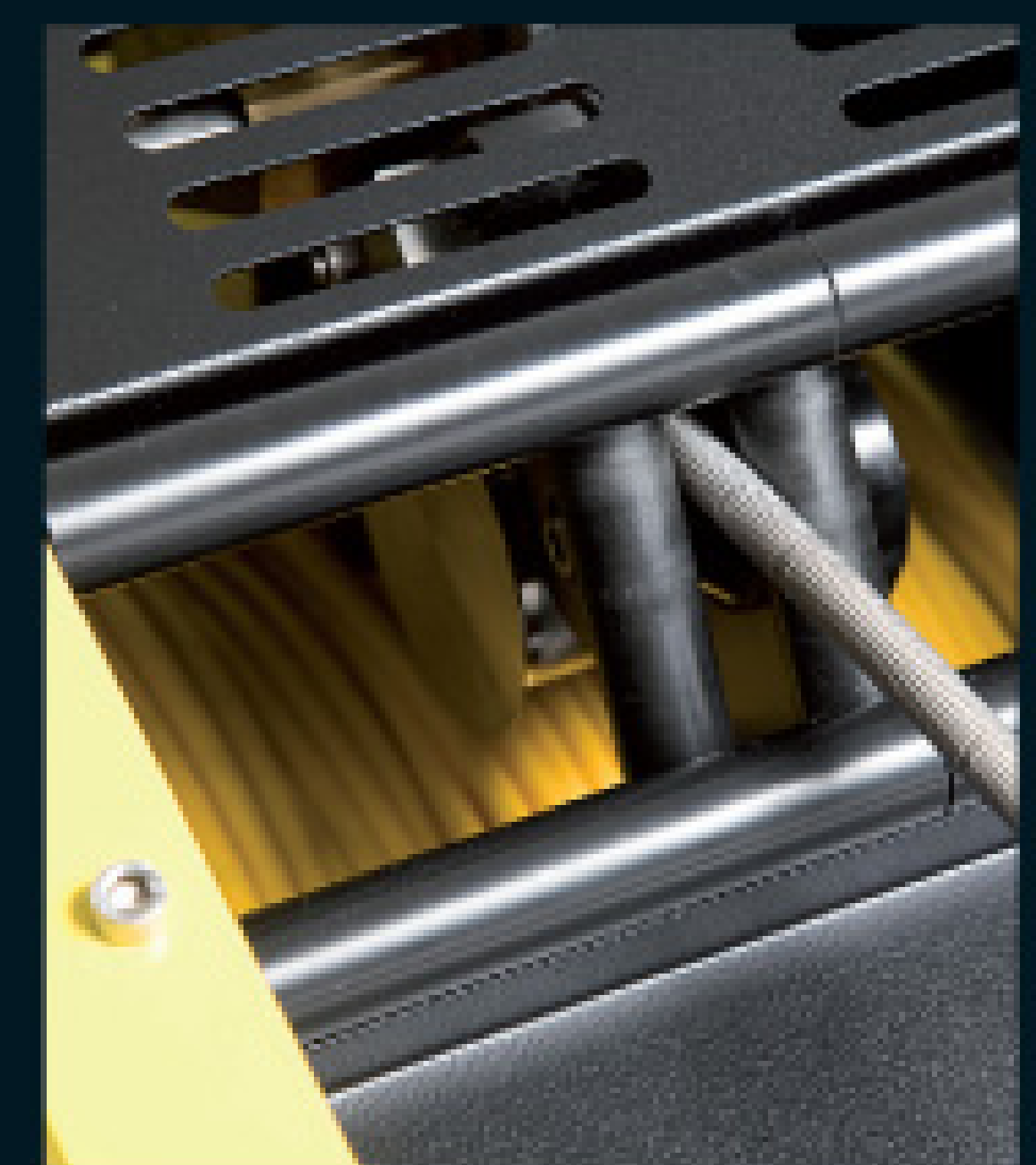
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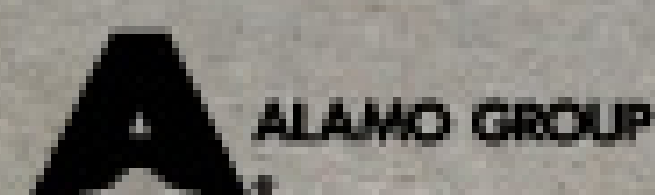
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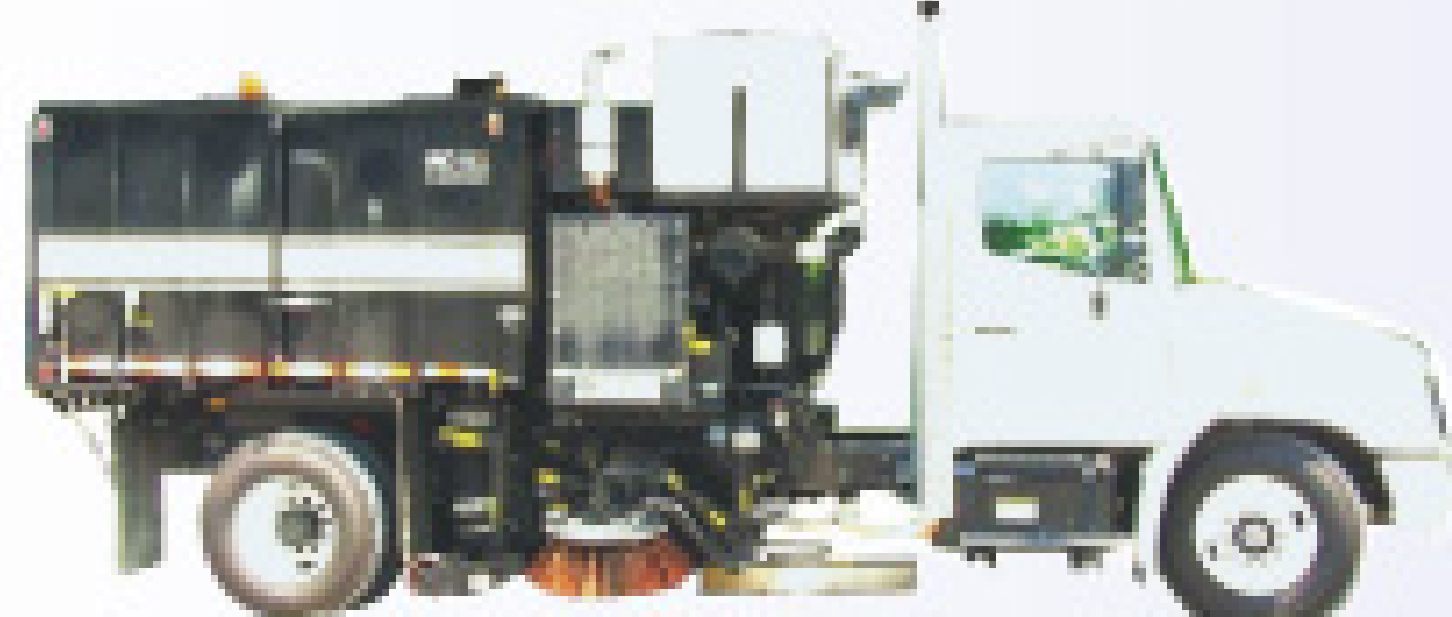
2000 Sterling LT9513, Clean Earth Wet-Dry Dresser Roots 1021 DVJ Blower, 16 cy Debris, 181,506 Miles, 1610 Blower hr.



2005 International 7600, Vac-con 4716SMXD Hydro-Excavator, 16 cy Debris tank, 3000 psi @ 15 gpm cat 3560 73,370 miles, 2560 engine hr. 1175 blower hr. 1021 DVJ



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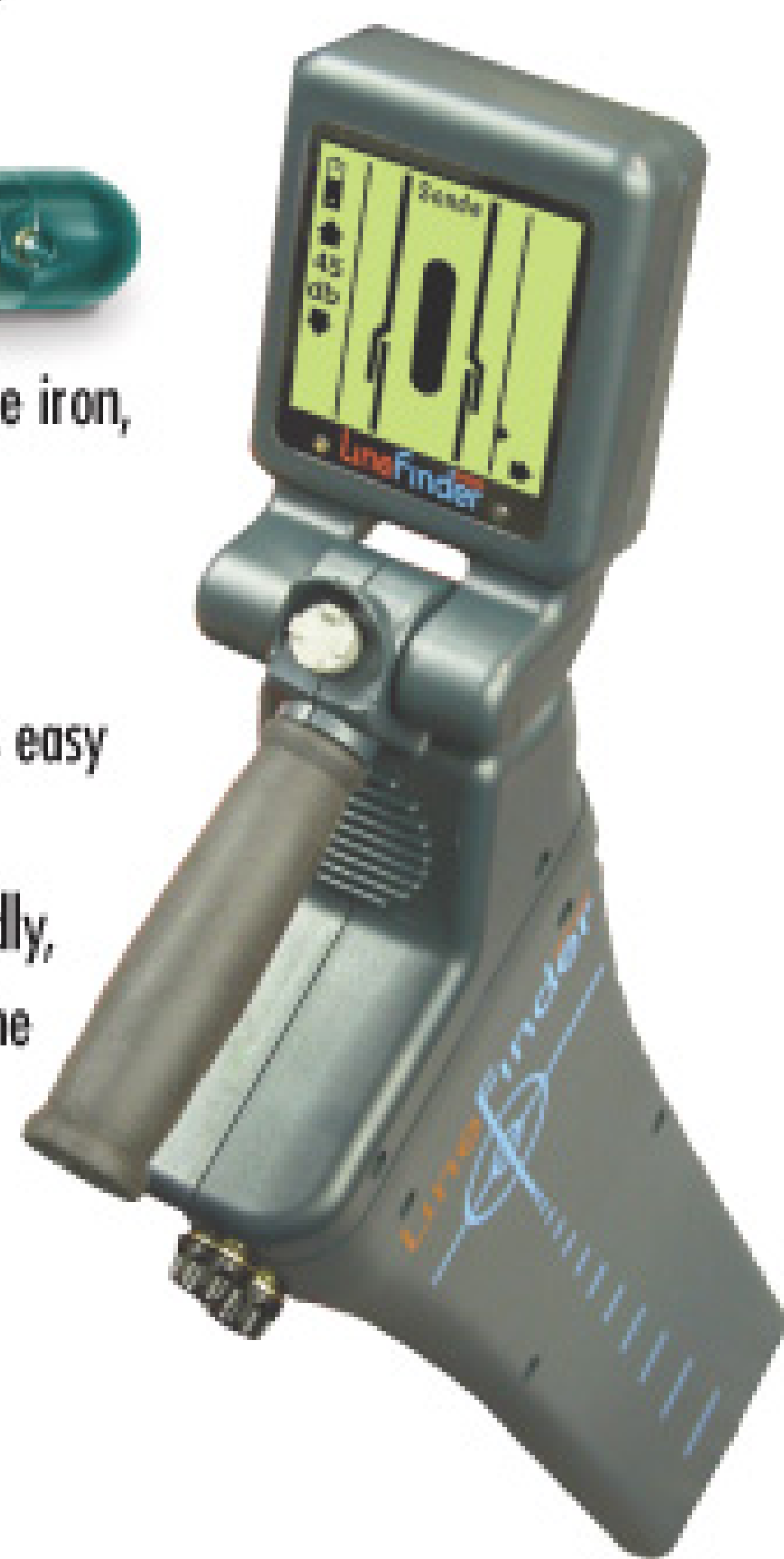
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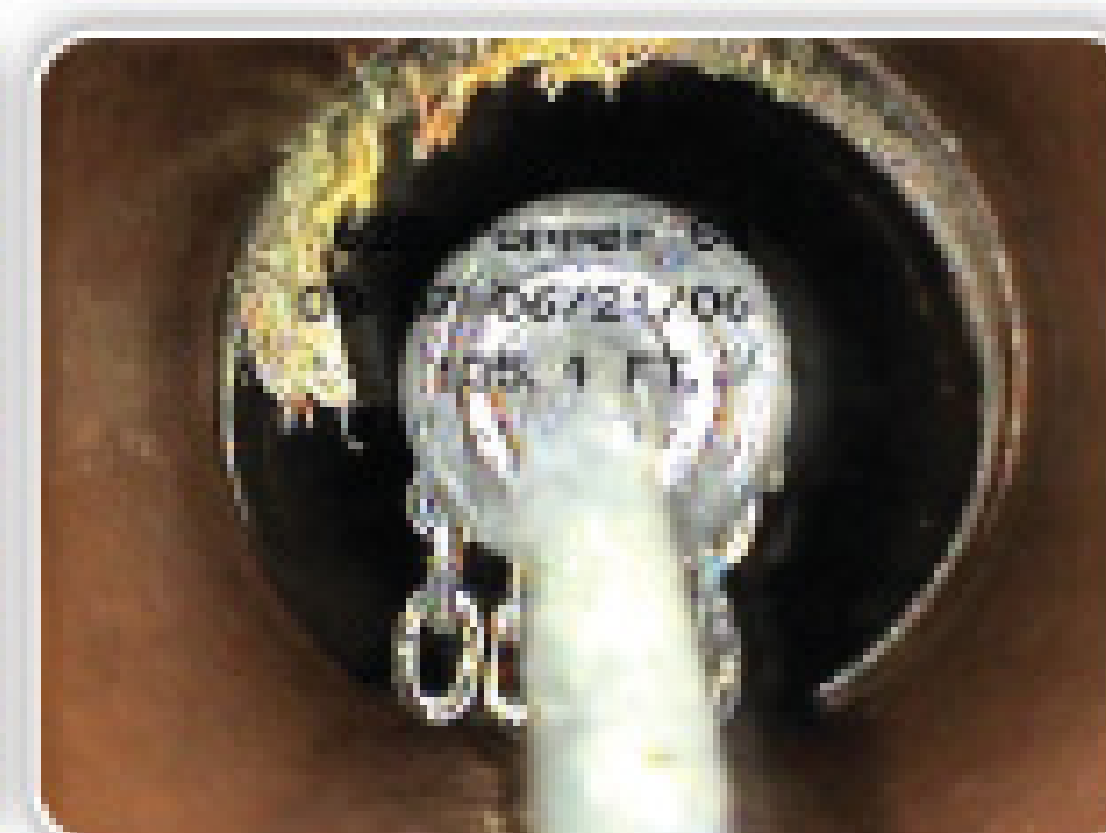
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# CARING FOR THE CONDUIT

Attention to a critical supply pipeline helps the City of Greeley maintain access to high-quality water in a gravity-fed system

By Angus W. Stocking, L.S.

**I**n 1905, when the 5,000 citizens of Greeley, Colo., voted to build a new water plant, they were making a decision with greater consequences than they could have predicted. Completed in 1907, the Bellvue Water Treatment Plant is still in operation, and still provides more than half of Greeley's water.

And it's still about 33 miles from town, high up in the mountains, near high-altitude reservoirs

and the headwaters of the Cache La Poudre River.

"Thirty-three miles was a tremendous distance for a pipeline, even in those days, when there wasn't much development," says Dan Moore, P.E., a water systems engineer and project manager for the city. "Wells near town had become contaminated, and our forefathers decided it was a good idea to be upstream of any possible pollution sources."

Moore says the high-quality water and reliable gravity flow make

the Bellvue plant worth keeping. But there is a downside. One hundred years later, Colorado's fifth-largest city, Fort Collins, has sprung up between Greeley and its primary treatment plant. That complicates pipeline repairs, leak detection and maintenance, and greatly increases the cost of line replacement and augmentation.

And high mountain water sources are variable, as snow pack varies from year to year and reservoirs wax and wane. Moore esti-

mates that 25 percent of water department resources are devoted to the legal costs of water and easement acquisition.

Keeping the water flowing in the face of these challenges requires thinking flexibly, thinking creatively, and, most of all, thinking ahead. The city has safeguarded its water supply by upgrading the delivery system from the Bellvue plant and by aggressively rehabilitating aging water mains throughout the distribution system.

## Swagelining also useful

The Bellvue plant transmits water through two 27-inch steel lines, both about 50 years old. Partially due to a neglected sacrificial anode system, 8,000-foot sections in both pipes developed severe corrosion and sprang frequent leaks. In 1995, a severe leak near a railroad track caused serious problems and gave notice that something had to be done. Another issue was a planned pressure increase that would aggravate the situation.

**PROFILE:**  
City of Greeley,  
Colo.

**INCORPORATED:**  
1885

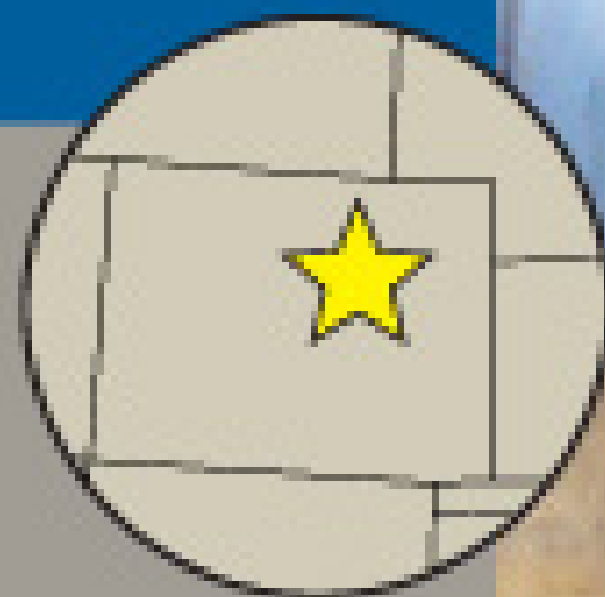
**POPULATION:**  
119,000

**EMPLOYEES:**  
75

**INFRASTRUCTURE:**  
500 miles of water mains

**ANNUAL BUDGET:**  
\$29.5 million (operation  
and maintenance)

**WEB SITE:**  
[www.greeleygov.com](http://www.greeleygov.com)



Contractor personnel install a part of the 60-inch steel transmission pipeline under the Cache la Poudre River near Windsor, Colo. The white exterior is a polyethylene tape coat system, and the interior is cement lining from the factory. (Photos courtesy City of Greeley)





But replacement would be difficult because of heavy development over the lines — residential, commercial, and a cemetery. Supply disruption had to be avoided, as the two lines deliver about 20 mgd in summer, all of it needed.

Spray-on lining of the damaged sections was not a solution because such processes typically do not restore structural integrity. Sliplining would reduce the size of pipes that were already too small

**“Thirty-three miles was a tremendous distance for a pipeline, even in those days, when there wasn’t much development. Wells near town had become contaminated, and our forefathers decided it was a good idea to be upstream of any possible pollution sources.”**

**Dan Moore, P.E.**

(the reason for the planned increases in pressure was to increase capacity).

After a lengthy proposal and evaluation process, Greeley decided on the Swagelining process, developed by BG plc (formerly British Gas plc) for rehabilitating its gas lines. The city did the work in winter, when supply is relatively low. To minimize service disruption, just one section per season was lined.

Swagelining uses HDPE pipe with outside diameters slightly larger than the inside diameter of the original pipe. To accomplish

this seeming impossibility, the pipe is warmed and pulled through a reducing die, and then pulled through the host pipe.

As the HDPE pipe relaxes, it expands and cleaves tightly to the inside of the host pipe, leaving no annular space. The pipe’s carrying capacity remains about the same, because the pipe diameter is reduced only by the new pipe’s wall thickness, and because the HDPE pipe is usually smoother than existing pipe and reduces resistance to flow.

Swagelining can be performed in straight pulls of up to 1,500 feet, but bends of more than 15 degrees in the Greeley lines limited pulls to about 1,000 feet. Because wind chills during work days were well below zero, the crews used plywood “tents” and special heaters to warm the pipe sufficiently for the process. Even with this extra requirement, workers usually completed pulls of 1,000 feet in less than four hours.

The new HDPE easily spans large gaps in the existing pipe, and standard design life is at least 50 years. Work was done in 1996 and 1997, and the rehabilitated sections have been leak free ever since.

### Long-term planning

In the longer term, Greeley officials knew that rehabilitation of the two 27-inch lines was not enough. When the city completed a water system plan in 2003, a key component was installation of a new 60-inch line from the Bellvue plant to complement existing lines.

The costs of the project were judged to be less than the additional maintenance costs of pressurizing the existing lines and would guarantee continued gravity-fed



**Rust buildup (tuberculation) in old cast iron mains was a major concern in the City of Greeley’s water distribution system.**



**Cement lining leaves the pipes in like-new condition and no longer vulnerable to tuberculation.**

## USING NON-POTABLE WATER

In 1995, the City of Greeley endorsed the use of non-potable water as part of a comprehensive plan for water policies through 2020.

The relevant section of the plan says, “Non-potable water has not been treated to drinking water standards, but is safe to use for irrigation and other outside purposes, such as washing a car. A separate water system is necessary to deliver non-potable water so that potable water supplies remain pure.”

To this end, the city has been developing incentives that encourage non-potable water use and is looking into development and extension of the required parallel system. For example, the non-potable system could be

installed along primary roadways to irrigate landscaped medians. Funds are made available in each budget with the goal of increasing non-potable irrigated area by 60 acres annually. In 2008, \$465,000 was set aside for this purpose.

Use of non-potable water is fairly common worldwide, and use in the United States dates back to at least 1929, when the Los Angeles County Sanitation District began to provide treated water to golf courses and parks for irrigation. The Orange County Water District Green Acres Project has the capacity to provide up to 7.5 million gallons of recycled water for irrigation and industrial use.



access to Bellvue's high-quality water. (The city built a pump station as a stopgap.) Financial constraints dictated a 10-year timeline, and work was divided into five segments. City staff used three factors to determine the order of segment completion:

- Ease of construction (quickly installing long sections would give momentum to the project).
- Effect on hydraulic capacity.
- Level of existing and proposed development along the segment corridor.

Sophisticated GIS technologies aided route planning. Existing development meant that sometimes a straight line wasn't the shortest route. To compare and contrast proposed routes quickly, the staff divided the entire study area into 5-foot grid cells, with the help of ESRI ArcView Spatial Analyst.

Each cell was intersected with existing data layers, like zoning, level of development, and environmental factors, to assign a per-foot pipeline installation cost, broken down into pipeline costs, easement costs, and costs of road crossings. Staff also assessed proposed developments in conceptual or approval phases. With this work complete, engineers had a powerful tool to evaluate alternatives that might not have been obvious otherwise, and to confirm intuitive judgments.

A number of other challenges appeared along the way. For example, most routes had several railroad crossings and long stretches along railroad corridors. Fees proposed by the railroads were exorbitant, and Greeley challenged them using Colorado legislation that empowers municipalities when dealing with utility companies.

The city was prepared to go to court, but the railroad companies settled at more favorable rates, and an important precedent was set. Similarly, tough negotiations with irrigation companies saved tens of thousands of dollars and reduced onerous liabilities and restrictions over the life of the project.

Early in the planning phases, Greeley paid for a non-mandated engineering study to alleviate environmental and historical concerns of owners along the final proposed route. Fluctuating steel costs have been another headache, and budgets have been adjusted to accom-

modate rising prices.

As of spring 2008, the pipeline project is half done. Segments of five to seven miles are being completed annually, and completion is scheduled for 2012. Some finished segments have been tied into existing lines to increase cross-sectional area for flow, thus realizing some increased capacity before completion.

### Cement lining

While making major investments in the transmission pipelines, the city took strong action to improve its distribution system, much of it consisting of unlined cast iron pipes installed in the 1940s or before. Seventy years later, the pipes, from 4 to 27 inches, have heavy tuberculation that

**“You have to be willing to say the pipe is good. We have some that’s almost a hundred years old. But if there’s enough metal to support cement, you can have a very successful project, with a life expectancy of 50 years. Replacement can cost two to three times as much.”**

Dan Moore, P.E.

severely reduces flow and pressure and turns the water brown.

Because the area has developed, most of the cast iron pipe is prohibitively expensive to trench and replace, and traffic disruptions are also a factor. Fortunately, the city has options other than replacement, and they include cement mortar lining.

Each year from 1991 to 2007, the city has lined 20,000 to 50,000 feet per year, for a total of more than 200,000 feet. Moore expects eventually to mortar nearly all unlined pipe. “You have to be willing to say the pipe is good,” he says. “We have some that’s almost a hundred years old. But if there’s enough metal to support cement, you can have a very successful project, with a life expectancy of 50 years. Replacement can cost two to three times as much.”

The city considered epoxy lining but found cement lining better for Greeley's purposes. “Epoxy is expensive,” says Moore. “The pipe has to be cleaned spotlessly, and the coating is applied in such a thin layer that it won't even cover pits left by rust. To me, there's more room for error with cement.”

One downside is the relatively low number of cement mortar lining contractors: Greeley has worked with six, and Moore estimates that there are only about 10 nationwide.

Cement mortar lining is simple. About every 400 feet, usually at intersections, a crew excavates a 10- by 10-foot hole for access. A rotating scraper, bottle brush with metal tines, is winched through several times, cleaning the pipe nearly to bare metal.

Then a spinning spray nozzle, supported by springy steel and powered by a 2-inch reinforced air hose, is pulled back through the pipe. The rate of withdrawal determines the mortar thickness. The mortar is smoothed by a spring-loaded conical trowel, which follows the spray nozzle.

ic asset — the pipeline from the Bellvue plant. Keeping that plant productive has taken high-quality planning and innovative thinking. On the other hand, the effort has given Greeley continuous access to superb water with all the benefits of a gravity-fed system.

Keeping the whole system functioning has also required conservation. “Basically, despite all the trees, we're in a desert here,” Moore says. The city works hard at leak detection and has been a national leader in the use of non-potable water for irrigation at industrial and municipal sites.

It would be easy to complain about the difficulties of long transmission lines that pass through a heavily developed neighboring city, but instead Greeley has focused on the virtues of the Bellvue plant. As a result, the city is still reaping the benefits of a decision made more than a century ago. ♦

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A worker installs new valves in a newly lined section of water main.

The mortar isn't intended to seal leaks but to prevent corrosion. “Because there's a lot of calcium in concrete, which is high pH, the mortar creates a barrier that neutralizes our low-pH water, so it doesn't corrode pipes aggressively,” Moore says.

### Back to the well

Half or more of Greeley's water supply is tied up in one problemat-

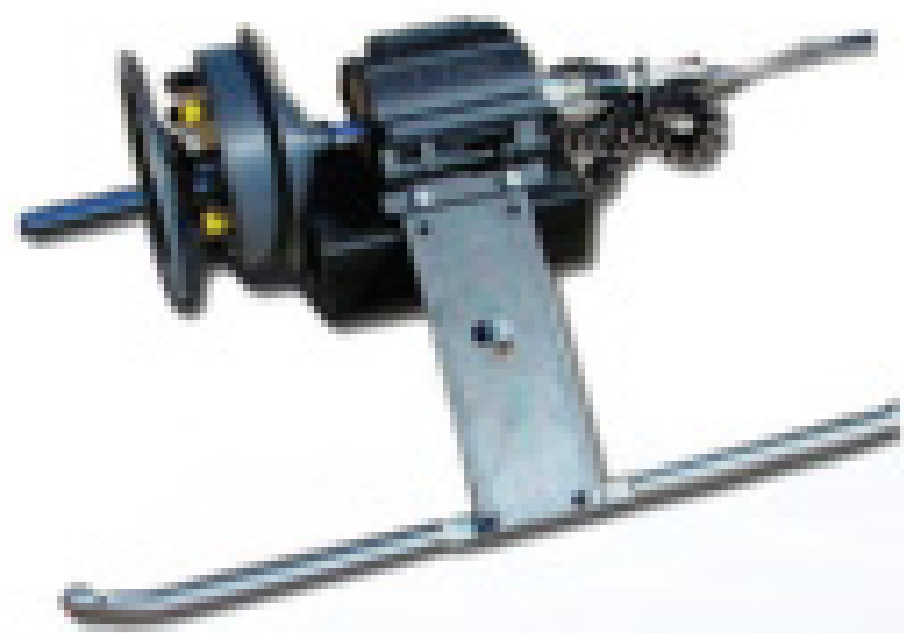


Wood stulls keep the cement-lined transmission pipe in shape until assembly.

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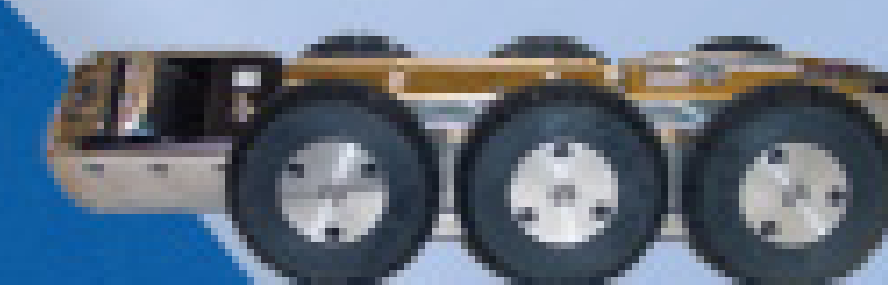
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15-36-35	03			00-00-21	59AL	
15-36-36	03			00-00-32	60AL	
15-36-37	03			00-00-43	61B	0 9
15-36-38	03			00-00-54	62B	0 4
15-40-34	11	2		00-11-01	63B	0 10
15-40-35	11	3		00-11-10	64AL	
15-40-36	11	3		00-11-20	65B	1 4
15-40-37	11	3		00-11-30	66AL	
15-40-38	11	3		00-11-40	67B	1 4
15-40-39	11	3		00-11-50	68AL	
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15-40-41	11	3		00-12-10	70B	7 7
15-40-42	11	3		00-12-20	71B	7 7
15-40-43	11	3		00-12-30	72B	7 7
15-40-44	11	3		00-12-40	73B	12
15-40-45	11	3		00-12-50	74B	12
15-40-46	11	3		00-13-00	75B	12
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15-40-61	11	3		00-15-30	90B	12
15-40-62	11	3		00-15-40	91B	12
15-40-63	11	3		00-15-50	92B	12
15-40-64	11	3		00-16-00	93B	12
15-40-65	11	3		00-16-10	94B	12
15-40-66	11	3		00-16-20	95B	12
15-40-67	11	3		00-16-30	96B	12
15-40-68	11	3		00-16-40	97B	12
15-40-69	11	3		00-16-50	98B	12
15-40-70	11	3		00-17-00	99B	12
15-40-71	11	3		00-17-10	100B	12

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# EVERYTHING UNDER CONTROL

An aggressive program against root intrusion is part of a comprehensive and effective maintenance strategy for Union Sanitary District

By Angus W. Stocking, L.S.

**U**nion Sanitary District (USD) manages 777 miles of sanitary sewer line, most of it 8-inch clay pipes. Clay pipe means a lot of root issues. "It only takes a 0.1 millimeter gap for a root to get started," observes Andy Morrison, collection system manager.

"At one time, roots were easily the biggest source of maintenance issues and generated the most service complaints. Thanks to a chemical root-control program that started

in the early 1980s, roots are no longer the No.1 source of our stoppages. That honor now belongs to grease buildups."

Root control is just one initiative that has helped the district achieve excellence. As the last stop for wastewater between its residents and San Francisco Bay, USD works in a highly regulated environment and runs a tight ship. The district's TV inspection program and ongoing maintenance help keep sewage spills to a minimum.

"We need to have a manage-

ment plan, a comprehensive budget, maps, contingency plans, ordinances that address sanitary sewer overflows (SSOs), the works," says Morrison. The district's approach is effective. In fact, USD has won the California Water Environment Association (CWEA) Collection System of the Year for large systems a record four times.

## Taking it seriously

USD, founded in 1918, serves Fremont, Newark, and Union City. It is a proud organization: the facil-

ities are spotless, the trucks and equipment are well kept, and the geographic information system (GIS) is state of the art and heavily used.

The district's approach to root control is an excellent example of its systematic approach to maintenance, and it shows how hard work up front reduces problems and expense in the long run. The program is completely in-house. The district spends \$40,000 annually on herbicide, plus \$20,000 on another chemical, for corrosion control of



**PROFILE:**  
Union Sanitary District,  
Union City, Calif.

**FOUNDED:**  
1918

**INFRASTRUCTURE:**  
777 miles of sanitary sewer

**AREA SERVED:**  
60 square miles

**POPULATION SERVED:**  
323,000

**TREATMENT:**  
26.6 mgd (average dry-weather flow)

**WEB SITE:**  
[www.unionsanitary.com](http://www.unionsanitary.com)

Joe Pereira of Union Sanitary District withdraws the hose after applying a chemical root control foam in the sewer lines in Union City, Calif. (Photos by Lezlie Sterling)



**“What we really want is to treat the roots right where they come into the pipe, or even just outside the entry point. And you want a clean root. Rinsing the roots removes a slime layer that can prevent chemical uptake.”**

**Andy Morrison**

concrete pipe and manholes.

A Vactor 2100 series combination truck, fitted with a Jet-Set Foamaker unit from Vaporooter, is dedicated to root control. Six staff members are state-certified for herbicide application, a process that requires 20 hours of training by the Pesticide Applicators Professional Association (PAPA) and renewal every two years.

“We’ve been through the entire system three times on our six-year-cycle clean and TV program,” says James Schofield, a wastewater collection supervisor (or “coach” in USD parlance). “For the root control, it is twice that — six times on a three-year cycle. Some of our schedules were overkill at first. Now we’re learning how to stretch out the cycles.”

Morrison adds, “We weren’t very successful at first. We had to learn how to cut-wait-treat.” In other words, USD learned that simply applying a root-killing agent to



Joe Pereira (left) and Rob Shenk begin a chemical treatment in a sewer line.

a clogged pipe doesn’t work. “The roots fall off and cause a blockage,” he explains.

Cutting alone isn’t the answer, either. “With just cutting, you’re actually encouraging thicker growth, like pruning, and eventually you’ll be in there every month,” Morrison says.

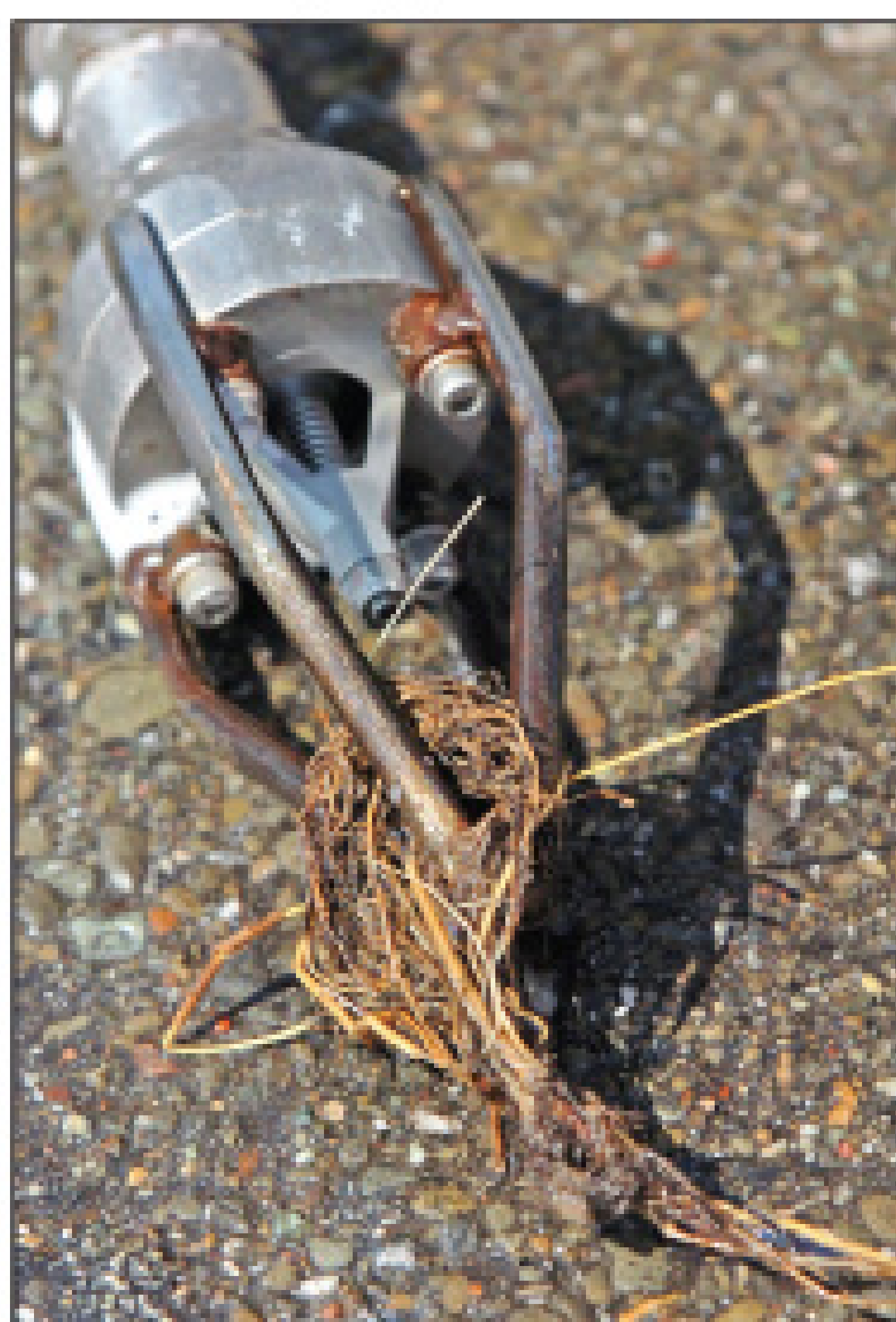
Now, the pipes are cleaned with a jetter and chain flail, and roots are left to grow for about six months. Then, the roots are rinsed before application. Herbicide is most effective when applied to clean, healthy roots. “If chemical is applied too soon after cutting,” says Morrison, “then bleeding sap will wash away the product. But if you wait too long, the root is too big.

“What we really want is to treat the roots right where they come into the pipe, or even just outside the entry point. And you want a clean root. Rinsing the roots removes a slime layer that can prevent chemical uptake.”

#### Attention to detail

As in any maintenance program, details are important. Herbicides are applied with a foamer, and USD learned that foam quality is critical. “We used to TV the lines the day after foaming to check the application,” says Morrison, “but that was a mistake. The hydro we used to pull the tag line for the camera would wash off the product, so we stopped doing that. Now

**Root fragments cling to the hose applicator for Union Sanitary District’s chemical treatment program.**



## PROMOTING EXCELLENCE

The California Water Environment Association (CWEA) is a non-profit group devoted to developing the expertise of wastewater professionals.

To that end, the organization conducts training sessions, publishes training manuals and *Wastewater Professional* magazine, serves as a clearinghouse for information, administers competency testing, certifies professionals in six categories with up to four grades each, and recognizes achievement with awards in more than 20 categories — 350 awards given each year.

The CWEA was founded in 1927 and has 7,200 members. Of these, 3,570 hold certificates. About 1,100 certification tests are administered annually, and certificates are often a job requirement in California.

**Union Sanitary District uses a foam herbicide in its root-control program.**



we just foam it and leave it.

"The foam really needs to be like shaving cream, so it will stick and stay, and so that we can push it if we need to. Ideally, we want to be able to see it if we take a look the next day. The small diameter of most of our pipes makes this possible."

Mixing and applying foam isn't rocket science, but it does take care to get it right. Typically, USD has bound this knowledge to the system by writing *Foamer Operation: Standard Operating Procedures*, a 12 page document that clearly lists all the steps required in various foamer operations, such as mixing, application, and spill cleanup. "And we have cards in the trucks that spell out nozzle retrieval rates in different situations," says Shawn Nesgis, another wastewater collection supervisor.

The district also passes on specific knowledge by assigning new workers to experienced workers, such as Rob Shenk, a lead worker who does most of the actual foam application. "It's pretty basic," says Shenk, "but there is a technique, a few things about the truck you need to know." One tip Shenk passes on to new operators is to pop a manhole lid occasionally and look at the foam to judge its quality. By taking advantage of experienced operators like Shenk, USD saves training time.

### Chemicals used

The district's choice of chemical formulations has been consistent. "We've used Sanafoam Vaporooter for years now," says Morrison. "Really, there are only three choices of chemicals in California — metam-sodium, diquat dibromide, and dichlobenil. Sanafoam uses dichlobenil, a growth inhibitor, with metam-sodium, a fumigant. They're all contact herbicides."

The chemicals are all used in a closed system, and customers are never exposed to airborne material. It is possible to overload lines, so that foam is pushed too far up laterals, "but it's been 18 years since we've done that," says Morrison, "and then all we had to do was scoop up a little foam. We did replace a rose bush once."

The district is keeping its options open by experimenting with diquat dibromide. Sometimes



Rob Shenk checks the controls while executing a root treatment. (Photo courtesy Union Sanitary District)

the problem isn't the chemical but the method of application.

The consistent application of root killing chemicals discourages root growth over time, according to Schofield. "Once we've treated a line for a while, the roots will find another water source," he says. "It's like using Roundup in a yard. If you're consistent, you'll get results."

Consistent application means the district can stretch the time between root treatments, from every three to six months when the program started, to three years between treatments now. A scheduling glitch once kept part of the system off the root control program for more than three years, and there was substantial root buildup when the problem was discovered.

Since the root-control chemicals used are monitored by the state, USD keeps careful records. "We have records of gallons used, in how many applications," Nesgis says. "We track the chemical registration numbers, and we share it all with the county agricultural commissioner. Keeping good records is the best way to avoid

headaches when it's time for an inspection."

### It all works together

Of course, the root control program isn't separate from the rest of USD operations. It's an integral part that depends on other things working well. For instance, the district's GIS, based on ArcIMS from ESRI and GeoSmart from MoosePoint Inc., is the best way to schedule cut-wait-treat, and the best way to systematically cover all parts of the system at the desired intervals. Cleaning Area Reports tell workers how they're doing compared to a yearly schedule and help managers to allocate resources.

CCTV is also a vital underpinning of the entire program. The district runs two vans equipped with Omni III cameras and 6-inch to 15-inch crawlers from RS Technical Services Inc. "We really focus on TV programs," says Schofield. "We find problems before they find us."

Besides capturing the entire system every six years, USD applies TV as needed in problem areas. When that happens, "We get everything from manhole to manhole, and get

more than we need," Schofield says.

New pipe is inspected a little less than a year after installation, so that USD can take advantage of contractor warranties, if needed. In recent years, the district has moved from VHS to digital capture, replacing a large video library with a 12 terabyte disc drive. Digital capture also enables video links that are accessible from the GIS.

USD constantly seeks new ideas and techniques. One way of doing this has proven popular with surrounding districts: "We host equipment shows," says Morrison. "We bring in vendors and other agencies. We have a grill going. Last time we had 300 people." Besides giving vendors a chance to showcase new equipment, the shows give wastewater professionals a chance to talk informally and trade tips.

### Romance of maintenance

Stewart Brand, creator of the *Whole Earth Catalog* and life long thinker about sustainability and the role of civilization, has written: "The romance of maintenance is that it has none. Its joys are quiet ones. There is a certain high calling in the steady tending to a ship, to a garden, to a building. One is participating physically in a deep, long life."

Tending a wastewater system confers no glory, yet it is a high calling. By keeping the lines flowing, USD serves its customers efficiently and protects the environment. Its quiet, behind-the-scenes competence is an example for those involved in maintenance of all kinds. ♦

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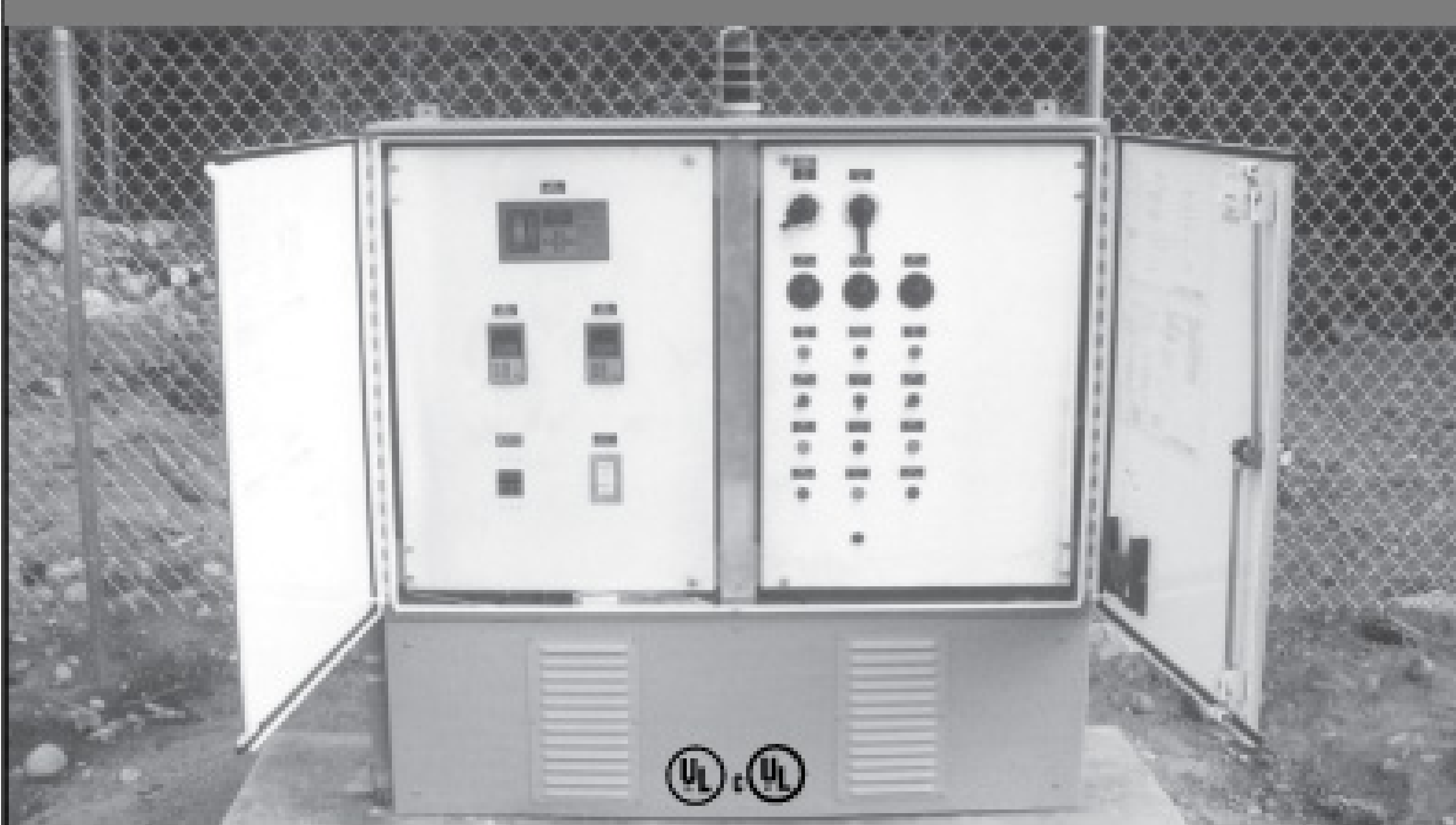
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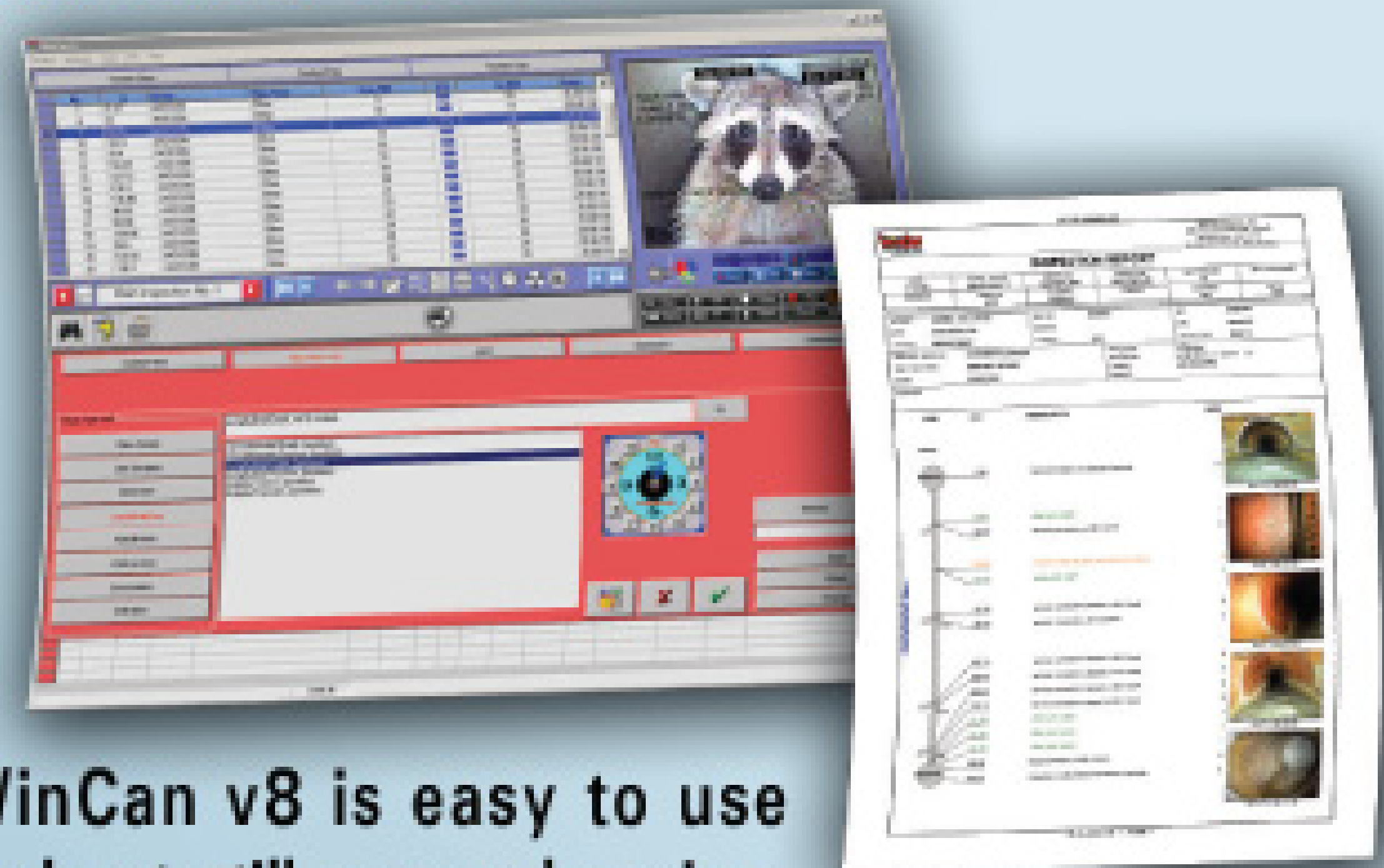
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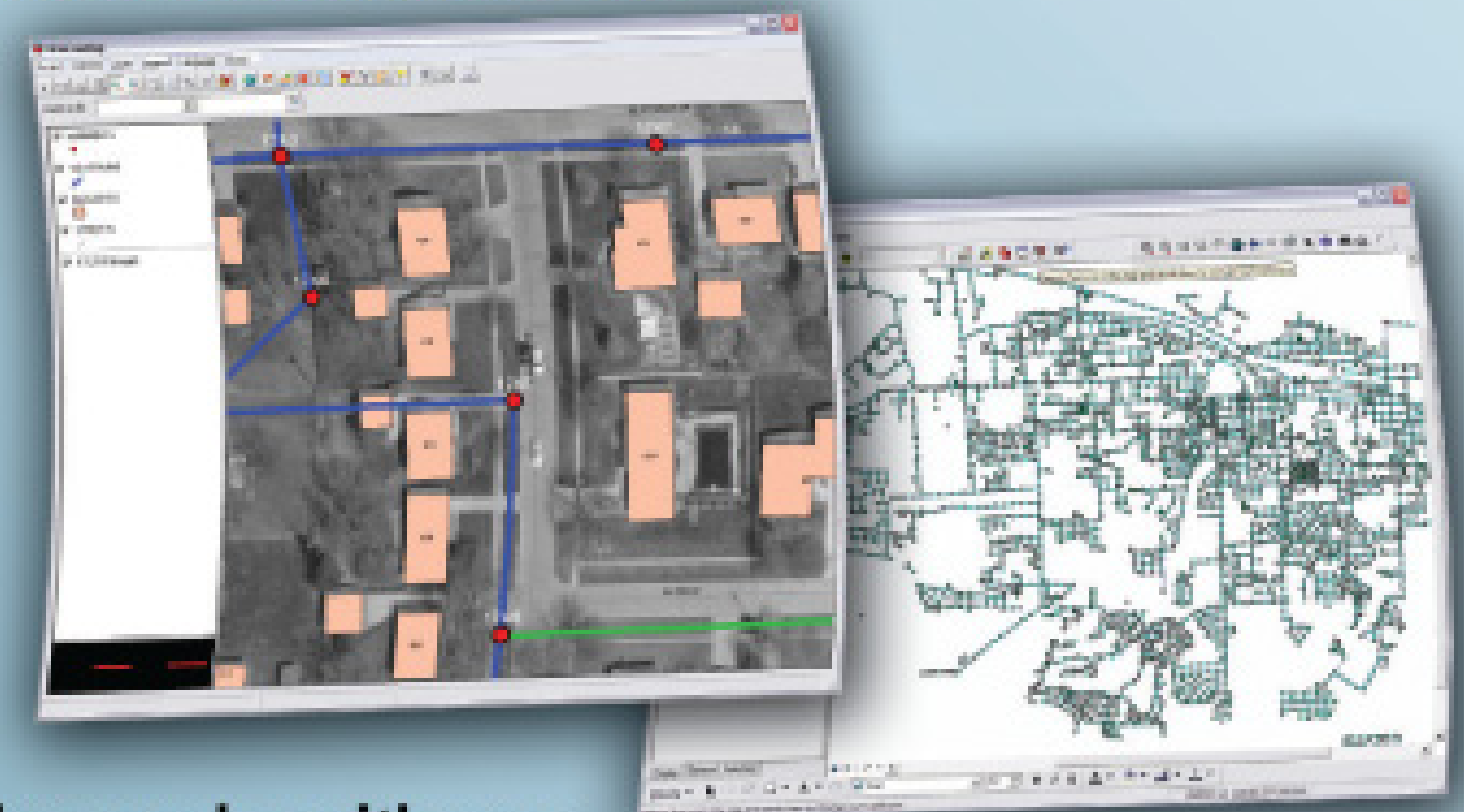
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Brewer Middle School science teacher Brenda Willis and class are shown with the Brewer groundwater/watershed demonstration model. Willis uses it to teach the value of maintaining clean groundwater and practical methods of doing so. (Photos by Michael C. York)



## FOCUS: STORM

# IT'S UP TO EVERYONE

Public education in the City of Brewer, Maine, makes sure that managing stormwater and reducing water pollution is a shared responsibility

By Jim Force

**Y**ou could say that the stormwater team in Brewer, Maine, consists of hundreds and maybe thousands of people. That's because the city uses innovative public education to enlist the support of citizens ages 8 to 80 for its stormwater management program.

The wide-ranging effort recently earned Kenneth Locke, director of environmental services, the first-ever Steve Ranney Award for Stormwater Management Excellence from the Maine Department of Environmental Protection (MDEP).

Brewer and the 27 other Maine communities holding MDEP stormwater discharge permits must develop a comprehensive storm-

water management program that includes six components:

- Public education
- Public participation
- Illicit discharge detection and elimination
- Construction site runoff control
- Post-construction stormwater management
- Pollution Prevention (good housekeeping of municipal facilities)

Brewer is progressing on all fronts, but in the area of public education and public participation, the city has generated the kind of local enthusiasm that would be the envy of Prof. Harold Hill of *Music Man* fame. "Instead of just coming in and telling the

community to meet the new stormwater rules," explains Locke, "we thought it would be a lot more effective to approach the solution through public education."

### Stream cleanup

The signature initiative of the stormwater program is the annual Stream Cleanup Event in Brewer, held on a Saturday in May. Imagine 170 people — directed by city employees, outfitted in orange safety vests and armed with garbage bags — moving along a riverbank like an invasion force, picking up tons of debris and trash.

Funded fully by more than \$6,000 in contributions from area businesses and organizations, the cleanup covers a seven-mile stretch



**PROFILE:**  
City of Brewer,  
Maine

**SETTLED:** 1770

**INCORPORATED:** 1812

**AREA:** 10,106 acres

**POPULATION:** 8,900

**INFRASTRUCTURE:**  
46 miles of sanitary sewers,  
65 miles of storm sewers

**ANNUAL BUDGET:**  
\$75,000  
(fiscal 2009, stormwater only)

**WEB SITE:**  
[www.brewerme.org](http://www.brewerme.org)



**“Instead of just coming in and telling the community to meet the new stormwater rules, we thought it would be a lot more effective to approach the solution through public education.”**

**Kenneth Locke**

### Staff participation

The same city employees who plan the event lead each group. In addition to Locke, they include city planner Linda Johns, code enforcement officer Dave Russell, treatment plant chief operator Lou Colburn, treatment plant lab manager Steve Butler, city engineer Frank Higgins, assistant city engineer Jeff Hand, water department director Mike Riley, collection systems supervisor Tracy Drew, and public works foreman Russell Wilson.

“The involvement of our city staff is critical,” says Locke. “We get support from the city council, city manager, and department heads, which is the key to success.” The police department controls traffic, public works provides trucks, and the fire department sends standby medical personal and firefighters. Any payment for city services comes out of the contributions, not from taxes.

The city-owned construction demolition debris landfill recycles metal, plastics, and wood waste trash. A private waste-to-energy plant takes remaining burnable debris. After the cleanup, the crews celebrate at a volunteer recognition picnic sponsored and funded by Jeff’s Catering, a local

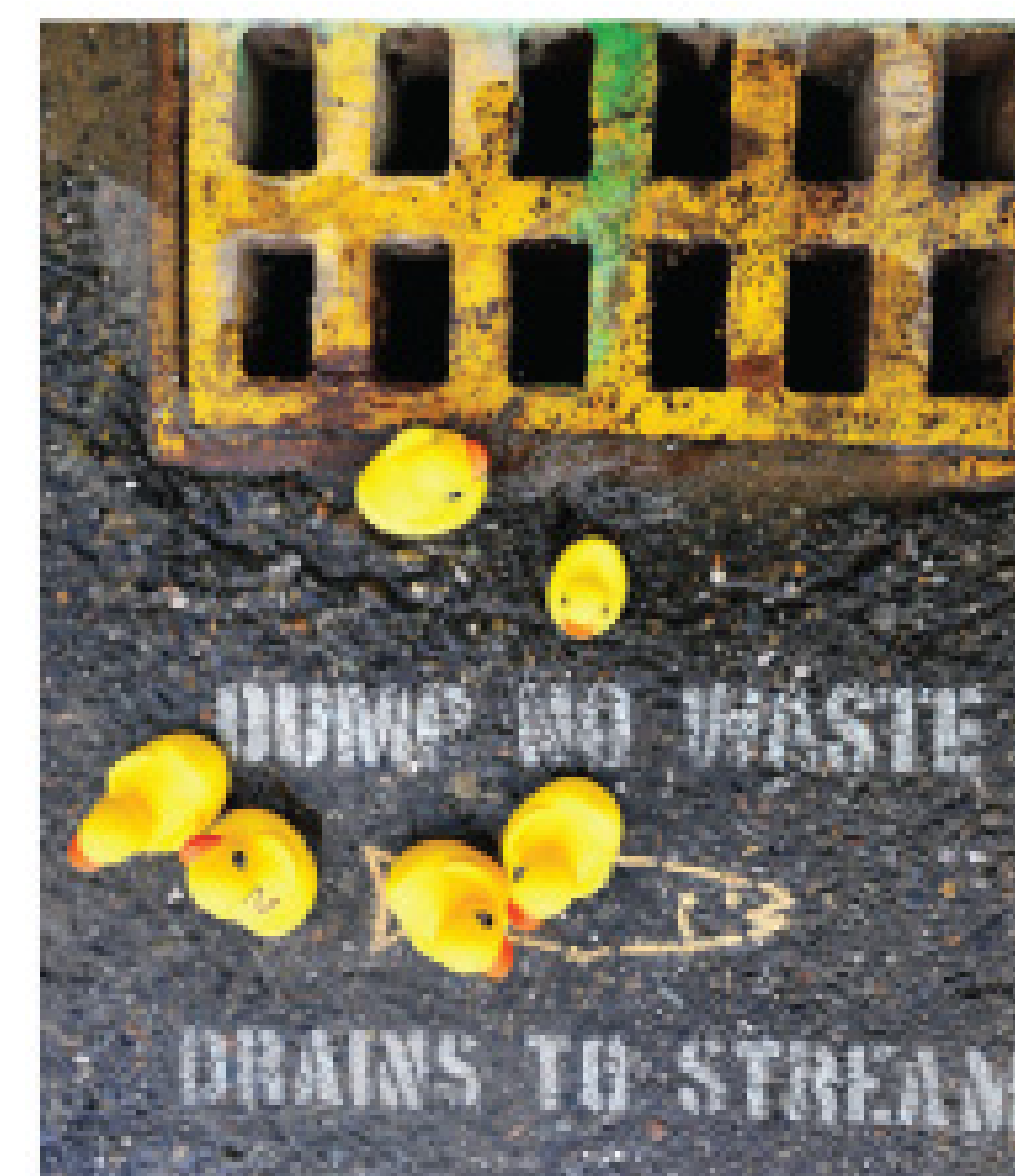
**Brewer treatment facility employees Craig Lilley (left) and Mark McVey use a grapple to clean storm drains. Crews have to be ready to deal with all kinds of weather and temperatures. Inset, McVey and Lilley prepare a storm drain for cleaning.**

program. It puts us on the map.” Volunteers include citizens from Brewer and around the state, school children, Scout troops, members of the Maine Geocaching organization, volunteers from businesses, and many city department heads and employees.

The day starts at the Brewer Auditorium, where the volunteers receive coffee, juice and doughnuts, and learn important safety procedures, like staying away from the water’s edge and avoiding needles or other dangerous objects. Next the volunteers organize into groups assigned different sections of the riverfront.

of the Penobscot River, as well as numerous tributaries. Their haul over the three years of the event: 19 tons of stuff that otherwise might have polluted Brewer’s surface waters.

“We started in 2005,” says Locke, whose in-house staff includes two environmental technicians and one supervisor. “It’s the biggest thing we do that attracts attention to our stormwater management



## REGIONAL INITIATIVE

The Bangor Area Stormwater Group (BASWG) is a formal regional collaboration of regulated entities within the Bangor Urbanized Area to comply with stormwater regulations from EPA and Maine Department of Environmental Protection.

Municipal members include

- City of Bangor
- City of Brewer
- City of Old Town
- Town of Orono
- Town of Hampden
- Town of Veazie
- Town of Milford

Other members include the University of Maine, University College at Bangor, and Air National Guard at Bangor. The BASWG is responsible for the Rubber Ducky media campaign, and last year gave away 2,000 rubber ducks at public events.

## STEVE RANNEY AWARD

The Steve Ranney Award is named after the late city engineer and stormwater manager for the City of Lewiston, Maine. The 2007 winner, Kenneth Locke of the City of Brewer, was credited for his “low-key, stick-to-itiveness” by Brenda Zollitch, facilitator for the Bangor Area Stormwater Group.

“Steve would have been immensely proud of the changes Ken has made happen through his hard work and perseverance,” she says.

David Ladd, statewide stormwater coordinator for the Department of Environmental Protection, agreed: “Ken continuously seeks ways to make municipal operations more efficient and implements a program that goes well beyond the state’s minimum requirements.”





The stream cleanup committee meeting at the Brewer Water Pollution Control facility sets up a working model of the spring cleanup campaign. Members seated (from left) are Ken Locke, director of environmental services; Frank Higgins, city engineer; Linda Johns, city planning office; and Tracy Drew, environmental services department. Standing: Steve Butler, Water Pollution Control Facility lab manager; Jeff Hand, city engineer; Lou Colburn, chief of operations; and David Russell, code enforcement.



business. There, the volunteers receive commemorative T-shirts and thanks from the mayor, and hear a pep talk on pollution prevention and control from the MDEP.

Local media cover the event aggressively. Reporters from the Bangor Daily News write articles before, during and after the event, and local TV stations send reporters. To help solicit volunteers, a local radio station airs daily public service announcements for weeks.

### Learning by canoe

Some communities might stop at one successful event like this, but not Brewer. The public education program includes other projects that bring citizens and municipal services together around the stormwater management cause. Working with the Penobscot River

bypass system. They lunch on pizza, chips, cookies and soda, and talk with plant staff about local water quality and pollution prevention. "This is an excellent tool for stormwater education, says Locke. "We see 40-60 students each trip."

Brewer takes full advantage of other opportunities to work with area students. The Environmental Department owns a tabletop model that traces non-point-source pollution and shows how various pollutants can enter the watershed and threaten water quality. Brewer Middle School sixth grade science teacher Brenda Willis uses the model (available from Enviroscape in Chantilly, Va.) in her classroom.

"I'm a firm believer in water conservation," she says. "We take students down to the wastewater treatment plant so they can see what happens to the water they use, and then we come back to the classroom and use the model." The model lets students "make it rain" so they can see how the water washes into the river. They simulate oil spills and runoff of pet waste and other pollutants.

"We've been doing this for 16 or 18 years," Willis says. "The kids love the hands-on experience, and the City of Brewer has been absolutely supportive of what we're doing."

Locke and his team make the model available at other venues, as well. An AmeriCorps volunteer hired by the Bangor Storm Water Group demonstrates it at other area schools, and the city makes it



John the Baptist High School students visit the Brewer Water Pollution Control Facility for tours. (Photo courtesy City of Brewer)

available at a local Water Day sponsored by the Brewer Salmon Club.

### To the streets

Stenciling the city's 1,200 catch basins is another project that draws public attention to stormwater management. Each June, when students and teachers are looking for outside projects, Brewer staff and Willis organize up to 60 sixth-graders into teams that paint "Do Not Dump — Goes To River" in yellow or white on the basins. They do half the basins each year. "People drive by the kids and honk and wave," says Locke. "It's just another way to teach students and educate the public."

Brewer seeks opportunities to collaborate with other groups on water education, and save money in the process. Working with the Bangor Area Stormwater Group (BASWG), Brewer's staff helps carry the stormwater message to public gatherings like the Bangor Folk

Festival and Bangor Garden Show.

"We target the homeowners ages 30 to 55," says Locke. "Our message is environmentally friendly lawn care." The programs urge property owners to use phosphorus-free fertilizer and to fertilize lawns in the fall, rather than in spring when rains are more likely to carry chemicals into the watershed.

"We also recommend setting lawn mowers at three inches to promote better root growth and shade out weeds, and leaving clippings on the lawn as a free natural nutrient," says Locke.

The training also emphasizes cleaning up pet waste, avoiding the use of pesticides if at all possible, using green gardening practices, and limiting oil runoff from driveways.



Keepers and local schools, Brewer takes part in a unique water education event five to seven times a year.

Advanced biology and environmental science students from area schools pile into 10-person war canoes and paddle down the Penobscot River, as the River Keepers volunteers educate them about stream history. (The canoes are built by retired teacher Mike Mayberry).

Midway through the voyage, they stop at the Brewer Wastewater Treatment Plant to tour the facility and the stormwater treatment

## Floating ambassadors

That is where rubber ducks come in. "Eighty percent of the people at these events have seen the statewide 'rubber ducky' outreach media campaign that the BASWG runs each summer on local TV to raise awareness about stormwater pollution," Locke says.

In the ads, the ducks represent different types of pollution, so when Locke and his team talk to people about stormwater pollution and in-home prevention measures, they give away a rubber duck as a reward for listening or answering a question correctly. The ducks also play a role in the interactive display about pollution.

"In our display, we feature five different forms of stormwater pollution: oil and grease, soil erosion,

ordinance to cover this issue, which will require all post-construction Best Management Practices (BMPs) to be operated, maintained and inspected by the developer or a homeowner group. There is also discussion about the BASWG hiring a consultant annually to inspect stormwater BMPs in all that group's MS4 communities.

**Pollution prevention.** Using an Elgin Whirlwind MV sweeper from Elgin Sweeper Co., Brewer cleans all streets each spring, removing 1,000 to 2,000 cubic yards of sand used during winter road maintenance. The material is recycled at the city's Construction Demolition Debris landfill as cover.

**Catch basin cleaning.** A crew of two, plus a supervisor, cleans and flushes 800 of the city's 1,200 catch

**"We target the homeowners ages 30 to 55. Our message is environmentally friendly lawn care. We recommend setting lawn mowers at three inches to promote better root growth and shade out weeds, and leaving clippings on the lawn as a free natural nutrient."**

Kenneth Locke

pet waste, fertilizer and pesticides," Locke says. "If we select a pet waste duck, we place it on the display near the pet waste, and the water carries the duck to the stormwater collection system on the display, and eventually to the receiving stream. This is how we connect the source of pollution with the river."

## Other measures

As required by its state permit, Brewer has launched several other programs to control stormwater pollution throughout the community. They include:

**Illicit discharge detection and elimination.** A city ordinance prohibits illicit dumping, and a Stormwater Hotline helps apprehend and stop violators. Citizens report incidents over the hotline, which connects directly to cell phones and e-mails of stormwater and wastewater treatment managers.

**Construction site runoff control.** A local ordinance will cover this issue, but at present the city relies on the Maine Construction General Permit, and refers contractors to that.

**Post-construction stormwater management.** The city is writing an

basins every year, removing 300 to 400 cubic yards of material. Equipment includes a clamshell-type Stetco Model 920T/13 catch basin cleaner manufactured by Stedt Hydraulic Crane, and a Vactor Model 2110 sewer and basin cleaner from Vactor Manufacturing.

**Training of municipal employees.** Brewer makes certain its own employees are knowledgeable about stormwater pollution prevention. Employees from the environmental, wastewater, public works, fire, code enforcement, planning, and parks and recreation departments receive training annually.

Combined with effective public education, all these measures help Brewer and its residents keep local waters clean and healthy. ♦

## MORE INFO:

**369 Elgin Sweeper Co.**  
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www.elginsweeper.com

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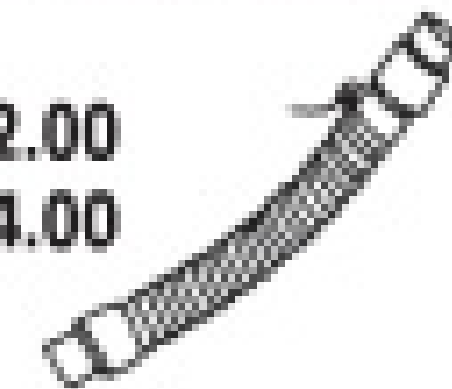


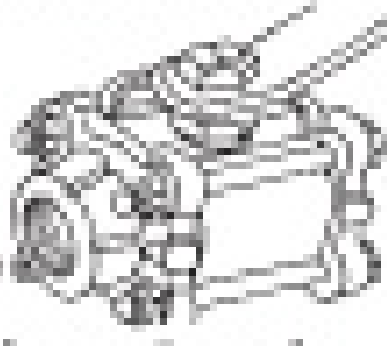
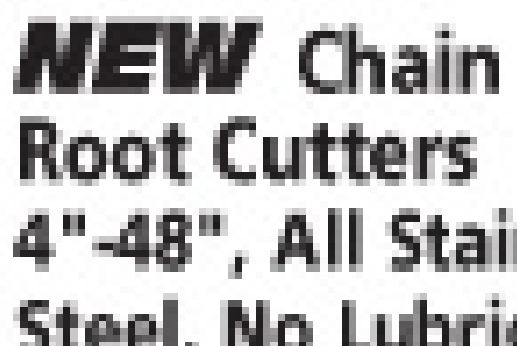


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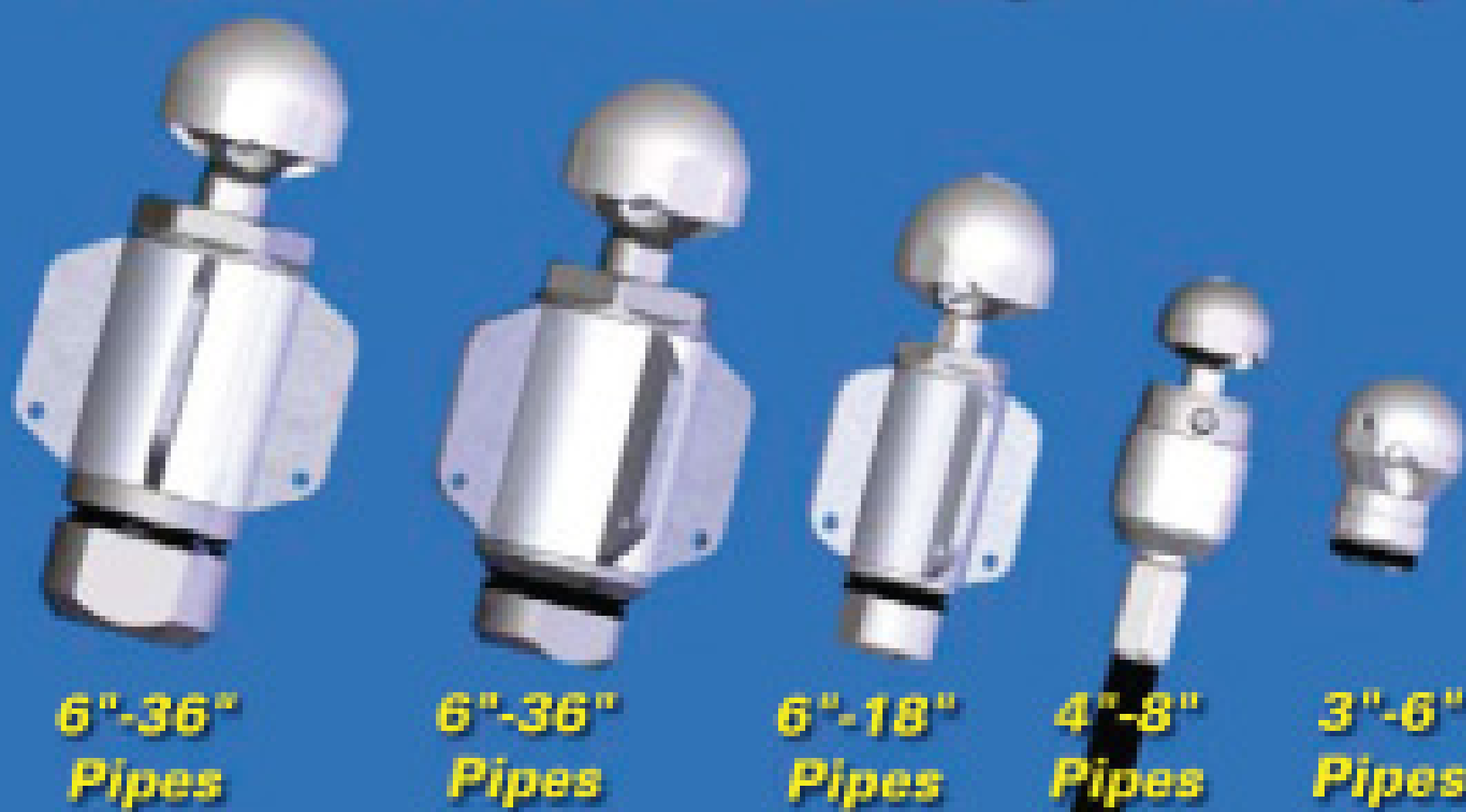
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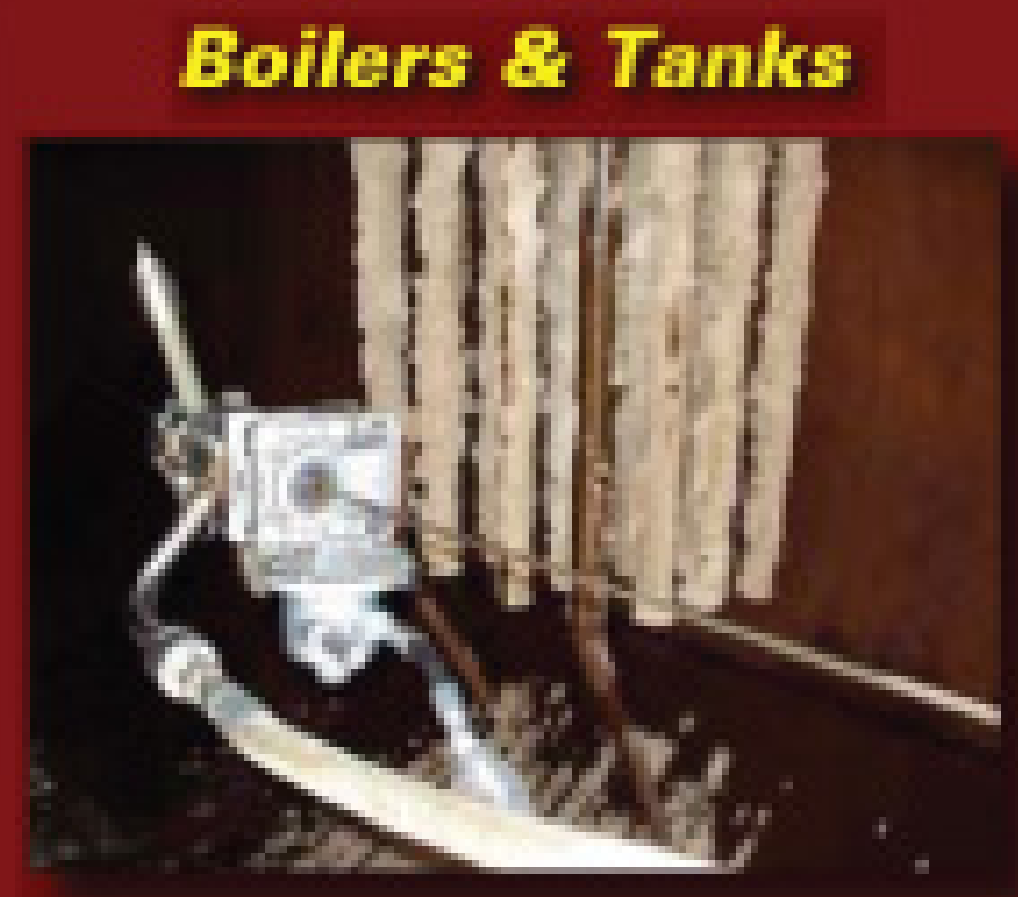
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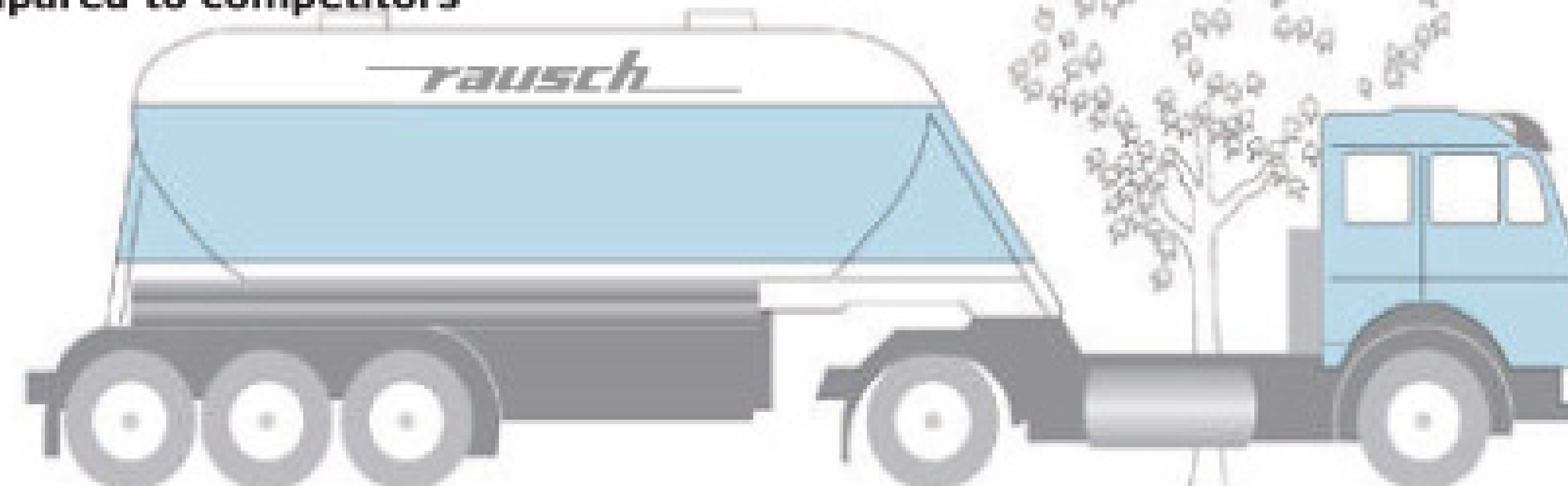
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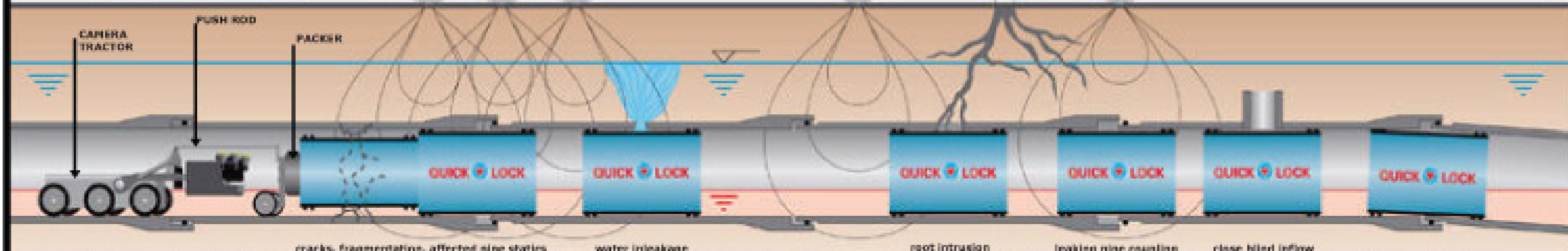


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A worker from George Schmid & Sons readies the wet well base for installation.

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# QUICK CHANGE

A pre-engineered system enables a city in Washington to replace a trouble-prone lift station with minimal disruption and at affordable cost

*By Megan Monson*

**“The stations are all similar, enabling our maintenance people to work on them easily. They don’t have to learn different telemetry for different stations, and the same is true for the pumps.”**

**Jim Hodges**

The pump station on busy Brady Road in Camas, Wash., had a reputation for pump failures, and maintenance and corrosion problems. The station, one of the city’s largest, served the populated west side.

The Public Works Department had replaced four wastewater pump stations in as many years, but the Brady Road station posed some challenges. First, it could not be taken out of service. Second, the site’s small footprint complicated the mechanics of building

on it. The station is next to a steep slope and lies alongside Brady Road. Any construction would mean blocking one traffic lane for trucks and equipment.

“We had to complete the project efficiently and fast,” says Jim Hodges, capital projects manager for the city. As in previous pump station replacements, the department installed a pre-engineered system made by Romtec Utilities Inc. in Roseburg, Ore.

“The project was very successful. It was built on time, under budget, and we had no change

orders,” says Hodges. “The system was exactly the way we wanted it. We put it in, it worked, and we walked away.”

Lift station components — structural, mechanical, electrical, and communication — arrived in coordinated deliveries. The integrated system, configured to meet the city’s requirements, came pre-tested and ready to install, allowing the city to standardize its lift station network.

“The stations are all similar, enabling our maintenance people to work on them easily,” Hodges

says. "They don't have to learn different telemetry for different stations, and the same is true for the pumps."

The pumps remained fully functional during installation of the new system, which took less than two months. Workers left the existing power service intact, installed its replacement, then started up and tested the new station before decommissioning the old.

The city added an innovative twist to the project. Contractor George Schmid & Sons of Washougal, Wash., removed the pumps from the old wet well and piped that well into the Romtec

8-foot-diameter precast concrete wet well. That gave the lift station more storage capacity, and the pumps run less frequently.

"We know the city's west side is going to grow," says Hodges. "Replacing the Brady Road pump station has made that expansion possible, and the Romtec system is providing critical reliability, as it does in our other pump stations." ♦

**MORE INFO:**

**233 Romtec Utilities Inc.**  
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The new Brady Road wastewater lift station uses a complete system design from Romtec Utilities Inc. that has helped the City of Camas standardize its lift station network.

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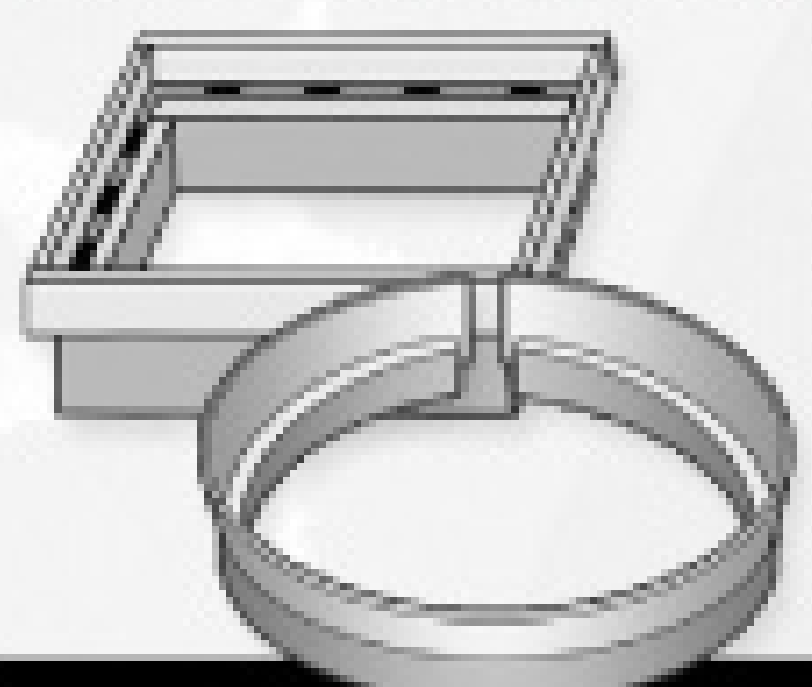
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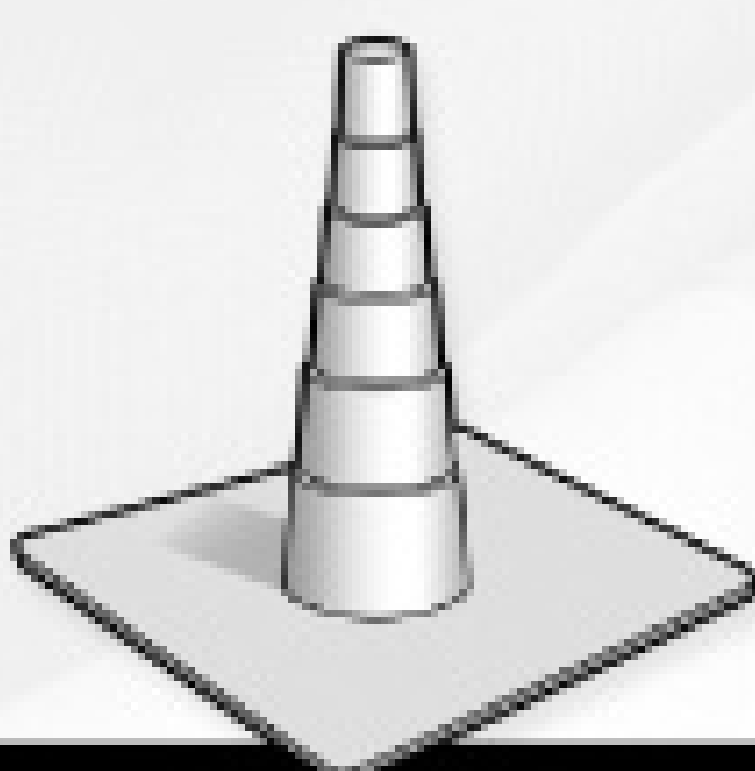


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Catch Basin and Monument Box Risers



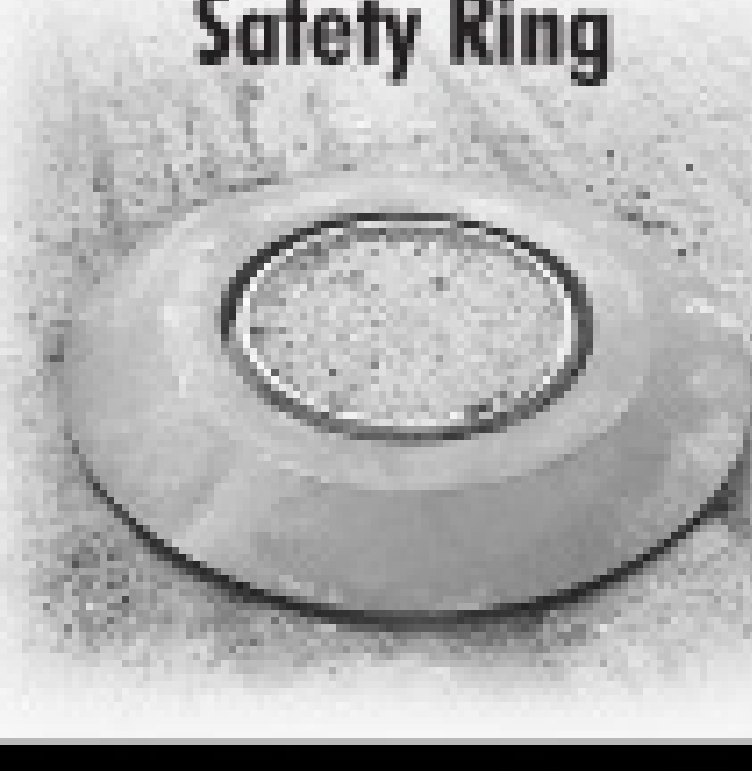
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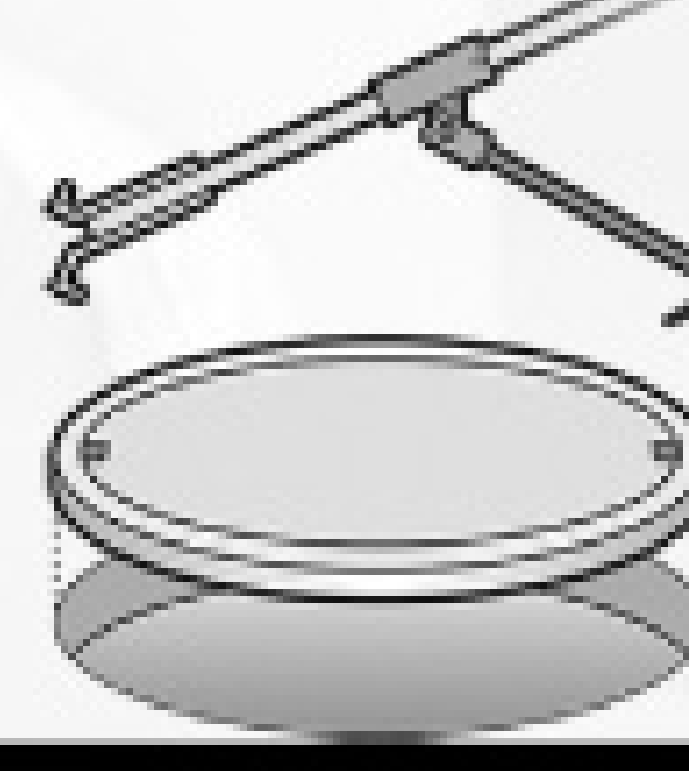
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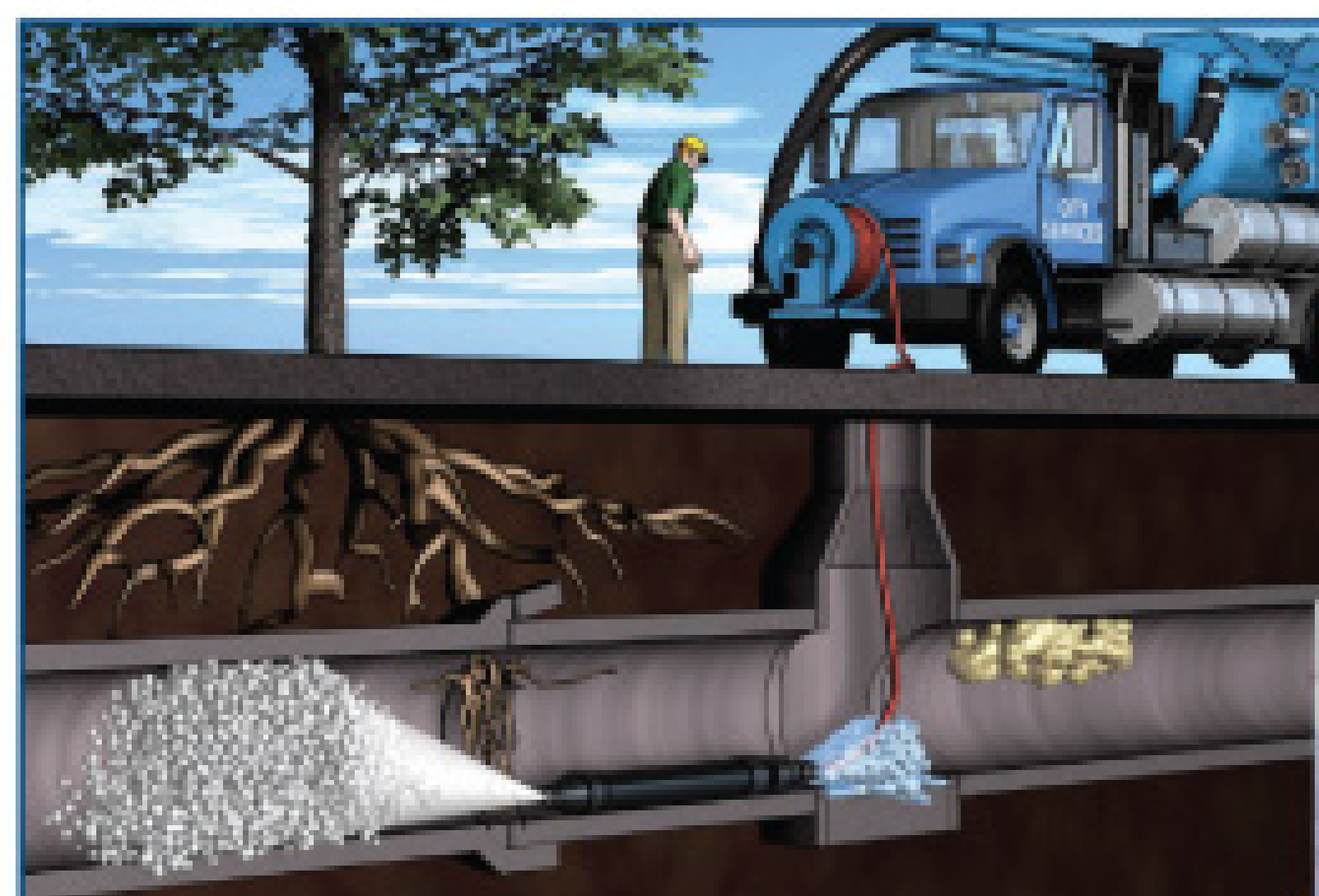




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# Product Spotlight

## New Catch Basin Cleaner Delivers Versatility

By Ken Wysocky

The VC16 vacuum catch basin cleaner from Vacall Industries Inc. is designed for municipalities that need a single machine able to perform multiple tasks. "The key feature is versatility," says Terry Galica, director of operations. "The VC16 is a catch basin cleaner, a street sweeper, and a leaf collector, all in one machine."

The unit's 125-hp turbocharged Cummins 6BT5.9 six-cylinder engine adds power. "Compared to a four-cylinder engine, this unit conserves fuel because it doesn't have to work as hard and is more durable," Galica says.

The engine drives a 33- by 12-inch, 300-pound blower fan that creates 190 to 235 mph airflow and is rated at 16,500 usable cfm. The blower also is acoustically suppressed to reduce noise.

"The fan is built to last the lifetime of the unit itself," Galica says. "I've seen fans that have lasted for more than 30 years." The machine has a 12-inch-diameter, 8-foot-long rubber, steel-wire reinforced vacuum intake hose. When coupled to the intake hose assembly, a 12-inch-diameter, 7-foot-, 8-inch-long catch basin tube provides a cleaning depth of 20 to 30 feet. A rotating, hydraulically powered boom guides the hose.

The VC16 also offers a heavy-duty 16-cubic-yard debris hopper, providing more productivity and cost-efficiency than smaller hoppers. "With the price of fuel today, you want to spend as much time as possible on the road, not running back and forth to dump loads," Galica observes.

Powder-coat paint provides a more durable, resistant and no-fade finish. The VC16 comes with a 350-gallon polyethylene water tank. A centrifugal pump can move 50 to 120 gpm at 50 to 75 psi. An indicator light in the cab alerts the operator when the water level is low.

Options include street sweeping equipment in right- or left-side configurations. **For information: 800/382-8302; www.vacallindustries.com.**



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VC16 vacuum catch basin cleaner from Vacall Industries Inc.

## Zoeller Offers Progressing Cavity Grinder Pump

The E810 progressing cavity grinder pump from Zoeller Pump Co. adapts to existing progressing cavity grinder pump systems and has a quick-disconnect coupling. It features finned class 30 cast-iron construction to reduce heat, corrosion-resistant powder-coated epoxy finish, stainless-steel hydraulic pump rotor, upper and lower ball bearing construction and a carbon/ceramic mechanical seal.

**800/928-7867; www.zoeller.com.**



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## Polylok Introduces New-Design Catch Basins

The new catch basin from Polylok Inc. features adjustable inlets and outlets and a patent-pending seal and nut assembly that instantly adapts to accept 2-, 3-, 4-inch and corrugated pipes. Available in 9-inch and 12-inch-square models, the basins allow up to four inlets or outlets. Made of high-impact plastic, the unit is suitable for landscape and hardscape applications, as well as light vehicle traffic. Cast iron grates are available.

**888/765-9565; www.polylok.com.**



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## Almetek Creates E-Z Hit Marker Kit

The compact E-Z Hit Marker Kit from Almetek Industries Inc. is designed

to make it easy to mark damage to underground facilities at excavation sites, and save costly legal fees and court costs. The kit conforms to Common Ground Alliance Best Practice Documentation standards and comes in a 19- by 4-inch crush-proof storage case. It includes a 6-foot, HDPE measure ruler with large number graphics that can be unrolled to lay flat or stand on edge with two anchoring spikes, along with a user's guide. The two fiberglass markers can be placed in the ground to show and mark damaged areas. **800/248-2080; www.almetek.com.**



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## COXREELS Launches 12-Inch Welding Cable Reel

The 112WCL series welding cable reel from COXREELS is equipped with an integrated drag brake/reel stop to avoid free-wheeling and cable uncoiling during storage and transport. The reel handles up to 100 feet of 2/0 gage welding cable and features a Cable

Keeper to prevent the pigtail from whipping or twisting. The bronze, self-lubricated spherical bearings at each end of the drum are designed for rough, heavy-duty applications. **800/269-7335; www.coxreels.com.** ♦

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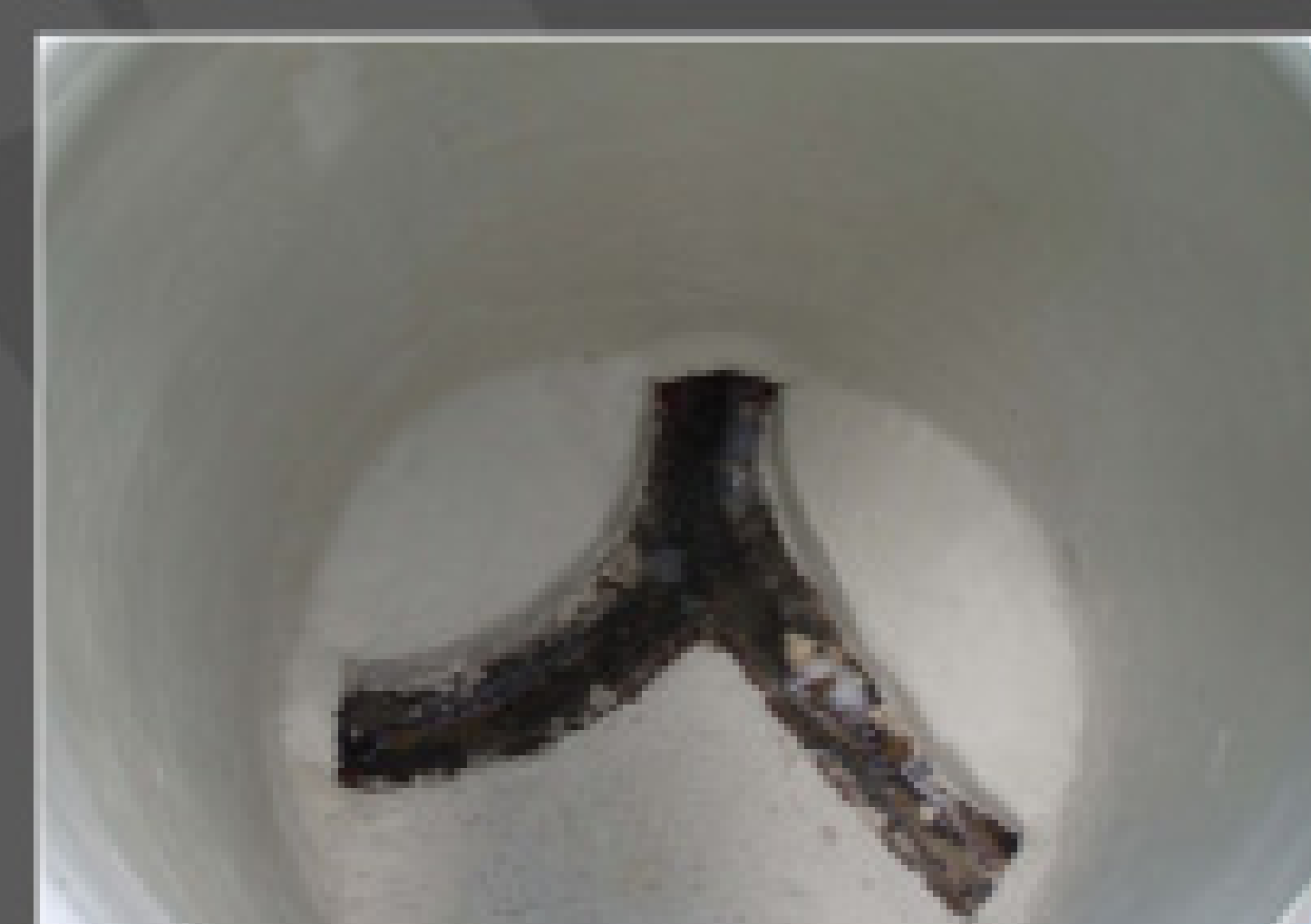
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# NEW TWIST ON VALVE CARE

The Spin Doctor valve and hydrant exerciser is designed to simplify the processes of exercising valves and collecting and analyzing data

By *Ted J. Rulseh*

**E**xercising of valves and fire hydrants is a necessary but often time-consuming job. Mechanized and automatic exercisers reduce manual labor, and accompanying computerized systems simplify record keeping and analysis of valve condition, helping water utility managers plan repairs, replacements and upgrades.

The Spin Doctor hydraulic-powered valve and hydrant exerciser

from Hurco Technologies Inc. is designed to enable quick and easy setup and to minimize operator fatigue and the risk of repetitive motion and other types of injuries. The unit can mount to a variety of vehicles, including pickup trucks (front or rear hitch), trailers, vacuum units, or off-road vehicles for remote right-of-way service.

It works in conjunction with the company's Valve Star data collection system, which enables electronic entry of complete information about each valve and the exercising performed on each visit. The system automatically gives GPS positions on all valves and hydrants and is compatible with most mapping systems.

On May 19, Leo Baumgart, national sales manager with Hurco Technologies, led a demonstration of the equipment for the Water Utility in the Village of Menomonee Falls, Wis. Taking part were water maintenance technicians Louie Thon and Troy Bacon, and Eric McRoberts, representing Davies Water of Muskego, Wis., a Hurco distributor.



Utility maintenance technician **Troy Bacon** operates the Spin Doctor unit with Valve Star head. The joystick at his left thumb activates valve closing and opening.

The village purchased a Spin Doctor unit in spring 2008 and plans to use it to exercise its 4,473 valves on a two-year rotation.

## Walk-around

The demonstration included the village's Spin Doctor unit and a demonstration model equipped with the Valve Star system, to which the village unit could be upgraded. The village unit is trailer-mounted. The system includes a 6.5-hp manual-start gasoline engine coupled to a hydraulic power pack.

The control console is mounted on a jointed arm designed for a wide range of motion and a reach of about 13 feet from the vehicle. This lets users reach multiple valves and hydrants in close proximity without repositioning the vehicle. Simple gas springs support the weight of the console, making it easy for users to move and position.

To exercise a valve, the user grasps two handles, positions the

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### MANUFACTURER:

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www.gethurco.com

### LOCATION OF DEMO:

Menomonee Falls, Wis.

### DEMONSTRATED BY:

Leo Baumgart, national sales manager, Hurco Technologies

### LIST PRICE:

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The demonstration unit includes the Valve Star head with screen for recording valve data. (Photos by *Ted J. Rulseh*)



**Utility maintenance technician Louie Thon uses the Spin Doctor unit to operate a valve beneath a street in Menomonee Falls, Wis. Inset: A close-up shows the control console on the Spin Doctor unit owned by the Village of Menomonee Falls. The operator's right hand controls the lever that activates the system to open or close each valve.**

accord with the difficulty of turning the valve. A hydraulic fluid bypass system keeps the unit from exceeding the preset torque level.

The demonstration unit supplied by Hurco was mounted on a pickup truck trailer hitch. It included a hydraulic power pack, 13.5-hp gasoline engine with electric start, and an alternator. It had the same jointed arm as the village unit, but the control console included the Valve Star system. This unit replaces the control lever on the right side of the console with a finger-operated joystick on the left side.

It also includes a data screen used for entering valve information and for adjusting system

torque. A built-in GPS receiver automatically receives valve coordinates, which are stored in memory. Data from an exercising session is stored on a memory card for later transfer to the master valve maintenance database in the office.

Operators use a set of six function buttons on the right side to navigate between different information screens. A round knob on the right side of the screen lets users “click” around fields on the screen, and a dial function lets them change or add data. The round knob is also used for torque adjustment.

## Operation

Thon and Bacon towed the village Spin Doctor unit to a quiet street a short distance from the Water Utility headquarters. Thon removed a valve cover in the street near a fire hydrant. Bacon pulled-started the engine, and Thon maneuvered the control console on its jointed arm until it was over the 6-inch gate valve.

He deployed a valve key to engage the operating nut on the valve, then connected the key to the square fitting on the control unit. As he squeezed the control lever into the up position, the key turned, closing the valve. After 16

**To exercise a valve, the user grasps two handles, positions the console directly over the valve, and mates a valve key with the square lug in the base of the console. The user moves a low-effort lever — up for close, down for open — to activate the hydraulically powered mechanism that turns the valve.**

revolutions, he pulled the control lever down to reopen the valve.

Thon then swung the unit's arm several feet to the curbside to demonstrate how the unit's reach enables exercising of additional valves without moving the trailer. When Thon took his hands off the control panel handles, the panel remained in position, the arm supported by the gas springs.

Baumgart showed how turning the knob on the console left or right increases or decreases torque.

With the first phase of demonstration complete, Bacon and Thon

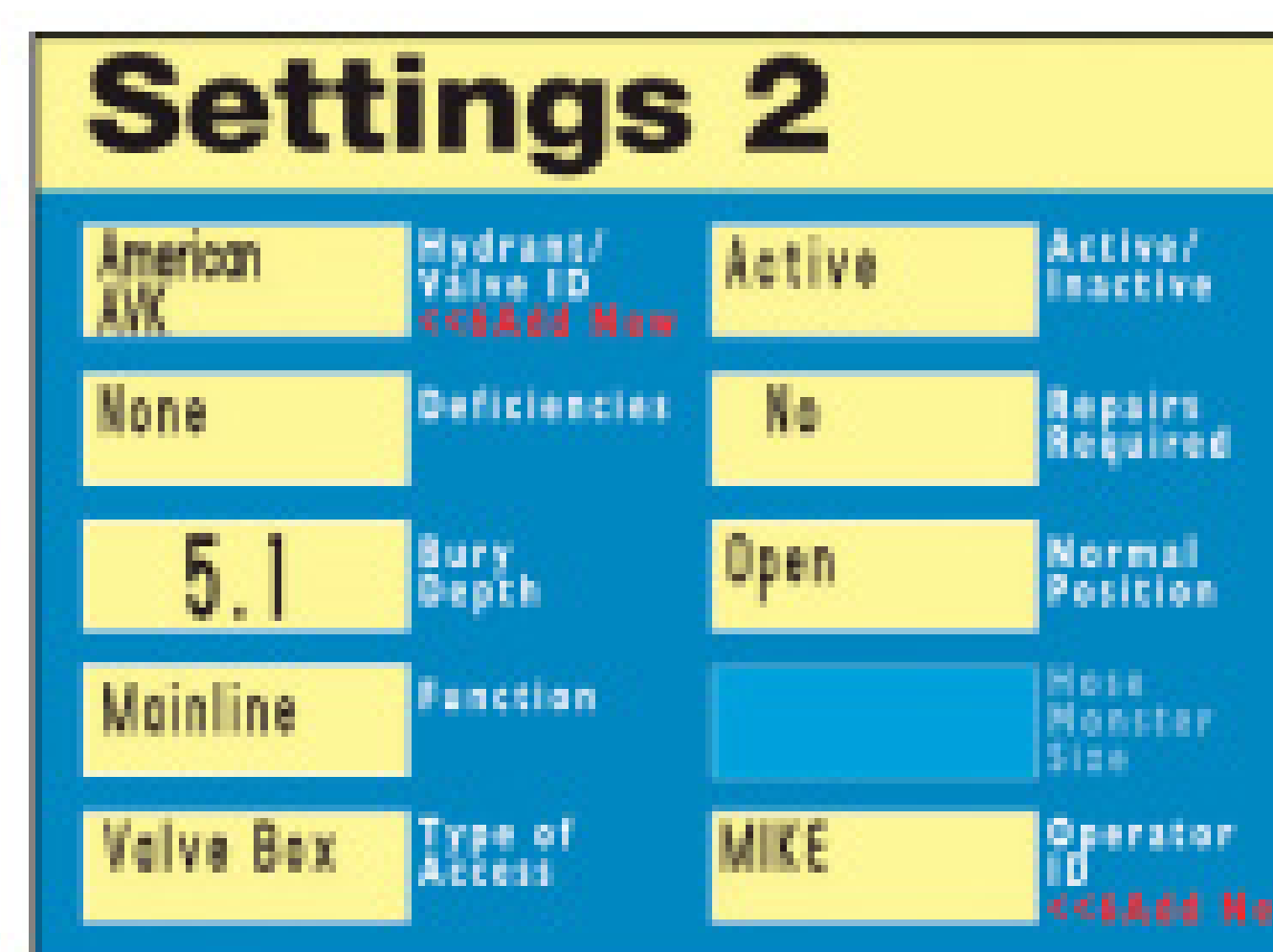
moved the village's Spin Doctor unit, and Baumgart backed the Hurco demonstration unit into position near the same valve. He fired up the engine with the electric start and moved the control console into position over the valve.

Because the mechanical functions of the system with the Valve Star head are essentially the same as for the village's unit, Baumgart demonstrated the workings of the data screen. He used the function keys to show the series of screens. Users can take advantage of as few or as many data points as they wish — the more data, the more complete the information for future

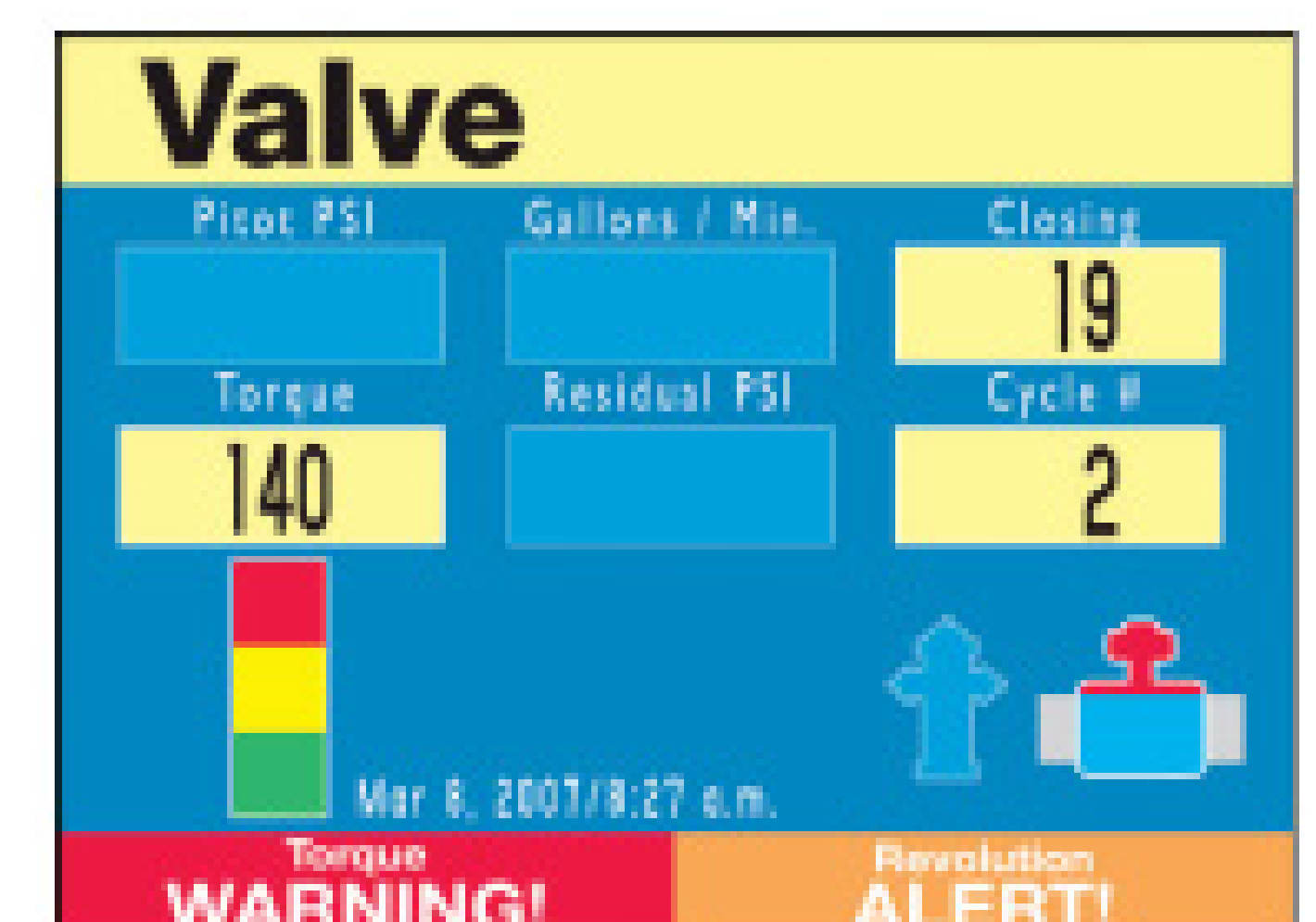
reference. Screens include:

**Settings 1.** Users can choose valve or hydrant, and enter the valve size and type, direction of operation (e.g. Open Left), actuator type, maximum torque, maximum rotation speed, and maximum revolutions.

**Settings 2.** Users can enter the valve manufacturer, bury depth, function, type of access, status (active or inactive), normal position, and operator identification. This screen also enables entry of any deficiencies noted and repairs required (See Figure 1).



**Figure 1. The Settings 2 screen on the Valve Star panel.**



**Figure 2. The Valve screen on the Valve Star panel.**



**Location.** This screen provides GPS coordinates, including elevation, and provides space where the user can enter an address or other location data.

**Valve.** This screen displays the actual exercising data: hydraulic pressure, flow, torque, cycles, and status. A valve icon shows the progress of opening and closing (see Figure 2 on the previous page). Here, a torque warning triggers an on-screen alert and a siren alarm if the pre-set torque level is exceeded. In addition, the computer automatically sets the number of revolutions according to the size of the valve and triggers audible and visual alarms when the operator approaches that number. This prevents valve damage.

If a valve is left in a partially closed position, the valve icon lights up red as a warning to operators to reopen it.

#### Observer comments

The Spin Doctor unit is a clear advantage over the heavy valve wrench that Thon and Bacon also carry in their service truck. "It saves us a lot of time and a lot of labor, as compared to needing two of us to turn a wrench to get a valve open," Thon observed.

"The system won't break the valve because it stops at the torque level that you set." These benefits translate to greater productivity in the field and less risk of damage to assets.



Utility maintenance technician Louie Thon demonstrates how the Spin Doctor unit's jointed arm provides reach that can enable exercising of more than one valve without repositioning the trailer.

**"The system gives you a history of your valve exercising program. Users can easily upload this data into any system that accepts a Microsoft Excel program. Most GIS and asset management programs accept Excel or Access-based information."**

Leo Baumgart

The Valve Star unit simplifies the process of data collection by replacing handwritten forms with on-screen data collection, which transfers directly into a database for office use. Data fields on the various screens are simple to use, and it appears that operators could become proficient with minimal instruction.

A few modifications could make the system easier to use. The screen was difficult to read in moderately intense sunlight. More brightness, or a hood such as those used on video camera monitors, would make the screen more readable. (Of course, readability is not as critical for simple data entry as for making and recording pipe inspection observations).

The dial system for entering letters and numerals to record observations is somewhat cumbersome; some type of keypad would help. A laptop-style interface could make data handling easier, especially if the entire unit could be detached and carried to the office, reducing reliance on memory cards for data transfer.

#### Manufacturer/ user comments

Baumgart notes that Hurco is continuously evaluating improve-

ments to the system, including a sun shield for the Valve Star data screen. Also under exploration is a handheld computer interface.

He notes that data handling is already simple, as all valve data is saved to an SD memory card that can be taken to the office for download into a computer and entry to a database. "The system gives you a history of your valve exercising program," he says. "Users can easily upload this data into any system that accepts a Microsoft Excel program. Most GIS and asset management programs accept Excel or Access-based information."

Tom Dimoff, water utility crew leader, reports that maintenance technicians were at first skeptical of the Spin Doctor unit, which replaced older electrically powered valve turners. On trying the unit, the technicians universally favored its hydraulic operation.

Dimoff notes that staff reductions are forcing his department to do more with less. He reports that valve exercising volume has doubled to about 75 valves per day since the utility put the Spin Doctor unit to work. "The guys are also reporting less fatigue and less elbow, back and shoulder pain," says Dimoff. "That may translate to fewer workers' compensation claims." ♦

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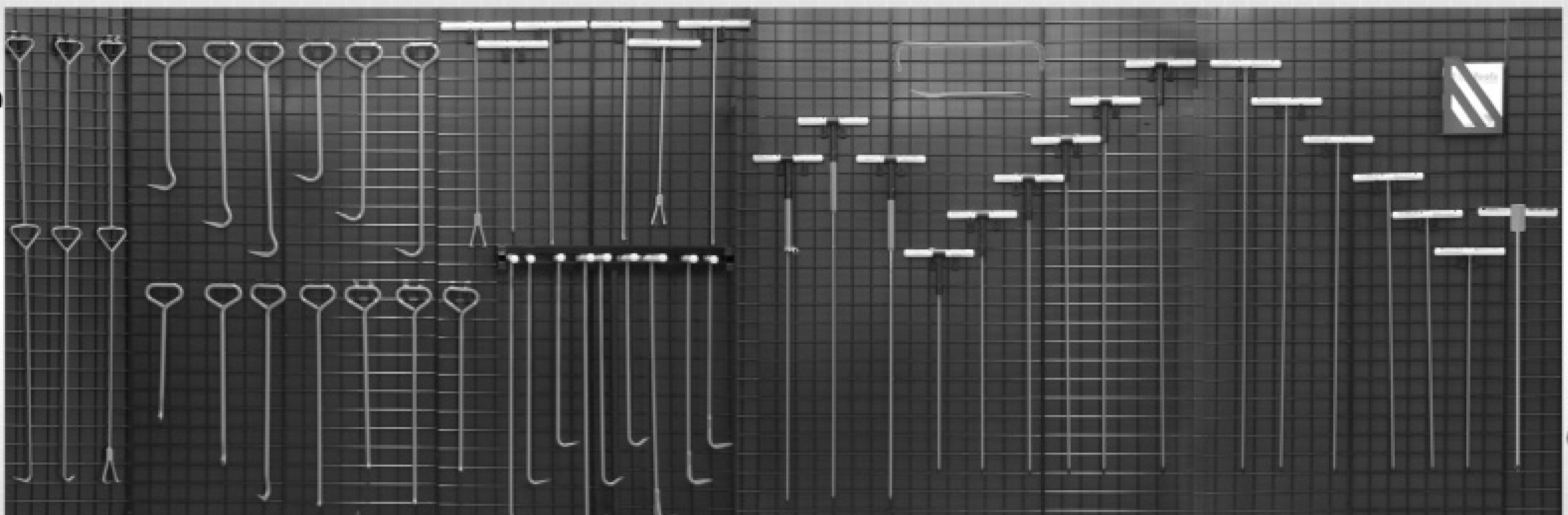
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# BOUNCING BACK

Resilience is the key to helping team members stay productive and energized even in the face of rapid change and constant pressure

By Ken Wysocky

**B**eset by budget cuts, waves of retirements, shifting agendas from newly elected officials, and scarce resources, public employees need a new ally to survive: resilience.

"Nowadays, public sector employees are under pressure to get more done with fewer people in less time, and with lower budgets and under constant scrutiny, and all the while wondering if their job is safe," observes Al Siebert, founder and director of The Resiliency Center.

He's also author of *The Resiliency Advantage: Master Change, Thrive Under Pressure and Bounce Back from Setbacks*, and was a guest speaker at the 2007 American Public Works Association annual International Public Works Congress and Exposition in San Antonio last fall.

These pressures pose a challenge for what Siebert calls "caretaker managers," who are accustomed to essentially keeping the existing system functioning smoothly, as well as those who've reached the point of "on-the-job retirement."

## Under adversity

"The good caretaker is suddenly an impediment to change," says Siebert, who has studied management psychology for more than 30 years. "You have new managers coming in with new ideas, and the mentality is, 'Well, we never did things that way before.' The most desirable employee under these

circumstances is self-motivated and change-proficient. It's essential that people be resilient."

How can a manager determine if an employee is resilient? An easy litmus test is how they respond to adversity. A resilient employee will focus on solving the problem, while others will look for someone to blame, play the "woe-is-me" card, and remain mired in unhappiness, unable to move ahead, and dragging down their colleagues.

Managers can also gauge staffers' resilience by observing how they react to constantly changing technology, such as Global Positioning Systems and new computers.

"Younger employees are completely OK with new computer systems or GPS or new software, while old-timers just shake their heads," Siebert notes. Other attributes of resilient employees include the ability to bounce back from failures and remain physically and emotionally healthy under duress.

## New approaches

So how does a public sector manager develop resilient employees? First of all, stop instructing and start coaching. "A number of younger people are really eager to learn — coach them and challenge them," Siebert says. "Manage them with questions instead of managing them with instructions.

"This encourages self-motivation, responsibility and good coping skills. It invites people to bring

their minds and feelings to work, and that increases job satisfaction. Instruction, on the other hand, tends to create unmotivated employees who sit and do only exactly what they're told to do."

Managers also need to take a good, hard look at their direct reports and figure out what satisfies them emotionally. "The organization takes care of paychecks and benefits," Siebert says, "but managers must focus on the emotional paychecks. Employees need to feel appreciated and recognized and gain a sense of achievement. This is what makes a job a great job, rather than something that just pays the bills."

Of course, managers must be careful not to go overboard. "As a manager, you don't want to become so relationship-oriented and concerned about everyone's feelings that you don't get the job done," Siebert cautions.

## Weakness to strength

Managers can also nurture resilience by taking a bothersome attitude or behavior and looking at it as a strength. For example, consider the employee who's constantly negative. Most managers have a negative attitude toward chronically negative employees, Siebert says. But those naysayers' ability to see flaws and envision worst-case scenarios can actually help managers assess things more realistically.

Moreover, suppressing contrarian viewpoints can lead to faulty

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

"group think" that can spawn bad decision-making. "Listen to them, validate their points, and cultivate them into being a group asset," Siebert says. "Don't try to change them. Instead, tell them, 'I need your help here. What could go wrong with this idea?'"

In fact, Siebert says a chronic negativist is so valuable that if a department doesn't have one, a manager should appoint someone to play devil's advocate on new proposals. Learning how to counter-

**"You have new managers coming in with new ideas, and the mentality is, 'Well, we never did things that way before.' The most desirable employee under these circumstances is self-motivated and change-proficient. It's essential that people be resilient."**

balance positive and negative viewpoints help managers develop a more flexible style, which in turn becomes a model for the employees they supervise.

Managers can improve their flexibility by purposely reacting to situations in exactly the opposite way they'd normally react. "It's the power of paradoxes," Siebert notes. "You can consciously choose to be both one way and another way."

In other words, a flexible manager could be both creative and analytical, optimistic and pessimistic, serious and playful. This ability to counterbalance indicates high emotional intelligence. The more counterbalanced traits a manager has, the better he or she can handle disruptions and change, Siebert says.

#### Encourage input

When confronted with a drastically new problem or situation, managers can strengthen employee's resiliency by asking for their input. "In any situation where senior management says, 'You people will change,' and there's no veto, you get grumbling," Siebert says. "A solution that a group comes up with will work much better than any idea that management comes up with. To impose a solution tells employ-

ees, 'You're too dumb to figure it out on your own,' and that decreases the psychological paycheck."

Last but not least, managers need to look out for employees' mental and physical health, which often suffers when they work longer hours and worry about job security. That means encouraging employees to participate in any work-sponsored health and lifestyle programs and ensuring they strike a proper balance between work and home.

"It's analogous to equipment maintenance," Siebert says. "If a truck is going to last, you've got to perform maintenance all the time. The same is true for your body.

Be sure you laugh, play and eat healthy — it serves as a good role model. Anyone who's resilient is also happy and has a sense of humor."

Managers who don't support

and encourage healthy lifestyles run the risk of weakening their employees' cognitive skills and resiliency, which can lead to more accidents and mistakes, as well as disability claims. "People who are resilient don't file disability claims," Siebert says.

In short, there are few constants in the fast-paced world of the public sector. But by being resilient, and helping others develop resiliency skills, you can make it a lot easier to roll with the changes. ♦

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### SPIR STAR Names Sales Manager

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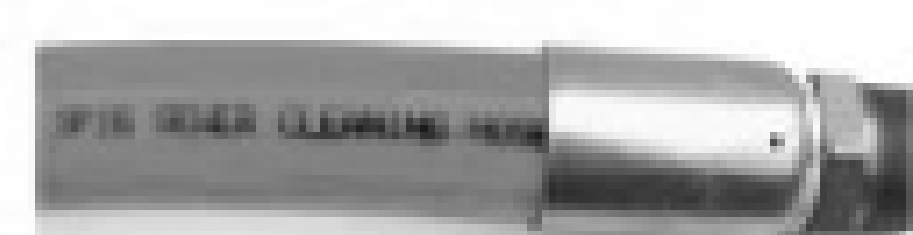
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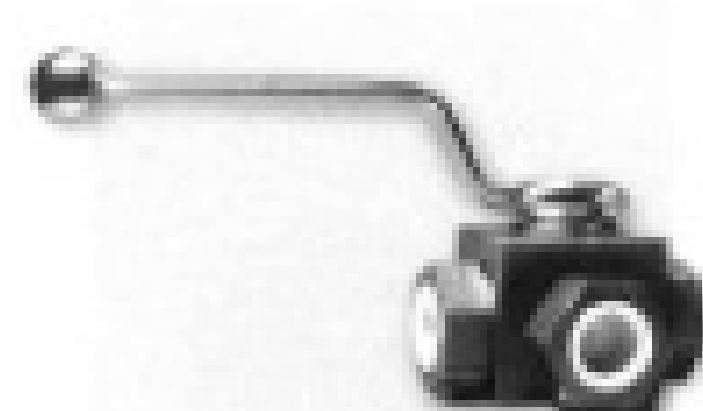
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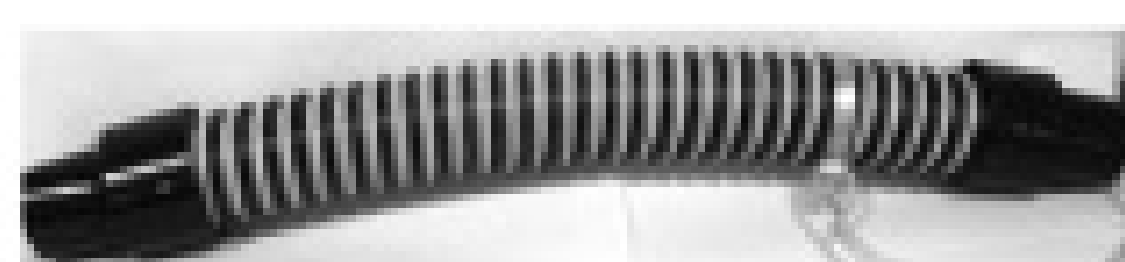
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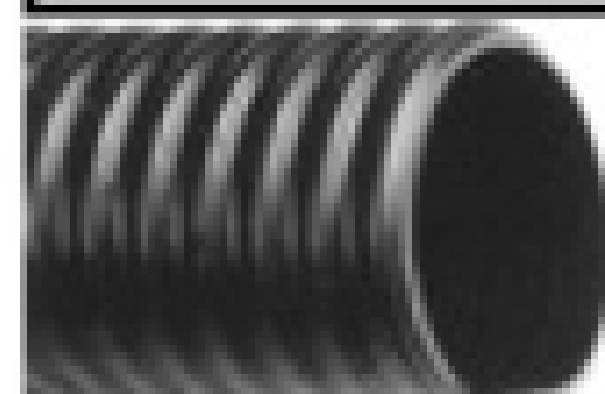
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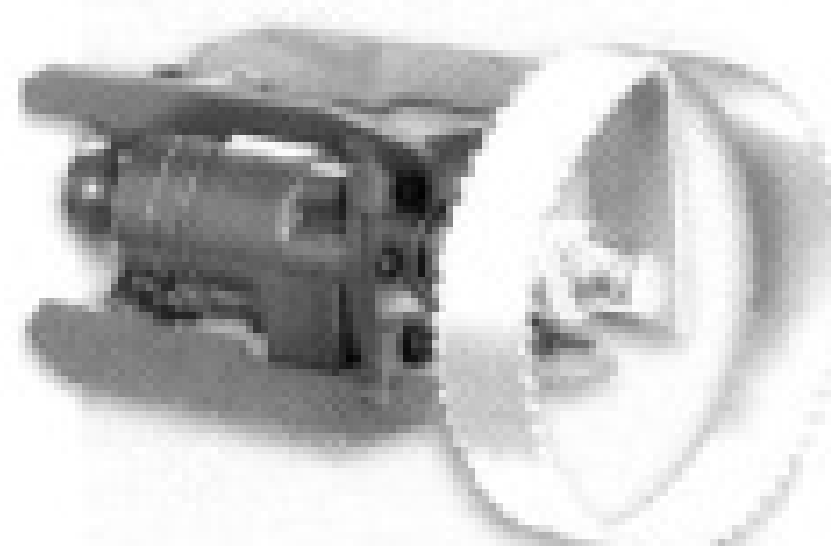
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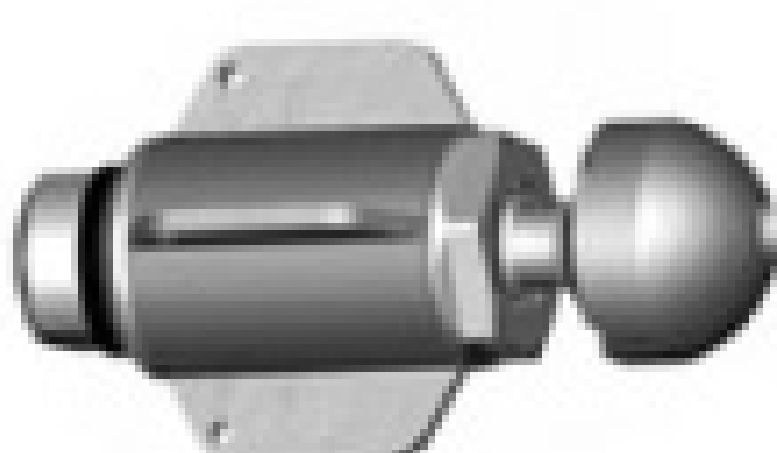
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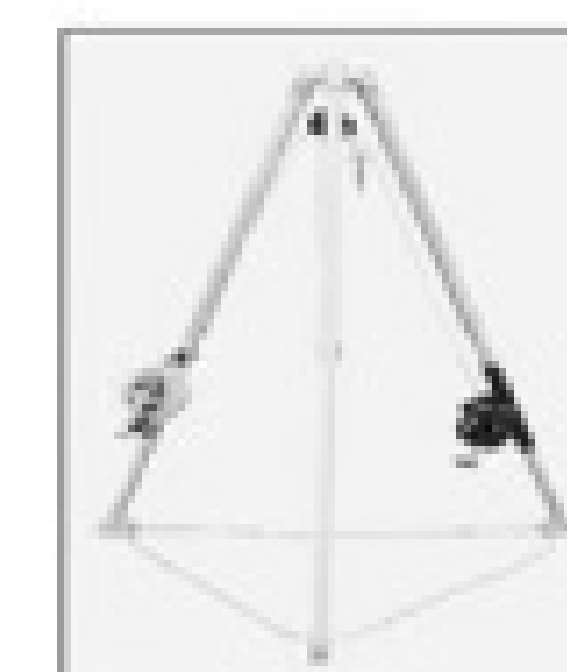
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# SETTING THE PACE

PACP becomes the industry standard in Quebec, and the new mandatory guideline helps position the program as the standard for Canada

By Irv Gemora

**I**t's always satisfying when we accomplish our goals. I'm experiencing that satisfaction right now as NASSCO's vision of creating standards for the rehabilitation of underground utilities in the United States and across North America is becoming more and more of a reality.

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I'm confident this agreement will demonstrate the value of using

a single standard for defect coding, and that eventually it will lead to PACP becoming the defect coding standard for Canada. PACP provides standardization and consistency in the way sewer pipes are evaluated, coded and managed.



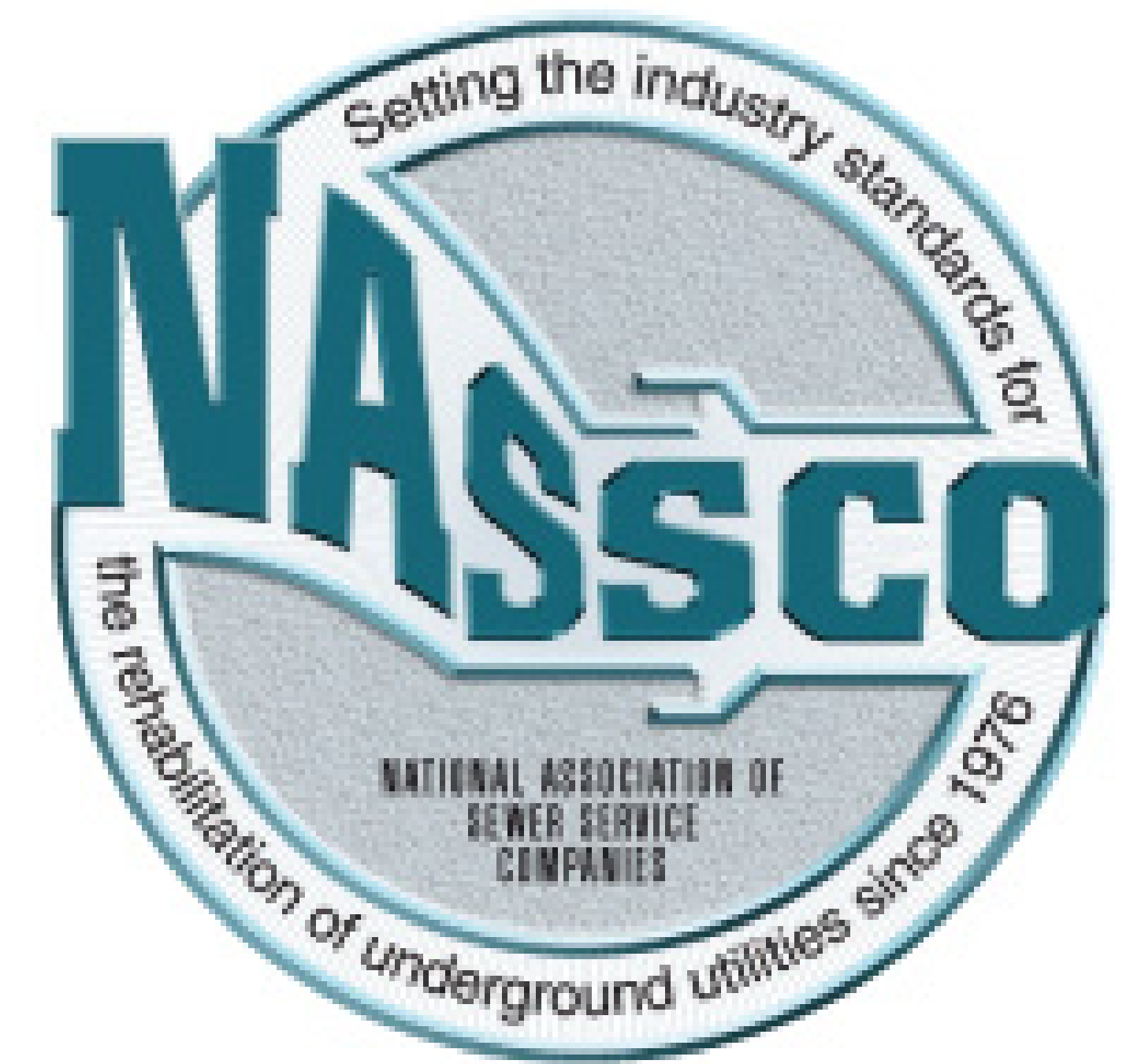
Recognized as the industry standard in North America since 2001, it creates a comprehensive and reliable reservoir of data that can be used to plan and set priorities in collection system renovation.

A 2006 survey by CERIU found discrepancies in the way sewer systems were evaluated and inspected. This lack of consistency

led some to classify a defect in a pipe as a crack, while others labeled it a fracture. That made it difficult for professionals to establish a protocol for successful assessment and rehabilitation. As a result, CERIU established a committee of city representatives and closed-circuit television (CCTV) inspection professionals to discuss the issue. Together, the group adopted the NASSCO protocols for mains, laterals and manholes.

By implementing NASSCO's proven standard protocol, Quebec professionals will be able to create, exchange and integrate their reports on common rules and codification objectives, enabling more effective rehabilitations.

In addition to standardizing the evaluation of sewer pipes and



standardizing TV inspection codes, PACP includes user certification, tools for data integration and mapping. NASSCO offers PACP training throughout the year across the United States. To see a complete schedule of PACP and other training and education courses, visit [www.nassco.org](http://www.nassco.org) or call Andrea Carter at 410/486-3500. ♦

Irv Gemora is executive director of NASSCO. He can be reached at [director@nassco.org](mailto:director@nassco.org). The new NASSCO headquarters is at 11521 Cronridge Drive, Suite J, Owings Mills, MD, 21117. Call 410/486-3500.



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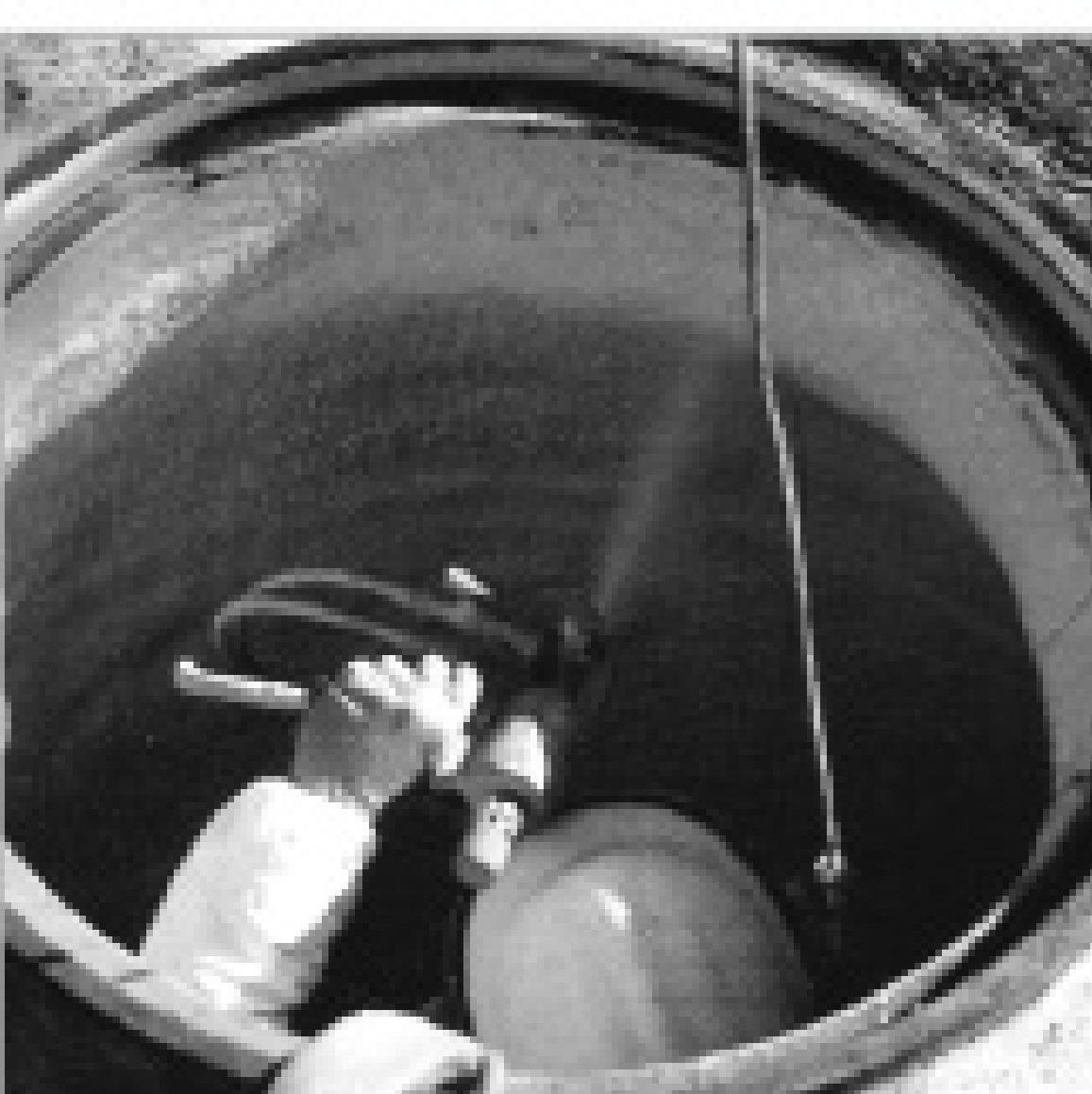


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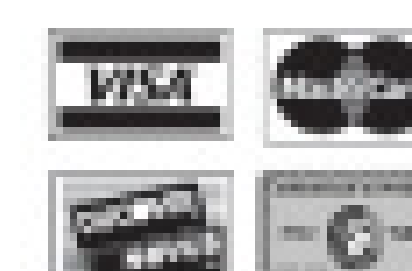
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1993 Ford E 350 Hi Cube, gas, V8 Honda power, 60,000 miles, Cues console, completely rebuilt by Cobra with Cobra camera equipment including reel. Can be outfitted to your specifications. For further information go to Cobra Web site at [www.cobratec.com](http://www.cobratec.com) or contact Alan Grant at Cobra, Tel 770-435-8991. (C8)

Pearpoint P600, portable 6-wheel steerable tractor, 360 P&T color explosion proof camera, motorized drum, 600' Kevlar reinforced cable, detachable monitor, qwerty, digital video recorder, integrated 512Hz sonde - Perfect! Asking \$25K. 954-263-2981. (P7C8)

## TV INSPECTION

Mainline RST system. '94 Chevy P30HD box. 45K on Jasper 454 engine & auto trans. POSM data system, new NovaStar camera. Ready to go to work. \$29,500. Pete 757-615-7776. (C8)

RST System take out, city owned, 3 years old, zoom camera. Complete system with 2000 ft. cable. Ready to install in your truck. Additional details on Cobra web site including pictures at [www.cobratec.com](http://www.cobratec.com). For pricing call Alan Grant at Cobra. Tel 770-435-8991. (C8)

Envirosight 125 system, many wheel sets, \$30,000. Also: 900 with elevator and P&T, \$26,000. Both like new condition! Looking for Vactor 2103. Steve 716-894-9236. (C8)

1996 Aries TV Seal step van, GMC, 50,000 miles. White diesel with Onan 7.5 diesel generator. Quad hose, rebuilt grout reel, rebuilt Graco pumps, Aries inspection system, new video cable, grout and TV system fully operational. Packers available. You tell me what you need from 6" to 48" new and old style Cues. Call with your requirements. For further information go to Cobra Web site at [www.cobratec.com](http://www.cobratec.com) or contact Alan Grant at Cobra, Tel 770-435-8991. (C8)

1998 GMC Cues TV System: Approx. 1,700 L.F. of multi conductor cable, pan & tilt, Shorty transporter, washdown system, lots of storage. Good condition. Ready to work. Financing available. \$55,000. Kelly 608-279-2299. (CBM)

Used and rebuilt camera kits in stock. Gen-Eye II color and black-white cameras. Push rods 131, 155, 200. Ratech 180. Pearpoint P332 color self-leveling 194. The Cable Center. 800-257-7209. (CBM)

Aries LETS Lateral Launcher 2020 (pan and tilt camera version) 80 ft. rod for sale. Municipal owned. Complete with controller and all wiring connections. Can install unit in any multi conductor inspection system. For further information contact Alan Grant at Cobra Technologies at 770-435-8991. (C8)

Sreco Flexicam Video system w/ 200' push cable on reel, b&w monitor/vcr in metal carrying case, locator w/in-line sonde, extra monitor/vcr, extra locator. \$4,500 OBO. 918-340-0752. (C8)

## TV INSPECTION

RIDGID sewer camera, 1050 Spartan sewer machine, 100 Spartan sewer machine. All three run great and are ready to work. \$3,000. Carbondale, IL. 618-925-0136. (CBM)

Used and rebuilt line locators: Gen-Eye II, Rapid Detection RD-4000, Prototek ARD4, Ferris and LF2100, Ridgid Navitrack. The Cable Center. 800-257-7209. (CBM)

**EASYCAM COLOR CAMERA. FINALLY! A COMMON SENSE APPROACH TO CAMERA DESIGN.** EasyCam requires no special monitor, all parts and components are owner-replaceable. With EasyCam, there is no more expensive repair costs, no more lengthy downtime. Built tough to last. 2-year guarantee. (US & Foreign Patent Pending) **ONLY \$3,950.00. EASYCAM - "It just makes sense."** [www.easycaminc.com](http://www.easycaminc.com); 1-423-349-4300. (CBM)

**Cables, Connectors & Pigtails** for all major TV Inspection Systems. Web site under construction. Jim Fowler, Oceanquip. 504-738-7833 phone/fax. (CBM)

**REBUILT INSPECTION CAMERAS:** Gen Eye I, II, III. For more information call Jack at Dynamic Cable Repairs. 973-478-0893. (CBM)

Pearpoint Flexiview P494 color pan & tilt crawler camera, explosion proof, with motorized welded steel cable drum, 1000' kevlar reinforced cable, power supply, wheels & spacers, spare parts etc., Cdn. \$50,000. 2002 Chev 3500 ETV, 29,699 km (18,454 mi), studio & storage space, wash down system, safety lights, Cdn. \$30,000. Pictures and more info available. Call Jeremy at 416-936-6103 or [jcook@terradiscovery.ca](mailto:jcook@terradiscovery.ca). (C9)

1996 Ford E-450 with complete Cues camera system. 1995 Ford E-350 with complete RST camera system. Ex-city owned, turnkey, must sell. \$19,000 each. 909-762-4271. (P8C9)

**BEST BUY:** Must see this 1997 RST video system that includes a P & T, tractor, and an additional mainline camera. Converted ambulance with odometer of 48,000, perfect studio, storage space and safety lights. The software includes printed reports, hard disc, and Sony Photomate. Photos of interior and exterior are available via e-mail. Special Price \$24,000. Call Don at 503-969-9557. (C9)

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## Special NPDES Stormwater Workshop

The National Association of Flood and Stormwater Management Agencies Annual Meeting, Aug. 25-28, at the Meritage Resort in Napa, Calif., will include a special NPDES Stormwater Workshop. The one-day session covers evolution of Best Management Practices, a permit program effectiveness assessment model, stormwater program financing, defining a national agenda for 2009, and trends and challenges in stormwater permitting.

The conference will present information on critical pending legislation including the Water Resources Development Act of 2008, wetlands regulatory legislation, water infrastructure funding bills, National Flood Insurance Program reform bills, levee certification, levee safety, and other flood risk management issues. Also included is a special session on map modernization. Call 202/218-4133 or visit [www.nafsmo.org](http://www.nafsmo.org).

## Plastics Pipe Institute Joins Clean Water Council

Plastics Pipe Institute executive director Tony Radoszewski announced that the trade association has joined the Clean Water Council. As one of 33 national construction-based organization members, PPI helps increase awareness of the need to modernize underground infrastructure. PPI represents all segments of the polyethylene pipe industry, and CWC works in the legislative process to promote more water infrastructure funding.

## New Water Institute Formed

Kathy Robb, a partner in the resources, regulatory, and environmental law practice at Hunton & Williams LLP, is founder and director of the new Water Policy Institute. Its chair is former EPA administrator and New Jersey governor Christine Todd Whitman. The consortium will address water-related issues and provide information to the public through its web site.

Members representing water districts, multi-national companies, and energy companies will review challenges affecting global and local water including supply, quality, use, and wildlife and agricultural concerns. They

will develop white papers, provide thought leadership on legal and regulatory issues, and collaborate to propose sustainable solutions. Visit [www.waterpolicyinstitute.com](http://www.waterpolicyinstitute.com).

## Research Foundation Changes Name

The American Water Works Association Research Foundation is now the Water Research Foundation. The name change is designed to enhance the organization's ability to procure funding.

## Wanted: Decentralized Systems for Case Studies

The Water Environment Research Foundation research team for Non-traditional Indicators of System Performance is looking for community-sized or cluster wastewater collection and treatment systems with flows of 5,000 to 50,000 gpd that use online sensing or data acquisition technologies in their remote monitoring.

Project leaders are assessing the technological ability to provide real-time or near real-time information on the performance and operational status of these facilities. For information, call Lynne MacLennan at 905/829-8880 or e-mail [LynneM@XCG.com](mailto:LynneM@XCG.com).

## Distribution Systems Symposium & Exposition

The Distribution Systems Symposium & Exposition is Sept. 21-24 in Austin, Texas. American Water Works Association leaders will discuss how to make the most of new technology and products, manage personnel effectively, and increase system security. Workshops include Pump School and Fundamentals of Pump Station Design, Modeling, and Case Histories of Pipeline Corrosion.

The exposition hall will showcase the latest in distribution systems, engineering and plant operations products and services. Technical and exhibitor education sessions qualify for Continuing Education Units or Professional Development Hours. Call 800/926-7337 or visit [www.awwa.org](http://www.awwa.org).

## LEARNING OPPORTUNITIES

### American Water Works Association

The organization is offering the following CEU/PDH webcasts:

- Sept. 3 – Simultaneous Compliance
- Sept. 17 – PVC Pipe in the Field
- Sept. 27 – PVC Pipe in the Field

Call 800/926-7337 or visit [www.awwa.org](http://www.awwa.org).

### UW-Madison Engineering Courses

The University of Wisconsin-Madison Department of Engineering Professional Development is offering the following CEU, LU, PDH classes. They are at the Madison campus unless indicated otherwise:

- Sept. 15-16 – Stormwater Detention Basin Design (J891)
- Sept. 17-18 – Storm Sewer System Design (J892)
- Oct. 6-7 – Designing Bio/Infiltration BMPs for Storm Water Quality Improvement (K214)
- Oct. 14-15 – Storm Sewer System Design (J977), Las Vegas, Nev.
- Oct. 16-17 – Stormwater Detention Basin Design (J976) Las Vegas, Nev.
- Oct. 27-31 – Cross-Connection Control and Backflow Prevention (J829)
- Nov. 5-6 – Preparing an Effective Municipal Capital Improvements Plan (J974), Las Vegas, Nev.
- Nov. 17-18 – Pumping Equipment and Systems: Selecting, Operating, Maintaining, and Troubleshooting (K272), Las Vegas, Nev.

- Nov. 17-18 – Storm Sewer System Design (J892), Las Vegas, Nev.
- Nov. 19-20 – Stormwater Detention Basin Design (J891) Las Vegas, Nev. Call 608/262-2061 or visit <http://epdweb.engr.wisc.edu>.

### North Carolina

North Carolina State University is offering these courses at its Raleigh campus unless stated otherwise:

- Sept. 10-12 – Subsurface Wastewater Operator Training, Bolivia
- Oct. 14-16 – Designing Wastewater Irrigation Systems
- Nov. 5-7 – Subsurface Wastewater Operator Training, Plymouth
- Nov. 18-19 – Onsite Wastewater System Inspector Training, Plymouth

Call Joni Tanner at 919/515-1678 or visit [www.soil.ncsu.edu/training](http://www.soil.ncsu.edu/training), then Training, Shortcourses and Workshops.

### Maine

The Maine Wastewater Control Association and York County Community College in Wells have developed a Certificate of Business Management for Wastewater program. Sessions are Thursday from 8 a.m. until noon at the college.

- Sept. 4 - Oct. 23 – Project Management
- Oct. 30 - Dec. 18 – Problem Solving

Call 203/646-9282, ext. 203 or visit [www.mwwca.org](http://www.mwwca.org). ♦

## CALENDAR

### Aug. 3-7

StormCon North American Surface Water Quality Conference and Exposition, Orlando (Fla.) World Center Marriott. Call 805/682-1300 or visit [www.stormcon.com](http://www.stormcon.com).

### Aug. 17-20

American Public Works Association Congress: The Best Show in Public Works, Morial Convention Center, New Orleans, La. Call 800/848-2792 or visit [www.apwa.net](http://www.apwa.net).

### Aug. 25-28

National Association of Flood and Stormwater Management Agencies annual meeting, Meritage Resort, Napa, Calif. Call 202/218-4133 or visit [www.nafsmo.org](http://www.nafsmo.org).

### Sept. 7-10

WaterReuse Symposium, Hilton Anatole, Dallas, Texas. Call 703/548-0880 or visit [www.watereuse.org](http://www.watereuse.org).

### Sept. 17-18

Trenchless Road Show, Hilton Concord Hotel, Sacramento, Calif. Call Michelle Magyar at 330/467-7588 or visit [www.trenchlessroadshow.com](http://www.trenchlessroadshow.com).

### Sept. 21-24

Distribution Systems Symposium and Exposition for distribution, engineering and plant operations professionals, Austin, Texas. Call Tricia Loughhead at 800/926-7337 or visit [www.awwa.org](http://www.awwa.org).

### Oct. 1-2

3 Rivers Wet Weather Sewer Conference, Four Points by Sheraton, Pittsburgh, Pa. Call 412/578-8375 or visit [www.3riverswetweather.org](http://www.3riverswetweather.org).

### Oct. 5-8

National Rural Water Association Convention, Reno, Nev. Call 508/252-0629 or visit [www.nrwa.org](http://www.nrwa.org).

### Oct. 18-22

Water Environment Federation, WEFTEC 08, McCormick Place, Chicago, Ill. Call 800/666-0206 or visit [www.weftec.org](http://www.weftec.org).

### Nov. 11-12

Trenchless Road Show, Baltimore, Md. Call Michelle Magyar at 330/467-7588 or visit [www.trenchlessroadshow.com](http://www.trenchlessroadshow.com).

### Nov. 16-19

International Low Impact Development Conference, Westin Seattle, Wash. Call 800/548-2723 or visit <http://content.asce.org/conferences/lid08/index.html>.

### Nov. 16-20

American Water Works Association Water Quality Technology Conference and Exposition, Cincinnati Convention Center, Ohio. Call 800/926-7337 or visit [www.awwa.org](http://www.awwa.org).

### Dec. 9-10

Damage Prevention Conference and Expo, Riviera Hotel and Casino, Las Vegas, Nev. Visit [www.damageprevention.com](http://www.damageprevention.com).

### Jan. 25-27

American Water Works Association Water Resources Symposium: "Managing in Times of Change and Uncertainty," Portland, Ore. Call 800/926-7337 or visit [www.awwa.org](http://www.awwa.org).


### Feb. 25-28

Pumper & Cleaner Environmental Expo International, Kentucky Exposition Center, Louisville. Education Day Feb. 25; exhibits open Feb. 26-28. Call 800/257-7222 or visit [www.pumpershow.com](http://www.pumpershow.com).

### March 4-6

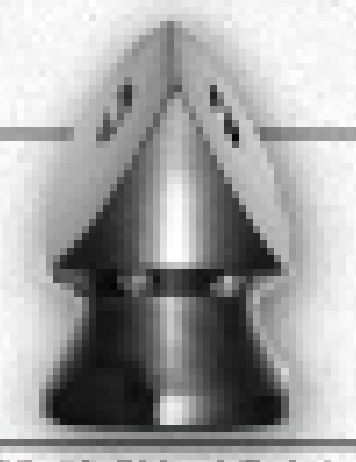
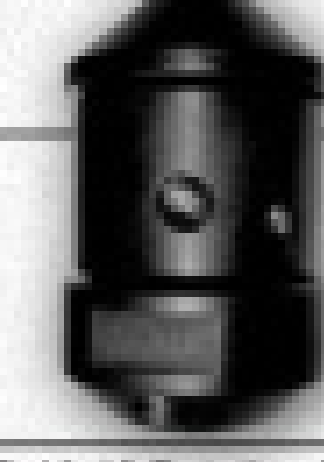
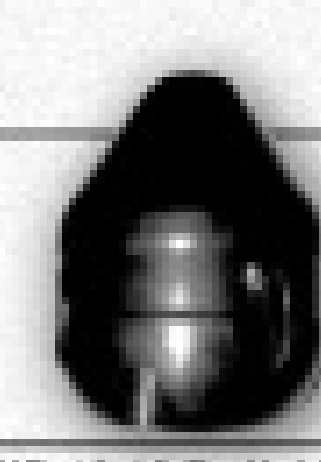
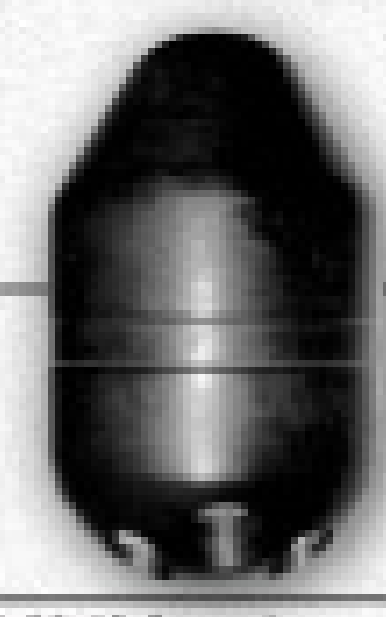
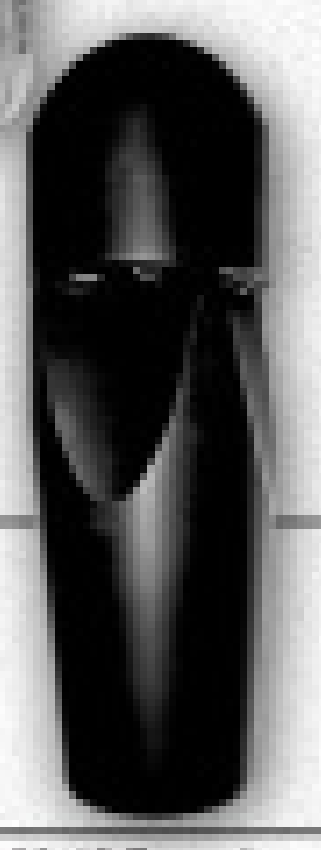
Utility Construction Heavy Equipment Expo, Phoenix Convention Center, Ariz. Call 703/358-9300 or visit [www.nuca.com](http://www.nuca.com).

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<b>LHD-30.16 Chisel Point</b> <b>Use:</b> Blockages of all types <b>Features:</b> <ul style="list-style-type: none"> <li>• 8 Rear Jets for maximum thrust to ram blockages</li> <li>• 4 forward jets to clear stubborn blockages</li> <li>• Aggressive chisel shape &amp; tool steel blasts through obstructions</li> </ul>	<b>LHD-10.16 Rotating Nozzle</b> <b>Use:</b> Cleaning crowns, general cleanup of newer installations <b>Features:</b> <ul style="list-style-type: none"> <li>• High speed spinning barrels scours crowns effectively</li> <li>• Excellent cleanup of newer lines plus PVC</li> <li>• Right angled cleaning jets direct maximum force to the pipe wall to tear away grime</li> </ul>	<b>LHD-40.16 Radial Nozzle</b> <b>Use:</b> Every day workhorse <b>Features:</b> <ul style="list-style-type: none"> <li>• 8 rearward dual angled jets for optimal coverage &amp; cleaning power on the pipe wall</li> <li>• Optional forward jet allows for forward cleaning (shipped plugged)</li> </ul>	<b>LHD-20.16 Grenade</b> <b>Use:</b> Main Line Cleaning especially larger lines <b>Features:</b> <ul style="list-style-type: none"> <li>• 10 rearward dual angle jets maximize cleaning &amp; minimize streaking</li> <li>• Massive 3"x6" size for stability in larger lines</li> <li>• Aggressive jet design creates exceptional vortex vacuum action for maximum finish cleaning</li> </ul>	<b>LHD-60.16 Torpedo</b> <b>Use:</b> Long pulls and hills <b>Features:</b> <ul style="list-style-type: none"> <li>• Aluminum lightweight body maximizes velocity</li> <li>• Used for difficult long runs &amp; hills, this is the ultimate pulling nozzle</li> <li>• Low cost hardened steel insert design</li> </ul>

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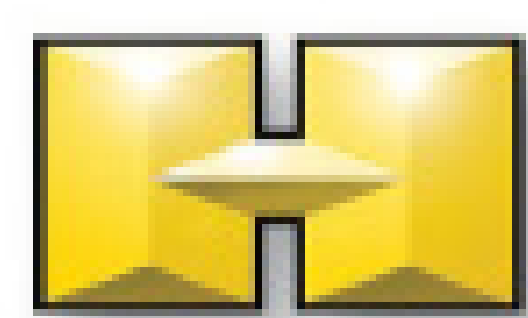
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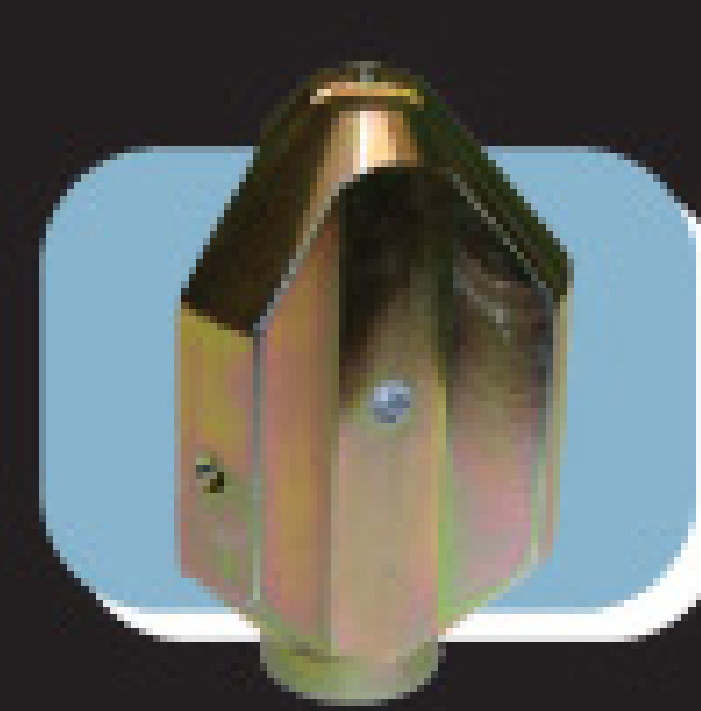


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