

# On Tap

Winter 1997  
Volume 6, Issue 4

## SDWA One Year Later Change Is the Only Constant

by Kathy Jespersen  
NDWC Staff Writer

*Editor's Note: This is the fourth installment in On Tap's 1996 Safe Drinking Water Act (SDWA) followup. We will continue to track SDWA implementation throughout the next year.*

The reauthorized Safe Drinking Water Act (SDWA) is now more than one year old, and states are quickly making changes. For many states, drinking water state revolving fund (DWSRF) checks are in the mail. Others have their awards and are set to begin making loans. Technical assistance, source water protection, and operator certification programs are springing up

in response to the new law. And, for the most part, change has only just begun.

In a September 1997 U.S. Environmental Protection Agency (EPA) document—*The SDWA One Year Later*—the agency notes that changes are indeed occurring. (See page 6.) EPA recognizes that the 1996 amendments are by far more realistic and flexible than the original SDWA and 1986 amendments. And, states are finding their way through the maze much more easily by developing partnerships with the agency as well as with environmental and drinking water organizations within their boundaries.

### **New Hampshire Forms Coalition**

In New Hampshire, environmental experts came together to form a coalition, supplying  
*Continued on page 8*

## In Washington: Technical Assistance Takes Many Forms

by Kathy Jespersen  
NDWC Staff Writer

*Editor's Note: Over the next several years, On Tap plans to look at what individual states are doing to help small systems meet technical assistance needs.*

Providing technical assistance to drinking water systems can be a complicated venture. However, the Washington Department of Health (DOH) has had a technical assistance program in place since the 1970s.

More recently, because of recommendations from a stakeholders group known as the Water Supply Advisory Council and a state directive toward alternative approaches to compliance with availability of Drinking Water State Revolving

Fund (DWSRF) set-aside money, DOH is directing additional resources toward technical assistance—in particular for small systems.

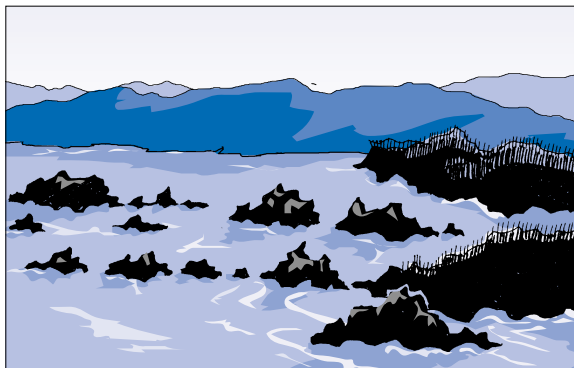
DOH provides technical assistance through many programs as well as its regional offices. “DOH has regional engineers, planners, and other

support staff who work directly with water systems and local county health jurisdictions providing one-on-one personal contact and technical assistance through sanitary surveys, special purpose investigations, and complaint investigations,” says Lisa Raysby, small water system program manager with DOH.

“We have ‘joint plans of operations’ with most of our

local health jurisdictions delegating regulatory oversight and technical assistance to typically the very small water systems—two to 14 connections,” she continues.

*Continued on page 11*



*Sea-stacks rise from the Pacific Ocean at Point of Arches*

[See Trench Safety for Operators, page 14](#)

On Tap is a publication of the National Drinking Water Clearinghouse, sponsored by the Rural Utilities Service.



Volume 6, Issue 4  
Winter 1997

# OnTap

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Established in 1991 at West Virginia University, the National Drinking Water Clearinghouse is funded by the Water and Waste Disposal Division of the Rural Utilities Service.

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*On Tap* is a free publication, produced four times a year (February, May, August, and November). Articles, letters to the editor, news items, photographs, or other materials submitted for publication are welcome. Please address correspondence to:

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ISSN 1061-9291

## On Tap Views the SDWA After a Year

In this issue of *On Tap* we take a look at the Safe Drinking Water Act (SDWA) Amendments of 1996 one year later. The U.S. Environmental Protection Agency (EPA) continues to meet every statutory deadline related to the SDWA. Stakeholders meet and guidance documents arrive on time. Implementation appears to be working—the pieces are falling into place.

What's the word from professionals on the water front? In our continuing series on the progress of the SDWA, Staff Writer Kathy Jespersen finds that while implementation seemed sluggish at first, now "Change Is the Only Constant." (*See page 1.*)

The reauthorized SDWA gives states a fair degree of latitude in deciding how to provide technical assistance. How are individual states assisting small systems? In this issue, we embark on a new series—one that will extend over many years—in which we look at how states provide small systems with technical assistance, beginning in the far corner of the lower 48—"In Washington: Technical Assistance Takes Many Forms." (*See page 1.*)

*On Tap* takes a step away from water treatment and regulations to consider "Killer Polymers," emerging technology with implications that reach beyond drinking water. Sara Pritchard, news editor for the National Research Center for Coal and Energy, who attended a recent press conference about biocidal polymers, contributed this article. (*See page 5.*)

We review EPA's recent document "SDWA—One Year Later." (*See page 6.*) A number of programs are springing up to help small systems implement SDWA requirements, among them, American Water Works Association's voluntary partnership program (*see page 4*), and Rural Community Assistance Program's new "Access for All." (*See page 7.*)

Nothing is more important than safety. We featured two pages of safety resources for operators in the Fall *On Tap* and follow that in this issue with a feature on trenching safety. (*See page 14.*) In future issues we plan to discuss other safety issues, such as confined spaces and chlorine.

Mohamed Lahlou, NDWC technical assistance specialist, provides readers with the sixth Tech Brief fact sheet that discusses package plants for small systems. (*See the center pages.*) In the Q&A this time, Salam Murtada, NDWC research assistant, looks at Supervisory Control and Data Acquisition technology, better known as SCADA systems. What is a SCADA system and is it an option for small drinking water systems? (*See page 18.*)

Thus far *On Tap* has received 325 replies to the survey published in our Fall issue. Many thanks to readers for the great response. Survey results are being compiled and we'll report on the outcome in the next issue. We carefully consider each comment and suggestion. If you haven't returned your survey yet, send it in. We want to know what you think of *On Tap* and how we can do a better job of providing the information you need most.

We plan to publish two theme issues within the near future—one on source water protection and the other on water conservation. Does your community have a success story you'd like to share with us? Do you have resources you'd like us to know about or information you'd like us to pass along to other *On Tap* readers? Let us know. Our phone numbers and address are listed in the staff box at the left. You may also e-mail [hemerson@wvu.edu](mailto:hemerson@wvu.edu). ■



### We Want Your Newsletter

Do you publish a newsletter about drinking water in small communities? If so, we'd like to see your latest publication. And, please add the National Drinking Water Clearinghouse (NDWC) to your mailing list.

Mohamed Lahlou, NDWC technical assistance specialist, is gathering information nationwide that will help us monitor issues facing small water systems—those serving fewer than 10,000 people. We plan to use this information to tailor NDWC services and publications to better meet the needs of small community drinking water systems.

Address publications to Mohamed Lahlou, NDWC, PO Box 6064, Morgantown, WV 26506-6064. For further information, you may contact Lahlou at (800) 624-8301 ext. 5577, or [mlahou2@wvu.edu](mailto:mlahou2@wvu.edu).

## Public Notification Stakeholders Meet

In September, the U.S. Environmental Protection Agency (EPA) held its second stakeholder meeting on potential revisions to the public notification regulation. Individuals representing utilities, associations, and federal and state regulators, as well as environmentalists, gathered in Washington, D.C. A number of local consumers—concerned by recent drinking water problems in the area—attended the meeting as well.

EPA requested input in the following areas: defining “violations with potential to have adverse effects on human health” and what should be the form, manner, and content of public notice; the form, manner, content, and frequency of public notice for other violations; and whether public notification regulations should prescribe mandatory health effects language for each contaminant violation.

Although no consensus was reached, discussion of the term “violations with potential to have adverse effects on human health” led to a preliminary concept of three tiers for public notification based upon level of danger to consumers.

There was general agreement that health effects language needs to be simpler than what is currently available. There was also discussion of whether public notification should be tied into the Consumer Confidence Report. A third stakeholder meeting is scheduled.

*For further information on regulations, contact the EPA Drinking Water Hotline at (800) 426-4791. You may access the EPA Office of Ground Water and Drinking Water Web site at <http://www.epa.gov/OGWDW/>. ■*



## SDWIS Database Is on the Internet

The U.S. Environmental Protection Agency’s (EPA) Safe Drinking Water Information System (SDWIS) can now be accessed on the Internet at [http://mountain.epa.gov/enviro/html/sdwis/sdwis\\_query.html](http://mountain.epa.gov/enviro/html/sdwis/sdwis_query.html).

SDWIS is a database that stores information about public drinking water systems and their violations of EPA’s regulations. It tracks information on drinking water contaminant levels as required by the Safe Drinking Water Act and its amendments. SDWIS provides compliance information with drinking water requirements for the last 10 years.

“This is very important information,” comments Mohamed Lahlou, National Drinking Water Clearinghouse (NDWC) technical assistance

specialist. He says the NDWC receives many requests for information SDWIS contains. “Consultants, environmental groups, and the public want to find out about their water.”

SDWIS provides information on public water systems in the U.S., Puerto Rico, the Virgin Islands, American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, and the Republic of Palau.

The site provides a click-on map of states and territories. The database can be searched by water system name or ID, county, or population served.

*For additional information on SDWIS, see <http://www.ruralwater.org/sdwis-on.htm> and <http://www.ruralwater.org/washington-reports/sdwis.htm>. ■*

## Two of Three RUS Loan Rates Decrease This Quarter

After holding steady for three quarters, two of three interest rates for Rural Utilities Service (RUS) water and wastewater loans have decreased this quarter.

RUS interest rates are issued quarterly at three different levels: the poverty line rate, the intermediate rate, and the market rate. The rate applied to a particular project depends on community income and the type of project being funded.

The rates for the first quarter of fiscal year 1998, which applies to all loans issued from October 1 through December 31, 1997, are:

- poverty line rate: 4.5 percent (unchanged from the previous quarter);

- intermediate rate: 4.875 percent (down .125 from the previous quarter); and
- market rate: 5.375 percent (down .125 from the previous quarter).

RUS loans are administered through local or state Rural Development offices, which can provide specific information about RUS loans and applications.

*For the phone number of your state Rural Development office, contact the National Drinking Water Clearinghouse at (800) 624-8301 or (304) 293-4191.*



## Partnership Promotes Safe Drinking Water

The Partnership for Safe Water is a voluntary joint effort formed in early 1995 to help improve the quality of America's drinking water by lessening contamination and increasing treatment plant performance.

The group's goal is to implement prevention programs where no legislation or regulation currently exists.

Bill Lauer, manager of the partnership, said the program is targeted at surface water treatment plants. "A commitment to water quality excellence is necessary. Any size utility can benefit as long as they have surface water, or groundwater under the direct influence of surface water, as a source," he added.

Partnership participants include the U.S. Environmental Protection Agency (EPA), the Association of Metropolitan Water Agencies, American Water Works Association (AWWA), National Association of Water Companies, Association of State Drinking Water Administrators, and the American Water Works Association Research Foundation.

In addition, more than 200 surface water utilities that serve almost 90 million people throughout the U.S. have joined the partnership, providing baseline data for more than 320 water treatment facilities.

### How was the group was formed?

The partnership grew out of a 1994 EPA report called *Strengthening the Safety of Our Drinking Water: A Report on Progress and Challenges and an Agenda for Action*.

The report pointed out violations of drinking water standards, including monitoring violations where microbiological and chemical standards were exceeded.

It also contained some alarming statistics, stating that some 30 million people, about 12 percent of America's population, were served by drinking water systems that violated one or more public health standards during one or more reporting periods.

In addition, the report noted that the 1993 *Cryptosporidium* outbreak in Milwaukee and other major city "boil water" alerts emphasize the need for additional safe drinking water standards. The partnership was formed out of a concern for safety, along with the realization that appropriate legislation to address these concerns could take years to implement.

### How does the partnership work?

There are four phases involved in becoming a member of the partnership: commitment, data

collection, self-evaluation, and outside assessment. (The first three phases are required, the last is optional.)

"The program assists the utility to self evaluate its plant performance, identify areas where operational improvements may be made, make those improvements, and measure the effect of the improvements," said Lauer.

He added that the first phase of any partnership is a commitment. "The idea is to change mindsets from simply meeting the rules to evaluating existing deficiencies and correcting them," he said.

Once a utility commits to the partnership, they are required to return a signed final agreement form to the EPA that indicates their willingness to proceed. The cost is \$150 for initial materials, including guidance manuals, procedures, and computer software.

The second phase requires each water utility to collect one year's worth of turbidity data to be used as a baseline data set. This information gathering and analysis is repeated yearly for as long as the utility wishes to participate in the partnership.

The third phase allows the utility to examine the capabilities of the existing plant's operation and administration. Once the utility has performed the self examination, it develops a plan to implement corrections.

The fourth phase repeats phase three, but uses a team of outside evaluators to make a site visit for the evaluation and make recommendations for improvement. Lauer said the advantage of this phase is to obtain an unbiased opinion by a committee of knowledgeable professionals.

"The utility can demonstrate their commitment and progress to their customers and regulators by progressing through the program steps," Lauer said.

"Recognition certificates are awarded to those utilities that have satisfied the partnership goals and principles. This certification is issued by EPA on behalf of the partnership."

*For more information, write to Lauer at the AWWA, 6666 West Quincy Avenue, Denver, CO 80235, telephone (303) 347-1440 or e-mail blauer@awwa.org. The partnership's Web site can be located at <http://www.awwa.org/partner1.htm>.*

*To order a copy of Strengthening the Safety of Our Drinking Water, call the National Drinking Water Clearinghouse at (800) 624-8301 or (304) 293-4191 and request item #DWBLRE08. You also may order via e-mail at [ndwc\\_orders@ndwc.wvu.edu](mailto:ndwc_orders@ndwc.wvu.edu). There is no charge for this booklet; however, postage charges are added to orders.* ■

"The idea is to change mindsets from simply meeting the rules to evaluating existing deficiencies and correcting them."

■  
Bill Lauer,  
manager,  
Partnership for  
Safe Water

## Biocidal Polymers:

# Is this the future of water treatment?

Infectious disease is an ever-increasing problem, from bacteria, such as *E. coli* and salmonella, to viral agents such as Hepatitis A.

Recently, an audience that included scientists, engineers, chemical manufacturers, and legislative representatives gathered at West Virginia University (WVU) to hear about a new product that could revolutionize disinfection.

The product, polystyrenehydantoin or poly1, is a material that, when chlorinated, acts as an air, water, and surface disinfectant. It kills disease-causing microbes and viruses in seconds.

The applications for this emerging technology are very broad. Poly1 has great potential for use in urban and rural water treatment applications, especially in developing countries plagued by problems of scarce and contaminated drinking water.

"The potential for the use of poly1 in food service products, water and air filters, construction industries, and medical applications is immense," says John Richards of Biopoly in Clarksburg, West Virginia, the firm that coordinated the development and manufacture of poly1 within the state.

Dave Worley, Ph.D., a professor of organic chemistry at Auburn University, invented and patented poly1. Worley and his colleague, Gang Sun, Ph.D., of the University of California-Davis, were able to attach a soluble stabilizer used in spas and swimming pools to a nonsoluble plastic (polystyrene), thereby making a nonsoluble stabilizer. In chemistry, a stabilizer is a substance that causes a chemical to retain its properties.

Poly1, the chemically altered polystyrene Worley and Sun created, now acts much like a magnet to the family of chemicals known as halogens (fluorine, chlorine, bromine, iodine, and astatine), attracting halogens to itself and holding them there, intact (stable), for long periods of time.

For example, if chlorine is wiped over a poly1 plastic, the plastic will attract the chlorine atoms onto its surface, making the plastic capable of killing germs. If a countertop made with poly1 were wiped with common bleach, the chlorine atoms would become a part of the surface of the counter and remain so anywhere from days to months to years, depending on use and exposure to germs.

Wet or dry, the chlorine atoms would stay on the structure, and germs that came in contact with the counter would be killed. Another unique feature of poly1 is that it can be recharged like a rechargeable battery. The surface of the countertop, for instance, could be recharged by wiping it with bleach.

If poly1 were incorporated into a water filter, it would be possible to drink disinfected water

without ingesting the disinfection by-products associated with chlorinated water. Unlike free chlorine or bromine—the most common water disinfectants—poly1 is not water soluble; the germ killing occurs on the surface of poly1, which holds the chlorine atoms snugly on its surface. In water treatment applications, poly1 is effective in broad pH and temperature ranges for all qualities of water. As a manufacturing plus, unchlorinated poly1 can withstand temperatures up to 300 degrees C (572 degrees F), allowing it to be easily extruded or mold injected.

According to Worley, NASA and the U.S. Army have tested poly1 in water applications with very positive results and have found that it kills many microorganisms, including *E. coli*, within seconds. For the military's purposes, filters made with poly1 could replace iodine tablets used for treating contaminated water.

There is a need, however, to develop ways to coat plastics and other materials with poly1 so that pipes, filters, and other products can be used as disinfectants. Richard Turton, Ph.D., a particle engineer in WVU's chemical engineering department who is working on surface coating applications of poly1, says the polymer could be bound to a variety of particles and used in larger water filters, and it could also be used to coat the inside of faucets, water pipes, and valves.

Janet Stout, Ph.D., a microbiologist with the Veterans Medical Center Special Pathogens Laboratory in Pittsburgh, and an expert on legionella detection and disinfection, noted that a biocidal polymer, such as poly1, could be used in respirators, dialysis equipment, incubators, air and water filtration systems, and innumerable other medical applications where sterility is paramount.

Jeff Williams, Ph.D., a microbiologist at Michigan State University who collaborated with Worley on poly1 research, is now director of research and development at Halosource Corporation in Seattle, which has worldwide rights to the N-halamine chemistry, including poly1, developed at Auburn University. Williams adds that poly1 could be woven into fabrics, such as those used for sterile hospital clothing and operating table covers. In the home, poly1 could be used in everything from heating and cooling systems and water purification to carpets, paints, upholstery, bedding and drapery fabric, and even children's toys

*For more information, contact Worley at (334) 844-6980, or e-mail worlesd@mail.auburn.edu. You may contact Turton at (304) 293-2111, ext. 415, or e-mail turton@cemr.wvu.edu. ■*





## SDWA Is on Track One Year Later

*Editor's Note: In September 1997, the U.S. Environmental Protection Agency (EPA) released its report "The SDWA—One year Later—Success in Advancing Public Health Protection." Since the Safe Drinking Water Act (SDWA) was reauthorized in August 1996, On Tap has tracked implementation progress. Writer Kathy Jespersen regularly talks with a selected group of drinking water professionals from across the country. (See "Change Is the Only Constant," page 1.)*

"To date, EPA has taken every required action on or before the statutory deadlines," said U.S. Environmental Protection Agency (EPA) Administrator Carol Browner's in opening "The SDWA—One Year Later—Success in Advancing Public Health Protection."

Browner emphasized that the act's priority is public health protection. Briefly stated, the Safe Drinking Water Act (SDWA) Amendments of 1996 emphasize public health protection through regulatory improvements, increased funding, prevention programs, and public participation that includes partnerships and stakeholders.

According to the report, the public health goal is being met by focusing decision-making on the greatest risks, preventing contamination, ensuring local flexibility, public involvement and citizen right-to-know, supporting small water systems, and establishing a Drinking Water State Revolving Fund (DWSRF) for local water systems to improve deteriorating drinking water infrastructures.

"The new law achieves strong public health protection without imposing a 'one-size-fits-all' requirement for specific action," Browner said.

To ensure the new act's direction toward public involvement and partnership, non-federal stakeholders—individuals from states, Tribes, and the general public, as well as drinking water professionals, such as operators, consult with EPA.

The National Drinking Water Advisory Council (NDWAC) was chartered under the SDWA and established interest groups that provide comments and advice. NDWAC stakeholder working groups focus on major themes in the act: consumer confidence reports, source water protection, DWSRF, small drinking water systems, water system operator certification, and contaminant selection.

There is a new focus on risk-based priority setting. In its 1996 drinking water redirection effort, EPA identified microbial contaminants, such as *Cryptosporidium* and *Giardia lamblia*, and disinfection by-products (DBP) as the highest potential risk to human health.

And, the act increased requirements for research and sensitive population analysis. This change will mean better health protection for infants and

children, the elderly, and others vulnerable to contaminants, such as individuals with suppressed immune systems.

In February, EPA announced a comprehensive study plan outlining research needed to support the Microbial and DBP (M/DBP) rules. The agency has begun more than 200 studies that will provide information on health effects, exposure, treatment technologies, and threats to sensitive subpopulations by M/DBP. A number of these studies are being carried out in partnership with other federal agencies, such as the Centers for Disease Control, drinking water utilities, and nonprofit organizations, such as the National Sanitation Foundation. (See "Partnership Promotes Safe Drinking Water," page 4.)

Among the joint EPA research projects are: M/DBP research with the American Water Works Association Research Foundation (AWWARF), waterborne disease studies and sensitive subpopulation research with the Centers for Disease Control and Prevention (CDC), arsenic research with the AWWARF and the Association of California Water Agencies, radon research with the National Academy of Sciences, and cancer and reproductive studies with the National Institute of Environmental Health Sciences.

The SDWA amendments stress preventing drinking water problems by assessing and protecting source water and improving water systems' ability to provide safe drinking water. The multi-year, multi-billion dollar DWSRF provides funds for infrastructure improvements, and in February, EPA released DWSRF guidelines. In March, a capitalization grant under the DWSRF was awarded to Georgia. Forty-four states have established the necessary legislative authorities for their DWSRF.

In preparation for the extensive source water assessments ahead, California has already drafted source water protection guidance, drawing on the initial EPA draft guidance.

Massachusetts has done a preliminary assessment of surface water suppliers, which included updating Geographic Information System maps covering 214 surface water sources and making more than 200 corrections to the maps. The information gathered includes surface water supply protection zone delineations and land use information, including some information on land uses regulated by the state that may threaten source waters.

EPA's Needs Survey provides information on the infrastructure needs of the country's community drinking water systems and in March, EPA released its allotment formula. The report on the survey affirms that the cost of making drinking  
*Continued on next page*

"To date, EPA has taken every required action on or before the statutory deadlines."

■  
Carol Browner,  
Administrator,  
U.S. Environmental  
Protection Agency

## Access for All Is RCAP's Goal

As the 20th century draws to a close, a number of rural Americans still live without indoor plumbing and on tap drinking water.

In 1994, the U.S. Department of Agriculture (USDA) announced its Water 2000 initiative that aims to assure safe drinking water in every home, no matter how remote and distressed, by the year 2000. USDA believes safe drinking water is essential to improving the health and productivity of rural communities in this country as well as to controlling long-term public costs related to consuming unsafe water.

The national Rural Community Assistance Program's (RCAP) "Access for All" project is an aggressive, focused response to the Water 2000 call to action. In 1997, RCAP implemented a nationwide program specifically targeted to support Water 2000's goals in rural areas with the greatest safe drinking water needs.

Access for All concentrates efforts on completing the work of providing indoor plumbing, a safe drinking water supply, and wastewater treatment facilities to individual households and rural areas that lack these basic services.

A secondary component of Access for All focuses on public and private resources for Water 2000 activities at the local, state, regional, and federal levels nationwide.

In September, RCAP's Arkansas office indicated that the Water 2000 project sites, the Nashville

Rural Water Association in Howard County and the Van Buren Water Association in Van Buren County, will be funded as soon as the state allocations were received. When the funding commitments are made by USDA's Rural Utilities Service, 1,200 homes that are currently without water service will gain access to public water for the first time.

The national RCAP network includes six regional offices and a national office. Its mission is to improve the quality of life for rural Americans. Providing free technical assistance to small, rural communities, RCAP's expertise is in water, wastewater, solid waste, and capacity building. As part of its services, RCAP offers free publications and information.

*For more information on Water 2000, see Fall 1997 On Tap, Volume 6, Issue 3. For information on RCAP, see Fall 1997 E-train, Volume 6, Number 4. Back copies of newsletters are free; however, postal charges are added to orders. To order either newsletter, call (800) 624-8301 or (304) 293-4191. You also may order via e-mail at [ndwc\\_orders@ndwc.wvu.edu](mailto:ndwc_orders@ndwc.wvu.edu).*

*For further information on RCAP you may also write to RCAP, 602 S. King St., Suite 402, Leesburg, VA 20175 or call (703) 771-8636. RCAP maintains a web site at <http://www.rcap.org/>.* ■



## SDWA Is on Track One Year Later

*Continued from previous page*  
water infrastructure improvements to protect public health falls most heavily on customers of small public drinking water systems. Thus the DWSRF emphasizes assistance to small systems. (See "How great is infrastructure need?" page 12. Also see "Little Systems: Big Problems," page 6, Summer 1997 On Tap, Volume 6, Issue 2.)

The SDWA amendments provide for operator certification and initiated partnerships with states, water suppliers, and the public in taking a step toward developing certification standards.

The amendments also provide for much greater public involvement. EPA has welcomed public input at each stage in the process. A number of provisions of the act specifically discuss public involvement, including consumer confidence reports, DWSRF intended use plans, source water assessments, capacity development strategies, national occurrence database, variances, and state

annual compliance reports. (For contaminant occurrence information, see "SDWIS Is On the Internet," page 3.)

In August, EPA released source water assessment guidance, source water protection program guidance, alternative monitoring guidelines, a list of alternative technologies for small systems, and guidance for state groundwater protection grants.

*Those curious about local watersheds or beginning source water assessments may want to see EPA's "Surf Your Watershed" on the Internet at <http://www.epa.gov/surf/index.html>.*

The SDWA—One Year Later document is available on the Internet at <http://www.epa.gov/OGWDW/year1/sdwa1y.html>. For more information on EPA's implementation activities, call EPA's Safe Drinking Water Hotline at (800) 426-4791. ■

## Change Is the Only Constant

*Continued from page 1*

technical assistance across the state. “New Hampshire has hired a combination of experts to handle its technical assistance program,” says Ed Betz, engineer and superintendent for the town of Littleton, New Hampshire. “Rural Housing Incorporated, Northeast Rural Water Association, and North Country Council will work together to provide this assistance for the state.”

Although final plans for the coalition are still being ironed out, it is expected that each member will provide its own particular expertise. “We have experience with putting together financial packages for communities,” says Cathy Conway, project engineer for North Country Council. “We will help small systems with applications for financial assistance as well as helping with problems at very small systems—serving 20,000 gallons per day or that have 50 or fewer service connections.

“We have two engineers on staff who have a lot of experience with figuring out what the problems are and helping systems solve them. Rural Water already supplies much technical assistance through its circuit rider program.

“But the coalition is in the basic stages and we’re still working on who will provide what kind of support to communities and systems,” she concludes.

Betz says New Hampshire is moving forward in other areas as well. “We are also doing surveys of watersheds in aquifer recharge areas. We’re identifying watershed areas and developing regulations and identifying potential threats. We’re developing a base map. There’s been some money set aside for systems that need help mapping out their watersheds as well as for groundwater systems that need help mapping out their aquifer recharge areas.”

With all the other changes, water systems also will see new paperwork to complete for contaminant evaluation along with training sessions to aid in those evaluations, he adds.

However, the state is still in the rule-making process, concerning DWSRFs. “The state has set aside its share. We hope to be making loans by spring,” he concludes.

### Idaho Ready To Begin Programs

Idaho’s DWSRF award is on its way, and they have already planned how it will be spent. “We have work teams set up to develop programs for technical assistance, source water protection, capacity development, and all the areas we need to be concerned with,” says Steve Tanner, program supervisor for Idaho’s Division of Environmental Quality (DEQ).

“We hired Idaho Rural Water to help systems exceeding the lead and copper rule to develop a corrosion treatment recommendation. And we’re adding a number of courses for small systems to our operator certification program.”

Idaho’s operator certification requirement will be something new for the state’s operators. “We were the only state that didn’t already have an operator certification requirement,” says Bill Jerrel, loan specialist, DEQ. The state’s approach to this new requirement is still in the working stages, and EPA guidelines have not yet been published, he says, adding that, until then, DWSRF loans will be the primary concern.

“We’ll be getting \$14.1 million in DWSRF money. So far we have no real commitments for any loans,” he says. “We have been looking at 20 projects that need funding. We targeted these systems from the intended use plans (IUP) we submitted to EPA with our application.”

Idaho also has a technical assistance plan, which it intends to put into action this year. “Rural Water is going to be visiting systems four times a year,” says Howard Woods, senior water quality analyst, DEQ. “Through a one-year contract, they’ll aid the state’s water systems with all the steps up they need to take until the state specifies what kind of corrosion treatment will be acceptable for each system.

“Another part of our technical assistance plan is viability assessments, which involve the Environmental Finance Center at Boise State. They will be looking at what systems need to do to prove they have financial, managerial, and technical capability to pay back a loan as well as advising them on how to apply.

“DEQ’s part of technical assistance comes through the source water assessments. EPA has not specified any kind of consequences for states when it comes to these assessments. But if systems don’t have one done, they may lose monitoring relief options. Our role will be to make sure the assessments get done, keeping options open for the water systems,” concludes Woods.

### PA Develops Technical Assistance Plan

Pennsylvania made its first DWSRF loan to the Williamsburg Municipal Authority, a small water supplier serving 855 customers. The system did not have the funds to improve deteriorated infrastructure, which threatens the public health. Distribution lines were old and falling apart, making disinfectants less effective against microbial growth, notes EPA’s *SDWA—One Year Later* document. Approximately 62 percent of the state’s loans from its first grant will go to water

*Continued on next page*

#### Water Fact



Boiling water contaminated with nitrate increases the nitrate concentration and the potential risk. Persons worried about nitrate should talk with their doctor about alternatives to using boiled water in baby formula.

*Water on Tap: A Consumer's Guide to the Nation's Drinking Water*

*Continued from previous page*

systems serving fewer than 10,000 customers, the document continues.

The state has made much progress in this first year after the new law was passed, says Matt Milliron, community water system program coordinator for the Centre County Planning Office. "Pennsylvania is in the final stages of developing its technical assistance program," he says. "The state expects to have a draft of the plan completed in two or three months. It will then be submitted to EPA for review, comment, and subsequent approval.

"Once approved, EPA will release funds to Pennsylvania for implementation. The state has already created a new division within the Department of Environmental Protection (DEP) to oversee tech assistance programs—simply called the Division of Technical Assistance—for both water and wastewater.

"DEP has pilot programs operating in the state that have been used for modeling the proposed programs. The proposed program will also place emphasis on capacity development or training in some of the administrative and regulatory responsibilities that small water systems must comply with," Milliron concludes.

### **Virginia Discusses Changes**

"The Virginia Department of Health (VDH) held a one day seminar to explain the new SDWA requirements to Virginia's water systems," says Glenn Tillman, director of utilities in Berryville. "The one thing that I'm confused about is the consumer confidence reports. It all seems kind of vague. I suggested a kind of form letter, but that really didn't get a very good response.

"VDH already has a list made up of systems that will likely receive DWSRF loan money. Berryville will not likely be eligible for any loan money because we have such a high median income. We're a 'bedroom community' for the D.C. area, and most people have high paying jobs and large homes.

"VDH has come up with a priority list of systems that need the most help," Tillman adds. "They are interested in helping systems with economic troubles and that have a lot of problems complying with regulations."

Tillman says that he is pleased with the operator certification portion of the new law, but has some concerns about recertification. "Many of the operators I've spoken with have a lot of concerns about recertification," Tillman explains. "They've worked hard to get where they are, and don't want to chance losing their position over a recertification

exam. At this point they pretty much know what they're doing. But many of them are not college educated and struggled to get to where they are.

"I wouldn't mind seeing some kind of continuing education units (CEU) program in place in Virginia," he continues. "That makes the most sense to me. I would hate to lose good people because, for whatever reason, they didn't pass a recertification exam.

"The consumer confidence reports were also a confusing part to me," Tillman says. "People hear about *Cryptosporidium* and *Giardia* all the time. Right now we're not required to sample for them, but if the consumers think these are potential contaminants, then they may expect us to sample for them. There's a lot of farm land in this area, and microbials would certainly be a concern. It's just confusing about what they are going to expect from the systems.

"The source water protection part seems like it's going to be fairly straightforward. The VDH says they are going to do this part for us with our participation. I was really impressed with their approach. They want to make sure the money gets spent in the most practical way and isn't wasted. They seem like they're prepared to hold our hand through all of this," Tillman adds. "They told us if we had any questions to feel free to get in touch with them. They seem to want to help us do what needs to be done."

The VDH is working to help alleviate concerns operators may have about recertification. "We haven't really begun to make changes yet," says Hugh Eggborn, engineering field director, VDH. "Operator licensing is taken care of under the Professional and Operational Regulation (POR). Rural Water and the American Water Works Association already provide CEUs not in conjunction with POR.

"We believe that our program works fairly well, but under the new law we will likely have to make changes. Whether or not that will involve taking a test is still not known—my guess is that it will. But we're still waiting for federal guidelines. At this point operators only have to renew their licenses.

"Consumer confidence reports are also a new thing," he continues. "The way I understand it is that if monitoring has already taken place for a particular contaminant, then it will have to be included in the report. In other words, we'll be reporting on what monitoring has already been done at the highest level found.

"But, Virginia is still in a waiting mode," Eggborn says. "And, it's all still so new."

*Continued on page 10*

*"Many of the operators I've spoken with have a lot of concerns about recertification .... I would hate to lose good people because, for whatever reason, they didn't pass a recertification exam."*

*Glenn Tillman,  
director of utilities,  
Berryville, Virginia*



## Tech Briefs Explain Drinking Water Technology

“Tech Briefs”—four-page fact sheets that provide information about drinking water treatment technologies relevant to small systems—have been one of *On Tap*’s most popular series for the last year and a half. The National Drinking Water Clearinghouse (NDWC) continually receives requests for additional copies.

Tech Briefs are aimed at drinking water professionals, particularly small system operators, and the content is fairly technical. Tables, helpful illustrations, and additional resources are provided.

The topics of the first five Tech Briefs are disinfection, filtration, corrosion control, ion exchange and demineralization, and organics removal. The topic for the sixth Tech Brief—in this issue *On Tap*—is package plants. Like the others, it also is available as a separate product.

Mohamed Lahlou, NDWC technical assistance specialist, researches and writes the fact sheets. He selects technologies based upon current interest in

topics, which he gauges by the number of calls he receives requesting information as well as by monitoring online drinking water bulletin boards.

Lahlou often consults U.S. Environmental Protection Agency documents for information. For those who want to go more deeply into fact sheet topics, each Tech Brief lists the documents used and information about where to obtain them.

*To order any or all of the Tech Briefs, call the NDWC at (800) 624-8301 or (304) 293-4191 and request by title and item number. (See box below.) To order by e-mail, send name, address, item numbers, quantities you wish to order, and your phone number to ndwc\_orders@estd.wvu.edu. There is no charge for these facts sheets; however, a postage fee is added to orders.*

*Tech Briefs may also be downloaded from the NDWC’s Web site at <http://www.ndwc.wvu.edu> where they are available in the Products section. ■*

### Fact Sheets Currently Available

#### **Number one: Tech Brief Disinfection**

Provided is an explanation of disinfection as a drinking water treatment, the regulations governing it, the advantages and disadvantages of using it, and the methods for disinfecting. (#DWBLPE47)

#### **Number two: Tech Brief Filtration**

This fact sheet explains filtration as a drinking water treatment, why filtration is necessary, regulations, the advantages and disadvantages of using it, and the different methods in use. (#DWBLPE50)

#### **Number three: Tech Brief: Corrosion Control**

Provided is an explanation of corrosion and how it can cause problems for drinking water systems. Included also is information about how corrosion is diagnosed, system design, ways to reduce corrosion, the use of corrosion inhibitors, and commercial pipe coatings and linings. (#DWBLPE52)

#### **Number four: Tech Brief Ion Exchange and Demineralization**

This fact sheet describes ion exchange and membrane water treatment processes, including reverse osmosis and electrodialysis. (#DWBLPE56)

#### **Number five: Tech Brief Organic Removal**

Provided is an explanation of methods for removing organic materials from drinking water. Granular activated carbon and aeration are discussed as the most suitable technologies. (#DWBLPE59)

#### **Number six: Tech Brief Package Plants**

This fact sheet discusses package plants, an alternative to conventional drinking water treatment, which some small communities turn to in order to reduce expenses. (#DWBLPE63)

### Change Is the Only Constant

*Continued from page 9*

#### **Oklahoma Is Still Waiting**

“Once EPA approves our intended use plan, we have three technical assistance programs that we’re working on,” says Gene Whatley, director of Oklahoma Rural Water Association. “One program is for source water, one is for capacity development, and one is for assistance to water systems, which will involve a person who will go to the different systems within the state to aid them.

“We’ve submitted our IUP to EPA, but right now we’re just in the waiting process. DEQ is fairly optimistic that things will pick up soon,” Whatley concludes.

*For more information about the SDWA amendments, access EPA’s Web site at <http://www.epa.gov/OGWDW/>. Information may also be found by calling the Safe Drinking Water Hotline at (800) 426-4791. ■*

## Technical Assistance Takes Many Forms

*Continued from page 1*

### **DOH Assigns Staff**

Raysby says that DOH has also made staff assignments directly related to implementation of program activities, many of them related to the reauthorized Safe Drinking Water Act (SDWA). "For instance," she says, "we have program managers for lead and copper, operator certification, cross-connection, system capacity, compliance, noncommunity systems, and source water protection.

"We have one person located out of our headquarters office who spends 70 percent of his time in the field inspecting treatment facilities and discussing problems with plant operators," she says.

Besides this personal contact, DOH also publishes a quarterly newsletter *Water Tap*, which includes news and technical information for all its public water suppliers. And answers to drinking water-related questions and requests for publications can be filed through the department's toll-free hotline.

"We maintain a list of comprehensive publications available from our department and other organizations, such as from American Water Works Association and Washington Rural Water Association. We are also making great strides in the amount of information we have available on our home page on the Internet," says Raysby.

### **Organizations Work Together**

But DOH doesn't try to shoulder the responsibility alone. "We work with a number of other organizations in several different ways," she continues. "We have staff who participate with voluntary organizations, such as the Pacific Northwest Section of American Water Works Association (PNWS-AWWA). For instance, we help develop or participate directly in training activities with PNWS-AWWA through their annual conference, workshops, and subsection training programs.

"We have a contract with the Washington Environmental Training and Resource Center (WETRC) to track operator certification continuing education units, and to put on an annual Drinking Water Priorities Workshop for us. We have provided limited funding and indirect support for other groups such as Rural Community Assistance Corporation (RCAC) and Evergreen Rural Water of Washington, and hope to do more activities in this regard through DWSRF funding.

"We have a number of other stakeholders, such as Association of Washington Cities, Washington Public Utility District Association, and Washington Association of Water Systems, for which we provide train-the-trainer type programs, as well as providing staff resources to make presentations.

"With the DWSRF program, we are planning to promote more technical assistance through third-party contracts for services. We also plan on funding one or more county pilot programs that will specifically look at small system issues and more localized programs for addressing their needs," Raysby says.

### **State Assists Very Small Systems**

In addition to the technical assistance, DOH provides, through its main offices, a variety of technical assistance through three regional offices and third parties. "We provide a wide range of training-related activities or actively support third-party training efforts," explains Raysby. "New expanded program efforts are directly related to funding available through the DWSRF program. Resources have recently been dedicated to one full-time position to coordinate small water system activities—my new position—and include expanded outreach efforts to community water systems with fewer than 100 service connections.

"Our reasons for this include:

- We have lots of systems, namely almost 11,000 Group B water systems (non-federally regulated two to 14 connections or less than 25 people), and about 4,300 Group A community and noncommunity water systems (subject to federal water quality standards under the SDWA).
- In Washington state, systems with fewer than 100 connections account for the majority of all non-compliance violations.
- Systems with fewer than 100 connections currently are not required to have a certified operator except when they provide other simple treatment, or they have been identified as a significant non-complier under the state rule.
- We are planning on implementing a third-party sanitary survey program for systems with fewer than 100 connections.
- We have a separate work plan under development for targeting noncommunity systems.

"Training efforts in the past have not attracted owners or operators of systems with fewer than 100 connections primarily because those systems have no mandated operator certification requirements," Raysby continues. "We target water systems with compliance problems or respond to customer complaints.

"Systems that seek our assistance are responded to. Small systems appear to be reluctant to seek technical assistance from state regulators, which is why we devote resources to working on outreach through other parties," Raysby concludes. ■

*For more information about Washington's technical assistance program, contact Raysby at (360) 664-3951. You may also tour their Web site at <http://www.doh.wa.gov/>.*



## How great is infrastructure need?

*Editor's Note: Following is the second review of the U.S. Environmental Protection Agency's Drinking Water Infrastructure Needs Survey: First Report to Congress, an unprecedented study of 4,000 community water systems and their infrastructure improvement needs for the next 20 years. For a review of American Indian and Alaska Native systems needs, see On Tap Summer 1997, page 6, "Little Systems, Big Problems."*

The U.S. Environmental Protection Agency's (EPA) *Drinking Water Infrastructure Needs Survey: First Report to Congress* states that in order to ensure safe drinking water, the nation's 55,000 community water systems need to invest at least \$138.4 billion over the next 20 years to install, upgrade, or replace infrastructure.

The survey only examined the needs of community water systems. Noncommunity water systems, such as schools and churches that have their own water systems, were not included. Needs solely associated with future growth were excluded from the survey as well. The report, intended to meet the requirements of Sections 1452(h) and 1452(i)(4) of the Safe Drinking Water Act (SDWA), identifies needs through December 2014.

### How did EPA conduct the survey?

In 1994, a working group convened to develop a method of determining drinking water infrastructure need for community systems nationwide—admittedly a colossal task. The group met several times during 1994 and 1995 to develop survey methodology and design the resulting report to Congress. It included staff and representatives of state drinking water agencies, American Indian and Alaska Native systems, Indian Health Services, and EPA regional and main office staff.

### Systems were classified by size as follows:

**Large** ..... serving more than 50,000,  
**Medium** ..... serving from 3,301 to 50,000, and  
**Small** ..... serving 3,300 or fewer individuals.

Questionnaire packages were mailed to all 794 large community water systems and 2,760 of the 6,800 medium systems in the country. Systems were asked to identify capital projects needed to continue supplying safe drinking water. The questionnaire requested descriptions of each need, cost estimates for the project, and documentation, as well as information that could be used to model costs for infrastructure projects that did not include a cost estimate.

Questionnaires completed by drinking water system personnel in each state were sent to state drinking water staff who ensured that documentation from each system was adequate and then forwarded questionnaires to EPA for review. Responses were entered into a database containing drinking water infrastructure needs for all systems surveyed. The report says that many medium and large systems were able to provide high quality information.

The working group estimated small water systems needs using a national statistical model. Individuals from EPA, usually accompanied by state staff, visited 537 of the more than 46,500 small water systems, determining needs through onsite inspection. Information collected was reviewed by state and EPA staff, then entered into the database.

Most small systems did not have documented estimates for identified projects. Thus, data provided by states, engineering firms, and large systems was used to develop cost models for small water systems.

### What is the estimate of total need?

Community water systems nationwide need \$12.1 billion now to comply with the SDWA and an additional \$18.2 billion in the future to maintain compliance. Total 20-year need is estimated at \$58.5 billion for large systems, \$41.4 billion for medium systems, \$37.2 billion for small systems, and \$1.3 billion for American Indian and Alaska Native systems, 98 percent of which are small systems.

More than \$76.8 billion of the total estimated cost is for infrastructure improvements needed now to protect public health. The remaining \$61.6 billion is for future needs, including projects designed to provide safe drinking water through the year 2014. These projects include replacing existing infrastructure and meeting proposed regulations.

### What do systems need most?

Four major categories of need are listed: transmission and distribution, treatment, storage, and source. Transmission and distribution needs—\$77.2 billion—account for more than half of the total need for community water systems in each size category. Water main improvement projects are necessary to minimize the risk of water supply contamination. Deteriorating distribution infrastructure threatens drinking water quality and can cause violations of the SDWA. Some systems have pipe that was installed during World War II when, due to the demand for metal during the

*Continued on next page*

*The Drinking Water Infrastructure Needs Survey is intended to meet the requirements of Sections 1452(h) and 1452(i)(4) of the Safe Drinking Water Act.*

## EPA's Water On Tap Answers Questions

Where does my drinking water come from? How do I know if my water is safe? How can I protect my drinking water and what can I do if there's a problem with it?

The U.S. Environmental Protection Agency (EPA) recently released a 23-page booklet *Water on Tap: A Consumer's Guide to the Nation's Drinking Water* to help answer these—and other—questions that consumers often ask.

The report brims with easy to understand information and drinking water facts, including explanations of treatment methods, how source water is threatened, why drinking water systems can't remove 100 percent of contaminants, and why

and how maximum contaminant levels are set. The report stresses the need for individuals and communities to take responsibility for drinking water.

To order a copy of *Water on Tap: A Consumer's Guide to the Nation's Drinking Water*, write to *Water On Tap*, #634D, Consumer Information Center, Pueblo, CO 81009, or call the Consumer Information Center at (719) 948-4000 and request publication #634D. Please allow 4 to 6 weeks for delivery.

You may also view the document online or download it from EPA's Web site at <http://www.epa.gov/OGWDW/wot/wot.html>. ■



### How great is infrastructure need?

*Continued from previous page*  
war, thin-walled pipe was used. Other communities still have wooden pipe in parts of their systems.

The report notes that even in systems with excellent treatment, leaking pipes can lead to a loss of pressure and cause back-siphonage of contaminated water. The danger becomes greater as the condition of pipes becomes worse, allowing more opportunities for water to be contaminated. In addition, leaks waste water and energy as treated water escapes from the distribution system.

Eighty-one percent of small systems need to upgrade distribution systems. In many instances, water from small systems poses health risks because system components were improperly designed and constructed. In some cases, entire water systems need to be replaced.

#### Treatment Needs Are High

Treatment is the second largest category of need accounting for approximately \$36.2 billion or 26 percent of the total. Twenty billion dollars are needed for treatment of microbiological contaminants that can cause acute health affects, usually associated with gastrointestinal illnesses. To minimize microbiological contamination, 35 percent of systems that use surface water sources need to install, replace, or upgrade filtration plants.

According to the report, most small systems use groundwater sources. The absence of disinfection in this type of system can be a pressing public health concern as disinfection minimizes the threat of microbiological contamination. More than 10 percent of small groundwater systems need to install or replace disinfection equipment.

Almost \$10.7 billion is needed for treatment of contaminants associated with chronic adverse health effects, including cancer and birth defects. Among these contaminants, the largest need is for treatment of disinfection by-products and lead.

Another \$0.2 billion is needed to treat for nitrates, which, in infants, can interfere with the ability of blood to carry oxygen. And \$5.3 billion is needed to treat for secondary contaminants that affect taste, odor, and water color.

#### Storage and Source Improvements Needed

Nine percent—\$12.1 billion—of estimated total need is for storage. Storage is critical. Aside from ensuring positive water pressure necessary to prevent contaminants from entering the systems, it provides water for periods when demand exceeds the capacity of source and treatment facilities. Two-thirds of water systems of all sizes reported a need for improvements to storage facilities.

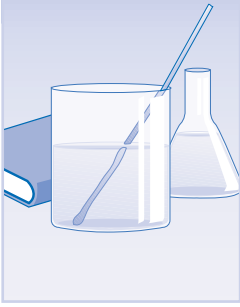
Source needs, which range from huge new surface water reservoirs for Los Angeles to new wells for tiny systems, account for 8 percent or \$11 billion. Two-thirds of small systems need to improve their sources, which are usually wells. Poor quality source water can threaten public health and force a system to use expensive treatment. Many communities need to rehabilitate systems, and others need to develop new water sources.

For a copy of the infrastructure needs survey, call the EPA's Safe Drinking Water Hotline at (800) 426-4791 and request EPA/812/R-97/001. There is no charge. The needs survey is also available on EPA's Web site at <http://www.epa.gov/OGWDW/docs/needs>.

If copies of the Drinking Water Infrastructure Needs Survey: First Report to Congress are unavailable, the publication is available free from the National Drinking Water Clearinghouse. Call (800) 624-8301 or (304) 293-4191, and request item #DWBKFN09. You also may order via e-mail at [ndwc\\_orders@ndwc.wvu.edu](mailto:ndwc_orders@ndwc.wvu.edu). Actual shipping charges are added to each order. ■

Eighty-one percent  
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Drinking Water  
Infrastructure  
Needs Survey: First  
Report to Congress



*“To protect themselves from a cave-in workers need to cut back trench walls to a safe slope, or provide adequate shoring or shielding.”*

*Michael Hein, professor of building sciences, Auburn University*

## *In the Trenches:*

# ***It's Always Better To Be Safe than Sorry***

by Kathy Jespersen  
NDWC Staff Writer

**Bloomfield Town (ShapenherM** 24, 1995)—One worker died and two were injured when a dirt wall caved in on them. The workers were constructing a sewer line when the accident occurred.

**Statesville, North Carolina** (February 23, 1996)—A worker was killed when a trench caved in on him, burying him beneath three feet of dirt. A co-worker uncovered him within a few minutes, but paramedics arriving on the scene were unable to revive him. Police reports state that the trench had not been shored.

**Platte, South Dakota** (June 26, 1996)—A 33-year-old construction worker died when a trench caved in on him at the Snake Creek Recreation Area. The victim and another worker were buried in the cave-in while installing a water line. Rescuers were able to save one worker, but the other was further down the trench. He was pronounced dead at a nearby hospital.

Why do these cave-ins happen? According to a Fall 1994 *MRWA Today* [Minnesota Rural Water Association] article on excavating and trenching, “with little or no warning, an unsupported, improperly shored or sloped trench or excavation wall can collapse, trapping the workers below in seconds.”

Although work-related injuries do occur on many job sites, there’s no reason to be “an accident waiting to happen.” Becoming familiar with safety practices and using that knowledge on the job site may be the key in preventing many injuries as well as unnecessary deaths.

Bearing that in mind, safety in trenches means far more than just complying with Occupational Safety and Health Association (OSHA) standards. However, understanding those standards and why they exist is the beginning of a good safety program. Using that information may save your life.

### ***What is a trench?***

OSHA defines a trench as a “narrow excavation (in relation to its length) made below the surface of the ground. The depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension to 15 feet or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.”

Under OSHA standard 1926.652, subpart P, trenches that do not exceed a depth of 20 feet

require sloping, shoring, or shielding to protect workers from cave-ins.

“Trenches are common at many construction sites,” says Michael Hein, professor of building sciences at Auburn University in Alabama. “They are usually required for laying water or sewer lines. And workers in a trench must be protected from a variety of dangers.”

### ***What is a cave-in?***

“The mechanics of a cave-in are simple,” says Hein. “Undisturbed soil is kept in place by the horizontal and vertical forces of adjacent soil. The soil removed to create a trench is no longer available to provide support for the soil left behind in a trench wall. With no support, soil from the trench wall will eventually move downward and inward into the excavation, creating a serious and life-threatening hazard for workers in the trench.”

Hein says there are numerous reasons why a cave-in may occur. “Soil, equipment, and stored materials stacked too close to a trench increase the likelihood of a cave-in. Vibration from vehicles or machines operated in nearby buildings as well as compaction equipment increase the chances of a cave-in. Sudden changes in soil moisture conditions, such as after a rain or from a broken pipe, can precipitate a cave-in.

“If enough water is present in soil,” he continues, “it can push the soil particles apart, destroying the frictional strength between them. When pressures exceed the weakened soil strength, a large mass of soil will slide downward and into the trench opening.”

Heavy equipment and materials such as pipes or timbers should be kept as far back from the excavation as possible, notes the MRWA article. “When heavy loads must be kept near an excavation, the walls must be braced, sheet-piled, or shored to safely support the extra weight.

“Spoil—the excavated material—can exert great pressure on excavation walls. It must be stored two feet or more from the edge of the excavation and be barricaded or retained in an effective manner,” states the MRWA article.

### ***Preventing Cave-ins***

“To protect themselves from a cave-in,” says Hein, “workers need to cut back trench walls to a safe slope, or provide adequate shoring or shielding. And, a trench deeper than 20 feet must have a protective system designed by a registered professional engineer.”

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How can cave-ins be prevented? "Such accidents seldom have a single cause," notes the MRWA article. "To help alleviate such accidents, a competent person must continually evaluate the potential risk to workers in a trench," Hein adds.

According to OSHA standards, "a 'competent person' means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them." But just who is this person?

"Anyone can be a competent person," explains Hein, "a supervisor, foreman, engineer, or backhoe operator. The conditions set by OSHA are that this person be 'capable' and 'authorized.' Persons become capable through training and experience.

"Although OSHA does not require the competent person to be trained, this is the most likely means for them to become capable. Persons are authorized by the company they work for. Someone must clearly designate who the competent person is, and this must be understood by all workers.

"The competent person must be on the job site whenever workers are in a trench, evaluating changing soil conditions, inspecting protective systems, and looking out for the safety of workers," he says.

"A person does not need to be buried completely to be seriously injured or killed," Hein explains. "Soil is so heavy that it can suffocate a person by not allowing them to expand their chest to breathe. The impact of heavy soil can crush bones and damage internal organs. OSHA provides guidelines for proven safe excavation practices."

### **Soil Is Heavy**

According to OSHA, in general, a cube of soil measuring one foot on each side weighs around 100 pounds. A cubic yard of soil contains 27 of these cubes and weighs approximately 2,700 pounds. That's about as much as a mid-sized automobile. (The soil's actual weight will vary depending on the type of soil, moisture content, and other factors.)

A trench wall collapse may contain three to five cubic yards of soil, weighing from 8,000 to 14,000 pounds. A person buried under only a couple of feet of soil could possibly suffocate within approximately three

minutes. Even if the person is rescued before suffocation occurs, the heavy soil loads are likely to cause serious internal injuries.

A person buried in earth as high as his diaphragm would not be able to dig out, and chances of survival are low. If a person's face is even partially covered, death is almost certain.

The soil's type also must be carefully identified to insure its stability during excavation, notes the MRWA article. "Excavations in wet or sandy soil, or areas that have been backfilled are relatively unstable and must have strong support. Even hard rock sometimes can be hazardous; faults in the strata can make it unstable when cut."

Changing weather conditions also affect the soil, according to the MRWA article. A heavy rain or melting snow can loosen soil, which may drastically increase the pressure on the shoring system, the article states. "Shoring frozen ground presents another potential problem—a sudden thaw can undermine an entire section of shoring. Even excessively dry conditions can reduce the cohesiveness of the soil."

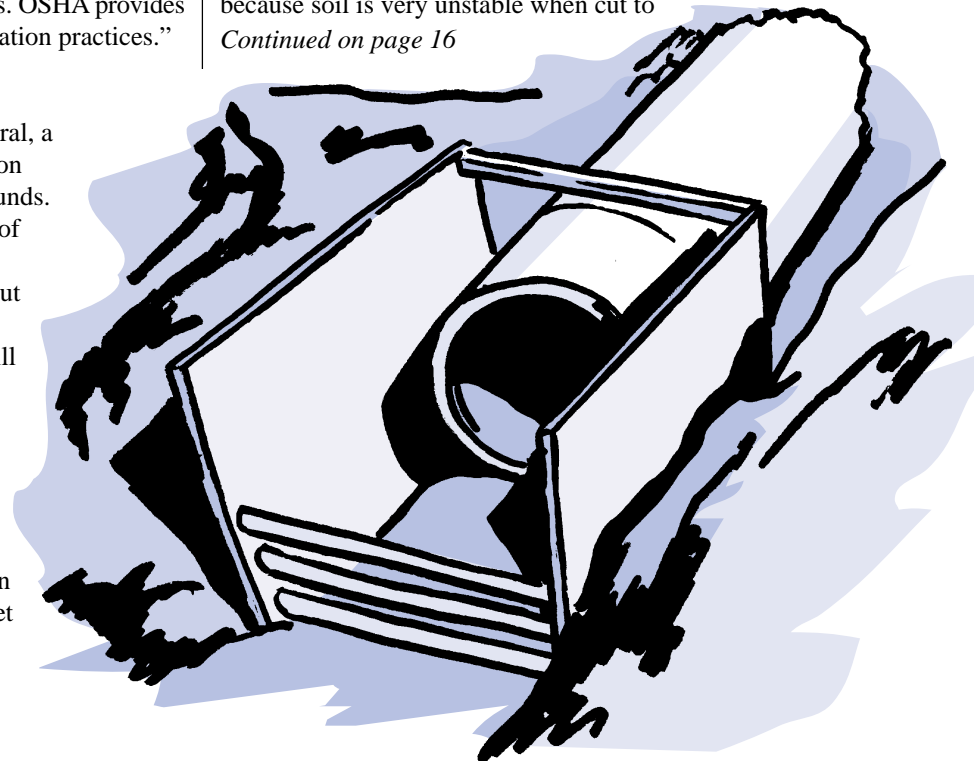
### **Sloping, Shoring, and Shielding**

According to OSHA, properly sloping a trench adds to its safety. Sloping is a method of protecting workers from cave-ins by excavating trench sides to form an incline away from the excavation. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, moisture content, and application of surcharge loads.

"It is important to properly slope a trench because soil is very unstable when cut to

*Continued on page 16*

*Shields may be permanent or designed as portable devices. These structures are able to withstand the force of a cave-in, protecting workers within the trench.*



## ***It's Always Better To Be Safe than Sorry***

*Continued from page 15*

an angle deeper than its natural angle of incline,” says Hein. “In addition, surcharge pressures from soil, stored materials, vehicles, and equipment next to the trench increase pressures in the soil adjacent to the trench.”

OSHA defines shoring as a structure—such as a metal hydraulic, mechanical or timber shoring system—that supports the sides of an excavation and is designed to prevent cave-ins. Shoring requirements vary for different soil types and trench depths.

“Commercially available aluminum hydraulic trench shores, when properly used, can securely brace trenches up to 12 feet wide or 20 feet deep,” says Hein. “And many aluminum hydraulic trench shores can be installed and removed quickly by one worker.” (*See illustration on this page.*)

A shield is a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect workers within the structure. Shields may be permanent structures or may be designed to be portable and moved along as work progresses. Some trench shields are stackable to provide safe work areas in deeper trenches. Commercially available trench shields are typically made of either steel or aluminum components.

Additionally, shields may be either premanufactured or job-built in accordance with OSHA regulations. Shields used in trenches are also referred to as “trench boxes” or “trench shields.” (*See illustration page 15.*)

### ***Installing a Support System***

Whether workers are installing a sloping or shielding system, they should always start from the top down. When installing shoring, “care must taken to place the cross beams or trench jacks in true horizontal position and space them vertically at appropriate intervals. The braces also must be secured to prevent sliding, falling, or kickouts,” notes the MRWA article.

Workers also should take care to use shoring or shielding materials that are in good condition—free from defects and of the right

size. Timbers with large or loose knotholes should not be used.

Further, trenches should be left unshored for as little time as possible. “Installing shoring should closely follow the excavation work,” the article continues. “Even if no work is being done in them, dirt walls will slough off, causing dangerous overhangs. The longer a trench is left unsupported, the greater the chance of a cave-in.”

### ***Safety Measures***

Maintaining safety standards may save workers from injury or even death, Hein adds. “Most injuries that occur in trench accidents are severe or fatal.”

Besides the risk of cave-in, trench workers need to be aware of other potentially hazardous conditions. “Hazardous atmospheres may exist in a trench and should be tested if digging near a landfill or other gas-bearing soil,” he explains.

Be aware of gas lines or other utilities. A trench that fills with water because of a broken line or high water table can be as dangerous as one with a leaking gas line, adds Hein.

Workers must also be able to get out the trench when necessary as well. “Ramps and ladders must be provided for egress of workers,” says Hein. This equipment must always be at the job site. According to OSHA regulation, ladders or steps should be placed so that no more than 25 feet of lateral travel is required.

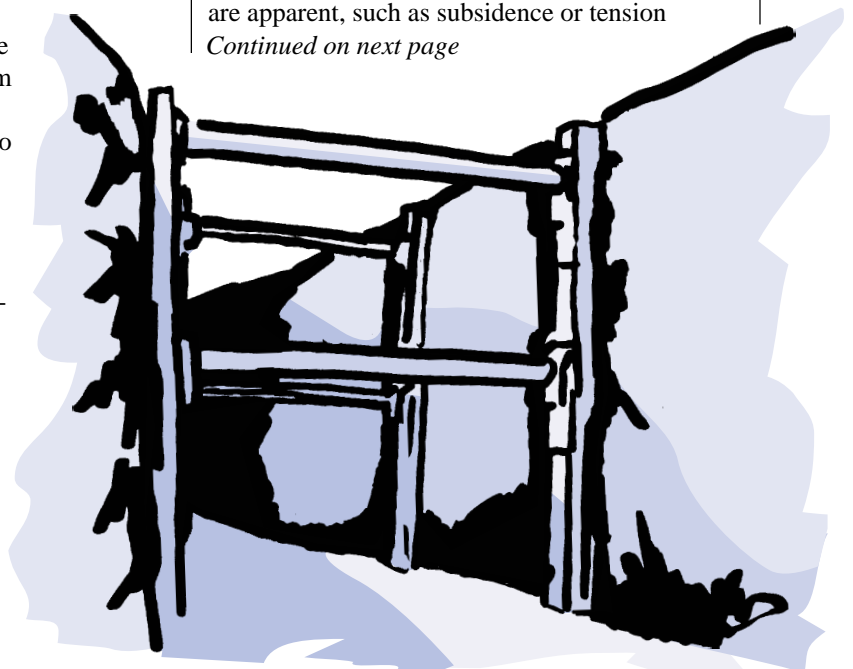
Also, daily inspections of the trench and safety systems should be carried out by a competent person, states the MRWA article. Inspections also are required after a rainstorm or any change in conditions that can increase the possibility of a cave-in or slide. “If dangerous ground movements are apparent, such as subsidence or tension

*Continued on next page*

*“Most injuries that occur in trench accidents are severe or fatal.”*

■  
*Michael Hein,  
professor of  
building sciences,  
Auburn University*

*Shoring supports the sides of an excavation and is designed to prevent cave-ins. It can be made of metal or timber.*



## EPA Survey Estimates Clean Water Needs

The U.S. Environmental Protection Agency's (EPA) 1996 *Clean Water Needs Survey* estimates that \$139.5 billion is needed to meet municipal wastewater treatment capital needs over the next 20 years. This amount is even greater than the \$138.4 billion needed to maintain safe drinking water during the same time period. (*For information on the drinking water needs survey, see page 12.*)

The clean water needs survey estimates costs for completing various water quality infrastructure projects—many eligible for funding from the clean water state revolving fund (SRF). This survey includes costs for publicly owned municipal wastewater collection and treatment facilities and for activities, such as stormwater, combined sewer overflows, and nonpoint source pollution projects.

An estimated \$3 billion is available from the clean water SRF for fiscal year 1998. Since the SRF program began in 1988, \$20 billion has been loaned for various water quality projects.

Further, the survey states that water quality program needs for small communities represent approximately \$14 billion, and that the need for basic infrastructure is even greater in small communities than in larger communities. A small community is defined as having fewer than 10,000 residents and wastewater flows of less than one million gallons a day.

The 1996 survey was the twelfth conducted since the Clean Water Act was first passed in 1972. The needs survey is conducted every four years, in part, to determine how funding for the clean water (SRF) should be allocated. The survey does not address private wastewater treatment facilities. The Indian Health Service is conducting a separate assessment for Indian tribes and Alaska Native Villages.

To order a copy of the 1996 Clean Water Needs Survey, contact Sandi Perrin at EPA at (202) 260-7382. The survey also may be downloaded from the EPA Office of Wastewater Management Web site at <http://www.epa.gov/owm/repcong.htm>. ■

## It's Always Better To Be Safe than Sorry

*Continued from previous page*  
cracks, all work in the excavation must be stopped until the problem has been corrected."

However, no matter how careful workers try to be, accidents do happen. "If an accident does occur, get out of the trench and call 911," explains Hein. "Do not go back into the trench after a buried or trapped companion. The extra weight and vibration can precipitate a second or third cave-in. Shut off all vibrating equipment. Leave all hand tools in place. Do not attempt to dig the trapped workers out with sharp tools that could further injure them.

"The best way to excavate a trench is to use any method that insures workers in the trench are adequately protected," says Hein. "Leave the trench open for as short a time as possible. Have as few workers in the trench as necessary. And always, always follow OSHA guidelines."

### Where can I find more information?

For more information about OSHA standards, tour their web site at <http://www.osha-slc.gov/> and look under OSHA regulations or call the regional OSHA office in your area. OSHA provides training on many topics, which is available through regional offices. To report life-threatening situations, call (800) 321-OSHA.

To obtain a free copy of Excavations, OSHA 2226, you may download it from their Web site,

or write U.S. Department of Labor, OSHA/OSHA Publications, P.O. Box 37535, Washington, D.C. 20013-7535, or call (202) 219-4667. You may also send a fax to (202) 219-9266.

To learn more about trench safety through an interactive trench safety tutorial, check out <http://www.bsc.auburn.edu/research/trench/>. A fee of \$75 applies to individual users and \$299 for organization use. This tutorial takes about three hours to complete and is available for continuing education units. It covers many aspects of trench safety, including cave-ins, shoring, and shielding.

Other safety Web sites include:

- <http://www.safetyonline.net> for Safety Online,
- <http://www.paho.org/> for the Pan American Health Organization
- <http://www.who.ch> for the World Health Organization, and
- <http://www.ASSE.org/> for the American Society of Safety Engineers

To receive a copy of the MRWA article "Excavating and Trenching," available through the National Small Flows Clearinghouse, call the NSFC at (800) 624-8301 or (304) 293-4191 and request item #L003639. The cost is \$0.75 plus a charge for postage. You may also order via e-mail at [nsfc\\_orders@estd.wvu.edu](mailto:nsfc_orders@estd.wvu.edu). ■



### Water Fact



Currently, the nations approximately 55,000 community water systems must test for more than 80 contaminants.

*Water on Tap: A Consumer's Guide to the Nation's Drinking Water*



## Can SCADA put your plant on remote control?

Supervisory Control and Data Acquisition technology—or SCADA—in drinking water treatment refers to an automated process by which drinking water can receive continuous standard treatment without requiring manual control or the presence of an operator. In other words, water treatment is put on an auto pilot. This technology enables the operator to gain access to vital plant facility control from a personal computer (PC) in order to record, analyze, and report data. SCADA systems include a modem to allow control of the operation at a remote location, and hence the term Remote Telemetry.

### What are the system components?

SCADA system hardware includes the following:

- (1) Remote Telemetry Unit(s) (RTU) placed at the plant site,
- (2) central site generic personal computer,
- (3) modem for communication, and
- (4) selected monitoring equipment and instrumentation. Instrumentation can monitor for treated and raw water flow, pH, finished and raw turbidity, filter head loss, high and low trans-membrane pressure, chlorine residual, treated and raw pressure, and reject or wash water flow.

### How does a SCADA system work?

- Each RTU is programmed to control selected local processes such as turbidity or groundwater pumpage.
- The operator can then select and pre-program different commands in the central PC location which travel to the RTU via serial link in order to retrieve the required data.
- When data is received, the operator can load it into the central site display and erase it from the computer random access memory (RAM) in order to maintain the required memory space for subsequent automatic data retrieval.
- The operator can control the automated process through a graphical user interface (GUI) by moving the cursor to a selected icon in the menu display and selecting a process through “point and click” method.

### What are the system features?

- SCADA technology can be used to control various treatment targets. For instance, Enid, Oklahoma, (population 2,000) utilized SCADA to reduce the ammonia levels through continuous automated operation resulting in annual savings of \$2,500.

- The system can control several treatment plants from one PC or master location by placing an RTU in each location. In Bay City, Texas, SCADA was utilized to control 19 sewage pumping stations, one sewage treatment plant, four water treatment plants, several ground and elevated water storage tanks, and various well/booster stations, all through two master stations.
- The SCADA system can be equipped with an “Exception Reporting” emergency feature that lets the system auto-dial pre-programmed phone numbers to alert the operator of impending site problems such as increasing levels of turbidity or nitrates.
- The system can also report data on an automatic basis to fulfill regulatory compliance and required paperwork.

### How can SCADA benefit small systems?

SCADA can help small communities save water, reduce manpower, and maintain on-the-clock high drinking water quality to ensure compliance with Safe Drinking Water Act regulations. The technology can be used to conserve water by controlling leaks and water usage. For instance, Sun Lakes, a small desert community in Arizona (population 2,000) has used SCADA to automatically turn on and off their groundwater wells based on the inconsistent water demand of the community.

Furthermore, SCADA can be utilized for multi-plant system control in order to control the operation of small scattered communities from one control room. Since SCADA technology does not technically require the on-the-clock presence of an operator, it can result in labor reduction and overall treatment cost savings. However, some states may require the presence of an operator at all times.

If a community acquires SCADA, operators should undergo computer training in order to operate and maintain the system. The cost of SCADA systems varies from approximately \$5,000 to \$10,000.

*SCADA is an acronym that is not copyrighted, and several companies manufacture SCADA systems.* ■

## NATaT Offers Source Water Funding Guide

The National Association of Towns and Townships (NATaT) has developed a guide to help local elected officials understand how recent federal legislation provides them with an opportunity to protect and preserve local water supplies through a source water protection program.

NATaT's National Center for Small Communities produced *Small Town Action Guide for Source Water Funding* to promote timely involvement by local and county officials. The guide:

- summarizes local source water protection responsibilities and strategies,
- explains opportunities for local governments available through the Safe Drinking Water Act, and
- identifies key points at which local, timely input can help determine state-based source

water priorities and set-aside funding levels to benefit municipal and county governments over the next five years.

To obtain a free copy of this guide, contact NATaT at (202) 624-3550 or fax (202) 624-3554. You may also write to the National Center for Small Communities, 444 N. Capitol Street, NW, Suite 294, Washington, DC 20001.

The National Drinking Water Clearinghouse (NDWC) also offers *Small Town Action Guide for Source Water Funding* free; however, shipping charges are added. To order, call the NDWC at (800) 624-8301 or (304) 293-4191 and request item #DWBLFN12. You also may order via e-mail at [ndwc\\_orders@ndwc.wvu.edu](mailto:ndwc_orders@ndwc.wvu.edu). ■



## Newsletter Explores System Privatization

Emotions can run high when a community considers "public-private partnerships" or "privatization" of its water or wastewater systems.

This doesn't need to be the case. Even though these concepts can be confusing, a little education can go a long way toward clarifying options.

The Summer 1997 issue of *Water Sense*, published by the National Drinking Water Clearinghouse (NDWC), addresses this need for information with a "theme" issue devoted to privatization. The newsletter explains how small communities might involve the private sector in providing drinking water or wastewater services.

"Private sector involvement can cover a wide range of options, from simply contracting out engineering or billing services, to contracting with a company to operate a system, to what is sometimes called 'full privatization,' where a

private company actually owns and operates the facility," according to the newsletter.

The publication discusses reasons to privatize, common obstacles and considerations when contracting for services or selling systems to private buyers. It also covers the role of state regulators and provides a brief glossary and listing of resources for additional information.

For a free copy of the Summer 1997 *Water Sense*, call the National Drinking Water Clearinghouse at (800) 624-8301 or (304) 293-4191 and request item #WSENSE11. To order by e-mail, send name, address, item numbers, quantities you wish to order, and your phone number to [ndwc\\_orders@estd.wvu.edu](mailto:ndwc_orders@estd.wvu.edu).

The newsletter also may be downloaded from the NDWC Web site, <http://www.ndwc.wvu.edu>. ■

## Free Training Newsletter Is Available

Small community drinking water operators and officials who occasionally train or educate others will appreciate *E-train*, the environmental training newsletter for small communities.

Operators, circuit riders, local officials, technical assistance specialists, regulatory officials, and those involved in health and safety issues all can find information to aid them in educating others.

Published quarterly by the National Environmental Training Center for Small Communities (NETCSC), a "sister" organization of the National Drinking Water Clearinghouse, *E-train* features articles relevant to the field, practical tips and techniques for successful instruction, and coverage of exemplary training programs. It also includes listings of upcoming training events and

training resources such as books, manuals, and videos.

"Numerous readers have written to us with positive feedback about the newsletter's editorial content," says Diana Duran, *E-train* editor. "They say the publication is interesting, appealing, and most of all, useful."

For a free *E-train* subscription call (800) 624-8301 or (304) 293-4191, or write to NETCSC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. The newsletter may also be accessed through NETCSC's Web site at <http://www.netc.wvu.edu>. ■



**Features**

SDWA One Year Later, Change Is the Only Constant, page 1

In Washington: Technical Assistance Takes Many Forms, page 1

SDWA Is on Track One Year Later, page 6

NDWC Tech Brief: Package Plants, center pages

How great is infrastructure need? page 12

**Departments**

NDWC Page, page 2

News and Notes, page 3

Operator Section, page 14

Q&A, page 18

Resources, page 17



On Tap is printed on recycled paper.

## NDWC Provides Utility Management Products

*Note: Free items are limited to one of each per order. Call (800) 624-8301 or (304) 293-4191 to order products. You also may order via e-mail at ndwc\_orders@ndwc.wvu.edu. Please allow three to four weeks for delivery. Actual shipping charges are added to each order.*

■ **Water Board Bible: The Handbook of Modern Utility Management**

Item #DWBKMG05

This handbook, intended for water boards and council members, provides information and guidance about the regulatory and financial aspects of managing a water utility. It also includes sample board problems and solutions, informational quizzes, and a reading list.

Cost: \$13.80

■ **Practical Personnel Management for Small Systems**

Item #DWBKMG15

The second volume in *The Water Board Bible* series, this handbook discusses the legal aspects of dealing with water system employees and customers, personnel administration and the future of customer relations. Both handbooks were written by Ellen G. Miller, president of the Ellen Miller Group consulting firm.

Cost: \$9.00

■ **Drinking Water Handbook for Public Officials**

Item #DWBKMG09

This handbook is filled with useful information to help public officials understand water systems. From basic operation and maintenance through the regulations affecting those systems, the *Drinking Water Handbook*, a 97-page book, may be the tool you need to keep your system on track.

Cost: \$0.00

■ **Water System Self-Assessment for Homeowners' Associations**

Item #DWBLMG03

This booklet is designed to help homeowners' associations—those that regularly supply drinking water to 15 or more hookups or 25 or more people—learn about financing and managing small drinking water systems. It offers solutions to help with common problems faced by these groups.

Cost: \$3.90

■ **Self-Assessment for Small Privately Owned Water Systems**

Item #DWBLMG01

This guide was developed to help officials identify financial and managerial problems. It includes a series of questionnaires to help assess a system's financial condition.

Cost: \$4.10.

■ **Water System Self-Assessment for Mobile Home Parks**

Item #DWBLMG02

This 27-page booklet provides suggestions for solving common water system problems. It contains worksheets that help operators assess their needs in areas of planning, financing or maintenance operations.

Cost: \$3.90.

### NDWC Mission Statement

The National Drinking Water Clearinghouse assists small communities by collecting, developing, and providing timely information relevant to drinking water issues.

### National Drinking Water Clearinghouse

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