Drinking Water News For America's Small Communities

On Tap

Winter 1996
Volume 5, Issue 4

Special SDWA Reauthorization Issue

SDWA Amendments of 1996:
What's the impact on small systems?

Editor's Note: On Tap *staff asked Peter Shanaghan, small systems coordinator for the U.S. Environmental Protection Agency's Office of Ground Water and Drinking Water, how the Safe Drinking Water Act Amendments of 1996 will impact small systems.*

How will the Safe Drinking Water Act (SDWA) Amendments of 1996 strengthen protection for America's drinking water?

The amendments bring substantial and much needed change to the national drinking water program. The changes will correct problems we have all faced in trying to implement the 1986 law.

Most importantly, the 1996 amendments offer a workable framework within which water systems, states, and the U.S. Environmental Protection Agency [EPA] can face current and future drinking water safety challenges and assure the sustainable availability of safe drinking water.

There are four major themes to the reform in the 1996 amendments: new funding for communities and states through a drinking water state revolving fund [DWSRF]; a focus on preventing problems, not merely on correcting them once they have occurred; regulatory improvements, including better science, prioritizing effort, and risk assessment; and better information for consumers.

What do you see as the biggest changes made by the amendments?

The amendments represent a balanced, integrated framework of reform. The entire package

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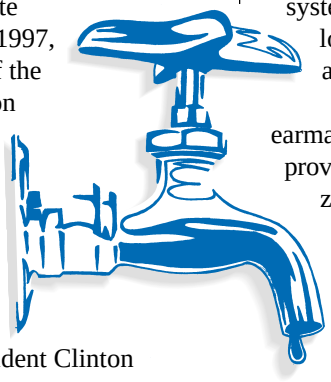
Reauthorized Act Includes Drinking Water SRF

by P.J. Cameon
Water Sense *Associate Editor*

Water systems will begin seeing the benefits of the new drinking water state revolving fund (DWSRF) in 1997, according to Jamie Bourne of the U.S. Environmental Protection Agency (EPA).



Bourne oversees the development of the new fund, one of the provisions of the reauthorized Safe Drinking Water Act (SDWA) passed by Congress and signed by President Clinton this summer.

In the best case scenario, according to Bourne, some states will issue low-interest loans as early as late winter, and many other states will issue loans in the middle or latter part of 1997.

The drinking water fund will operate similarly to the existing wastewater state revolving fund (SRF), which began in 1987 under the Clean Water Act.

Here's how the new fund will operate: The federal government will provide most of the initial funding, or "capitalization," to start each state's SRF. Each state will provide a minimum 20 percent matching grant as its share. The state will then issue loans to local systems. As the systems repay principal and interest on their loans, that money will be available for additional loans.

A portion of the DWSRF fund will be earmarked for small communities. States can provide up to 30 percent of their federal capitalization grant in the form of "disadvantaged loan assistance" to those systems the states define as "disadvantaged."

Funds Geared Toward Compliance

The new fund for drinking water can be used toward a range of projects, but the primary focus, according to Bourne, is projects that help systems maintain or come into SDWA compliance and projects needed to "maintain public health."

Bourne mentioned that land purchases relating to water projects are eligible only if they are integral to projects.

There are also set-asides to help states establish source water protection and capacity development

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Sponsored by
Rural Utilities Service

Administrator
Wally B. Beyer

Loan Specialist
Donna Roderick

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National Drinking Water Clearinghouse

Manager, WVU Environmental Services and Training Division
John L. Mori, Ph.D.

Program Coordinator
Sanjay Saxena

Technical Services Coordinator
David Pask, P. Eng.

Publications Supervisor
Jill A. Ross

Managing Editor
Harriet Emerson

Staff Writers
P.J. Cameon
Lauretta Galbraith
Kathy Jesperson

Graphic Designer
Eric Merrill

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Editor, *On Tap*, NDWC
West Virginia University
P.O. Box 6064
Morgantown, WV 26506

(800) 624-8301
(304) 293-4191

http://www.ndwc.wvu.edu

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On Tap Reviews SDWA Amendments of 1996

On Tap has dedicated this issue to the long-awaited Safe Drinking Water Act (SDWA) Amendments of 1996.

P.J. Cameon, *Water Sense* associate editor, talked with several drinking water professionals about the new drinking water state revolving fund, one of the most important and historic elements of the amended SDWA (see page 1).

We've included an interview with Peter Shanaghan, small systems coordinator for the U.S. Environmental Protection Agency's (EPA) Office of Ground Water and Drinking Water (see page 1), and comments by drinking water professionals from the National Rural Water Association, the Arkansas Health Department, and the American Water Works Association regarding their views of the reauthorized SDWA (see page 5).

There is a synopsis of the reauthorized SDWA based on EPA's online summary (see page 6); a glossary of commonly used SDWA terms (see page 10); and an SDWA help page with information about ordering and accessing summaries or the full-length legal document of the SDWA (see page 11). There is also a selection of important dates (see page 12).

A major element of the reauthorized SDWA is an emphasis on protecting public drinking water supplies from microbial contaminants. In this issue, we're fortunate to have articles by two experienced drinking water professionals, Dan Fraser, a private consultant from Montana (see page 16), and Larry Rader, West Virginia Rural Water Association program specialist (see page 18), about microbial contaminants, the barrier method, and plant optimization.

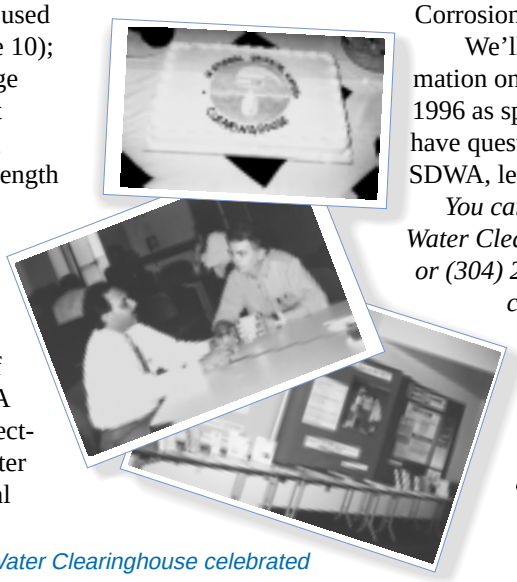
While these two articles primarily provide information applicable to surface water systems, Bruce Macler, EPA Groundwater Disinfection Rule (GWDR) regulation manager, gives an update on GWDR progress (see page 21).

Thanks to the many drinking water professionals who helped us with this issue—by writing, commenting, and reviewing.

Due to the amount of information in this special SDWA issue, we have postponed the third installment of the history of water treatment and waterborne disease, as well as "Tech Brief: Corrosion" until the Spring 1997 *On Tap*.

We'll continue to pass along information on the SDWA Amendments of 1996 as specifics are ironed out. If you have questions about the reauthorized SDWA, let us know.

You can reach the National Drinking Water Clearinghouse at (800) 624-8301 or (304) 293-4191. Also, questions and comments can be e-mailed to me at hemerson@wvu.edu.



The National Drinking Water Clearinghouse celebrated its fifth birthday in September with cake and conversation.

Harriet Emerson
On Tap Editor

RUS Market Rate Lower; Others Unchanged

Two of the three interest rates for Rural Utilities Service (RUS) water and waste program loans remain unchanged. The market rate has decreased slightly.

RUS issues loans at one of three interest rates, according to community qualification criteria. The rates for the first quarter of fiscal year 1997 apply to all loans issued from October 1 through December 31, 1996. These rates are:

- *poverty line* rate: 4.500 percent (unchanged from the previous quarter);
- *intermediate* rate: 5.125 percent (unchanged from the previous quarter); and
- *market* rate: 5.750 percent (down .125 percent from the previous quarter).

RUS loans are administered through local or state Rural Development offices, formerly known as Rural Economic and Community Development offices. These offices can provide specific information concerning RUS loans and applications.

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

NDWC Is Now on World Wide Web

To be more accessible to those interested in small community drinking water issues, the National Drinking Water Clearinghouse (NDWC) has developed a World Wide Web site.

Located at http://www.ndwc.wvu.edu, this new site provides an overview of the NDWC's program and services. It includes abstracts of *Water Sense* and *On Tap*, online access to the NDWC's products catalog, information about new products, and links to other relevant sites.

The Web site includes a section called "Water Facts." These brief facts provide general information about drinking water topics, such as how drinking water is regulated, where water comes from, and how it is treated.

The Web site also serves as a link to the Drinking Water Information Exchange Bulletin Board System, a free computer service that allows users to discuss drinking water issues with others around the country.

Future plans for the site include online access to NDWC's newsletters and selected products and database information, according to Lauretta Galbraith, NDWC Web site coordinator.

The NDWC's two "sister" organizations, the National Small Flows Clearinghouse and the National Environmental Training Center for Small Communities, also have new Web sites, which are linked to the NDWC's site.

Site users are encouraged to let the Web master know what they find useful by leaving a message via an online link.

"Users' comments will be considered as we make future improvements to the sites," says Galbraith.

For more information about NDWC's Web site, call Galbraith at (800) 624-8301 or (304) 293-4191.

Saxena Appointed to Protocol Committee

Sanjay Saxena, National Drinking Water Clearinghouse (NDWC) program coordinator, has been appointed to a steering committee that will assist the U.S. Environmental Protection Agency (EPA) and NSF *International* with the technical and public health aspects of testing drinking water package technologies.

The steering committee is part of the Environmental Technology Verification (ETV) Program, funded by EPA's Environmental Technology Initiative. ETV's goal is to provide verified performance data from impartial third parties in five pilot areas, including one that will test drinking water package treatment plants.

The Small Package Drinking Water Systems pilot program will assess the performance claims of packaged and modular drinking water treatment systems using various technologies in the U.S. and internationally.

Because small communities often do not have the equipment necessary to comply with the Safe Drinking Water Act requirements, package treatment plants or modules of treatment systems, which can be designed to deal with specific problems, may offer a less costly and more effective solution.

But obtaining approval for new or alternative technologies can be time consuming and sometimes redundant, says Saxena, because other states may be conducting tests on similar technologies.

The Small Package Drinking Water Systems pilot program will develop widely accepted verification study protocols and test plans and provide third-party testing on such aspects as the operation of the technology and the quality of source water.

Committee members represent federal and state governments, manufacturers/vendors, engineering and scientific services, and drinking water industry trade associations and organizations.

Sanjay Saxena, National Drinking Water Clearinghouse program coordinator

The steering committee is one critical part of the Small Package Drinking Water Systems pilot program, according to Bruce Bartley, NSF *International* project manager. Members will be responsible for developing strategic plans, reviewing documents, and providing input and feedback to the program from various industry and government perspectives.

"Information obtained from the drinking water pilot program and from the verification protocols will be valuable to include in the NDWC's RESULTS database," says Saxena.

RESULTS, or Registry of Equipment Suppliers of Treatment Technologies for Small Systems, is a database of alternative drinking water technologies in place around the country. Searchable by contaminant, technology, manufacturer, and state, the database also contains general information about the technology and manufacturer, state official, and system contact information.

For more information about the Small Package Drinking Water Systems pilot program, contact Bartley at (800) 673-6275. For more information about RESULTS or to contribute information to the database, call the NDWC at (800) 624-8301 or (304) 293-4191.

Alternative Technology Protocol Established

by Natalie Eddy
NDWC Contributing Writer

A new protocol has been developed to help public water systems obtain approval for alternative drinking water treatment technologies.

The protocol establishes a basic framework for approval of technologies, ranging from point-of-use to centralized treatment for water systems.

Vanessa M. Leiby, executive director of the Association of State Drinking Water Administrators (ASDWA), said the document "is not meant to replace current state plan review and approval processes, but sets a common protocol for the type of information to be submitted to states in order for new technologies to be considered for approval."

Developed by ASDWA, the U.S. Environmental Protection Agency (EPA), state drinking water program personnel, industry representatives, and other interested parties, Leiby said the protocol is meant to streamline the approval process and to improve the consistency of response across states.

In addition, the document provides guidelines to manufacturers, suppliers, consulting engineers, and system owners on the types of data required before a technology can be approved.

"It is expected that the use of the protocol will decrease the need for pilot or demonstration projects over time."

Vanessa M. Leiby, executive director, Association of State Drinking Water Administrators

How many small systems exist?

Currently, states regulate more than 186,000 public water systems under the Safe Drinking Water Act.

According to the EPA's *1994 National Compliance Report*, 30 percent (or 56,747) of those are community water systems, 13 percent (or 23,639) are nontransient noncommunity systems, and 57 percent (or 106,438) are transient noncommunity systems.

The majority of these, some 96 percent, are small systems, serving fewer than 3,300 persons. In addition, 85 percent of the systems are considered very small, serving fewer than 500 persons.

These small and very small systems are responsible for more than 90 percent of the violations, primarily for failure to monitor, according to EPA statistics. As drinking water regulations have become more complex and burdensome, small systems have found it increasingly difficult to comply.

The EPA, states, and manufacturers have attempted to promote development and approval of alternative technologies for small systems to help them meet requirements, remain affordable for customers, and be easy to operate and maintain.

Approval Process Is Outlined

The first step in the approval process outlined in the protocol is to identify the problem with a particular drinking water system. Next, all available alternatives should be evaluated. Where an alternative treatment is an option, the protocol should be used.

Once a system's problems are identified, the applicant should propose a technology and submit information. Based on the information provided by the applicant, the state will determine whether the technology is a viable solution.

The submittal should include information on the following: source of water, water quality characteristics, pumping capacity of source, backwashing capacity, piping materials, storage facilities, power availability, existing treatment units, location of facilities, waste disposal facilities, existing monitoring and reporting, other water quality concerns, and drawings illustrating existing and proposed facilities.

Compliance with basic materials safety standards to ensure that they do not introduce harmful chemicals or leachates into the water is another component of the protocol.

The operation and maintenance requirements of the system also must meet the needs and expertise of the system owner or operator. It must be cost-effective, as well.

In addition, it is helpful for states to have credible third-party test data to provide information over a range of source water quality conditions or information from full-scale operation of the technology in other applications.

Prior to installation or construction of any proposed alternative technology, final plans and specifications must be submitted.

The state reviews all of the pertinent data and makes one of several determinations: acceptance without site-specific piloting, conditional approval, need for additional information, onsite piloting still needed, or technology not appropriate.

Leiby said, "It is expected that the use of the protocol will decrease the need for pilot or demonstration projects over time. A key to this effort will be the development of an appropriate mechanism that states, water systems, and engineers can use to share data and information about treatment approvals and effectiveness."

The protocol encourages states to share information about their experiences with alternative technologies. It recommends providing the information to the Registry of Equipment Suppliers of Treatment Technologies for Small Systems (RESULTS) database maintained at the National Drinking Water Clearinghouse.

For more information or to obtain a copy of the protocol, contact Leiby or Bridget O'Grady of ASDWA at (202) 293-7655.

Reauthorization Opens Door to Change

by Kathy Jesperson
NDWC Staff Writer

The Safe Drinking Water Act (SDWA) has been reauthorized, and although the U.S. Environmental Protection Agency (EPA) still has many details to iron out, changes are on the way for states, water systems, and assistance organizations.

Major changes in the act include contaminant regulation based on risk assessment and cost-benefit analysis and the creation of a state revolving loan fund to make grants and low-interest loans available to water systems for infrastructure upgrades, compliance activities, and source water protection programs.

Protecting Source Water

"Source water protection is where you're going to see changes in Arkansas," says Ginger Tatom, Arkansas Health Department watershed protection coordinator. "Because we don't have a source water protection program in place, it's going to be time and labor intensive."

Tatom explains that setting up a source water protection program involves conducting system assessments. "We're going to have to conduct assessments of all the public water systems, and that means assessing about 30 systems a month."

An assessment includes examining monitoring records, inspecting system equipment, and reviewing financial records—quite a job for anyone to take on. "There is already a time extension built into the act," says Tatom, "and we would need all of that time to assess the water systems in Arkansas."

But even with this much laid out, Tatom, along with many other water professionals across the country, are still not exactly sure what the coming months will bring.

"We won't know exactly what to expect until EPA publishes its guidance report," Tatom continues. "But it might not be as bad as it sounds. We just aren't sure what they will focus on."

One thing they do know is that more money will eventually be on the way. And the health department is looking forward to using those funds to help with training programs. "If we can supply a better training program," says Tatom, "we can increase the passing rate of operator certification testing."

And because operator certification is also part of the new act, the money could not be spent in a better way.

Providing Training

Dwight Calhoun, West Virginia Rural Water Association (WVRWA) president, also sees his job as that of trainer. "Training will probably end up being the most important thing we do," he says. And not just for system operators.

"Decision makers can make informed choices, but they need to be educated," he continues. "It's not the fault of a community's officials that they're not engineers. They have to have somebody who is knowledgeable come in on their behalf to help them make decisions."

Calhoun says he sees WVRWA taking on that task in West Virginia—and preferably on a larger scale. "If I can get 30 people in a room together, I'm reaching 30 systems. Otherwise I'm doing it one system at a time."

Another aspect of the act that Calhoun says he is excited about is the change in contaminant selection based on risk assessment and cost-benefit analysis. "EPA is making a change from looking at exotic compounds to focusing on microbiological treatment of water, which I think is a good thing," he says.

Serving Small Systems

"Also, this new act contains some provisions for communities under 10,000," Calhoun continues. He says the act requires EPA to make provisions for small communities, such as reducing the high cost of monitoring, identifying affordable technologies, establishing technical assistance programs, and granting variances and exemptions.

The American Water Works Association (AWWA) also sees the reauthorization as an opportunity, says Joe McDonald, AWWA small systems project coordinator.

"When I first looked at the amendments, I said, 'This really is, for once, paying attention to small systems and their needs,' " he says.

Besides making money available for states and drinking water systems, the new act brings about opportunities to educate and train system operators, McDonald continues. He also stresses that AWWA sees the reauthorization as an opportunity to get involved in small system training through its 43 national sections.

But how the AWWA responds really depends on what the states ask for, he continues. "And there are still a lot of things up in the air." Regardless, McDonald views SDWA implementation as a long-term endeavor. "It certainly has given us a lot to think about."

"When I first looked at the amendments, I said, 'This really is, for once, paying attention to small systems and their needs.' "

Joe McDonald, small systems project coordinator, American Water Works Association

SDWA Amendments of 1996 Summarized

Editor's Note: The following synopsis of the Safe Drinking Water Act (SDWA) Amendments of 1996 is based on the U.S. Environmental Protection Agency's (EPA) summary, SDWA Amendments of 1996: General Guide to Provisions*. It is important to note that these changes will not be made immediately to existing drinking water regulations. Until state and federal regulatory agencies issue revised regulations and procedures, current regulations remain in effect.*

Congress passed the original Title XIV of the Public Health Service Act—commonly known as the Safe Drinking Water Act (SDWA)—in 1974, and amended it in 1986 and 1996.

The SDWA Amendments of 1996 authorize funding for states and local water systems, improvements in the regulatory program, new prevention approaches, and increased consumer information measures.

Source Water Protection

Each state program with primacy will submit its source water assessment program to the U.S. Environmental Protection Agency (EPA) for approval. Assessments may make use of sanitary surveys, state wellhead protection programs, state pesticide management plans, and state watershed initiatives, including efforts under the Surface Water Treatment Rule (SWTR) and efforts under the Clean Water Act to delineate boundaries of source water for public water systems and identify (as far as possible) the origins of regulated and certain unregulated contaminants.

A state may use 10 percent of its drinking water state revolving fund (DWSRF) allotment in fiscal years (FY) 1996 and 1997 to delineate and assess source water protection areas.

EPA must publish guidance for the states, including information to help states develop source water quality protection partnership programs and to assist local governments and community water systems in developing partnerships and assessing source water quality. State grants of $5 million are authorized for such projects.

Annual national funding for state wellhead protection programs is reauthorized for FY 1997–2003 at $30 million, underground injection control programs at $15 million, and critical aquifer protection at $15 million. A state may use 10 percent of its DWSRF allotment to implement wellhead protection programs.

State Groundwater Protection

EPA may make grants to states to develop groundwater protection programs: $15 million is authorized for state grants for each FY between 1997–2003. EPA will publish guidance for state grant application and report annually to Congress on the quality of the country's groundwater and the effectiveness of state groundwater protection programs.

Capacity Development

Capacity refers to the ability of a drinking water system to function effectively as a water treatment and distribution unit and to meet primary drinking water standards. A system with enough money, sufficient technical know how, and the managerial skill to comply with the SDWA is said to have "capacity."

Each state must develop the authority or other means to ensure that new community water systems and nontransient noncommunity water systems have the technical, financial, and managerial capacity to meet national primary drinking water regulations. A state without that authority will lose 20 percent of its DWSRF allotment.

States must give EPA a list of community water systems and nontransient noncommunity water systems with a history of noncompliance and the reason for the noncompliance. Systems in significant noncompliance or lacking capacity to ensure compliance with regulations may not receive DWSRF assistance unless the assistance will ensure compliance and the capacity to continue effective operations.

States need to establish strategies to help small systems develop and maintain capacity and must report to EPA on the success of their efforts. States that do not meet these requirements will lose a portion of their DWSRF allotment.

When promulgating new regulations, EPA also must include an analysis of the likely effect of regulations on the capacity of water systems.

Operator Certification

EPA, in cooperation with states, public water systems (PWS), and the public, must gather information and publish guidelines specifying minimum standards for drinking water system operators. A state will lose 20 percent of its DWSRF allotment if it doesn't implement the guidelines or an equivalent operator certification program.

Through grants to the states, EPA will reimburse training and certification costs for operators of systems serving fewer than 3,300 customers.

Consumer Awareness

Community water systems must prepare an annual consumer confidence report on source water and the levels of contaminants found in drinking water. The report must be mailed to all

Continued on next page

Through grants to the states, EPA will reimburse training and certification costs for operators of systems serving fewer than 3,300 customers.

SDWA Admendments of 1996

Continued from previous page
customers; however, governors may allow systems serving fewer than 10,000 people to publish the report in a local newspaper rather than mailing it. Governors may allow systems serving fewer than 500 to simply notify customers that a report is available.

Each annual report must include:

1. information on the source of drinking water;
2. a brief definition of terms;
3. if regulated contaminants are found, the maximum contaminant level goal (MCLG), the maximum contaminant level (MCL), and the level found;
4. if an MCL is violated, information on health effects; and
5. if EPA requires it, information on levels of unregulated contaminants.

EPA will issue regulations establishing requirements for these consumer confidence reports. The regulations must be developed in conjunction with PWS, environmental groups, public interest groups, risk communication experts, and states. Regulations must include plainly worded definitions of MCLG, MCL, variances, exemptions, and health concerns associated with contaminants.

EPA also will establish a hotline so consumers can obtain information about drinking water contaminants and potential health effects. The Food and Drug Administration (FDA), which currently regulates bottled water, will publish a study on possible ways to inform consumers about the contents of bottled water.

Public Notification

The amendments clarify public notification requirements for violations of MCL, treatment techniques, testing procedures, monitoring requirements, and violations of a variance or exemption. As in the old law, unregulated contaminants may be included.

If violations have the potential for "serious adverse effect," consumers and the state must be notified within 24 hours of the violation. The notice must explain the violation, potential health effects, what the system is doing to correct the problem, and whether consumers need to use an alternate water source. Notice must be made by appropriate media or posted door-to-door.

Less serious violations must be reported to consumers in the first bill after the violation, in an annual report, or by mail or direct delivery within a year.

Each state must prepare an annual report of violations, publish and distribute summaries of the report, and specify where the full report is available. EPA will prepare an annual report summarizing state reports. Its report will include recommendations on resources needed to improve compliance.

Contaminant Selection

EPA's authority to set an MCLG and regulate contaminants will now apply only to contaminants that may adversely affect human health, are known to or likely to occur in PWS at a frequency and level of public health concern, and for which regulation presents a meaningful opportunity for health risk reduction for PWS customers.

As in the old law, EPA will consult with its Science Advisory Board and the National Drinking Water Advisory Board in promulgating regulations. In addition, EPA is required to use the "best available, peer-reviewed science."

EPA will establish an occurrence database—available to the public—that includes information on unregulated contaminants for which EPA requires monitoring, and regulated contaminants detected at quantifiable levels—even if the level does not constitute a violation.

EPA will publish a list of contaminants known or anticipated to occur in PWS, and as such, may eventually require regulation. In developing the list, EPA will consult with the scientific community, allow for public comment, and consider the occurrence database noted above.

The requirement that EPA regulate 25 additional contaminants every three years is eliminated. Instead, starting five years from the date of enactment and every five years thereafter, EPA must determine whether or not to regulate five contaminants from the contaminant list.

EPA must make determinations for contaminants that present the greatest public health concern. In selecting contaminants, it must consider the effect of contaminants on sensitive subpopulations, such as infants, children, pregnant women, the elderly, and individuals with a history of serious illness.

EPA may issue interim regulations for any contaminant that poses an urgent threat to human health without going through the usual process and cost-benefit analysis.

Standards and Regulation Development

In support of each regulation, EPA must make available to the public a document specifying, to the extent possible:

- the population addressed by the regulation,
- estimates of risk from exposure to contaminants,

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Water Fact

The requirement that the U.S. Environmental Protection Agency regulate 25 additional contaminants every three years is eliminated.

Sec. 102(b), Safe Drinking Water Act Amendments of 1996

SDWA Amendments of 1996 Summarized

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- uncertainties of risk and studies that would help resolve these uncertainties, and
- peer-reviewed studies that support or refute estimates of risk.

EPA must publish a cost-benefit analysis whenever it proposes a national primary drinking water regulations.

As in the old law, MCLs must be set as close to MCLGs as is technologically feasible, except when EPA determines the costs of a standard at that level are not justified by the benefit, or when "risk-risk" trade-offs occur. In these cases, EPA has discretion to set a less stringent standard.

EPA will promulgate a regulation for filter backwash recycling within the PWS treatment process, unless the Enhanced Surface Water Treatment Rule (ESWTR) addresses backwash recycling.

EPA must now review each regulation every six years, rather than the current three.

The FDA must regulate the same contaminants in bottled water that EPA regulates in public water supplies.

EPA must list small system technologies that achieve compliance with existing regulations, including the Surface Water Treatment Rule.

SDWA Amendments of 1996

Arsenic, Sulfate, and Radon

EPA, in agreement with the National Academy of Sciences (NAS) and other federal agencies and stakeholders, will develop a plan to assess health risks associated with exposure to low levels of arsenic.

Centers for Disease Control and Prevention (CDC) and EPA will study the dose-response relationship for adverse human health effects from sulfate, including effects on populations at greater risk. Sulfate must be among the first five contaminants considered for regulation.

NAS will prepare a risk assessment for radon. EPA will publish a health risk reduction and cost analysis associated with possible MCLs and propose an MCLG and drinking water regulation for radon.

EPA must publish an "alternative MCL" for radon if the MCL is set at a level more stringent than a comparable level of radon in outdoor air, based on the national average concentration of radon in the outdoor air.

Each state can set up its own multimedia radon program—subject to EPA approval—that enforces only the "alternative MCL," provided the multimedia program is expected to achieve risk reduction at least as great as enforcing the MCL. (Multimedia radon programs may use voluntary or nonvoluntary approaches to reduce radon from all sources.)

Drinking Water Studies and Research

EPA must conduct studies to understand how chemicals cause adverse effects and on new approaches for studying the adverse effects of contaminant mixtures in drinking water.

After consulting the Department of Health and Human Service and U.S. Department of Agriculture, EPA must conduct studies to support development of disinfection by-product (DBP)/microbial pathogen (*Cryptosporidium* and Norwalk virus) rules.

EPA and CDC must conduct pilot waterborne disease occurrence studies, report on findings, and make a national estimate of disease occurrence. EPA and CDC must establish a national training and public education campaign to educate professional health care providers and the public about waterborne disease.

EPA will develop a strategic plan for drinking water research and transmit the plan to Congress and the public.

Small Systems Technology, Variances, and Exemptions

When promulgating new national primary drinking water regulations, EPA will identify technologies—which can include packaged or modular systems and point-of-use (POU) and point-of-entry units—that are affordable and achieve compliance for categories of systems serving fewer than 10,000 people (fewer than 500, 500–3,300, and 3,300–10,000 people). POU units cannot be used for microbial contaminants.

EPA must list small system technologies that achieve compliance with existing regulations, including the SWTR.

When an affordable technology that meets an MCL cannot be identified, EPA must identify "variance technology" that is affordable but doesn't necessarily meet the MCL. These technologies shall "achieve the maximum reduction or inactivation efficiency that is affordable considering the size of the system and the quality of the source water."

EPA must issue guidance on variance technologies for existing regulations. States are authorized to grant variances from standards for systems serving up to 3,300 people if the system cannot afford to comply (through treatment, an alternative source, or restructuring) and the system installs the variance technology. States can grant a variance to systems serving 3,300–10,000 people with EPA approval.

Terms of the variance must ensure adequate protection of human health. EPA, in consultation

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with states, will promulgate regulations for variances. Customers of water systems for which the state proposes a variance may also petition EPA to object to the variance. Variances are not available for microbial contaminants or for contaminants regulated prior to 1986.

EPA, in consultation with the states and the U.S. Department of Agriculture's Rural Utilities Service, must publish information to help states develop affordability criteria to use in making variance determinations.

The variance process is now streamlined so that a system can receive a variance "on the condition" that it install the best available technology, rather than having to wait until actually installing the technology before the variance is approved. This change applies to systems of all sizes.

EPA may request information from manufacturers, states, and others on the effectiveness of commercially available treatment systems and technologies so that it can develop guidance or regulations related to small system technologies and variances.

Before states can grant an exemption to systems, the state must determine whether water quality can be improved or compliance achieved by management or restructuring changes, or both.

Eligibility for renewable exemptions is expanded from systems serving fewer than 500 connections (approximately 1,500 people) to systems serving fewer than 3,300 people.

Monitoring

EPA may require monitoring information to assist in developing standards, determining compliance, evaluating health risk, or advising the public of risks. To obtain this information, EPA cannot require installation of treatment, testing of technologies, or analysis of monitoring samples unless it provides funding.

Within two years, EPA will review the monitoring requirements for at least 12 contaminants and promulgate any modifications.

A state may modify monitoring requirements of PWS serving 10,000 or fewer people for any regulated or unregulated contaminant (except microbial contaminants, DBP, or corrosion byproducts) so that no further quarterly monitoring is required if initial monitoring fails to detect the presence of the contaminant, and the state determines it is unlikely the contaminant will be detected.

A state with primacy may adopt permanent alternative monitoring requirements in accordance with EPA guidelines if the state has an approved source water assessment program.

EPA is to issue alternative monitoring requirement guidelines when it issues guidelines for source water assessments. EPA can approve alternative monitoring requirements for systems in a state that does not have primacy.

EPA will issue regulations establishing criteria for monitoring unregulated contaminants. Within three years, EPA will list 30 unregulated contaminants to be monitored. Results will be included in the national contaminant occurrence database.

Monitoring will vary based on system size, source water, and contaminants likely to be found. Only a representative sample of systems serving 10,000 or fewer individuals will be required to monitor.

Each state may develop an unregulated contaminant monitoring plan for small and medium systems. EPA must cover reasonable costs of testing and laboratory analysis to carry out such plans. Water systems must provide results of unregulated contaminant monitoring to the primacy agency and notify customers that the results are available.

EPA will waive monitoring requirements for unregulated contaminants if the state demonstrates that criteria for monitoring are not applicable in the state.

Drinking Water State Revolving Fund

EPA will enter into agreements with eligible states to make grants furthering the health protection objectives of the SDWA: $9.6 billion is authorized in FYs 1994–2003.

To be eligible for a grant, a state must establish a DWSRF and meet other requirements.

DWSRF money can be used for a number of purposes; however, a PWS can only use funds to facilitate compliance and significantly further SDWA health protection objectives.

Systems serving fewer than 10,000 people are to receive 15 percent of a state's annual DWSRF. Up to 30 percent of a state's annual DWSRF allotment may be used for loan subsidies for disadvantaged communities.

Each state must prepare an annual Intended Use Plan indicating how it will use its DWSRF. States must give highest priority to projects that address the most serious public health risks, are necessary to achieve compliance, and assist systems most in need on a per household basis.

Each state must match at least 20 percent of total federal contributions.

Prior to allotment to states, EPA may reserve 2 percent of funds appropriated for technical assistance. Funds must also be set aside for operator training cost reimbursement if there is no separate appropriation.

After dispersal to states, each state may use 4 percent of its DWSRF allotment for administration

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Systems serving fewer than 10,000 people are to receive 15 percent of a state's annual drinking water state revolving fund.

SDWA Admendments of 1996

SDWA Amendments of 1996 Summarized

Continued from page 9

of the fund. A state may also set aside an additional 2 percent for small system technical assistance.

Ten percent may be used for activities, such as state capacity development strategies, operator certification programs, and source water protection programs.

No more than 15 percent may be used for a combination of loans for acquisition of land or conservation easements, loans to implement voluntary source water protection measures, technical and financial assistance to water systems as part of the state capacity development strategy, delineations/assessments of source water protection areas, and establishment and implementation of wellhead protection programs.

Financial administration can be combined with that for other funds as long as separate accounts are maintained. The primacy agency will establish assistance priorities and oversight responsibilities.

After one year of operation the governor may transfer up to 33 percent of the funds in the DWSRF to the Clean Water Act state revolving fund and vice versa.

EPA must assess the capital improvement needs of all eligible PWS and report to Congress. EPA will publish guidelines for water conservation plans. Eventually states can make submitting a water conservation plan a condition for receiving DWSRF money.

EPA can withhold up to 20 percent of DWSRF allocations from states that do not set up capacity development programs or do not meet operator certification program requirements.

Miscellaneous

Additional reauthorized SDWA provisions deal with lead leaching standards, prohibition of lead plumbing fixtures, solder, and flux; limited alternatives to filtration; grants for Alaska Native villages; relationships of grants to the DWSRF fund; Washington Aqueduct management and funding; drinking water and wastewater funds for colonias; and zebra mussel control, as well as various definitions.

Glossary of Commonly Used SDWA Terms

Surface Water Treatment Rule (SWTR)—applicable to all public community and noncommunity water systems that use surface water sources or groundwater sources under the direct influence of surface water. This rule gives the U.S. Environmental Protection Agency (EPA) broad authority to regulate contaminants that may have adverse effects on the health of the public.

Enhanced Surface Water Treatment Rule (ESWTR)—a revision of the SWTR, the purpose of this proposed rule is protection from *Cryptosporidium* and other waterborne pathogens, including *Giardia* and viruses.

Drinking Water State Revolving Fund (DWSRF)—allows states to develop drinking water revolving loan funds to help finance infrastructure improvements for community and nontransient noncommunity public water systems.

Public Water System—a system that has 15 or more service connections or that regularly serves at least 25 people a day for at least 60 days each year. Public water systems are divided into two categories: *community water systems* and *noncommunity water systems*.

Community Water System—a public water system that has at least 15 service connections for year-round residents or that serves at least 25 year-round residents.

Noncommunity Water System—a public water system that does not meet the definition of a community water system. Noncommunity water systems can be either *transient noncommunity systems* or *nontransient noncommunity systems*.

Transient Noncommunity System—these water systems typically serve travelers and others who are "passing through" or staying temporarily at locations, such as highway rest stops, restaurants, and public parks. These systems serve at least 25 people a day for at least 60 days a year, but typically do not serve the same people each day.

Nontransient Noncommunity System—in contrast to the transient noncommunity systems described above, nontransient noncommunity water systems serve the same 25 or more people for at least six months a year. Examples include schools, factories, and other workplaces that have their own drinking water supply.

Maximum Contaminant Level (MCL)—the enforceable standard, or number against which your system's water samples are judged for compliance with the regulations.

Maximum Contaminant Level Goal (MCLG)—this is a number that is associated with no adverse health effects from drinking water containing a particular contaminant over a lifetime. For chemicals believed to cause cancer, for example, the MCLGs are set at zero, as there is no known safe consumption level. It is a nonenforceable, ideal health goal issued as part of the National Primary Drinking Water Regulations. MCLs are set as close to MCLGs as possible, considering costs and technology.

Primacy—a selected agent, usually the state, has the primary responsibility of administering and enforcing the regulations under the Safe Drinking Water Act.

Safe Drinking Water Act Help Is Available

With the recent reauthorization of the Safe Drinking Water Act (SDWA) Amendments of 1996, drinking water professionals need accurate and understandable information. The following is a brief selection of information sources for the SDWA.

- The U.S. Environmental Protection Agency's (EPA) 18-page summary, *Safe Drinking Water Act Amendments of 1996: General Guide to Provisions*, is available from the Safe Drinking Water Hotline at (800) 426-4791. Request EPA #810/S-96/001. The summary also is online at http://www.epa.gov/OW/OGWDW/SDWAsumm.html.
- The EPA has a *Summary of the Safe Drinking Water Act Amendments of 1996* organized by theme at http://www.epa.gov/OW/OGWDW/SDWAthem.html.
- The EPA has a complete copy of the SDWA online at http://www.epa.gov/OW/regs/sdwa.html.
- A complete copy of the SDWA Amendments of 1996, an 80-page legal document, is available from the Government Printing Office by calling (202) 512-1808. The cost is $4. It can be ordered by phone with Visa or MasterCard. Request Public Law 104–182 (869-030-00088-1).

  You may also fax requests to (202) 512-2250 or write to the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954.
- A full-text version of the SDWA Amendments of 1996 may be downloaded or viewed on the American Water Works Association's (AWWA) World Wide Web page at http://www.awwa.org/govtaff/govaff.htm.
- AWWA also has a video designed to help drinking water professionals work with governing bodies in exploring the impact of the SDWA, to inform utility decision makers and the public about the act, and to help drinking water professionals develop planning strategies for the next five years.

  For more information or to order, call (800) 926-7337, or fax your order to (303) 347-0804. (AWWA has a fax order form online.) You may also mail orders to: AWWA, 6666 W. Quincy Ave., Denver, CO 80235. Request catalog #65105. AWWA member price is $100; nonmember price is $200. Shipping is $5.25 per video.
- *A Summary of Funding Authorizations of the SDWA Amendments of 1996*, prepared by AWWA's Fred Pontius, P.E., is available at http://www.awwa.org/govtaff/p182_fun.htm. You may also contact Pontius at (303) 347-6291 or e-mail him at fpontius@awwa.org.
- The National Rural Water Association (NRWA) has a considerable amount of information about the SDWA online at http://www.cais.net/nrwainfo.

  You may also speak with Brendan Murphy at NRWA about the SDWA, by calling (405) 252-0629. If you have questions about NRWA's World Wide Web site, call Mike Keegan at (202) 955-3130 or John Trax at (202) 955-3153.
- *Community Water Bulletin*, a four-page newsletter published by the Community Resource Group/Southern Rural Community Assistance Program (RCAP), dedicated a series of newsletters (issues 119–124) to the SDWA. Copies of the publication are free to systems in the Southern RCAP Region, which includes Alabama, Arkansas, Mississippi, Oklahoma, Tennessee, and Texas. However, a $5 postage and handling charge will apply to orders outside the region.

  For more information, write to *Community Water Bulletin*, RCAP, P.O. Box 1543, Fayetteville, AK 72702-1543, or call (800) 392-4120.

Water Sense *Begins Bond Series*

Water Sense, the National Drinking Water Clearinghouse's (NDWC) financial newsletter, is presenting a series of articles concerning the use of bonds for drinking water projects.

The Fall 1996 issue includes an overview of bond financing. The article describes the types of bonds used for water projects, issues pertaining to bond interest and maturities, and the types of professional assistance available to help small systems issue bonds. The newsletter also includes a brief bond glossary and bond Q&A.

Future articles in the series will cover bond banks and bond ratings.

For a copy of the most recent issue of Water Sense, *or to subscribe to the free newsletter, call the NDWC at (800) 624-8301 or (304) 293-4191.*

Selected Key Dates:

Mandates for EPA from 1996 Amendments

Editor's Note: The chart below lists key dates when reauthorized Safe Drinking Water Act (SDWA) regulations become effective. Due to space limitations, we are unable to list all SDWA dates and selected those that may be of most interest to readers.

Operator Certification	
Initiate partnership to recommend operator certification requirements	February 1997
Publish operator certification information	February 1998
Publish operator certification/recertification guidelines	February 1999
Consumer Awareness and Public Notification	
Issue consumer confidence report requirements	August 1998
States report violations	January 1998
Produce report summarizing state reports	July 1998
Contaminant Selection and Standards and Regulation Development	
Establish national occurrence database	August 1999
Publish unregulated contaminants list	February 1998 (and every 5 years after)
Determine whether to regulate 5 contaminants from list	August 2001 (and every 5 years after)
Propose maximum contaminant level goal (MCLG) and national primary drinking water regulations	August 2003
Publish MCLG and final regulations	February 2005
Issue Ground Water Disinfection Rule regulations	after August 1999
Promulgate regulation for filter backwash recycling	August 2000 (unless addressed in the Enhanced Surface Water Treatment Rule [ESWTR])
Arsenic, Sulfate, Radon, and Disinfection By-products (DBP)	
Develop arsenic study plan	February 1997
Propose arsenic standard	January 2000
Promulgate arsenic regulation	January 2001
Produce study on effects of sulfate	February 1999
Publish health risk reduction and cost analysis for radon	February 1999
Propose radon standard	August 1999
Promulgate final standard for radon	August 2000
Publish alternative MCL for radon	no date set
Approve state multimedia radon program	within 180 days of receipt
Review state multimedia radon programs	every 5 years
Promulgate Interim ESWTR	November 1998
Promulgate Final ESWTR	November 2000
Promulgate Stage I Disinfectants and DBP Rule	November 2000
Promulgate State II DBP Rule	May 2002
Small Systems Technology, Variances, and Exemptions	
Identify small system technologies that achieve compliance	when promulgating new regulations
List small system technologies that meet the Surface Water Treatment Rule	August 1997
List technologies that achieve compliance with existing regulations	August 1998
Issue guidance on affordable "variance technology"	August 1998
Promulgate regulations for variances	August 1998
Monitoring	
Review requirements for 12 contaminants	August 1998
List 30 contaminants to be monitored	August 1999 (and every 5 years after)
Drinking Water State Revolving Fund (DWSRF)	
Enter into DWSRF grant agreements with states	no final dates set
Report to Congress on public water system needs survey	February 1997 (and every 4 years after)
Publish guidelines for small water system conservation plans	August 1998

Reauthorized Act Includes Drinking Water SRF

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(i.e., sound management) programs and to fund projects related to these activities.

Interest on DWSRF loans can vary from 0 percent to market rates, as determined by each state, according to Bourne. Repayment periods can extend up to 30 years in some cases, and loans can cover up to 100 percent of eligible project costs.

And Bourne added that the DWSRF will provide some small systems with a less expensive source of capital financing. The fund contains several provisions to help small systems. These include:

- the possibility of loan forgiveness, zero-interest loans, and other financial assistance for small communities;
- the requirement that at least 15 percent of DWSRF funding be made available to small systems (those serving fewer than 10,000 people) to the extent that funds can be obligated; and
- the dedication of up to 2 percent of the DWSRF appropriation for technical assistance for small systems.

Loan Funding vs. Demand

Nearly $1.3 billion is available for the DWSRF this fiscal year, according to James N. Smith, executive director of the Council of Infrastructure Financing Authorities (CIFA). The exact amount of funding Congress appropriates in future years will depend on the program's effectiveness in meeting needs and the support given by various drinking water organizations and other interests, he added.

"If Congress senses a consensus of need, and funding is effectively being delivered through the DWSRF, we should see future federal funding close to the $1 billion a year target," Smith said.

He said there is a tremendous need for this funding. But he made a distinction between the need for funding and the ultimate demand for DWSRF loans. He said the demand will depend on communities' willingness to improve their systems.

"Communities will have to come forward and complete a loan application, and they will also have to be ready to assume the financial responsibility of taking out a loan," Smith said.

Other factors in determining demand, according to Smith, include how aggressively the states market their funds to the communities and what interest rates the states offer when issuing loans.

A rate of 2.5 percent, for instance, on a 30-year loan would be highly attractive for a small community, he said, especially when interest on a bond issue is currently hovering above 6 percent.

Establishing State Funds

"We anticipate that several states may apply [for federal capitalization] by late this year and many more will apply early next year," Bourne said, stressing that "states can't receive funds until they apply."

Bourne said there will be a lag in each state between the time it receives federal funding and the time it actually issues loans for projects. He explained that the states will have to process individual project applications and then wait while project-related work goes out for bid.

"Optimistically, some refinancing loans may be issued as early as spring," Bourne predicted.

Starting in fiscal year 1998, each state's share of the federal capitalization fund will be based on a needs survey conducted by the EPA. This needs survey is still under review, according to Smith, so for the first year an existing EPA formula for distributing funding will be used.

States will be able to transfer a portion of the federal capitalization funds between their drinking water and wastewater loan funds, Bourne said.

Wastewater SRF Indicates Success

While Smith said he is not sure how effective the new drinking water fund will be, he suggested that if the existing wastewater SRF is any indication, it could be "a highly successful program."

All 50 states and Puerto Rico operate wastewater SRFs.

Smith mentioned that more than 4,000 loans totaling $20 billion have been issued through the wastewater SRFs since 1987.

"There has not been a single default on any of those loans," he said.

Repayments on those existing loans are beginning to pour close to $1 billion back into the SRFs each year, allowing for new loans to be issued. Smith noted that if current trends continue, the wastewater SRF could be self-sustaining at a level of around $2 billion by about 2010.

"We're talking about significant amounts of money here," Smith said.

Even so, he stressed that this funding doesn't come close to the estimated demand for wastewater financing.

Water systems interested in DWSRF loans should contact their state drinking water program. For the telephone number, call the National Drinking Water Clearinghouse at (800) 624-8301 or (304) 293-4191.

"Communities will have to come forward and complete a loan application, and they will also have to be ready to assume the financial responsibility of taking out a loan."

James N. Smith, executive director, Council of Infrastructure Financing Authorities

What's the impact on small systems?

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is important. Consideration of any one provision must always be in the context of the entire bill.

The DWSRF is clearly the centerpiece of the legislation. Creation of a state revolving fund is one of the most important changes in the nation's drinking water program since passage of the original SDWA in 1974.

"Creation of a state revolving fund is one of the most important changes in the nation's drinking water program since passage of the original SDWA in1974," says Peter Shanaghan, small systems coordinator, U.S. EPA Office of Ground Water and Drinking Water.

For the first time, the federal government is providing assistance to communities exclusively for compliance with [or to further the health protection objectives of] the SDWA.

I think that the other truly historic change by these amendments is in their focus on preventing problems. The old laws had a largely after-the-fact regulatory focus. The new amendments direct attention to source water protection; development of water system technical, financial, and managerial capacity; and operator certification.

These provisions are designed to prevent problems from developing. There is an old saying: "An ounce of prevention is worth a pound of cure."

Which provisions do you think will impact small systems the most?

If you read the bill and look at the legislative history, it is clear that Congress was very concerned about small water systems. I believe that small systems will be impacted, in a very positive way, by many of the bill's provisions.

Three provisions stand out, in my mind, as perhaps most significant. These are:

DWSRF: The amendments authorize a total of $9.6 billion for the DWSRF through 2003. States must reserve at least 15 percent of their annual allotment solely to assist systems serving fewer than 10,000 people. States may also reserve additional funds to provide additional subsidies or even loan forgiveness to communities they determine to be disadvantaged.

States are also able to set aside funds from the SRF to develop and implement key prevention programs: source water protection, capacity development, operator certification. These prevention programs will be very beneficial to small systems.

Capacity Development: The amendments require states to develop a strategy to assist water systems needing improvements in their technical, financial, or managerial capacity to consistently comply with standards. States can set aside funds from the SRF to develop and implement the strategy. (See "SDWA Amendments of 1996 Summarized" on page 6 for further information on capacity development.)

The capacity development provision establishes a common sense framework within which systems can work with the state to review their own characteristics, strengths, and weaknesses in light of their plans and expectations for the future.

States can use their strategy to target technical and financial assistance to systems most in need and most able to benefit from it. States can set aside additional funds from the SRF to provide technical and financial assistance to water systems as part of a capacity development strategy.

Consumer Confidence Reports: The amendments require that each water system prepare an annual consumer confidence report containing information about the system's source water and level of contaminants. Large systems are required to mail a copy to each customer. Small systems [those serving fewer than 10,000 people] may be allowed by the governor to publish a report in the newspaper in lieu of mailing. Governors may also allow very small systems [those fewer than 500 people] to simply notify customers that the reports are available.

I believe that consumer confidence reports offer small systems a wonderful opportunity to better engage their customers as partners in ensuring safe drinking water.

The American Water Works Association Research Foundation [AWWARF] conducted a survey of consumer attitudes on water quality issues in 1993. The results weren't pretty! Nearly two thirds of those surveyed said they received very little or no information about the quality of drinking water in their community.

More than half of respondents said that it was very important that they receive more information about drinking water quality in their communities. Less than half of those surveyed said they got information about their water quality from their local water utility; more than two thirds said they got information from the local media! Customers clearly want a lot more information than they are getting.

What is the significance of the operator certification provision of the new amendments? What will it mean for small systems?

The operator certification provision requires EPA to work with the states to develop guidelines

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Reader Says Chlorine Gas Is Safe

Editor's Note: On Tap *welcomes comments and suggestions for articles from our readers.*

Editor:

I am writing in regard to the article, "Town Treats Water with Chlorine Dioxide," appearing in the Summer 1996 *On Tap*, Volume 5, Issue 2. On page 12 under the subheading "Littleton Decides To Upgrade," there are some statements that may appear to reflect a common belief; however, they may not be factually correct.

The first sentence states that sodium hypochlorite is chlorine in liquid form. Sodium hypochlorite is actually commonly referred to as "bleach" containing from as little as 2–5 percent chlorine (household use) to as high as 15 percent (industrial use).

Liquid chlorine is the state of elemental chlorine when it is contained in a cylinder (100 and 150 pounds) or container (2,000 pounds) under pressure that is drawn off as a gas by using chlorinators. Chlorinators today are all vacuum operated with the most popular and safest design being directly mounted to the cylinder or container valve.

The second sentence, which states that sodium hypochlorite is slightly more expensive than chlorine gas, can also be debated. A sample poll of chlorine prices across the nation has resulted in an average cost of sodium hypochlorite being three-to-four times higher than chlorine gas. The words "slightly higher" now can take on a significantly different perspective. It also takes 1.2 gallons of 10-percent sodium hypochlorite to equal one pound of chlorine gas.

The second sentence continues to state that sodium hypochlorite is safer to handle than gas. Again, this is a common belief, but is not supported by statistical data. Chlorinators Incorporated conducted an unofficial study of the three forms of chlorine as a safety comparison. The three forms of chlorine are chlorine gas (pressurized liquid chlorine), sodium hypochlorite (bleach), and calcium hypochlorite (granules or tablets).

Our study concluded that the majority of accidents that occur each year involve sodium and calcium hypochlorite and not chlorine gas as commonly believed. We are not talking about just a little bit either, as the ratio is approximately seven-to-one!

Ron Grage
Special Projects Director
Chlorinators Incorporated

For further information about the use of chlorine gas in treating drinking water, contact Grage at Chlorinators Incorporated, 4125 Southwest Martin Highway, Suite 2, Palm City, FL 34990-5524. You can call him at (407) 288-4854.

What's the impact on small systems?

Continued from previous page

specifying the minimum standards for certification and recertification of water system operators. Existing state operator certification programs that meet the overall public health objectives of the guidelines will be considered substantially equivalent.

The operator certification provision should result in every water system having the service of a certified operator to perform certain key compliance functions. Water systems could obtain these services in a number of ways, including having an employee become certified, hiring a certified contract operator, or sharing a certified operator with other water systems. Small systems will be eligible for reimbursement of certification and training costs resulting from this provision.

Does EPA have a strategy for getting the word out to small systems about the reauthorized SDWA?

EPA has a strategy that can be summarized in three words—partnerships, partnerships, and partnerships! We are depending on the National Drinking Water Clearinghouse and other technical assistance providers to help get the word to small systems. Effective collaboration and partnerships will be the name of the game in all aspects of implementation of the new amendments.

It is essential that we all work together to ensure the clarity and accuracy of the information we get out about the new law.

Waterborne Pathogens: What's the best approach to prevention?

by Dan Fraser, P.E.
President South Hills Environmental Management

Editor's Note: Dan Fraser worked with the Montana Department of Health and Environmental Sciences for 18 years—12 as administrator of public water supply programs and three as administrator over all Safe Drinking Water Act and Clean Water Act programs for the state. Three years ago he began to work as a private water and wastewater consultant.

Although it seems like last week, it was more than 20 years ago that I began working for the Montana Department of Health and Environmental Sciences as a sanitary engineer in the Public Water Supply Program. Much has happened in the intervening years; I've learned a lot, and so has the entire water industry. Of particular interest is what we have learned regarding the relative risks that various contaminants pose to the public health.

How safe is surface water?

I think back to the early 1980s when sanitary surveys, along with occasional waterborne outbreaks of giardiasis, convinced me that Montana's most significant drinking water health risks were from surface water sources serving small water systems, both filtered and unfiltered.

We were learning that high numbers of pathogens are likely to be found on occasion in all surface waters, even those we label as "pristine." We tried monitoring the raw water for *Giardia* cysts in an effort to get a handle on the extent of the risks and determined monitoring just wasn't very effective.

When we found cysts, no one knew how to quantify the risks and, even more disturbing, we had waterborne outbreaks of giardiasis when we were unable to find cysts. Ultimately, our conclusion was that effective treatment had to be in place 100 percent of the time to ensure safe drinking water during those sporadic events when pathogens are present (e.g., during runoff events or when Mr. Beaver sets up housekeeping near the intake).

That is to say, surface water sources must have sufficient treatment and disinfection capabilities to remove and/or inactivate pathogens that may occur in the raw water.

Based upon my experience, I had some difficulty enthusiastically endorsing all of the requirements of the Safe Drinking Water Act (SDWA) Amendments of 1986. The provisions of the act seemed to direct too many of our scarce resources toward addressing contaminants of lesser concern than waterborne disease: contaminants rarely found in drinking water and which, when present, have health impacts only when consumed over long periods of time.

Are waterborne pathogens a problem?

I remember attending a meeting about eight years ago with representatives of the U.S. Environmental Protection Agency (EPA) in Washington, D.C. Individuals from approximately a dozen states attended, and each state was represented by its drinking water administrator, director, secretary, or commissioner of the department in which the Public Water Supply Supervision Program was located.

We were there to whine (something in which I have some expertise) about the EPA's demands on the time and resources of state programs. I was surprised, however, to hear a couple of the states' directors characterize the Surface Water Treatment Rule (SWTR) as a poor use of time and money. One stated that "we [the states] took care of those problems decades ago."

We weren't altogether sure we could make such claims about Montana. We also were not sure that having treatment in place necessarily meant that the problems were solved.

New SDWA Reflects Our Experience

That was only a few years ago but consider what has happened since. First, we have a newly reauthorized SDWA that is reflective of the many things we have learned since the 1986 amendments were enacted. Research and experience—sometimes bitter experience—have greatly expanded our horizons.

Some things we've learned include the following:

- The risk of waterborne disease is still very much with us.
- These problems are not limited to small water systems or to any particular state or region.
- Having a surface water treatment plant in place does not necessary ensure safe water.
- Compliance with the SWTR provides no guarantee that outbreaks of waterborne disease will not occur.
- *Cryptosporidium*, the latest "bug of the month," is not inactivated by common disinfection techniques.
- Many operators and managers of surface water treatment plants are not fully aware of

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the relationships between plant performance and public health.

- Consumers have, to some degree, lost their confidence that drinking water from our public water supplies is unquestionably safe.
- Operators of surface water systems must find new and innovative ways of minimizing risks from pathogens and providing the quality of water customers expect and deserve.

Where do we go from here?

Assuming we generally agree the above statements are correct, what is needed for surface water treatment plant operators to conquer these challenges? Will huge sums of money have to be raised to pay for the capital improvements necessary to achieve the required level of performance? Will new technologies have to be developed to ensure reasonably safe drinking water?

I believe that, in the majority of cases, the news is relatively good. To conquer the new challenges, the most important thing we need is an attitude adjustment. In other words, we have to establish a radically different concept of what is acceptable and necessary for safe drinking water.

We must establish new and higher goals for finished water quality and, finally, we must come to terms with the fact that we cannot accept anything less than full achievement of those goals.

After developing this kind of commitment to high quality drinking water, we must look at the process of water production from beginning to end in order to determine what modifications and changes may be in order.

Start at Source

The first step is to look upstream. Watershed protection, one of the first tools developed by public water supplies, was, and is, effective. However, the complacency we've developed over the past several decades too often has led us away from vigilant protection of our source water quality.

It is true today, as much as it was 100 years ago, that keeping contaminants—including pathogens—out of the source water will consequently reduce risks to the consumer. Everyone, it seems, has recognized that it is time to go back to basics.

Clean Water Act programs, for example, are emphasizing the watershed protection approach. Also, the newly reauthorized SDWA places emphasis on "source water protection."

Water suppliers can't afford to be left behind. Where possible, they must take the lead, involve other stakeholders, and strive to make sure their source water is properly managed and protected. Watershed protection can, and should be, an effective barrier to pathogens.

Plant Optimization Is Next Step

The next steps involve making sure your facility is doing the best job it possibly can. Assuming the facility has been designed to properly treat the raw water, you must establish new goals for the unit processes— goals that make each major unit process serve as a barrier to the passage of pathogens.

(Some plants may not be capable of achieving the goals of "optimization" without major capital improvements. Your state's primacy agency can advise you in determining if your plant is capable.)

The goals established through development of the EPA's Composite Correction Program are very effective in providing high quality finished water, and they are generally achievable. The goals include:

- consistent settled water of 2.0 nephelometric turbidity units (NTU) or less;
- consistent effluent from each filter of 0.1 NTU or less;
- an after-backwash rise in turbidity of 0.2 NTU for 10 minutes or less; and
- achievement of SWTR disinfection requirements.

These are very different from the compliance requirements of the SWTR, and they should be. They represent true "goals" in that this may be about the best finished water many plants are able to produce, thus, optimization.

The compliance requirements of the SWTR, on the other hand, represent a line in the sand you can't cross without getting yourself in trouble with the law. It is important to be legal, but we certainly should aspire to higher levels of achievement than simple compliance with minimum state or federal regulatory requirements.

What's essential for plant performance?

Some things that are essential for optimization of your plant's performance are:

1. properly designed treatment facilities;
2. trained and competent operators dedicated to the production of high quality drinking water;
3. continuous monitoring turbidimeters, with recorders, on the effluent of each filter;
4. monitoring of settled water quality;
5. implementation of a comprehensive coagulation control program, including process control testing, and use of those results, along with the understanding of water

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Water Fact

U.S. Environmental Protection Agency (EPA) is directed to make determinations for contaminants that present the greatest public health concern. In selecting such contaminants, EPA must take into consideration the effect of contaminants upon sensitive subpopulations, such as infants, children, pregnant women, the elderly, and individuals with a history of serious illness.

Sec. 104(a), Safe Drinking Water Act Amendments of 1996

SDWA, Crypto, and the Pretreatment Barrier

by Larry Rader
West Virginia Rural Water Association
Program Specialist

Editor's Note: For that last 11 years, Larry Rader has worked for the West Virginia Rural Water Association, providing onsite and technical assistance to water plant operators in West Virginia. Prior to that he operated a small water treatment plant for 10 years.

It is apparent that the U.S. Environmental Protection Agency (EPA) is changing its focus. Under the Safe Drinking Water Act (SDWA) Amendments of 1996, exotic compounds take a back seat to microbiological contaminants, such as *Cryptosporidium* and *Giardia lambia*.

Unlike many exotic compounds, microbiological contaminants are a threat to all surface water and surface water-influenced groundwater systems. *Cryptosporidium* and *Giardia*, both of which are parasites, are usually transmitted through contact with contaminated fecal matter.

If contaminated, drinking water is commonly polluted through indirect contamination caused by infected animals. In the case of *Cryptosporidium*, cattle are most often the carriers.

Giardia parasites have been found in the stools of many animals, such as cats, dogs, cattle, rodents, and wild animals, such as muskrats and beavers. Both *Cryptosporidium* and *Giardia* can cause flu-like symptoms, including diarrhea, vomiting, and abdominal cramps, and may go unnoticed until it reaches epidemic proportions.

A recent *Cryptosporidium* outbreak in a major city was only recognized after a health department official tried to buy anti-diarrhea medicine in the local drug stores only to discover that the entire city was sold out! And, unlike many of the more exotic compounds whose health effects may not show up for several years, if at all, both *Cryptosporidium* and *Giardia* can make you ill within a week or two after ingestion.

Although this article presents a quick and simple description of cause and effect, it is only intended to let you know that microbiological contamination:

- does occur,
- could threaten your water system,
- may have already occurred in your system without being identified, and
- will most certainly be more closely monitored in the coming years.

Build Barriers

The Environmental Engineering Division of West Virginia's Department of Health conducts sanitary surveys of water treatment plants throughout the state. One of the major parameters of the survey is the ability of the plant to achieve a 3-logarithm (log) reduction, which translates to 99.9 percent removal.

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What's the best approach to prevention?

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treatment concepts, to make process control adjustments; and

6. support from management to provide the required resources and to empower the staff to make necessary changes.

It is also essential to pay close attention to filter backwash procedures and timing, backwash water recycling procedures (when practiced), rates of production, flow rate changes, and a host of other factors that can impact plant performance.

Optimization Is a Lengthy Process

Achievement of plant optimization is a long-term process. Onsite and hands-on training is usually required. The plant's staff must learn problem-solving skills and gain experience in responding to changes in raw water quality. Technical assistance is often necessary and is usually well worth its cost in terms of finding nonconstruction alternatives to ensure safe drinking water.

It's true that we have gained many insights over the past few years and that water being provided from the nation's public water supplies is generally safer than it was just a decade ago. It is just as true that we can't afford to again become complacent.

We must continue to strive to provide the public with the safest and highest quality drinking water possible at a reasonable cost. These are the challenges that make the drinking water profession so interesting and rewarding.

For more information on plant optimization, order a free copy of Optimizing Water Treatment Plant Performance Using the Composite Correction Program *from the EPA. Call (513) 569-7562 and request EPA #625/6-91/027.*

If the publication is out of stock, it can be ordered from the National Drinking Water Clearinghouse by calling (800) 624-8301 or (304) 293-4191 and requesting item #DWBKOM02. The cost is $30.05, plus shipping charges.

Continued from previous page

A 3-log reduction is achieved by what Vic Wilford, assistant director of the West Virginia Environmental Engineering Division, calls the "barrier concept." The barrier concept consists of pretreatment, filtration, and disinfection. When any barrier is compromised, the treatment process is at risk.

Because the 3-log regulation was written before *Cryptosporidium* was known to be a problem, and because *Cryptosporidium* is much harder to inactivate than *Giardia*, a 4- or 5-log reduction requirement could appear in the near future. A 4-log reduction translates to 99.99 percent removal; a 5-log reduction to a 99.999 percent removal.

Pretreatment and filtration, although separate processes, combine to form the best defense against both *Cryptosporidium* and *Giardia*. Although both are resistant to chlorine, *Cryptosporidium* is the more resistant of the two. These protozoa are elephant-sized compared to other microbiological contaminants, such as viruses, and should be removed in the pretreatment/filtration barrier step.

Environmental Engineering Division personnel can assign up to a 2.5-log reduction for the pretreatment/filtration process in an exceptionally well designed and well operated plant, but this is rare.

Good News, Bad News

The good news is microbiological contaminants can be successfully removed in a well operated conventional treatment process. The bad news is many surface water treatment plants are not operated in a manner that ensures full-time protection from *Cryptosporidium* and *Giardia*. Much microbiological treatment occurs in pretreatment prior to filtration.

Most operators were taught to check the raw water and the finished water quality under the assumption that no matter what the quality of raw water, if the finished water was within standards the plant was operating properly. That's not necessarily so! The proof of a well operated surface water plant is the quality of the settled water prior to filtration.

Virginia Sets New Goals

I recently taught a jar testing class in Duffield, Virginia, and had the opportunity to visit with Dick Puckett of the Virginia Health Department. The Virginia Health Department has set the following goals for surface water plants: finished water should have 0.10 nephelometric turbidity units (NTU), and settled water prior to filtration should have 1.0 NTU.

Between 1.0 NTU and 2.0 NTU is acceptable if the plant is working toward the goal of 1.0 NTU. Anything more than 2.0 NTU prior to the filter is unacceptable. Also, the 1.0 NTU goal for settled water must be consistent with little or no fluctuation as the raw water changes!

What about turbidity?

As I said before, the pretreatment/filtration barrier is the most successful treatment for *Cryptosporidium* and *Giardia* because of the contaminants' size (between 3–15 microns) and EPA believes that a finished water turbidity of 0.10 NTU or less is an indicator that the cysts have been removed. However, many filters experience breakthrough and short duration turbidity spikes fairly frequently.

And although the turbidity in your finished water may change very little following a turbidity after backwash or filter breakthrough, it is these incidents that allow the cyst to enter into the finished water. In fact, during a *Cryptosporidium* outbreak in Las Vegas, finished water never exceeded 0.5 NTU.

Also, recent tests have shown that although turbidity in finished water may increase only slightly toward the end of a filter run, particle counts will go up. Particle counters are relatively uncommon in West Virginia due to the cost; however, if EPA increases cyst inactivation from a 3-log reduction to a 4- or 5-log reduction, some plants will want to consider investigating this piece of equipment.

Turbid Water on the Filter Is a Signal

By this time it should be obvious that turbid water sitting on top of a filter can be a serious accident just waiting to happen. No matter how good the turbidity of your finished water—add as many zeros as you want—if the settled water prior to the filter is turbid, it only proves three things: you have a good filter, you are very lucky, and your pretreatment isn't working.

The first indicator of pretreatment problems is short filter runs. Five- to eight-hour filter runs mean that the filter is doing most of the work and your pretreatment barrier has been compromised. And, in spite of what you have heard, filters were not designed to strain out dirt. Filters are for polishing.

Taking control of your pretreatment process begins with more lab work and more record keeping. Although no one requires operators to test settled water and keep records of those tests, it may be the most important information tool you can have. I recommend checking pH, alkalinity,

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"Taking control of your pretreatment process begins with more lab work and more record keeping," says Larry Rader, West Virginia Rural Water Association program specialist.

SDWA, Crypto, and the Pretreatment Barrier

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chlorine, and most importantly, turbidity in the settled water each time you run these same tests on your finished water.

What is most important in pretreatment?

Over the past 10 years, I have concluded that the most important factors in pretreatment are chemicals, proper mixing after the addition of chemicals, chemical application, time, energy to achieve coagulation and flocculation, and attitudes.

- *Chemicals*: I have yet to find a single coagulant that works at the optimum under all conditions year round. The capability to feed more than one coagulant and possibly a polymer at different times of the year will greatly enhance an operator's ability to provide optimal pretreatment.
- *Proper mixing*: Coagulants must mix completely with the raw water. Incomplete mixing not only wastes large quantities of the chemical, it will actually retard the entire coagulation/flocculation process. An equal amount of coagulant should be made available to each particle for an equal amount of time.
- *Chemical application*: Treatment chemicals should be applied in a specific order and at a specific point in the process. Applying all chemicals at the same location guarantees problems. Contact the manufacturer of the chemical used in your treatment process for the correct application point.
- *Time*: Chemicals must have sufficient reaction time to achieve effective pretreatment. The West Virginia Environmental Engineering Division recently proposed new design regulations that will require new surface water plants to have a minimum of two hours pretreatment prior to filtration. A pretreatment process must provide chemical and mechanical treatment as well as an area for the floc to settle.
- *Energy to achieve coagulation and flocculation*: Once a coagulant has been properly applied and thoroughly mixed with the raw water, some method of agitation must be used to cause the particles to continue to collide in order to complete the flocculation process. No amount of chemical can take the place of this part of the process. Either mechanical flocculators or a system of baffles will complete flocculation prior to settling.
- *Attitudes*: Attitudes concerning water treatment are perhaps the toughest improvement to make. When operators lose their enthusiasm for water treatment and their desire to learn new and better treatment techniques, no amount of equipment or chemicals will help.

  We must stop operating our plants under the assumption that things need to be done a certain way because that's the way they've always been done. Many treatment habits were started when drinking water standards were much less stringent than they are today, and these standards will only become tougher. Treating drinking water is the most important profession in any community, and there is no longer room for operators who have lost the desire to constantly improve both their product and themselves.

Boards and Councils Have Obligations

Local boards and councils also need to become more aware of their obligations to the people in their communities. As your customers become more educated to the possible adverse health effects of improperly treated drinking water, they will demand better performance.

Decision makers should not be expected to understand the technical aspects of water treatment or the sometimes confusing language of the SDWA. It is, however, the obligation of the boards and councils to make certain that their operators understand it.

Most of our rural treatment facilities are capable of meeting SDWA requirements, but it will take an effort on the part of both operators and decision makers. The first effort is continuing education for operators. They need to keep an eye out for training seminars that address the questions and concerns raised in this article.

Decision makers need to meet with operators when they return from training to discuss what they have learned and what can be done to help improve the quality of community water. Board and council members are always welcome at training seminars. By attending, they can gain insight into the expectations people have of a community water treatment facility.

Last but not least, don't wait until it's too late to make improvements to your treatment plant. As more customers are added and plant operation time increases, the load on the filters becomes greater, which increases the possibility that a problem can occur.

Keep your facilities up-to-date, in compliance, and providing customers with a quality product. After all, that's what your public utility is for.

"Local boards and councils also need to become more aware of their obligations to the people in their communities."

Larry Rader, West Virginia Rural Water Association program specialist

GWDR Development: What's the story?

by Bruce Macler, Ph.D.
U.S. EPA Ground Water Disinfection Rule
Regulation Manager

Editor's Note: Bruce Macler has a doctoral degree in biochemistry from the University of California at Berkeley and has worked on drinking water regulations for the U.S. Environmental Protection Agency for seven years. He has authored approximately 90 articles and scientific papers.

Over the last two years, substantial progress has occurred in the development of the U.S. Environmental Protection Agency's (EPA) Ground Water Disinfection Rule (GWDR). The GWDR work group has discussed a broad array of issues and developed draft regulatory options that appear to protect public health, yet are feasible and cost-effective. These will be further considered and developed with a goal for proposal in mid-1998.

What is the GWDR?

Under the Safe Drinking Water Act (SDWA), EPA is required to establish disinfection requirements for groundwater systems. A system in this case includes the source, well, treatment hardware, and distribution lines. The existing Total Coliform Rule (TCR) mandates monitoring for fecal contamination in public water supplies, but does not explicitly require correction of violations or other identified problems. Additionally, it only acts "after the fact," since by the time TCR monitoring results reveal contamination, people have already consumed the contaminated water. Congress asked EPA to ensure additional protection to the public to prevent such situations.

Currently, many states have some groundwater system protection and/or disinfection regulations already in place, although there's substantial variation in specific requirements. The GWDR will provide the national guidance and requirements to correct problems and provide adequate protection.

Why the public health concern?

There are legitimate concerns for public health from microbial contamination of groundwater systems. Microorganisms and other evidence of fecal contamination have been detected in a large number of wells tested, even those wells that had been previously judged not vulnerable to such contamination.

The scientific community believes that microbial contamination of groundwater is real and widespread. Public health impacts from this contamination—while not well quantified—appear to be large. Disease outbreaks have occurred in many groundwater systems.

Risk estimates suggest several million illnesses each year. Additional research is under way to better characterize the nature and magnitude of the public health problem.

What's the current view on the GWDR?

The working public health goals for the GWDR are preventing waterborne disease outbreaks and reducing endemic disease levels. To do this, the regulation will focus on protecting consumers from fecal contamination in their drinking water. To achieve this goal, the final regulation should ensure adequate protection of sources, wells, and distribution systems from fecal contamination and provide treatment if contamination occurs.

In addition, the GWDR must be feasible to implement and enforce. Options actively being considered center around a general requirement for a periodic sanitary survey to include wells and treatment, distribution, operations and management, and monitoring. Correction of fecal contamination or system defects—which could include installation of treatment—would be required.

Maintenance of a distribution system disinfectant residual (for systems with in-the-ground distribution) has wide support. A groundwater vulnerability assessment may be required. Highly vulnerable sources would have additional source water monitoring requirements, which may focus on *E. coli* and viruses as indicators of fecal contamination.

How might small systems be affected?

Groundwater-based public water supply systems are substantially different from surface water systems. Also, groundwater systems have very different circumstances with respect to each other and to the likely elements of this rule.

Compared to larger groundwater systems, small community systems (those serving fewer than 1,000 people) have fewer resources and less routine oversight. Small noncommunity systems (schools, restaurants, etc.) typically have even more limited resources and infrastructure. Most have no distribution system. The majority do not disinfect or treat their water at all. Operators are generally not certified and may have limited training.

These small systems have the majority of microbial violations, mostly from source or wellhead contamination. They are not well represented

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NDWC Databases Provide Answers

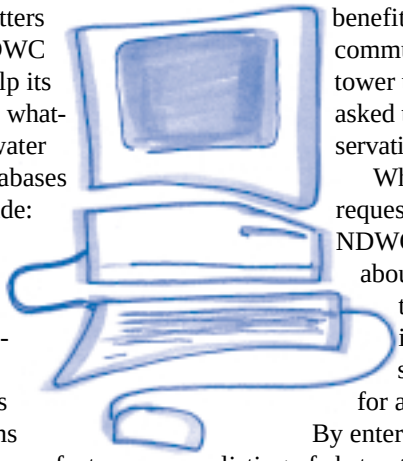
If you are looking for historical information to compare the recently reauthorized Safe Drinking Water Act to previous drinking water legislation, or if you want practical reading material about an aspect of operation and maintenance, the National Drinking Water Clearinghouse (NDWC) can help.

In addition to offering newsletters and educational products, the NDWC maintains several databases to help its staff engineers find the answers to whatever small community drinking water questions they receive. These databases are continually updated and include:

- the small drinking water technology database known as Registry of Equipment Suppliers of Treatment Technologies for Small Systems (RESULTS), which includes specifics about small systems around the country and the manufacturers who supplied the treatment equipment;
- the organizational database, which contains entries on organizations, associations, and groups that have some interest in drinking water–related activities; and
- the most versatile of NDWC's information tools, the bibliographic database.

With more than 750 entries, the bibliographic database contains a wealth of information that NDWC technical staff search by using 300 key words.

According to NDWC Research Assistant Arjita Sharma, "Callers are most often interested in finding out about contaminants' health effects and various modes of treatment." Those requesting searches range from researchers and health department staff members to students and the general public, she said.



However, the results of a database search can benefit myriad others as well, from the community considering a new water tower to the regulator who's been asked to discuss effective water conservation strategies.

When a particular information request is received, Sharma or another NDWC engineer will tell the caller about any relevant NDWC products that are available and, if more information is desired, will search the bibliographic database for additional materials.

By entering the appropriate key words, a listing of abstracts is generated that includes the relevant articles, research papers, reports, and other documents the NDWC has reviewed on the subject. The caller can then receive this information by phone (if the search results are minimal) or by mail or fax (for an additional fee). The cost for printed search results is 15 cents per printed page, plus postage.

Copies of the complete articles, reports, research papers, etc., also are available at this price, plus copyright charges, if applicable.

To request a drinking water–related search, contact the NDWC at (800) 624-8301 or (304) 293-4191.

GWDR Development: What's the story?

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in the drinking water community. Because of their resources and limited current involvement with drinking water regulations, the GWDR would likely have the most noticeable impact on these systems.

New SDWA amendments direct EPA to specifically consider the feasibility of regulatory requirements for small systems.

What are current work group activities?

Over the last year, broad issues of public health problems and goals, existing state protection approaches, vulnerability assessment methods, and general treatment possibilities have been discussed. As the work group discussions have developed, several specific areas have been identified for detailed study.

Information-gathering groups are now examining public health and microbiological monitoring issues, existing state and federal regulations and approaches, approaches to assessing groundwater vulnerability, criteria for sanitary surveys, possible requirements for operations and maintenance, and appropriate treatment technologies. Detailed cost and benefit analyses are under way.

It is expected that these groups will bring forward their recommendations during 1996 and 1997. EPA anticipates proposing a GWDR in early 1998.

How can I get involved?

The work group discussions are open to all. Individuals from small communities are especially encouraged to participate.

If you are interested or want more information on this rule, contact Macler at (415) 744-1884 or macler.bruce@epamail.epa.gov.

Do all package plants have the design described in the Fall 1996 On Tap*?*

The article, "Package Plants Are Option for Small Systems" (see Fall 1996 *On Tap*, pages 16–17) is accompanied by a schematic for a possible package plant design.

No, all package plants do not have the design indicated. As discussed in the article, package plant design depends upon many factors and varies from situation to situation; however, in most plant designs, water is routed to flocculators before going into a settling basin. Also, package plants almost always use open rapid sand filters rather than slow sand filters.

If a plant uses a pressure filter—which makes use of pressure rather than gravity (the force in conventional filters) to achieve filtration—design changes can be made to accommodate that filter type.

A basic package plant design is shown in the figure below, which indicates raw water being subjected to the basic treatment options most water treatment plants must follow: flocculation, sedimentation, filtration, and disinfection.

The type of equipment used depends upon design considerations and raw water quality. The chemicals used also depend upon the raw water quality. The raw water that the plant in the figure below uses has excess iron and manganese. In this case, potassium permanganate ($KMnO_4$) is used for iron and manganese removal. It is added to the raw water as close to the inlet as possible.

Alkalinity or pH adjustment, if needed, should be provided at this stage too. Some alkalinity or pH adjustment also may be needed after the water has been filtered.

Also, following the addition of coagulants and flocculants, this plant uses primary chlorination. Because of the fear of disinfection by-products, many plants are moving away from primary chlorination and prefer to chlorinate (secondary chorination) just before the water enters the clearwell.

Intermittent inlet disinfection may be needed if bacteria build up in the filter sand. This should be monitored by occasional sampling.

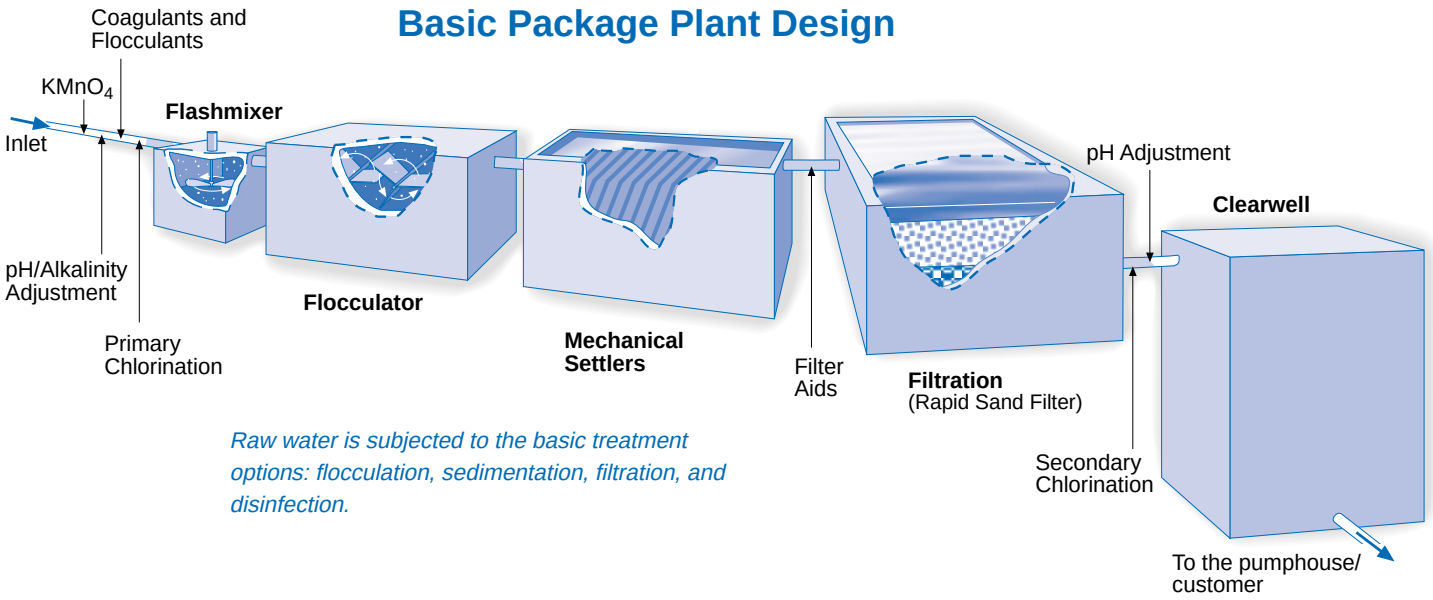
A flash mixer—a machine that speeds up blending—should be included in the system design to ensure proper mixing.

Some package treatment plants also use filter aids to make the filtration process more efficient. Filter aids are brand name chemicals that can expedite the filtration process.

An adequate dosage of chlorine and enough contact time must be provided in the clearwell to allow disinfection to take place and to leave residual chlorine in the finished water.

In the case of package plants, the contact time allowed for chemicals to react is often not adequate. This can result in an operator trying to achieve required treatment levels by adding additional chemicals, thereby increasing the costs of treatment. ■

Basic Package Plant Design



Raw water is subjected to the basic treatment options: flocculation, sedimentation, filtration, and disinfection.

On Tap is printed on recycled paper.

NDWC Offers Help for Small Systems

Note: The free items listed below are limited to one of each per order. Call (800) 624-8301 or (304) 293-4191 to order products. Please allow three to four weeks for delivery. Actual shipping charges are added to each order.

Office of Ground Water and Drinking Water Publications

Item #DWBKGN23

This 65-page book contains a listing of more than 400 available drinking water publications distributed free by the U.S. Environmental Protection Agency's Office of Ground Water and Drinking Water. Included are such items as fact sheets, technical assistance documents, youth educational materials, scientific fact finding reports, and Federal Register notices.

Cost: $0.00

Wellhead Protection: A Guide for Small Communities

Item #DWBKMG06

This 152-page book provides small communities with information to help them plan for groundwater protection and manage a wellhead protection plan. Four case studies from different parts of the country are included. Information about financing wellhead protection plans and the agencies involved is also provided.

Cost: $0.00

Turbidity Removal for Small Public Water Systems

Item #DWBKDM11

This 124-page book addresses such topics as defining a turbidity problem, developing and evaluating proposed solutions, understanding operational considerations, and explaining turbidity to consumers.

Cost: $0.00

Drinking Water Handbook for Public Officials

Item #DWBKMG09

This handbook provides information to help public officials understand water system operations. Included is information about water systems, regulations affecting water systems, sources of water, distribution of water to customers, and operation and maintenance issues.

Cost: $0.00

Technical and Economic Capacity of States and Public Water Systems To Implement Drinking Water Regulations: Report to Congress

Item #DWBKGN20

This document examines the financial and technical capacity of states and public water supply systems to comply with federal drinking water regulations. The report, prepared for Congress, contains detailed cost estimates of all federal regulations, and it recognizes small communities face the greatest challenge in meeting the regulatory requirements.

Cost: $0.00

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
West Virginia University
P.O. Box 6064
Morgantown, WV 26506-6064

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