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Safe Drinking Water Act (SDWA): Selected Regulatory and Legislative Issues

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Summary

Much progress has been made in assuring the quality of public water supplies since the Safe Drinking Water Act (SDWA) was first enacted in 1974. Public water systems must meet extensive regulations, and public water system management has become a much more complex and professional endeavor. The Environmental Protection Agency (EPA) has regulated some 91 drinking water contaminants, and more regulations are pending. In 2005, EPA reported that the number of systems reporting no violations of drinking water standards reached a new high of 94% in 2003. Despite such progress, however, an array of issues and challenges remain.

In the 110th Congress, key issues have involved infrastructure funding needs, related compliance issues, and concerns caused by detections of unregulated contaminants in drinking water, such as perchlorate and pharmaceuticals and personal care products (PPCPs). Another issue involves the adequacy of existing regulations (such as trichloroethylene) and EPA's pace in reviewing and potentially revising older standards. Congress last reauthorized SDWA in 1996. Although funding authority for most SDWA programs expired in FY2003, Congress continues to appropriate funds annually for these programs. No broad reauthorization bills have been proposed, as EPA, states, and water systems continue efforts to implement and comply with the requirements of the 1996 law and new regulations.

A long-standing and overarching SDWA issue concerns the cumulative cost and complexity of drinking water standards and the ability of water systems, especially small systems, to comply with standards. The issue of the affordability of drinking water regulations, such as those for arsenic, radium, and disinfection by-products, has merged with the larger debate over what is the appropriate federal role in assisting communities with financing drinking water infrastructure.

Water infrastructure financing legislation has been offered in recent Congresses to authorize increased funding for the DWSRF program and to provide grant assistance for small communities. In the 110th Congress, bills have been introduced to provide technical, financial, and other compliance assistance to small communities. The debate over the federal role in the funding of projects needed for SDWA compliance, and for water infrastructure improvement in general, continues.

Several bills have been introduced to address the underground injection of carbon dioxide (CO_2) for long-term sequestration as a means of reducing greenhouse gas emissions. P.L. 110-140 (H.R. 6), the Energy Independence and Security Act of 2007, includes carbon sequestration research and development provisions, and specifies that geologic sequestration (GS) activities will be subject to SDWA provision related to protecting underground drinking water sources. In July 2008, EPA proposed regulations under SDWA to provide a national permitting framework for managing the underground injection of CO_2 for commercial-scale GS projects.

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Safe Drinking Water Act (SDWA): Selected Regulatory and Legislative Issues

Introduction

The Safe Drinking Water Act[1] (SDWA) is the primary federal law for protecting public water supplies from harmful contaminants. First enacted in 1974, and broadly amended in 1986 and 1996, the SDWA is administered through programs that regulate contaminants in public water supplies, provide funding for infrastructure projects, protect underground sources of drinking water, and promote the capacity of water systems to comply with SDWA regulations.

The Environmental Protection Agency (EPA) is the federal agency responsible for administering SDWA; however, the 1974 law established a federal-state structure in which EPA may delegate primary enforcement and implementation authority (primacy) for the drinking water program to states and tribes. The state-administered Public Water Supply Supervision (PWSS) program remains the basic program for regulating public water systems, and EPA has delegated primacy for this program to all states, except Wyoming and the District of Columbia (which SDWA defines as a state); EPA has responsibility for implementing the PWSS program in these two jurisdictions and throughout most of Indian lands.[2]

Since the law was first enacted, much progress has been made in assuring the quality of public water supplies. EPA has regulated some 91 drinking water contaminants, and more regulations are pending. In 2005, EPA reported that the number of public water systems reporting no violations of the health-based standards reached 94% in 2003.[3] However, drinking water safety concerns and challenges remain. EPA and state enforcement data indicate that water systems still incur tens of thousands of violations of SDWA requirements each year. Although these violations primarily involve monitoring and reporting requirements, they also include thousands of violations of standards and treatment techniques. Moreover, monitoring and reporting violations create uncertainty as to whether systems actually met the

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[1] Title XIV of the Public Health Service Act, as added by P.L. 93-523 and subsequently amended (42 U.S.C. 300f-300j-26).

[2] For purposes of the PWSS program, the term "state" includes 57 states, commonwealths, and territories that have been approved to implement the drinking water program within their jurisdiction. It also includes the Navajo Nation, which received EPA approval to implement its drinking water program in 2000.

[3] U.S. Environmental Protection Agency, *Providing Safe Drinking Water in America: 2003 National Public Water Systems Compliance Report*. Office of Enforcement and Compliance Assurance. Report No. EPA 305-R-05-002. September 2005. 19 p. plus appendices.

applicable health-based standards. While noting increased compliance levels in the 2005 report, EPA estimated that only 65% of violations of health-based standards and 23% of violations of monitoring and reporting requirements were reported to the EPA database, thus increasing uncertainty as to the quality of water provided by many systems. EPA and the states have resolved some data quality and reporting problems, and efforts continue to address this issue. In 2008, EPA reported that 91.5% of the total population served by community water systems received drinking water that met all health-based standards during FY2007, up from 89.4% in FY2006.[4] Concern also exists over the potential health effects of drinking water contaminants for which standards have not been set, such as perchlorate and methyl tertiary butyl ether (MTBE). The act requires EPA to continually evaluate contaminants that may be candidates for regulation; however, EPA's perceived lack of action on contaminants of concern has generated criticism in Congress and elsewhere.

Last Major Reauthorization and Amendments

Congress last broadly revised the act with the Safe Drinking Water Act Amendments of 1996 (P.L. 104-182). These changes resulted from a multi-year effort to amend a statute that was widely criticized as having too little flexibility, too many unfunded mandates, and an arduous but unfocused regulatory schedule. Among the key provisions, the 1996 amendments authorized a drinking water state revolving loan fund (DWSRF) program to help public water systems finance projects needed to comply with SDWA regulations. The amendments also established a process for selecting contaminants for regulation based on health risk and occurrence, gave EPA some added flexibility to consider costs and benefits in setting most new standards, and established schedules for regulating certain contaminants (such as *Cryptosporidium*, disinfection byproducts, arsenic, and radon).

The 1996 law added several provisions aimed at building the capacity of water systems (especially small systems) to comply with SDWA regulations. It imposed many new requirements on the states. For example, the amendments require state programs for source water assessment, operator certification and training, and compliance capacity development. The law also requires community water systems to provide customers with annual "consumer confidence reports" that contain information on regulated contaminants found in the local drinking water. Congress authorized appropriations for most SDWA programs through FY2003, and although most funding authorities have expired, broad reauthorization bills have not been proposed, as EPA, states, and public water systems remain focused on meeting the requirements of the 1996 amendments.

In 2002, drinking water security provisions were added to the SDWA through the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (P.L. 107-188). Title IV of that act included requirements for community water systems serving more than 3,300 people to conduct vulnerability assessments and

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[4] U.S. Environmental Protection Agency, *FY2009 Annual Performance Plan and Congressional Justification*, Program Performance and Assessment, p. 795.

prepare emergency response plans. The law also required the EPA to conduct research on preventing and responding to terrorist or other attacks.[5]

Regulated Public Water Systems

Federal drinking water regulations apply to some158,200 privately and publicly owned water systems that provide piped water for human consumption to at least 15 service connections or that regularly serve at least 25 people. (The law does not apply to private residential wells.) Of these systems, 52,837 are *community water systems* (CWSs) that serve most people in the United States — a total residential population of roughly 282 million year-round. All SDWA regulations apply to these systems. Nearly 19,200 systems are *non-transient, non-community water systems* (NTNCWSs), such as schools or factories, that have their own water supply and serve the same people for more than six months but not year-round. Most drinking water requirements apply to these systems. Another 86,210 systems are *transient non-community water systems* (TNCWSs) (e.g., campgrounds and gas stations) that provide their own water to transitory customers. TNCWSs generally are required to comply only with regulations for contaminants that pose immediate health risks (such as microbial contaminants), with the proviso that systems that use surface water sources must also comply with filtration and disinfection regulations.

Of the nearly 53,000 community water systems, roughly 83% serve 3,300 or fewer people. While large in number, these systems provide water to just 9% of the population served by all community systems. In contrast, 8% of community water systems serve more than 10,000 people, and they provide water to 81% of the population served. Fully 85% (16,348) of non-transient, non-community water systems and 97% (83,351) of transient noncommunity water systems serve 500 or fewer people. These statistics give some insight into the scope of financial, technological, and managerial challenges many public water systems face in meeting a growing number of complex federal drinking water regulations. **Table 1** provides statistics for community water systems.

Table 1. Size Categories of Community Water Systems

System size (population served)	Number of community water systems	Population served (millions)	Percentage of community water systems	Percentage of population served
Very small (25-500)	29,666	4.93	56%	2%
Small (501-3,300)	14,389	20.85	27%	7%
Medium (3,301-10,000)	4,748	27.51	9%	10%
Large (10,001-100,000)	3,648	102.75	7%	36%
Very large (>100,000)	386	126.30	1%	45%
Total	52,837	282.3	100%	100%

Source: Adapted from US Environmental Protection Agency, *Factoids: Drinking Water and Ground Water Statistics for 2005*.

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[5] For more information, see CRS Report RL31294, *Safeguarding the Nation's Drinking Water: EPA and Congressional Actions*, by Mary Tiemann.

Safe Drinking Water Act Issues

Current drinking water quality issues include the gap between infrastructure funding needs and spending; the capacity of public water systems, especially small systems, to comply with a growing set of complex standards; and contamination of water supplies by unregulated contaminants, such as perchlorate and methyl tertiary butyl ether (MTBE). An emerging issue concerns proposals for large-scale storage of carbon dioxide deep underground to mitigate greenhouse gas emissions and the potential impacts this activity might have on groundwater quality. In July 2008, EPA proposed regulations to manage geologic sequestration under the authority of the Safe Drinking Water Act's groundwater protection provisions.

In the 110th Congress, bills have been introduced to address targeted drinking water issues, such as small system infrastructure funding needs (S. 1933 and S. 199) and compliance problems facing small communities (S. 1429 and H.R. 2141). Various bills also have been offered to address contamination of water supplies by specific contaminants, including perchlorate (S. 24, S. 150, and H.R. 1747), lead (H.R. 2076), and arsenic and other naturally occurring contaminants (H.R. 2141). The Senate Environment and Public Works Committee held an oversight hearing on selected EPA activities, including perchlorate regulation. The House Natural Resources Committee held a hearing on the impacts of perchlorate contamination on groundwater resources. The House Energy and Commerce Committee held a hearing on the contamination of drinking water at Camp Lejeune by trichloroethylene (TCE), related health and cleanup issues, and EPA's pace in updating its 1989 drinking water standard for TCE. Companion bills, S. 1911 and H.R. 5527, would require EPA to promptly issue a new TCE standard. On July 31, 2008, the Senate Environment and Public Works Committee ordered reported two perchlorate bills (S. 24 and S. 150), TCE legislation (S. 1911), and legislation to authorize a small system grant program (S. 1933). The committee also ordered reported S. 199, to increase the authorization of appropriations for water and wastewater grants for Alaska's rural and Native villages.

In the 1996 SDWA amendments, Congress authorized appropriations for most SDWA programs through FY2003; however, broad SDWA reauthorization efforts have not been on the agenda in this Congress. As with other EPA-administered statutes having expired funding authority, Congress has continued to appropriate funds annually for SDWA programs.

Regulating Drinking Water Contaminants

Contaminant Candidate List. The SDWA Amendments of 1996 directed EPA to publish, every five years, a list of unregulated contaminants that are known or anticipated to occur in public water systems and that may require regulation. EPA published contaminant candidate lists (CCLs) in 1998 (CCL 1) and in 2003 (CCL 2). In February 2008, EPA published for public comment a draft CCL 3 that contains 93 chemicals or chemical groups and 11 microbiological contaminants (73 *Fed. Reg.* 9627). The list includes commercial and agricultural chemicals, biological toxins, disinfection byproducts, and pathogens; 16 chemicals, including perchlorate, were carried over from CCL 2. EPA screened some 7,500 chemicals and microbes and selected 104 candidates for the draft CCL 3. However, as discussed below, the list does not include any pharmaceuticals, and EPA is now reviewing the adequacy of its screening process, which was recommended by the National Academy of Sciences.

Regulatory Determinations. Starting in 2001, and every five years thereafter, the EPA is required to determine whether or not to regulate at least five of the listed contaminants. The act requires the EPA to evaluate contaminants that present the greatest health concern, and then to regulate those contaminants that occur at concentration levels and frequencies of public health concern, where regulation presents a meaningful opportunity for health risk reduction.

In July 2008, EPA published final regulatory determinations for 11 contaminants from the CCL 2. All of the determinations were decisions not to regulate. In making these determinations, EPA noted that the data indicated that the contaminants either did not appear to occur in public water systems, or had low levels of occurrence at levels of health concern, and that regulating the contaminants did not present a meaningful opportunity for health risk reduction. For those contaminants with low occurrence frequencies, EPA is updating the health advisories to reflect new information or to include information on degradation byproducts.[6]

The agency did not make determinations for two chemicals that have been detected in numerous water supplies and have received considerable congressional attention: perchlorate and MTBE. EPA noted that a regulatory determination will soon be published for perchlorate, and that a decision was not made for MTBE because the health risk assessment for MTBE is being revised.

Unregulated Contaminant Monitoring. The 1996 amendments directed EPA to establish criteria for a program to monitor unregulated contaminants. This monitoring program enables EPA to collect data for contaminants that are not regulated but are suspected to be present in drinking water. Every five years, EPA is required to identify as many as 30 contaminants to be monitored. This list is largely based on the Contaminant Candidate List. All systems serving more than 10,000 people and a sample of smaller systems must monitor for the contaminants. The resulting data are added to the National Contaminant Occurrence Database (NCOD). EPA published the first unregulated contaminant monitoring rule (UCMR 1) in 1999 requiring monitoring for 26 chemicals. In January 2007, EPA issued the second rule (UCMR 2), requiring systems to monitor for 25 chemicals over a 12-month period between 2008 through 2010.[7] EPA had included perchlorate on the draft UCMR 2 list, but deleted it from the final list. EPA stated that it has sufficient perchlorate occurrence data, but some advocates of perchlorate regulation have been critical of EPA's decision not to require further monitoring.

Standard-Setting. As amended in 1996, the act directs EPA to promulgate a National Primary Drinking Water Regulation for a contaminant if the Administrator determines that the following three criteria are met:

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[6] Information on the CCL2 and the rationale behind EPA's regulatory determinations are available at [http://www.epa.gov/safewater/ccl/reg_determine2.html#fr].

[7] January 4, 2007 (72 *Fed. Reg.* 367-398)

- the contaminant may have adverse health effects;
- it is known, or there is a substantial likelihood, that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and
- its regulation presents a meaningful opportunity for health risk reduction for persons served by public water systems.

Drinking water regulations generally include numerical standards that establish the highest level of a contaminant that may be present in water supplied by public water systems. Where it is not economically or technically feasible to measure a contaminant at very low concentrations, EPA may establish a treatment technique in lieu of a standard.

Developing a drinking water regulation is a complex process, and EPA must address technical, scientific, and economic issues. The agency must (1) estimate the extent of occurrence of a contaminant in sources of drinking water nationwide; (2) evaluate the potential human exposure and risks of adverse health effects to the general population and to sensitive subpopulations; (3) ensure that analytical methods are available for water systems to use in monitoring for a contaminant; (4) evaluate the availability and costs of treatment techniques that can be used to remove a contaminant; and (5) assess the impacts of a regulation on public water systems, the economy, and public health. Regulation development typically is a multi-year process. EPA may expedite procedures and issue interim standards to respond to urgent threats to public health.

After reviewing health effects studies, EPA sets a nonenforceable maximum contaminant level goal (MCLG) at a level at which no known or anticipated adverse health effects occur and that allows an adequate margin of safety. EPA also considers the risk to sensitive subpopulations, such as infants and children. For carcinogens and microbes, EPA generally sets the MCLG at zero. Because MCLGs are based only on health effects and not on analytical detection limits or the availability or cost of treatment technologies, they may be set at levels that are not technically feasible for water systems to meet.

Once the MCLG is established, EPA then sets an enforceable standard, the maximum contaminant level (MCL). The MCL generally must be set as close to the MCLG as is "feasible" using the best technology or other means available, taking costs into consideration (SDWA §1412(b)).[8] The act does not discuss how EPA should consider cost in determining feasibility; consequently, EPA has relied on legislative history for guidance. Congress last addressed this issue in the Senate report accompanying the 1996 amendments, which stated that "feasible" means the level that can be reached by large, regional drinking water systems applying best available treatment technology. The Senate committee report explained that this approach is used because 80% of the population receives its drinking water from

[8] For a more detailed discussion, see CRS Report RL31243, *Safe Drinking Water Act: A Summary of the Act and Its Major Requirements*, by Mary Tiemann.

large community water systems, and thus, safe water can be provided to most of the population at very affordable costs.[9]

However, because standards are based on cost considerations for large systems, Congress expected that standards could be less affordable for smaller systems. In 1996, Congress expanded the act's variance and exemption provisions to give small systems some added compliance flexibility. (See the discussion below on Small System Issues.) Congress further revised the act to require EPA, when proposing a standard, to publish a determination as to whether or not the benefits of a proposed standard justify the costs. If EPA determines that the benefits do not justify the costs, EPA, in certain cases, may promulgate a standard that is less stringent than the feasible level and that "maximizes health risk reduction benefits at a cost that is justified by the benefits."[10] EPA used this authority to establish new standards for arsenic and radium.

Recent and Pending Rules. EPA's rulemaking activities include a January 2006 rule package that expanded existing requirements to control pathogens (especially *Cryptosporidium*) and disinfectants (e.g., chlorine) and their byproducts (e.g., chloroform). These rules, the Long Term 2 Enhanced Surface Water Treatment Rule (LT2 Rule) and the Stage 2 Disinfectant and Disinfection Byproduct Rule (Stage 2 DBP), complete a series of statutorily mandated rules that impose increasingly strict controls on the presences of pathogens and disinfectants and their byproducts in water systems.[11] EPA promulgated a related Ground Water Rule to establish disinfection requirements for systems relying on ground water. In the past several years, EPA also issued standards for several radionuclides, including uranium and radium, and a revised standard for arsenic. These rules are expected to reduce an array of health risks for consumers, but they have potentially significant costs for the communities that must expand treatment facilities to comply with the standards.

In September 2007, EPA completed targeted revisions to the Lead and Copper Rule (LCR). The revisions are intended to address weaknesses identified during a nationwide review of the rule, following the discovery of high lead levels in Washington, DC, tap water in 2004.[12] The changes involve LCR provisions on monitoring, treatment, customer awareness, and lead service line replacement. Among ongoing rulemakings, EPA has been working to finalize a radon rule (proposed in 1999), and has been evaluating numerous contaminants, including perchlorate and MTBE, for possible regulation. **Table 2** reviews the purposes and status of several recently completed or proposed drinking water regulations and guidelines.

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[9] U. S. Senate. *Safe Drinking Water Amendments Act of 1995*, Report of the Committee on Environment and Public Works on S. 1316. S.Rept. 104-169. p. 14. November 7, 1995.

[10] SDWA §1412(b)(6); 42 U.S.C. 300g-1.

[11] Information on these rules can be found at [http://www.epa.gov/safewater/disinfection].

[12] The newly revised Lead and Copper Rule and more information on lead in drinking water are available at [http://www.epa.gov/safewater/lcrmr/index.html].

Table 2. Recent and Pending Regulatory Actions

Regulatory Action	Date Published (*Fed. Reg.* Notice)	Purpose
Revisions to Lead and Copper Rule (LCR)	10/10/2007 (72 *Fed. Reg.* 57781) **Final**	EPA promulgated targeted changes to the LCR to improve implementation in the areas of monitoring, treatment, customer awareness, and lead service line replacement, to better control exposures to lead in drinking water. The revisions do not affect the lead MCLG or action level, or the rule's basic requirements.
Unregulated Contaminant Monitoring Rule (UCMR 2)	1/4/2007 (72 *Fed. Reg.* 367) **Final**	SDWA requires EPA to publish every five years a list of unregulated contaminants to be monitored. This second UCMR requires monitoring of 25 chemicals during 2008-2010. These data provide the main occurrence and exposure data for EPA to determine whether to regulate the contaminants. (Perchlorate was included in the first UCMR and in the draft, but not final, UCMR 2.)
Ground Water Rule (GWR)	11/8/2006 (71 *Fed. Reg.* 65574) **Final**	The 1996 amendments directed EPA to require disinfection for all public water systems, including all surface water systems and, as necessary, ground water systems to provide greater protection against microbial pathogens.
Proposed Revision of National Affordability Methodology and Methodology to Identify Variance Technologies	3/2/2006 (71 *Fed. Reg.* 65573)	EPA proposed options for revising its criteria for determining whether a technology needed to comply with a standard is affordable for small systems and for revising its methodology for determining if an affordable variance technology protects public health. As provided for in the 1996 amendments, states may grant variances to small systems for standards that EPA determines are unaffordable. Under the current criteria, no small system variances are available.
Long-Term 2 Enhanced Surface Water Treatment Rule (LT2 Rule)	1/5/2006 (71 *Fed. Reg.* 653) **Final**	Supplements existing rules by increasing *Cryptosporidium* treatment requirements for higher risk systems. Contains provisions to reduce risks from uncovered finished water reservoirs and to ensure that systems maintain microbial protection when they act to decrease the formation of disinfection byproducts (DBPs).
Stage 2 Disinfectants and Disinfection By-Products Rule (DBPR)	1/4/2006 (71 *Fed. Reg.* 387) **Final**	Builds on existing rules to strengthen requirements for higher risk systems to reduce potential health risks from DBPs in drinking water, which form when disinfectants are used to control microbial pathogens. Tightens monitoring requirements for 2 groups of DBPs, trihalomethanes (TTHM) and haloacetic acids (HAA5). (This rule was issued with the LT2 Rule to address concerns about risk tradeoffs between pathogens and disinfection byproducts.)
Proposed Radon Rule	11/2/1999 (64 *Fed. Reg.* 59245)	As provided for in P.L. 104-182, EPA proposed a multimedia approach to reducing radon risks in indoor air (the biggest exposure source) while protecting public health from radon in drinking water.[a] EPA proposed an alternative standard (AMCL) and requirements for multimedia mitigation (MMM) programs to address radon in indoor air. A community water system (CWS) may comply with the AMCL if the state develops an MMM program or the CWS develops a state-approved MMM program. EPA also proposed a stricter radon MCL to apply in states that do not implement MMM programs.

a. Most of the risk from exposure to radon in drinking water comes from breathing radon released from water (e.g., during showering or cooking) and not from ingesting the water. EPA estimates that 1-2% of the radon in indoor air comes from drinking water. Most of the radon present in indoor air seeps into homes and other buildings from underlying soil.

Perchlorate in Drinking Water

Perchlorate is the explosive component of solid rocket fuel, fireworks, road flares, and other products. Used predominantly by the Department of Defense (DOD) and related industries, perchlorate also occurs naturally (including in areas of the Southwest) and is present in some organic fertilizer.[13] This compound has been detected in sources of drinking water for more than 11 million people, usually at low levels. It also has been found in milk, fruits, vegetables, and bread. Perchlorate is known to disrupt the uptake of iodine in the thyroid, potentially affecting thyroid function. A key concern is that, if sufficiently severe, impaired thyroid function in pregnant or nursing women may impair brain development in fetuses and nursing infants. Because of this concern, bills have been repeatedly introduced in recent years and in this Congress to require EPA to set a drinking water standard for perchlorate.[14]

The agency has taken several steps toward establishing a standard for perchlorate in drinking water but has not made a determination to regulate it. Under SDWA, EPA must regulate a contaminant if the Administrator determines that the contaminant occurs at a frequency and level of public health concern, and that its regulation presents a meaningful opportunity for reducing health risks. Uncertainty about the health effects of perchlorate has slowed efforts to establish a drinking water standard and, relatedly, environmental cleanup standards for use at Superfund and other contaminated sites.

In the absence of a federal standard, states have begun to adopt their own measures. Massachusetts established a drinking water standard for perchlorate of 2 ppb in 2006. California recently approved a standard of 6 ppb, with an effective date of October 19, 2007. Several states have issued health goals or advisory levels, ranging from 1 ppb in Maryland (advisory level) and New Mexico (drinking water screening level) to 51 ppb in Texas (industrial cleanup level).

EPA identified perchlorate as a candidate for regulation in 1998, but concluded that information was insufficient at that time to make a regulatory determination. The agency listed perchlorate as a priority for further research on health effects and treatment technologies and for collecting occurrence data. In 1999, EPA required water systems to monitor for perchlorate under the Unregulated Contaminant Monitoring Rule (UCMR) to determine the frequency and levels at which it is present in public water supplies nationwide. In monitoring conducted under the UCMR, perchlorate was detected in 153 public water systems in 25 states, out of 3,600 water systems sampled nationwide. In August 2005, EPA proposed a second UCMR that included perchlorate for additional monitoring between 2007 and 2011. Most commentors did not support another round of perchlorate monitoring. Many felt that further monitoring would impose costs but would not likely yield much beneficial information. In the final rule, EPA announced that it had collected sufficient

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[13] Rao, B., Anderson, *et. al*., "Widespread Natural Perchlorate in Unsaturated Zones of the Southwest United States," *Environmental Science and Technology*, 41(13), p. 4522-4528, June 6, 2007.

[14] For further discussion, see CRS Report RS21961, *Perchlorate Contamination of Drinking Water: Regulatory Issues and Legislative Actions*, by Mary Tiemann.

occurrence data for perchlorate and that further monitoring was not needed (72 *Federal Register* 367, January 4, 2007).

The health effects assessments surrounding EPA's efforts to regulate perchlorate have been controversial. In 2002, EPA issued a draft risk assessment that concluded that potential human health risks of perchlorate exposure include effects on the developing nervous systems and thyroid tumors. The findings were based on rat studies that observed tumors and adverse effects in fetal brain development. This controversial draft assessment included a revised draft reference dose (RfD) intended to protect the most sensitive groups against these effects. That dose roughly translated to a drinking water standard of 1 part per billion (ppb). EPA's 1999 draft level had translated to a standard of roughly 32 ppb.

Because an RfD provides the basis for determining the level at which a drinking water standard is set, and because these standards are, in turn, the basis of environmental cleanup standards, DOD and other perchlorate users and manufacturers have followed EPA's perchlorate risk assessment efforts closely. As a result of interagency debate over the draft assessment, in 2003, EPA, the DOD, NASA, the Office of Management and Budget, and other federal agencies asked the National Research Council (NRC) to review the science for perchlorate and EPA's draft risk assessment.

The NRC released its study in January 2005.[15] The NRC committee broadly agreed with several of EPA's findings; however, the committee suggested several changes to the draft risk assessment. Among other findings, the committee concluded that studies of rats are of limited use for assessing human health risk associated with perchlorate exposure, and the committee recommended that EPA base its assessment on human data. The NRC calculated an RfD for perchlorate that incorporated an uncertainty factor intended to protect the most sensitive populations. This RfD translates to a drinking water equivalent level of 24.5 ppb. (If EPA were to develop an MCL, it would adjust this number to take into consideration the amount of perchlorate exposure that EPA determines comes from other sources, especially food.) EPA adopted the NRC's recommended RfD but has not decided whether to set a standard for perchlorate.

Despite the NRC recommendations, substantial disagreement has persisted regarding what level of exposure is safe, especially for fetuses and infants, and what drinking water standard is appropriate. Several studies have indicated that thyroid changes occur in humans at significantly higher concentrations of perchlorate than the amounts typically observed in water supplies.[16] However, a 2006 study by the Centers for Disease Control and Prevention (CDC) of a representative sample of the U.S. population found that environmental exposures to perchlorate have an effect on

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[15] National Research Council, *Health Implications of Perchlorate Ingestion*, Board on Environmental Studies and Toxicology, National Academies Press, January 2005, 177 p.

[16] Michael A. Kelsh et al., "Primary Congenital Hypothyroidism, Newborn Thyroid Function, and Environmental Perchlorate Exposure Among Residents of a Southern California Community," *Journal of Occupational Environmental Medicine*,45(10) p. 1116-1127, October 2003.

thyroid hormone levels in women with iodine deficiency. The researchers reported that more than one-third of the 1,111 women in the study were iodine deficient, and the median level of urinary perchlorate measured in the women was 2.9 ppb.[17]

The 109th Congress targeted some funding for perchlorate cleanup in conference reports for various appropriations acts, including DOD and EPA appropriations acts for FY2006 (P.L. 109-148 and P.L. 109-54, respectively). In the conference report for the Department of Health and Human Services FY2006 appropriations act (P.L. 109-149), conferees encouraged the National Institute for Environmental Health Sciences to support studies on the long-term health effects of perchlorate. The conference report for the FDA's FY2006 funding act (P.L. 109-97) directed the FDA to continue conducting perchlorate surveys of food and bottled water and to report back to Congress.[18] The House passed two bills aimed at remediating perchlorate-contaminated water in California, where most contamination has been found. No further action occurred on these bills, or on legislation calling for EPA to set a standard for perchlorate.

In the 110th Congress, perchlorate is again on the agenda. S. 24 was introduced following EPA's decision not to require further monitoring for perchlorate as an unregulated contaminant (as discussed above under "Regulatory Determinations"). This bill would require water systems to test for perchlorate and disclose its presence in annual consumer confidence reports. Similarly, in the absence of a decision by EPA to regulate perchlorate, S. 150 would require EPA to issue a perchlorate health advisory within 90 days of enactment, and then to promptly establish a drinking water standard. On July 31, 2008, the Senate Environment and Public Works Committee ordered both S. 24 and S. 150 to be reported, as amended. In the House, H.R. 1747 would require EPA to establish a drinking water standard for perchlorate within 30 months of enactment. In November 2007, the Environment and Hazardous Materials Subcommittee of the House Committee on Energy and Commerce held markup and forwarded H.R. 1747 to the full committee.

Pharmaceuticals in Drinking Water

As monitoring technologies have become available and testing has increased, traces of more pharmaceuticals and personal care products (PPCPs) have been detected in surface waters and drinking water supplies. Pharmaceuticals include prescription drugs, veterinary drugs, and over-the-counter medicines. Personal care products cover a broad spectrum and include cosmetics, hair products, sun-screens, fragrances, anti-bacterial soaps, and vitamins. These chemicals are released to the environment in various ways, including elimination of human and animal waste, disposal of unused medicines down the toilet, veterinary drug usage, hospital waste disposal, and industrial discharges.

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[17] Benjamin C. Blount, James L. Pirkle, et al., "Urinary Perchlorate and Thyroid Hormone Levels in Adolescent and Adult Men and Women Living in the United States," Centers for Disease Control and Prevention, *Environmental Health Perspectives*, 114(12), p. 1865-1871, December 2006.

[18] FDA monitoring data are available at [http://www.cfsan.fda.gov/~dms/clo4data.html].

Although significant research is being conducted, much is unknown about the occurrence and movement of PPCPs in the environment, their occurrence in drinking water supplies, or about the potential health risks from exposure to PPCPs at extremely low levels through drinking water. Nonetheless, the detection of pharmaceuticals and related products in public water supplies generates concern, because many of these products are specifically designed to have a biological effect in humans, animals, and/or plants. Pharmaceuticals often contain chemical compounds that can affect the endocrine system by altering, mimicking, or impeding the function of hormones. Such endocrine disrupting chemicals (EDCs) have the potential to affect growth, development, reproduction, and metabolism. Over the past decade, scientists and regulators have become increasingly concerned about the effects that exposures to low levels of PPCPs may be having on aquatic organisms, and also potentially on human health.[19]

The U.S. Geological Survey (USGS) and EPA have identified a wide array of research needs and gaps that, if addressed, would help delineate the scope of environmental and human health issues that might result from the presence of PPCPs in the environment. The USGS has conducted research on the occurrence of hormones, pharmaceuticals, and other wastes in residential, industrial, and agricultural wastewater, and has found that a broad range of these chemicals occur commonly downstream from large urban areas and concentrated animal production areas.[20]

EPA has been conducting and supporting numerous PPCP research projects in several areas, including the relative importance of different sources of PPCPs in the environment (e.g., veterinary vs. human medicine), how PPCPs move through the environment, human exposure pathways, ecological exposure pathways, monitoring and detection tools, assessment of potential human health effects, and assessment of potential ecological effects. Research is also being conducted to evaluate the ability of drinking water treatment technologies to remove various PPCPs.

Ecological research has received particular attention because exposure risks for aquatic life have been considered to be much greater than those for humans.[21] Nonetheless, a key research issue concerns the possible health risks from exposure to very low doses of the myriad chemicals found in PPCPs. Because PPCPs occur in the environment at low concentrations, their effects may be subtle. Among other research gaps, EPA has identified a need to develop tests that can detect more subtle health effects.

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[19] For more information on EDCs and potential health risks, see CRS Report RL31267, *Environmental Exposure to Endocrine Disruptors: What Are the Human Health Risks?*, by Linda Schierow and Eugene H. Buck.

[20] See for example, U.S. Geological Survey, *Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams*, USGS FS-027-02, June 2002.

[21] Aquatic organisms face higher risks of exposure than humans for several reasons. For example, these organisms have continuous exposure, and generally are exposed to higher concentrations of PPCPs in untreated water, compared to treated drinking water.

The agency is also conducting a study to determine the amount of PPCPs that are discharged to wastewater treatment plants from various sources. As part of this study, EPA is evaluating how hospitals and other institutions dispose of unused medications.[22] Other research projects address the development of analytical methods to determine the source and fate of PPCPs in the environment.

As noted above, EPA proposed its third list of unregulated contaminants being considered for regulation in February 2008. This Contaminant Candidate List 3 (CCL 3) contains 104 contaminants, none of which are pharmaceuticals. Following recent reports of the detection of pharmaceuticals and commonly used over-the-counter drugs in the drinking water supplies of 24 large community water systems, EPA has asked its Science Advisory Board (SAB) and stakeholders to evaluate and comment on the contaminant candidate screening and selection process to determine whether the process requires revision.[23]

Because of ecological concerns, as well as human health concerns, regulating contaminants in drinking water represents only part of the response to this multi-faceted problem. Recognizing that people and animals will continue to take and use pharmaceutical products, water suppliers and other stakeholders consider changes at wastewater treatment plants to be a key part of the solution.

The Association of Metropolitan Water Agencies (AMWA), which represents the largest publicly owned water systems, has made several recommendations to address this emerging drinking water issue. Among these recommendations, the AMWA strongly encouraged EPA to make research on treatment technologies a high priority, and urged water utilities to inform consumers of efforts to monitor and remove pharmaceuticals from water sources. AMWA also called for EPA and the Food and Drug Administration (FDA) to determine whether the presence of trace amounts of pharmaceuticals results in short-term or long-term effects on health and the environment, recommended that the federal government take the lead in developing a national program for disposing of unused prescriptions, and called for animal feeding operations to reduce their contributions of antibiotics and steroids into water supplies.[24]

H.R. 6820, introduced on August 1, 2008, would direct EPA to work with other agencies to conduct a study on the presence of PPCPs in the nation's drinking water supplies. The bill would require the Administrator to submit reports to Congress on the types, levels, and sources of PPCPs found in drinking water; the human health and ecological effects of PPCPs; monitoring and removal technologies; disposal methods; and other information.

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[22] For further information on PPCPs and related EPA activities, see [http://epa.gov/ppcp].

[23] Information of the CCL3 is available at, [http://www.epa.gov/OGWDW/ccl/ccl3.html].

[24] Association of Metropolitan Water Agencies, *AMWA Discusses Pharmaceuticals in Water Supplies*, March 11, 2008, [http://www.amwa.net].

Drinking Water Infrastructure Needs and Funding

A persistent SDWA issue concerns the ability of water systems to construct or upgrade infrastructure to comply with drinking water regulations and, more broadly, to ensure the provision of a safe and reliable water supply. In the 1996 amendments, Congress responded to growing complaints about the act's unfunded mandates and authorized a drinking water state revolving loan fund (DWSRF) program to help water systems finance infrastructure projects needed to meet drinking water standards and address the most serious health risks. The program authorizes EPA to award annual capitalization grants to states. States then use their grants (plus a 20% state match) to provide loans and other assistance to public water systems. Communities repay loans into the fund, thus replenishing the fund and making resources available for projects in other communities. Eligible projects include installation and replacement of treatment facilities, distribution systems, and some storage facilities. Projects to replace aging infrastructure are eligible if they are needed to maintain compliance or to further public health protection goals.[25]

Congress authorized appropriations for the DWSRF program totaling $9.6 billion, including $1 billion for each of FY1995 through FY2003. Since FY1997, Congress has appropriated nearly $9.5 billion for this program, including $837.5 million for each of FY2006 and FY2007. For FY2008, the President requested $842.2 million. The House approved the requested amount in H.R. 2643, and the Senate Appropriations Committee recommended that amount in S.Rept. 110-91. The Consolidated Appropriations Act for FY2008 (P.L. 110-161, Division F, Title II) includes $829.0 million for this program, after applying the 1.56% across the board rescission. (**Table 3** lists funding levels for the DWSRF program since its inception.)

Through June 2006, the EPA had awarded $7.33 billion in capitalization grants, which, when combined with the state match, bond proceeds, loan principal repayments, and other funds, amounted to $12.83 billion in DWSRF funds available for loans and other assistance. Also, as of June 2006, 4,985 projects had received assistance, and total assistance provided by the program reached $11.03 billion.

The DWSRF program is well-regarded, but many state and local officials and interest groups have argued that greater investment in water infrastructure is needed. EPA's 2003 drinking water infrastructure needs survey found that systems need to invest $276.8 billion in infrastructure improvements over 20 years to comply with drinking water regulations and to ensure the provision of safe water.[26] The survey includes funds needed for compliance with several recent rules (including the arsenic rule and the disinfectants and disinfection byproducts rules) and several proposed rules (including radon). The survey also identified $1 billion in security-related needs. All infrastructure projects in the needs assessment promote the health

[25] See also CRS Report RS22037, *Drinking Water State Revolving Fund: Program Overview and Issues*, by Mary Tiemann. For information on other assistance programs, see CRS Report RL30478, *Federally Supported Water Supply and Wastewater Treatment Programs*.

[26] U.S. Environmental Protection Agency, *Drinking Water Infrastructure Needs Survey and Assessment: Third Report to Congress*, June 2005, EPA 816-R-05-001, available at [http://www.epa.gov/safewater/needssurvey/index.html].

objectives of the act, but only $45.1 billion (16.3%) of the total need is attributable to SDWA compliance. Although aging, deteriorated infrastructure often poses a threat to drinking water safety, these needs occur independently of federal mandates.

Table 3. Drinking Water State Revolving Fund Program Funding, FY1997-FY2009

(in millions of dollars, nominal dollars and adjusted for inflation)

Fiscal Year	Authorizations	Appropriations	Adjusted for Inflation in 2007 Dollars
1997	$1,000.0	$1,275.0	$1,594.6
1998	$1,000.0	$725.0	$895.9
1999	$1,000.0	$775.0	$945.2
2000	$1,000.0	$816.9	$976.6
2001	$1,000.0	$823.2	$961.4
2002	$1,000.0	$850.0	$974.1
2003	$1,000.0	$844.5	$948.6
2004	—	$845.0	$925.1
2005	—	$843.2	$894.5
2006	—	$837.5	$859.9
2007	—	$837.5	$837.5
2008	—	$829.0	est. $813.3
2009 (req.)	—	$842.2	est. $809.9

Sources: Prepared by CRS using information from the following sources: FY1997-FY2000 and FY2002 enacted amounts are from the enacted appropriations bills for those fiscal years. FY2001enacted amount is the prior year enacted amount specified in EPA's FY2002 congressional budget justification. FY2003-FY2004 enacted amounts are from EPA's Office of Water. FY2005-FY2006 enacted amounts are prior year enacted amounts specified in House Appropriations Committee reports on subsequent year appropriations bills. FY2007 an d FY2008 enacted amounts, and FY2009 President's request, are as reported to CRS by the House Appropriations Committee. All enacted amounts reflect rescissions. Nominal dollar amounts were converted into 2007 dollar values using the GDP Chained Price Index from the Office of Management and Budget, *Budget of the United States Government for Fiscal Year 2009*, Historical Tables.

EPA also has prepared a broader municipal wastewater and drinking water infrastructure funding gap analysis, which identified potential funding gaps between projected needs and spending from 2000 through 2019.[27] This analysis estimated the potential 20-year funding gap for drinking water and wastewater infrastructure capital and operations and maintenance (O&M), based on two scenarios: a "no revenue growth" scenario and a "revenue growth" scenario that assumed infrastructure spending would increase 3% per year. Under the "no revenue growth" scenario, EPA projected a funding gap for drinking water capital investment of $102 billion ($5

[27] U.S. Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis Report*, Report No. EPA 816-R-02-020, September 2002, 50 p.

billion per year) and an O&M funding gap of $161 billion ($8 billion per year). Using revenue growth assumptions, EPA estimated a 20-year capital funding gap of $45 billion ($2 billion per year), and no gap for O&M. In response to the Gap Analysis, EPA's FY2004 budget request proposed that funding for the DWSRF program be continued at a level of $850 million annually through FY2018. EPA explained that this funding level would allow DWSRFs to revolve at a cumulative level of $1.2 billion (more than double the previous goal of $500 million) and would help close the funding gap for drinking water infrastructure needs.

Other assessments also have found a funding gap. In 2000, the Water Infrastructure Network (WIN) (a coalition of state and local officials, water providers, environmental groups and others) reported that over the next 20 years, water and wastewater systems need to invest $23 billion annually more than current investments to meet SDWA and Clean Water Act health and environmental priorities and to replace aging infrastructure. WIN and other groups have proposed multibillion dollar investment programs for water infrastructure. Others, however, have called for more financial self-reliance within the water sector.

In the 110th Congress, most water infrastructure funding bills have addressed wastewater treatment needs,[28] with the exception of S. 1933, which would create a grant program for small drinking water systems and would authorize $750 million annually for FY2008 through FY2014. The Senate Environment and Public Works Committee ordered S. 1933 to be reported without amendment on July 31, 2008.

In the 109th Congress, this committee reported the Water Infrastructure Financing Act, S. 1400 (S. Rept 109-186), which would have amended the SDWA and the Clean Water Act to reauthorize both SRF programs (authorizing $15 billion over five years for the DWSRF). The bill also would have directed EPA to establish grant programs for small or economically disadvantaged communities for critical drinking water and water quality projects; authorized loans to small systems for preconstruction, short-term, and small project costs; and directed EPA to establish a demonstration program to promote new technologies and approaches to water quality and water supply management. At markup, the committee adopted an amendment to apply Davis-Bacon prevailing wage requirements, in perpetuity, to projects receiving DWSRF assistance. The Davis-Bacon measure remained contentious, and S. 1400 received no further action.

In the face of uncertainty over increased federal assistance for water infrastructure, EPA, states, communities, and utilities have been examining alternative management and financing strategies to address SDWA compliance costs and broader infrastructure maintenance and repair costs. Such strategies include establishing public-private partnerships (privatization options range from contracting for services to selling system assets), improving asset management, and adopting full-cost pricing for water services. Still, these strategies may be of limited use to

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[28] For information on Clean Water Act proposals, see CRS Report RL33800, *Water Quality Issues in the 110th Congress: Oversight and Implementation*, by Claudia Copeland.

many small and/or economically disadvantaged communities, and stakeholders are likely to continue to urge Congress to increase funding for water infrastructure.[29]

Small Systems Issues

An issue that has received considerable attention concerns the financial, technical, and managerial capacity of small systems to comply with SDWA regulations. Roughly 84% (44,000) of the nation's 52,800 community water systems are small, serving 3,300 persons or fewer, and 57% (30,000) of the community water systems serve 500 persons or fewer. Many small systems face challenges in complying with SDWA rules and, more fundamentally, in ensuring the quality of water supplies. Major problems include deteriorated infrastructure, lack of access to capital, limited customer and rate base, inadequate rates, diseconomies of scale, and limited managerial and technical capabilities. Because of these same characteristics, the DWSRF program has not been as successful for small systems, compared to larger systems. Although these systems serve just 9% of the population served by community water systems, the sheer number of small systems has created challenges for policymakers and regulators.

In the earliest SDWA debates, Congress recognized that setting standards based on technologies affordable for large cities could pose problems for small systems. During the reauthorization debate leading up to the 1996 amendments, policymakers gave considerable attention to the question of how to help small systems improve their capacity to comply with SDWA mandates. The 1996 amendments added provisions aimed at achieving this goal, including a requirement that states establish strategies to help systems develop and maintain the technical, financial, and managerial capacity to meet SDWA regulations. Congress also revised provisions on standard-setting (§1412(b)), variances (§1415(e)), and exemptions (§1416) to increase consideration of small system concerns.

Exemptions. The act's exemption provisions are intended to provide compliance flexibility in certain cases. States or EPA may grant *temporary* exemptions from a standard if, due to certain compelling factors (including cost), a system cannot comply on time. For example, all systems are required to comply with the new arsenic standard five years after its promulgation date. An exemption would allow three more years for qualified systems. Small systems (serving 3,300 persons or fewer) may be eligible for up to three additional two-year extensions, for a total exemption duration of nine years (and for a total of up to 14 years to achieve compliance). In the preamble to the arsenic rule published in January 2001, EPA noted that exemptions will be an important tool to help states address the number of systems needing financial assistance to comply with this rule and other SDWA rules (66 *Federal Register* 6988).

However, to grant an exemption, the law requires a state to hold a public hearing and make a finding that the extension will not result in an "unreasonable risk to

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[29] For further discussion of infrastructure issues, see CRS Report RL31116, *Water Infrastructure Needs and Investment: Review and Analysis of Key Issues*, by Claudia Copeland and Mary Tiemann.

health." Because of the administrative burden to the states, the act's exemption authority has seldom been used. Approximately 13 states had indicated that they would likely use the exemption process for the arsenic rule, but it appears that many states have not exercised this option. H.R. 2141 was introduced to require primacy states to grant exemptions to eligible, nonprofit small systems for rules covering naturally occurring contaminants.

Small System Variances and Affordability. In contrast to exemptions, variances offer a more permanent form of compliance flexibility for small systems. Since 1996, SDWA has required EPA, when issuing a regulation, to identify technologies that meet the standard and that are affordable for systems that serve populations of 10,000 or fewer. If EPA does not identify affordable "compliance" technologies, then the agency must identify small system "variance" technologies. A variance technology need not meet the standard, but must protect public health. States may grant variances to systems serving 3,300 persons or fewer if a system cannot afford to comply with a rule (through treatment, an alternative source of water, or other restructuring) and if the system installs a variance technology. With EPA approval, states also may grant variances to systems serving between 3,300 and 10,000 people. (Regulations addressing microbial contaminants are not eligible for variances under the statute.)

In 1998, EPA published affordability criteria to establish guidelines for determining whether a regulation is deemed affordable for small systems, and whether small system variances would be available. Under the criteria, EPA evaluates the affordability of a regulation by determining whether the compliance cost would raise the total water cost above 2.5% of annual median household income (MHI) in the three categories of small systems. Using this approach, EPA has determined that affordable compliance technologies are available for every drinking water regulation. Consequently, the agency has not identified any small system variance technologies, and thus, no small system variances are available.

Several recent regulations (such as the revised arsenic and radium standards and the Stage 2 Disinfectants and Disinfection Byproducts Rule) have heightened concern, particularly among rural communities, that EPA has not used the tools Congress provided to help small systems comply with SDWA regulations.

Affordability Criteria Review. Prompted by debate over the revised arsenic standard and its potential cost to small communities, the conference report for EPA's FY2002 appropriations (H.Rept. 107-272) directed EPA to review its affordability criteria and how small system variance programs should be implemented for the arsenic rule. EPA began the review and sought the advice of the EPA's National Drinking Water Advisory Council (NDWAC) and Science Advisory Board (SAB).

After considering recommendations from its affordability work group, the NDWAC reported to EPA in 2003. The council acknowledged the statutory basis for small system variances and recommended changes, but cautioned that "significant practical, logistical, and ethical issues mitigate against the use of variances."[30] The National Rural Water Association, a member of the NDWAC work group, dissented and issued a separate report urging EPA to adopt a safe and affordable variance approach that would make variances available to small communities, as authorized by Congress. The Science Advisory Board concluded that EPA's basic approach was justified on the basis of equity, efficiency and administrative practicality, but recommended ways to improve the criteria. The SAB suggested that EPA consider lowering its affordability threshold, noting that "the national affordability threshold has never been exceeded, but some small water systems appear to have genuinely struggled with costs, suggesting that the 2.5% rule is too high."[31] The SAB also encouraged EPA to develop clear guidelines about when variances should be granted, and recommended that EPA consider measures other than median income to better capture impacts on disadvantaged households.

In March 2006, EPA proposed three options for revising its affordability criteria for determining whether a compliance technology is unaffordable for small systems (71 *Federal Register* 10671). EPA currently assumes that treatment technology costs are affordable to the average household if they do not cause median annual water bills to exceed about $1,000 (this threshold is calculated by taking 2.5% of median household income among small systems). Based on this approach, EPA has determined that affordable technologies are available for all standards. The three proposed options are well below that level: 0.25%, 0.50%, and 0.75%. EPA also requested comment on whether or not the agency should evaluate affordability strictly on a national level, or use a two-step process that would include evaluations of affordability first at the national level and then at the county level. A county level analysis would be performed only when a standard was found to be affordable at the national level. The revised criteria are further intended to address the issue of how to ensure that a variance technology would be protective of public health — an issue that has historically hampered the use of variances.

EPA is evaluating comments on its proposed revisions, and has noted its intention to apply the revised criteria only to the recent Stage 2 DBP Rule and future rules. States could use the criteria to grant small-system variances, on a case-by-case basis, when systems cannot afford to comply with a standard. If these variances become available, it is not clear how often they might be used. A key issue is that variances allow systems to provide lower-quality water in lower-income communities, and this could raise issues for states, communities, and consumers.

Small System Legislation. During the 109th Congress, various bills were introduced to help small water systems comply with the arsenic standard and other drinking water regulations. In the 110th Congress, legislation again has focused on

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[30] U.S. Environmental Protection Agency, *Small Drinking Water Systems Variances: Revision of Existing National-Level Affordability Methodology and Methodology to Identify Variance Technologies that Are Protective of Public Health*, (71 *Fed. Reg.* 10671), March 2, 2006, p. 10657.

[31] U.S. Environmental Protection Agency, Science Advisory Board, *Affordability Criteria for Small Drinking Water Systems: An EPA Science Advisory Board Report*, 2002, p. 4. The SAB report is available at [http://www.epa.gov/ogwdw/smallsys/affordability.html].

promoting small system compliance through funding assistance and compliance flexibility. S. 1933, the Small Community Drinking Water Funding Act, would direct EPA to establish a small public water system grant program. H.R. 2141 would require primacy states to grant exemptions to eligible small systems for rules covering naturally occurring contaminants, including arsenic, radon, radium, uranium, and several disinfection byproducts. S. 2509, the Small System Safe Drinking Water Act of 2007, would amend SDWA to provide more compliance assistance to small communities and prevent the enforcement of certain drinking water regulations unless sufficient funding is available or a variance technology has been identified. S. 2509 also would direct EPA to establish a research pilot program to explore new compliance technologies, and would establish new requirements for EPA's affordability criteria. S. 1429 (S.Rept. 110-242) would reauthorize SDWA funding for small system technical assistance. S. 199, ordered reported by the Senate Environment and Public Works Committee in July 2008, would increase the authorization of appropriations for grants to Alaska to build water and wastewater systems in rural and Native villages.

Underground Injection Control and Carbon Sequestration

Most public water systems rely on groundwater as a source of drinking water, and the 1974 Safe Drinking Water Act authorized EPA to regulate the underground injection of fluids (including solids, liquids, and gases) to protect underground sources of drinking water.[32] SDWA §1421 directed EPA to promulgate regulations for state underground injection control (UIC) programs, and mandated that the regulations contain minimum requirements for programs to prevent underground injection that endangers drinking water sources.[33] Section 1422 authorized EPA to delegate primary enforcement authority (primacy) for UIC programs to the states, provided that state programs prohibit any underground injection that is not authorized by a state permit.[34] Thirty-three states have assumed primacy for the program, EPA has lead implementation and enforcement authority in 10 states, and authority is shared in the remainder of the states.[35]

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[32] Underground injection control provisions are contained in SDWA §1421 - §1426; 42 U.S.C. 300h - 300h-5. (P.L. 93-523).

[33] § 1421(d)(2) states that

> underground injection endangers drinking water sources if such injection may result in the presence in underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system's not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons.

[34] P.L. 93-523, SDWA §1421 (42 U.S.C. 300h).

[35] To receive primacy, a state, territory, or Indian tribe must demonstrate to EPA that its UIC program is at least as stringent as the federal standards; the state, territory, or tribal UIC requirements may be more stringent than the federal requirements. For Class II (oil and gas) wells, states must demonstrate that their programs are effective in preventing pollution of underground sources of drinking water (USDWs).

The 1974 law specified that the UIC regulations could not interfere with the underground injection of brine from oil and gas production or recovery of oil unless underground sources of drinking water would be affected.[36] In the Energy Policy Act of 2005, the 109th Congress amended SDWA to specify further that the definition of "underground injection" excludes the injection of fluids or propping agents (other than diesel fuels) used in hydraulic fracturing operations related to oil, gas, or geothermal production activities.[37]

The UIC program regulations specify siting, construction, operation, closure, financial responsibility, and other requirements for owners and operators of injection wells. EPA has established five classes of injection wells based on similarity in the fluids injected and activities, as well as common construction, injection depth, design, and operating techniques.

Carbon Sequestration and Storage. In the 110th Congress, underground injection has received attention primarily regarding its role as a potential means for sequestering carbon dioxide (CO_2) emissions in geologic formations to control greenhouse gas emissions. Geologic sequestration (GS) is the process of injecting CO_2 captured from a large stationary source (such as a coal-fired power plant) through a well deep into the earth for long-term storage. Research indicates that numerous geologic formations exist in the United States and worldwide that have the capacity to store large volumes of CO_2. Because coal is responsible for nearly half of the electricity generated worldwide and its use is increasing, carbon capture and storage (CCS) is attracting a growing number of proponents who believe that, with proper site selection and management, geologic sequestration could play an important role in controlling CO_2 emissions.

Although considerable interest has emerged for the rapid, commercial-scale development of carbon sequestration projects, questions exist regarding the long-term safety and effectiveness of sequestration of large volumes of CO_2. Issues include how sequestration activities might affect underground sources of drinking water, what local health and environmental risks could arise from slow leakage or sudden releases of stored gas, and who would have long-term responsibility for water contamination or other damages that might result from sequestration activities.

A key public health and environment issue concerns the potential for stored CO_2 to contaminate underground water supplies or otherwise adversely affect human health and the environment. According to a 2005 report by the United Nations Intergovernmental Panel on Climate Change (IPCC), human and environmental risks potentially could result from leaking injection wells, abandoned wells, or leakage across faults in rock formations and ineffective confining layers. The IPCC report noted that,

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[36] SDWA §1421(d) specifies that "underground injection" does not include the underground injection of natural gas for storage purposes. In legislative history, Congress explained that the natural gas exclusion applies only to "natural gas as it is commonly defined" and "not to other injections of matter in a gaseous state." U.S. House of Representatives, H.Rept. 96-1348, 1980, USCCAN, p. 6080.

[37] P.L. 109-58, H.R. 6, Section 322,amended SDWA section 1421(d).

> Avoiding or mitigating these impacts will require careful site selection, effective regulatory oversight, an appropriate monitoring program that provides early warning that the storage site is not functioning as anticipated and implementation of remediation methods to stop or control CO_2 releases. Methods to accomplish these are being developed and tested.[38]

Noting that knowledge gaps exist and that more demonstration projects are needed, the IPCC report concluded that, although "more work is needed to improve technologies and decrease uncertainty, there appear to be no insurmountable technical barriers to an increased uptake of geological storage as an effective mitigation option."[39] However, uncertainties and research gaps involving the safety and effectiveness of long-term carbon sequestration, the potential health and environmental impacts, regulatory requirements, and long-term liability all pose hurdles to the rapid deployment of this technology.[40]

Congress has acted on several bills that would facilitate and/or regulate the use of underground injection wells for the purpose of carbon sequestration. Enacted in December 2007, the Energy Independence and Security Act of 2007 (EISA, P.L. 110-140) expands the Department of Energy (DOE) carbon sequestration research and development program. EISA Section 702 requires DOE to conduct at least seven large-volume sequestration tests, in addition to conducting research that promotes the development of sequestration technologies. Section 706 specifies that the injection and sequestration of CO_2 under EISA will be subject to the requirements of the Safe Drinking Water Act, including the act's UIC provisions.

In addition to EISA, several pending bills containing geologic sequestration provisions would require sequestration activities to be done in conformance with SDWA requirements. Both S. 3036 and H.R. 6186 would amend SDWA to require EPA to promulgate regulations to manage and facilitate carbon sequestration.[41]

In July 2008, EPA proposed regulations to create a nationally consistent framework for managing the underground injection of CO_2 for geologic sequestration

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[38] United Nations Intergovernmental Panel on Climate Change, 2005, IPCC Special Report on Carbon Dioxide Capture and Storage, p. 197.

[39] Ibid, p. 198.

[40] Commercial-scale deployment of CCS faces a range of technical, legal, economic, regulatory, and public policy issues. Capturing carbon and preparing it for transport and storage are generally considered the most economically and technologically challenging aspects of CCS, and no commercial technology to capture these emissions is currently available for large-scale coal-fired power plants. Moreover, carbon capture technologies would markedly increase the cost of electricity generation. Consequently, few companies may be inclined or able to install such technology unless they are required to do so, either by regulation or by a carbon price. For further discussion see CRS Report RL34621, *Capturing CO2 from Coal-Fired Power Plants: Challenges for a Comprehensive Strategy*, by Peter Folger, Larry Parker, and Deborah D. Stein.

[41] For a detailed discussion of geologic sequestration and related legislation, see CRS Report RL33801, *Carbon Capture and Sequestration (CCS)*, and CRS Report RL34218, *Underground Carbon Dioxide Storage: Frequently Asked Questions*, both by Peter Folger.

purposes, thus taking a step toward providing certainty to industry and the public about requirements that would apply to this activity.[42] The rule proposes to create a new class of injection wells (Class VI) for geologic sequestration, and establish national requirements that would apply to these injection wells. The proposed rule builds on the existing UIC program, including requirements for well owners and operators to ensure that wells are appropriately located, constructed, tested, monitored, and ultimately closed with proper funding.

EPA's stated regulatory goal is to ensure that permitting regulations are in place to ensure that GS can occur in a safe and effective manner in order to enable commercial-scale CCS projects to move forward. The proposed rule is open for public comment until late December 2008, and the agency expects to promulgate a final GS rule in December 2010 or 2011. EPA is coordinating with DOE on carbon sequestration research, development, and demonstration activities.

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[42] U.S. Environmental Protection Agency, *Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO2) Geologic Sequestration (GS) Wells*, Proposed Rule, 73 *Fed. Reg.* 43491-43541, July 25, 2008.

Congressional Hearings and Reports, and Documents

U.S. Congress. Senate. Committee on Environment and Public Works. *Water Infrastructure Financing Act*. Report to accompany S. 1400. 109th Cong., 1st sess. December 8, 2005. 52 p. (S.Rept. 109-186).

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Additional Reading

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