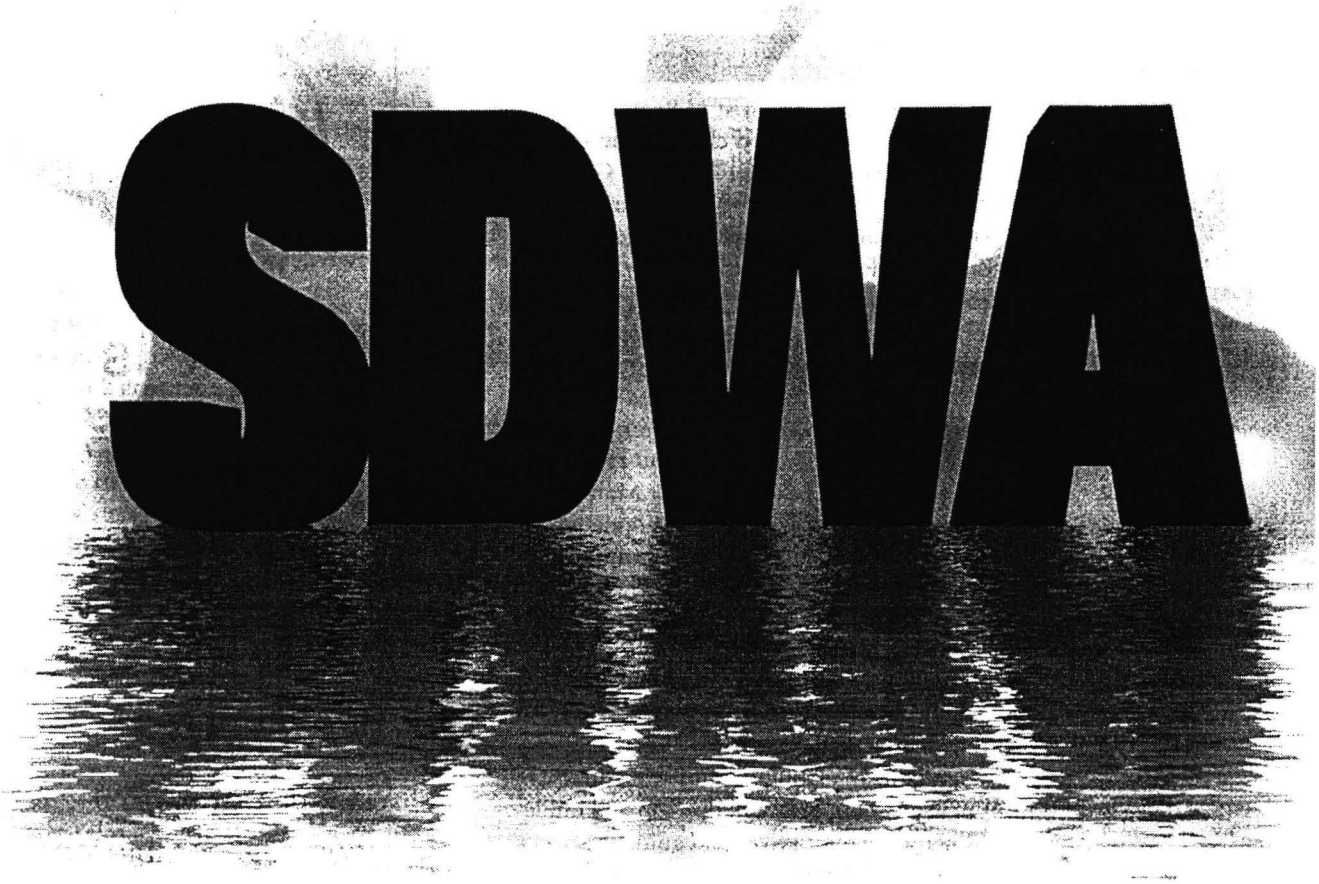


J. ALAN ROBERSON AND MICHELLE M. FREY

An SDWA Retrospective: 20 Years After the 1996 Amendments

NEARLY 20 YEARS SINCE THE 1996 AMENDMENTS TO THE SAFE DRINKING WATER ACT WERE PASSED, THERE HAVE BEEN SOME SUCCESSES, BUT ADDITIONAL WORK IS NEEDED TO OVERCOME CHALLENGES AND ENSURE THE SAFETY AND RELIABILITY OF DRINKING WATER IN THE UNITED STATES.

The Safe Drinking Water Act (SDWA) was first passed into law more than 40 years ago in response to discoveries of widespread contamination in drinking water (PL 93-523, 1974). Concerns were raised over industrial pollutants found throughout the Mississippi River Basin and trihalomethanes found in drinking water distribution systems. With the founding of the US Environmental Protection Agency (USEPA) in 1972, the SDWA quickly became a key initiative for the new agency.

However, struggles to create a sustainable regulatory framework for drinking water kept USEPA from making substantial progress in promulgating new drinking water standards. In fact, from 1974 until 1986 when SDWA amendments were passed, USEPA promulgated only one truly new regulation—and that was for the control of total trihalomethanes (TTHMs) for systems serving more than 10,000 people. The other regulatory action was to finalize 22 existing standards from the US Public Health Service under the SDWA (Table 1).

Frustrated by the lack of regulatory progress, Congress passed the first set of amendments to the SDWA in 1986 (PL 99-359, 1986), mandating a schedule for the regulation of 83 specific contaminants, as well as regulations for an additional 25 contaminants every three years—in effect, a "regulatory treadmill." In addition, the amendments mandated that USEPA require the filtration of surface water supplies used as drinking water sources. USEPA soon fell behind in meeting the statutory deadlines, and the agency found itself in a series of litigations and negotiations with the Bull Run Coalition to continually extend the regulatory schedule. While USEPA did not meet the mandated schedule set in the amendments, it did eventually publish regulations for all 83 contaminants and issued its first treatment technique rulemaking in the Surface Water Treatment Rule (Table 1).

In the midst of this active regulatory environment, bipartisan concerns arose over how to ensure that USEPA was addressing the most significant drinking water risks. Then, in 1993, the *Cryptosporidium* outbreak in Milwaukee occurred, further raising concerns about drinking water quality. Added to that, the AIDS crisis was in full swing in the United States during this time, and these patients, as well as other immunocompromised individuals such as the elderly and cancer patients, were more vulnerable to *Cryptosporidium*. The outbreak, combined with litigation over the delays in promulgating regulations under the 1986 amendments and the bipartisan desire to get USEPA off the "regulatory treadmill," spurred Congress to take action once more, and the 1996 amendments to the SDWA were passed (PL 104-110, 1996).

Although the amendments contained specific requirements for USEPA to address microbial and disinfectant/disinfection by-product (D/DBP) issues in drinking water, they also took a longer view on the overall regulatory program (Table 2). In lieu of mandating specific contaminants to be regulated within a defined period, Congress required USEPA to create a process by which contaminants of concern could be identified and assessed for occurrence and potential health implications in drinking water supplies, and to decide whether a national regulation

> The 1986 amendments to the SDWA mandated a schedule for the regulation of 83 specific contaminants, as well as regulations for an additional 25 contaminants every three years.

TABLE 1 Safe Drinking Water Act (SDWA) Timeline

Time Period	SDWA Policy Initiative	Regulatory Actions[a]
1974–1986	Discovery of widespread occurrence of disinfection by-products in drinking water along with other industrial contaminants. The SDWA was intended to create a regulatory program for ensuring the delivery of safe drinking water to the public.	1976—Conversion of 22 US Public Health Service contaminant limits to drinking water standard. 1983—Standard for Total Trihalomethanes (4)
1986–1996	Frustrated by the lack of regulatory progress, Congress passed the 1986 amendments and proscribed a schedule for the regulation of 83 contaminants in addition to the requirement for effective filtration and disinfection of surface water supplies.	1987—Phase I Volatile Organic Chemicals (8) 1989—Total Coliform Rule (1) and the Surface Water Treatment Rule (5) 1991—Phase II Synthetic Organic Chemicals and Inorganic Chemicals (39) 1991—Lead and Copper Rule (2) 1992—Phase V Synthetic Organic Chemicals and Inorganic Chemicals (23)
1996–present	*Cryptosporidium* outbreaks led Congress to mandate tougher standards for microbial control with mandatory disinfection for all water supplies. USEPA used a Federal Advisory Committee Act process for setting these standards, and issued an Information Collection Rule to gather data directly from water suppliers about their treatment processes and water quality. The amendments listed three additional contaminants for regulation (i.e., arsenic, sulfate, radon). The focus of the amendments shifted from defining a process by which contaminants of regulatory concern can be identified and to the provision of greater public transparency about drinking water quality.	1996—Information Collection Rule 1998—Stage 1 Disinfectants and Disinfection Byproducts Rule (6) and the Interim Enhanced Surface Water Treatment Rule (2) 2000—Radionuclides Rule (5) 2001—Arsenic Rule (1) 2003—Stage 2 Disinfectants and Disinfection Byproducts Rule (6) and Long-Term 2 Enhanced Surface Water Treatment Rule (2)

USEPA—US Environmental Protection Agency

[a]The number of contaminants for which National Primary Drinking Water Standards were set in each action is shown in parentheses.

would meaningfully reduce public health risk. Additional cost–benefit considerations in the regulatory development process were mandated. Schedules were provided for the process, and a six-year period was defined for the review of existing regulations—to determine whether they should be modified or possibly eliminated. The 1996 amendments contained several provisions for state primacy agencies, including requirements for source water assessments and protection programs, operator training and certification, and creation of the Drinking Water State Revolving Fund (DWSRF) program. Public information was emphasized through requirements for Consumer Confidence Reports (CCRs) (Table 2).

To its credit, USEPA met almost all of its SDWA mandates in the first 10 years after the 1996 amendments. Seventeen workgroups under the National Drinking Water Advisory Council (NDWAC) were established to provide stakeholder input on the mandated regulations. Requirements for the new state programs were developed, and the state primacy agencies met these requirements. USEPA finalized seven national primary drinking water regulations from 1996 to 2006, and twice used its discretionary authority to set regulations at higher concentrations for cost–benefit considerations: uranium and arsenic. The DWSRF program was created at both the federal and state levels, and loans were made to states and water systems; these loans began to get paid back so that the funding really started to revolve. Water systems learned how to develop and deliver the required CCRs, and USEPA recently approved electronic delivery for these reports.

We are now approaching 20 years since passage of the 1996 amendments. This retrospective is intended to identify where the amendments have succeeded in improving the safety and reliability of drinking water in the United States, how AWWA has contributed to regulatory activity, where more work may be needed to achieve these goals, and what new challenges the drinking water community faces in the future. Many of these challenges can likely

TABLE 2 Provisions of the 1996 amendments to the Safe Drinking Water Act (SDWA)

Provision	Policy Intent	Implementation Notes
Contaminant identification	Devise a scientific methodology that can be used to identify contaminants of potential regulatory concern.	Methodology created by USEPA does not prioritize contaminants appropriately. Improvement is needed, and AWWA has recommended an alternative methodology for consideration.
Monitoring and unregulated contaminant monitoring	As needed, require monitoring for unregulated contaminants under regulatory consideration to determine national occurrence levels and prevalence.	USEPA has implemented reasonable monitoring programs, but improvements are needed to target appropriate contaminants, ensure laboratory capacity with sufficiently sensitive and accurate analytical methods, and provide an effective means for all monitoring data to be used in making regulatory determinations (including the Six-Year Review process).
Standard setting and specific contaminants	Require a review process for all existing regulations every six years; mandate new standards for arsenic, sulfate, radon, and disinfection of all public water supplies; and revise existing standards for microbial agents of concern (specifically *Cryptosporidium*) and additional disinfection by-products.	USEPA successfully met the mandate for new regulatory standards to be set and used the cost–benefit criteria to set standards above what was feasible in two cases (i.e., arsenic, uranium). Additional work is needed in the Six-Year Review process for monitoring data integration and accessibility.
Public notification and Consumer Confidence Reports (CCRs)	Require CCRs to be issued annually by water suppliers and public notifications for noncompliance events to improve transparency to the public.	For both public notices and CCRs, restrictive language requirements limit the effectiveness of these tools. The wide variability of state implementation leads to uncertain outcomes in terms of true transparency and effective notification when public action is needed (e.g., boil-water advisories).
Drinking Water State Revolving Fund (DWSRF) program	Establish funding levels for the DWSRF to help water suppliers implement capital improvements necessary to comply with new standards.	In general, the DWSRF program has been successful. Improvements in the ease of the application process and standardized practices across states would be beneficial.
Source water assessment and protection	Require all water suppliers to identify potential sources of contamination in their source waters and implement appropriate protection measures.	Although source water assessment programs were performed, translating the assessments to meaningful protection measures has been limited. Routine updating of the assessment process is needed, but there is no provision or guidance for this.
Operator certification	Require states to establish standards for water system operator certification and to implement necessary training and certification programs.	USEPA successfully produced reasonable guidance, and all states except Wyoming have implemented operator certification programs. Although this is a great success, limitations such as reciprocity of licenses between states, sufficient funding to meet training program needs, and greater consistency in programs should be addressed moving forward.

USEPA—US Environmental Protection Agency

be addressed through modifications of ongoing SDWA implementation programs, but some may be good candidates for new provisions in the next re-authorization of the SDWA, whenever that may be.

MISSION ACCOMPLISHED?

In considering the outcomes of the 1996 amendments, the question that must be asked is, "Was it successful?" To answer this, it is necessary to first articulate what success means. The overall intent of the SDWA is to ensure the provision of safe drinking water to US consumers. This infers three requirements to define success:

- Drinking water supplies as delivered to consumers today are safer than they were in 1996.
- US consumers have as much if not greater access to these drinking water supplies today than they did in 1996.
- The causative factor for the water being safer and consumers having access is the implementation of the regulatory program required under the 1996 amendments.

A recent study by Seidel et al. (2014) created a methodology for assessing multiple risks compiled in a single index that could be used to inform utilities and policymakers alike of the relative concern various contaminants may pose in drinking water. The Relative Health Indicator (RHI) was used to evaluate regulated and selected nonregulated contaminants in drinking water nationally and at 10 utility case study locations. The results showed that there are clear differences in the risks posed by contaminants, and those of greatest concern—both from the health impact and likelihood of relevant exposure levels. In order of concern, these include

- microbes,
- arsenic,
- select individual DBPs (ie, bromodichloromethane, trichloroacetic acid, dichloroacetic acid, dibromochloromethane, chloroform),
- nitrate,
- selenium, and
- radium.

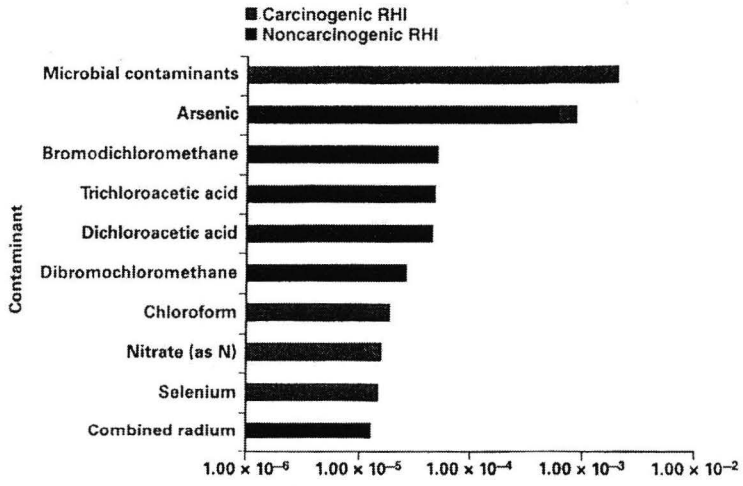
Figure 1 illustrates the RHI outcomes for each of the above contaminants based on national occurrence and risk levels from exposure through drinking water. An order-of-magnitude difference in risk separates microbes from the next-most significant contaminant of concern (i.e., arsenic), and multiple orders of magnitude differentiate microbes and arsenic from the next set of contaminants.

Microbes, DBPs, and arsenic were considered by USEPA to be "priority contaminants" as reflected by the mandated deadlines in the 1996 SDWA amendments, and it is an interesting confluence of risk and policy that these three contaminants provided the largest health risk reduction based on the 2014 Seidel et al. study. Nitrate and selenium have been regulated since 1976 with no further modifications, so no net change in water supply safety would be expected as a result of the 1996 amendments. Further, while a Radionuclides Rule was published as a result of the 1996 amendments, the regulation of radium was not altered from the original standard promulgated in 1976.

As part of its rulemaking process, USEPA estimates the number of waterborne disease events that can be avoided if a regulatory action is

> The 1996 amendments contained several provisions for state primacy agencies, including requirements for source water assessments and protection programs.

FIGURE 1 Relative health indicator for national risk of drinking water contaminants



Source: Seidel et al. 2014; ©Water Research Foundation and Drinking Water Inspectorate

RHI—relative health indicator

implemented. In the case of the D/DBP Rule (DBPR) and the arsenic regulation, the illnesses to be avoided were fatal and nonfatal cancer cases. Between these two rulemakings, nearly 320 cancer cases were estimated to be avoided with the majority associated with the DBPR (Table 3). The total national benefit annually for such illness avoidance was approximately $2.4 billion, while the total national cost to implement these regulations was estimated to be less than $200 million/year (USEPA 2005a; 66 FR 6975, 2001).

When examining the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), between 170,000 and 336,000 cases of nonfatal illnesses as well as 39 to 74 deaths each year were estimated to be avoided annually (Table 3). The national benefits were estimated to be between $335 million and $645 million per year with a total national cost of only $110 million to $120 million per year (USEPA 2005b).

The mission of the 1996 amendments to address drinking water safety was successful in that its regulation of microbes, DBPs, and arsenic have contributed to reduced drinking water risks. However, the national compliance picture shows that more needs to be done. From 1996 to 2011, the percentage of community water systems meeting health-based standards increased from 85.6 to 93.2% (USEPA 2013a). While the increase over that time frame is laudable, 93% compliance shows that there is room for improvement.

The mission of the 1996 amendments to address drinking water safety was successful in that its regulation of microbes, DBPs, and arsenic have contributed to reduced drinking water risks.

Additionally, ensuring that this health benefit is realized from tap water may be challenged by changes in consumer water consumption behaviors and the ongoing affordability of drinking water for all consumers. Since 2001, a nearly 60% increase in the selection of bottled water over other beverages has occurred (Thompson 2013). Further, the average person consumes more than twice the bottled water volume per year than nearly 20 years ago when the 1996 amendments were first passed (Statista 2015). While bottled water consumption accounts only for approximately 15% of the average consumer's daily water intake, it is still an important trend that could discount the value (i.e., benefits) attributed to drinking water regulations for public water supplies. The regulation of bottled water under the US Food and Drug Administration (FDA) does have "pass through" provisions to ensure that all drinking water standards are met by bottled water, but the monitoring and reporting processes differ widely, and the differences in the aging and delivery processes are not considered.

With respect to the affordability of drinking water supplies, there is no question that drinking water rates have risen significantly since 1996. Over the last five years alone, a 41% increase in water rates was found by a pricing survey of the top 30 cities in the United States (Walton 2015). An analysis performed by *USA Today* showed that between 2000 and 2012, at least one in four municipalities out of the 100 surveyed had doubled their water rates. Further, water costs have increased 34% (inflation adjusted), while natural gas and electricity increased only 12% and 7%, respectively, across the same period (Kepple et al. 2012). In both rural areas and some lower-income urban areas, affordability of water and wastewater services is becoming more of an issue. Serving the growing US population, as well as replacing and rehabilitating existing infrastructure, puts pressure on local officials to increase rates (US Conference of Mayors 2015). Addressing the affordability of public water supplies needs to be a consideration as the drinking water community explores trade-offs in potential benefits with the cost of compliance when looking beyond the 1996 SDWA amendments.

TABLE 3 Benefits and costs estimated by USEPA for key regulations from the 1996 SDWA amendments

Regulation	Illness Cases Avoided	Annualized Benefits *millions of $/year*	Annualized Cost *millions of $/year*
DBPR[a]	Fatal and nonfatal cancer: 280	2,290	80
LT2ESWTR[b]	Nonfatal illnesses: 170,000–336,000 Fatal illnesses: 39–74	335–645	110–120
Arsenic[c]	Nonfatal cancers: 7–17 Fatal cancers: 11–19	70–120	115

DBPR—Disinfectants and Disinfection Byproducts Rule, LT2ESWTR—Long Term 2 Enhanced Surface Water Treatment Rule, SDWA—Safe Drinking Water Act, USEPA—US Environmental Protection Agency

[a]USEPA 2005a
[b]USEPA 2005b
[c]USEPA 2001

HOW HAS AWWA SHAPED REGULATORY OUTCOMES?

More focused advocacy work was needed for the regulatory mandates and schedules in the 1986 SDWA amendments, and these mandates and schedules did not fit with the traditional AWWA committee structure. In 1987, the AWWA Water Utility Council established a series of technical advisory workgroups to collect data and information and to provide technical and policy input into the regulatory development process. At the same time, several water organizations started the Water Industry Technical Action Fund (WITAF) to provide funding for contracts for data collection and analysis, and to pay for volunteer travel for meetings to develop the technical and policy input. WITAF has funded several hundred projects since the late 1980s that have played a major role in framing all of the regulations that resulted from the 1996 SDWA amendments. WITAF started out being funded with an assessment to water systems, and later, when the funding from those assessments started to run out in the early 1990s, shifted to being funded by a portion of AWWA organizational members' dues.

AWWA responded to the 1996 SDWA amendments by increasing staff in its Washington, D.C., office and increasing volunteer involvement in the 17 NDWAC workgroups. This active volunteer involvement in the regulatory development process continued to the present day.

Taking time to look back at the last 20 years of the regulatory development process, one can see several instances in which AWWA has positively "shaped" regulations. It's not that AWWA "won," because with a winner, typically there is a loser, and nobody wants USEPA or drinking water consumers to be the "losers" of drinking water regulations and public health protection. But AWWA has the capability to collect data that USEPA cannot because of budgetary and data collection restrictions, and this capability has ensured that all of the national primary drinking water regulations over the past 20 years have been based on the best available science.

To follow is a list of the drinking water regulations that AWWA has been most effective in helping to shape, and how, over the past 20 years:

- Lead and Copper Rule: no lead maximum contaminant level (MCL) at the tap was implemented, as was originally proposed
- Arsenic: 10 µg/L instead of 5 µg/L as proposed, using the new discretionary authority in the 1996 SDWA amendments to set an MCL at a higher level than is strictly feasible
- Uranium: MCL set at 30 µg/L, using the same discretionary authority
- Filter Backwash Recycling Rule (FBRR): no mandated treatment for filter backwash
- Information Collection Rule (ICR): successful implementation of the rule, the largest mandated drinking water data collection effort that served as the foundation for the Microbial/DBP (M/DBP) cluster of regulations
- LT2ESWTR: a toolbox of compliance options rather than an MCL for *Cryptosporidium*
- Stage 2 DBPR: no MCL for total organic carbon and the 80/60 µg/L locational running annual average (LRAA) for TTHMs and five haloacetic acids (HAA5) instead of a 40/30 MCL, and the operational evaluation level that synthesizes the LRAA instead of a "single hit" of 100 µg/L
- Ground Water Rule: no mandate for all groundwater systems to disinfect
- Revised Total Coliform Rule (RTCR): eliminating the total coliform MCL and replacing it with the "find and fix" regulatory framework through the Level 1 and Level 2 assessments
- RTCR (which was originally called the Revised Total Coliform and Distribution System Rule): no distribution system regulations being promulgated
- CCRs: electronic delivery approved
- Fire hydrants: not required to meet the revised lead-free standards

AWWA is always looking for volunteers who have an interest in national drinking water policy to participate in the regulatory development process and needs knowledgeable volunteers who have a desire to learn more, and, most importantly, the ability to step back and think about how the subject being debated might affect all systems across the country.

WHAT ARE THE NEXT BIG CHALLENGES?

As we contemplate the potential re-authorization of the SDWA in 2016 (or thereafter), two questions will need to be answered. What are the challenges that should be addressed at the national level? Or has the SDWA accomplished its mission, meaning our focus should be on improving compliance rates, addressing the capital challenges of municipalities to maintain their infrastructure, and building public confidence in both the value and safety of public water supplies?

Since 1996, several events outside of the traditional SDWA regulatory development processes have complicated utilities' planning efforts as a result of the uncertain scope of the potential impacts. The events of 9/11 led to additional SDWA amendments in 2002 that required water systems serving more than 10,000 people to develop vulnerability assessments and emergency response plans. Since then, emergency preparedness has evolved from meeting the regulatory requirements for vulnerability assessments and emergency response plans

to an all-hazards approach that addresses a wide range of potential natural and man-made threats, as well as cybersecurity and responses to changes in climate and precipitation patterns.

More recently, the 4-methylcyclohexanemethanol (4-MCHM) spill in West Virginia and the algal bloom in Lake Erie that led to a "do not drink/do not boil" order in Toledo, Ohio, are just a couple of examples of the evolving threats to source waters. Generally, the current SDWA regulatory development processes are not designed for a timely reaction to such evolving threats. However, one thing is clear: the development of new standards and the revision of existing standards has slowed—and that may or may not be a good thing.

The 1996 SDWA amendments mandated two regulatory development processes. For new contaminants, the Contaminant Candidate List (CCL) serves as the starting point, with decisions made from the CCL on whether a contaminant would provide a "meaningful opportunity for health risk reduction." Since the 1996 SDWA amendments, USEPA made one final positive determination for perchlorate in 2011, and a preliminary positive determination for strontium in 2014. No final regulations have been developed for any CCL contaminants.

It should be noted that perchlorate was listed on the first CCL (CCL1) in 1998 and was included in the Unregulated Contaminant Monitoring Rule 1 in 1999, and the scientific debate about its potential health effects from drinking water exposure continues. The preliminary positive determination for strontium was primarily based on a reduction in the health reference level from 4,200 µg/L to 1,500 µg/L. The debate is ongoing as to whether a national drinking water regulation for either one of these contaminants would provide a "meaningful opportunity for risk reduction" as mandated by the SDWA.

The process for reviewing and potentially revising existing drinking water regulations every six years appears to be working a little better than the process for identifying and potentially regulating new contaminants. USEPA, on the basis of recommendations from another NDWAC workgroup process, published the final RTCR in 2013. Because of the extensive stakeholder effort through the NDWAC workgroup, this revision took 10 years, as the 1989 Total Coliform Rule was identified as the first regulation that needed revision in the first Six-Year Review in 2003.

The process by which USEPA identifies potential contaminants for regulation lacks a cohesive and well-coordinated research agenda. Outside of the research plans developed for arsenic and M/DBPs in the mid-1990s, USEPA has not developed an effective research plan for a new contaminant that has been listed on any CCL. Although there are many contaminants that may be in the environment, without further research on analytical methods, health effects, and occurrence/exposure potential, USEPA seems to be struggling to support reasonable decisions on regulatory need and to develop appropriate regulatory standards.

Another aspect of the drinking water regulatory development is how USEPA does (or does not) use the many resources available to it from its other programs:

- The Pesticide Program could provide information on human toxicity issues.
- The Air Program has unintentionally affected the formation of brominated DBPs downstream of power plants that have installed bromide scrubbers to remove mercury from emissions.
- The Clean Water Act, if managed differently or at least in concert with the SDWA, could significantly reduce the effect on the quality of source waters for many utilities.
- The Integrated Risk Information System, if better funded, could more quickly inform USEPA on human health risks of many contaminants.

ARE LOCALIZED ISSUES OUTWEIGHING NATIONAL CONCERNS FOR WATER QUALITY?

When considering the challenges facing the drinking water community, the ability to effectively respond to and manage local water quality events is important. Spill events occur frequently in our nation's water supplies, and the threat level posed depends on the volume and location of specific spills. The majority of these spills are small enough in volume so as to go undetected in drinking water supplies. However, when large spills occur, utilities are often working with insufficient information about the nature of the spill. Having greater transparency between water utilities and chemical producers and retailers when spill events occur is critical. Establishing a standard practice and conditions by which proprietary information on spilled chemicals can be shared is important to ensuring that utilities can respond appropriately under a range of spill conditions. Additionally, greater access to emergency remediation systems, laboratory capabilities, and alternative water supplies (e.g., tank trucks, interconnections when available) are important to assisting utilities affected by major spill events in their watershed.

Additionally, national drinking water standards may not be necessary for contaminants that may occur in a handful of states. Clearly, a contaminant that occurs in 25 states at a level of health concern warrants a thorough analysis to determine if a national regulation is warranted. But a different approach may be needed for a contaminant that occurs in five or six states. It may make more sense from a policy perspective for

USEPA to develop guidelines that those five or six states could use for their own state-level standards and not impose a regulatory burden on the balance of the states to follow a national regulation or on the water systems to conduct the first round of initial monitoring under a national regulation.

WHERE DO WE GO FROM HERE?

Overall, the 1996 SDWA amendments have been successful in addressing important public health concerns in drinking water. But this does not mean that we are done. There are several areas where improvement is needed in the implementation of the 1996 amendments. The following improvements fall outside of new legislative initiatives but should be a focus for the drinking water community as we move forward.

- **Increase compliance with existing regulations.** The most recent data available on compliance from 2013 show that improvements are occurring nationally, but work is still needed (USEPA 2013b). Only 3% of public water systems were identified as priorities for enforcement because of the severity of their noncompliance conditions—a reduction of 1% from 2012. However, 25% of public water systems were identified in 2013 as having at least one significant noncompliance event for either health-related (7%) or monitoring- and reporting-related (18%) violations. Improvement is needed to ensure that all US consumers receive the health benefits intended through the 1996 amendments.
- **Enhance the methodology for identifying contaminants of regulatory concern.** The methodology used by USEPA to produce CCLs does not produce prioritized results whereby the best opportunities for meaningful risk-reduction are likely to be available. Further, with the large number of contaminants that make up the CCLs, USEPA does not have the resources for the necessary research and information collection to make appropriate regulatory determinations. AWWA has provided recommendations on ways to improve the agency's methodology to achieve more targeted and meaningful outcomes.
- **Retire the regulation of contaminants that are no longer of concern in the Six-Year Review process.** Because of concerns over potential back-sliding for public health protection, USEPA has not made any regulatory determinations within the Six-Year Review process to retire the regulation of contaminants that are no longer of national concern in drinking water (e.g., dichlorodiphenyltrichloroethane [DDT], asbestos fibers). Some of these regulations can impose substantial monitoring expenses, and they can also confuse the public as to what might or might not be in their drinking water supplies. Attention is needed to define a method for retiring nonrelevant regulations that will not raise concerns for the potential back-sliding of public health protection.
- **Implement a consistent and streamlined process to access DWSRF money.** Improved use of the DWSRF could help ensure that water costs remain affordable and ensure continued accessibility to high-quality drinking water for all US consumers. A more streamlined funding application process with less red tape should be put in place to provide consistency in loan approval processes and encourage utilities to fund improvements through the DWSRF.

As to the future for reauthorization of the SDWA, a number of policy initiatives should be considered to address the dynamic and increasingly complex problems facing drinking water utilities and their consumers:

- Notification methods for relevant spill events in local watersheds
- Authorization for the development of an emergency water supply network of providers for such services as laboratory analyses, portable treatment systems, and tanked/trained water supplies, in coordination with the Federal Emergency Management Agency (FEMA) and beyond FEMA-managed events
- Process by which proprietary chemicals, when spilled in the environment, must be sufficiently identified to enable detection and facilitate an assessment of the appropriate methods for remediation
- Additional drinking water policy research to start collecting data that inform decision-making for potential reauthorization of the SDWA and for changing the implementation of the current SDWA, as well as to start the process of developing a broader suite of SDWA metrics beyond simple compliance with the regulations

The SDWA and its 1996 amendments have improved the quality of drinking water in the United States, but more work is needed and the future is expected to hold greater successes still. This is an exciting time to be a part of the drinking water community.

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REFERENCES

66 FR 6975, 2001. National Primary Drinking Water Regulation; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring. www.gpo.gov/fdsys/granule/FR-2001-01-22/01-1668 (accessed Feb. 5, 2016).

Kepple, K.A.; Gaines, D.; Murphy, J.; Carroll, D.; McCoy, K.; St. John, O.; & McGarrity, T., 2012. USA Today Analysis—Water Costs Gush Higher. *USA Today*, Sept. 27. www.usatoday.com/story/money/business/2012/09/27/rising-water-rates/1595651/ (accessed Nov. 11, 2015).

PL (Public Law) 93-523, 1974. Safe Drinking Water Act. *88 Statue 1660.*

PL 99-359, 1986. Safe Drinking Water Act Amendments of 1986. *88 Statute 642.*

PL 104-110, 1996. Safe Drinking Water Act Amendments. *88 Statue 1613.*

Seidel, C.; Gosh, A.; Tang, G.; Hubbs, S.; Raucher, R.; & Crawford-Brown, D., 2014. Identifying Meaningful Opportunities for Drinking Water Health Risk Reduction in the United States. Water Research Foundation, Denver.

Statista, 2015. Per Capita Consumption of Bottled Water in the United States from 1999 to 2014 (in Gallons). www.statista.com/statistics/183377/per-capita-consumption-of-bottled-water-in-the-US-since-1999/ (accessed Nov. 11, 2015).

Thompson, D., 2013. How America Drinks: Water and Wine Surge, Cheap Beer and Soda Crash. *The Atlantic*, Jan. 15. www.theatlantic.com/business/archive/2013/01/how-america-drinks-water-and-wine-surge-cheap-beer-and-soda-crash/267153/ (accessed Nov. 11, 2015).

US Conference of Mayors, 2015. Struggling Local Government Finances and Decelerating Public Water Investment. www.usmayors.org/urbanwater/publicwaterinvestmentreport2015.pdf (accessed Nov. 11, 2015).

USEPA (US Environmental Protection Agency), 2013a. Fiscal Year 2011 Drinking Water and Ground Water Statistics. EPA Document 816-R-13-003. Office of Water, Washington.

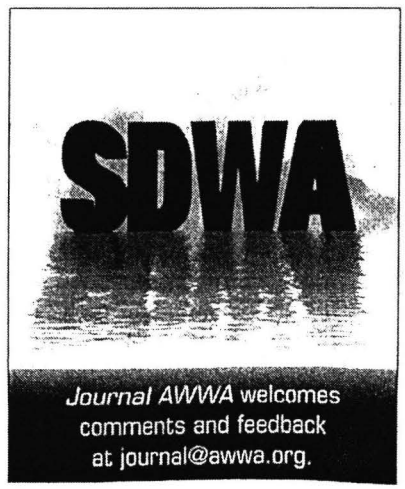
USEPA, 2013b. Providing Safe Drinking Water in America: 2013 National Public Water System Compliance Report. EPA Document 305-R-15-001. Office of Enforcement and Compliance Assurance, Washington.

USEPA, 2005a. Economic Analysis for the Final Stage 2 Disinfectants and Disinfection Byproducts Rule. EPA Document 815-R-05-010. Office of Water, Washington.

USEPA, 2005b. Economic Analysis for the Final Long Term 2 Enhanced Surface Water Treatment Rule. EPA Document 815-R-06-001. Office of Water, Washington.

Walton, B., 2015. Price of Water 2015: Up 6 Percent in 30 Major U.S. Cities; 41 Percent Since 2010.www.circleofblue.org/waternews/2015/world/price-of-water-2015-up-6-percent-in-30-major-u-s-cities-41-percent-rise-since-2010/ (accessed Nov. 11, 2015).

AWWA RESOURCES

- The Middle-Aged Safe Drinking Water Act. Roberson, J.A., 2014. *Journal AWWA*, 106:8:96. Product No. JAW_0080655.
- State Drinking Water Program Perspectives. Forbes, C., 2015. Proc. 2015 Annual Conference and Exposition. Catalog No. ACE_0082501.
- Drinking Water Regulation. AWWA. www.awwa.org/legislation-regulation/regulations/drinking-water-regulation.aspx.

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