



Using DWSRF Funds to Comply with the Stage 1 Disinfectants and Disinfection Byproducts Rule

The Drinking Water State Revolving Fund (DWSRF) program was established by the 1996 Safe Drinking Water Act (SDWA) Amendments and authorizes grants to states to capitalize revolving loan funds. The states provide low-interest loans to eligible systems for infrastructure improvements needed to ensure compliance with the SDWA and protect public health. The DWSRF program can play a significant role in helping systems, especially small systems, to meet the challenges of complying with new drinking water standards.

The Environmental Protection Agency (EPA) published the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) in 1998. The Stage 1 DBPR increases public health protection from disinfection byproducts (DBPs) and excess disinfectants by establishing new standards (see Exhibit 1) and expanding the regulations to include most public water systems. In addition, the Stage 1 DBPR sets a required removal percentage of total organic carbon (TOC) for surface water and ground water under the direct influence of surface water (Subpart H) systems that use conventional filtration treatment or lime softening. The new standards will impose significant financial burdens on some water systems. The DWSRF can provide assistance to systems to help ease this burden, increase compliance, and protect public health.

Exhibit 1: New or Revised Standards (mg/L)	
TTHMs	0.080
Five Haloacetic Acids (HAA5)	0.060
Chlorite	1.0
Bromate	0.010
Chloramines	4.0
Chlorine	4.0
Chlorine Dioxide	0.8

WHY DID EPA CREATE THIS RULE?

In 1979, EPA began regulating DBPs in drinking water by establishing an interim maximum contaminant level (MCL) for total trihalomethanes (TTHMs) that only applied to disinfecting community water systems (CWSs) serving at least 10,000 people. Although disinfectants are critical for inactivating microorganisms, they are harmful when consumed in excessive quantities and react with naturally occurring matter in source water to form harmful DBPs. DBPs have been shown to cause bladder cancer and adverse developmental and reproductive effects in laboratory animals. The 1996 SDWA Amendments required EPA to develop rules that balance the risks from microbial pathogens and DBPs. The Stage 1 DBPR expands health protection for 140 million Americans that drink disinfected water. The Long Term 1 and Interim Enhanced Surface Water Treatment Rules, being implemented concurrently, will ensure that reducing the risks from DBPs will not increase the risks from microbial pathogens.

TO WHOM DOES THIS RULE APPLY?

The Stage 1 DBPR applies to all CWSs and non-transient non-community water systems (NTNCWSs) that add a chemical disinfectant, regardless of system size or source water type. In addition, transient non-community water systems (TNCWSs) that use chlorine dioxide must comply with chlorine dioxide standards.

Source Type	System Type	Population Type
Surface Water ✓	CWSs ✓	< 10,000 ✓
Ground Water ✓	NTNCWSs ✓	10,000 - 100,000 ✓
GWUDI ✓	TNCWSs ✓	> 100,000 ✓

CRITICAL RULE DEADLINES & REQUIREMENTS

FOR SYSTEMS		FOR STATES
February 16, 1999	Methods specified for analyzing DBPs, disinfection residuals, and DBP precursors were approved for use.	
	States submitted Stage 1 DBPR primacy revision applications to EPA (triggered interim primacy).	December 16, 2000
January 1, 2002	Subpart H systems serving ≥ 10,000 people must comply with the Stage 1 DBPR requirements.	
	Primacy extension deadline—all states with an extension must submit primacy revision applications to EPA.	December 16, 2002
January 1, 2004	Compliance deadline for systems which received an extension from the state to install Granular Activated Carbon (GAC) or membranes.	
January 1, 2004	Subpart H systems serving < 10,000 people and all ground water systems must comply with the Stage 1 DBPR requirements.	
June 30, 2005	Systems that made a clear and irrevocable financial commitment before the applicable compliance date to install technologies that limit TTHM to 0.040 mg/L and HAA5 to 0.030 mg/L must have these technologies operating.	

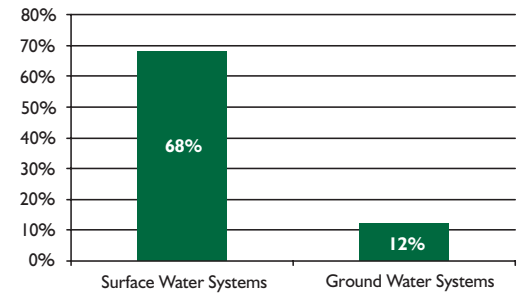
HOW WILL THIS RULE IMPACT SYSTEMS?

The costs systems will face to meet the Stage 1 DBPR standards are significant. EPA estimates that the total capital costs for investments in treatment technology and infrastructure will be over \$2.3 billion (see Figure 1). In addition, annual operation & maintenance (O & M) and monitoring costs for systems will exceed \$450 million. Most surface water systems will face increased costs to comply with the Stage 1 DBPR standards (see Figure 2).

Figure 1: TOTAL STAGE 1 DBPR PRICE TAG (in millions of 1998 \$)

		Capital Costs by System Size		
		Surface Water	Ground Water	
		< 100	\$6	\$69
		101-500	\$16	\$181
		501-1,000	\$25	\$169
		1,001-3,300	\$50	\$327
		3,301-10,000	\$146	\$252
		10,001-100,000	\$286	\$382
		> 100,000	\$269	\$146
Capital Costs	\$2,323			
Annual O & M Costs	\$362.5			
Annual Monitoring Costs	\$90.6			

Figure 2: Percentage of All Affected Systems Requiring Additional Treatment



Of the 76,000 systems that disinfect, EPA estimates that 5,000 surface water and 8,500 ground water systems will require additional treatment capability to comply with the Stage 1 DBPR (see Figure 3). To be in compliance with the Stage 1 DBPR, systems will need to make capital investments immediately. A majority of the systems that are facing a capital investment serve less than 500 people.

Figure 4 shows, on average, how much it will cost systems annually to comply with the Stage 1 DBPR. The estimated cost of compliance per smaller system is considerably lower than the cost for larger systems because less water must be treated, which allows systems to utilize cheaper treatment options. In general, the costs faced by surface water systems are lower

because most surface water systems will only need to upgrade treatment technology (coagulation or softening) already in place. However, the burden on small system households is significantly higher because the costs must be paid from a much smaller revenue base.

Figure 4 does not show the steep costs that the largest systems will experience. Ground water systems that will need to install new treatment and serve between 10,000 and 100,000 people face per system costs of over \$330,000 (\$110,000 for surface water systems of similar size). The 12 ground water systems that serve more than 100,000 people that will need to install new treatment will each face (on average) over \$2.6 million in annual compliance costs (\$1.1 million for the 141 surface water systems of similar size).

An estimated 116 million households are served by systems affected by the Stage 1 DBPR. EPA estimates that 95% of these households, which are primarily served by large systems, will see their monthly water bills increase by less than \$1, 4% are expected to see an increase of \$1 to \$10, and 1% are expected to see an increase of \$10 to \$40. Most of the 1 million households facing the largest increase are served by small ground water systems that face DBP regulations for the first time and will need to install expensive treatment processes.

Figure 3: Number of Systems That Will Need to Install New Treatment to Comply with the Stage 1 DBPR

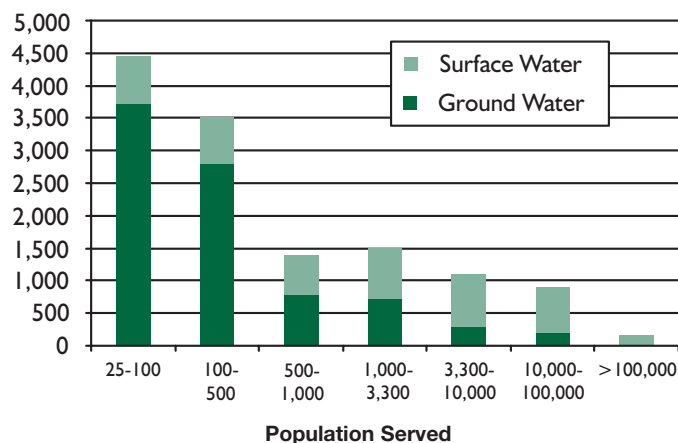
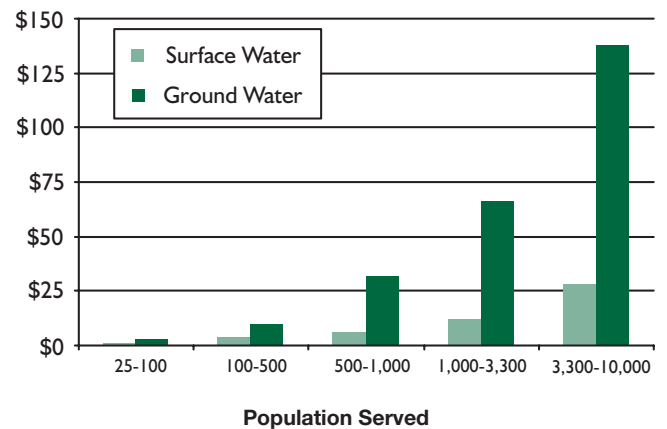


Figure 4: Average Annual Cost per System That Will Need to Install New Treatment to Comply with the Stage 1 DBPR (in thousands of 1998 \$)



Note: Costs based on total costs amortized over 20 years at a 3% discount rate.

WHAT TYPE OF TREATMENT WILL SYSTEMS HAVE TO PUT IN PLACE?

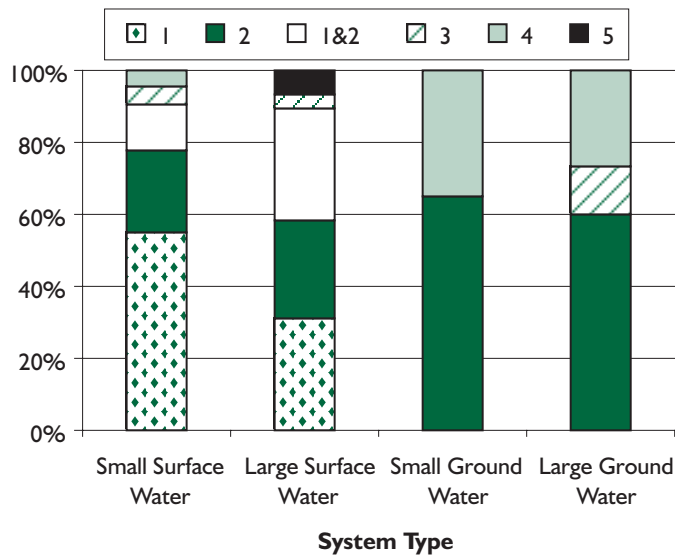
The Stage 1 DBPR introduces MCLs, maximum residual disinfectant levels (MRDLs), and a treatment technique requirement. The current DBP MCL for TTHMs has been tightened and expanded to apply to all disinfecting CWSs and NTNCWSs. An additional DBP MCL for HAA5 has been created that applies to the same systems. Two new DBP MCLs have been created for chlorite and bromate that only affect the limited number of systems that disinfect with chlorine dioxide and ozone, respectively. Systems can control DBP levels using a variety of methods, including decreasing the contact time and/or the concentration of the disinfectant, changing disinfectants, altering water pH, or installing additional treatment capability (see Exhibit 2). Treatment options, like enhanced coagulation, membranes, and GAC filters, remove the naturally occurring precursors that are necessary for DBP formation and/or capture the DBPs themselves.

Exhibit 2: Treatment Options for Stage 1 DBPR Compliance*

1 Enhanced Coagulation
2 Modified Chlorine/Chloramine Disinfection Process
3 Ozone Treatment
4 Membrane Filtration
5 Other (e.g., Chlorine Dioxide, Granular Activated Carbon, and Consolidation).

*Referenced in Figures 5 and 6

Figure 5: Percent of Systems Using Various Treatment Options for Stage 1 DBPR Compliance

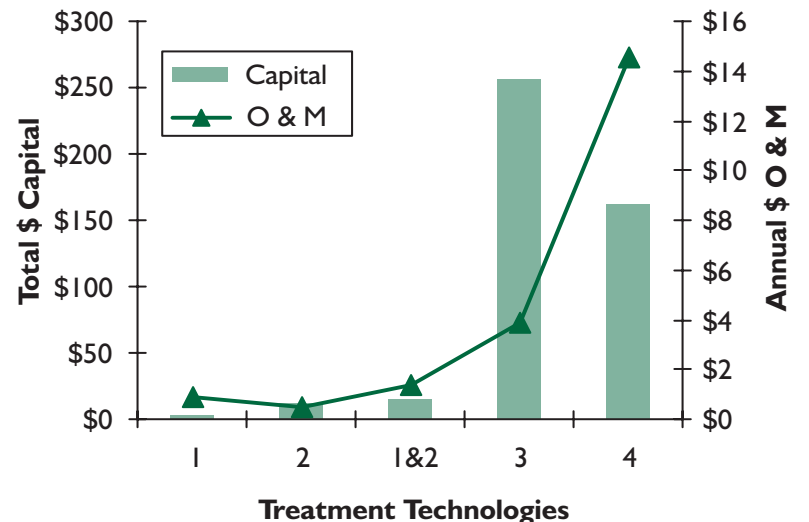


The term MRDL, which is not in the SDWA, was created to distinguish disinfectants (because of their beneficial use) from contaminants. The Stage 1 DBPR created MRDLs for chloramines, chlorine, and chlorine dioxide. Only systems that add chlorine or chloramine to their water must meet the chloramine and chlorine MRDL. Likewise, only systems using chlorine dioxide are subject to the chlorine dioxide MRDL. Rather than face large capital costs, systems exceeding an MRDL will likely alter the operations of their treatment processes to reduce the need for disinfectant and lower disinfectant levels.

Subpart H systems already using conventional filtration treatment are required to remove a certain percentage of TOC, based on surface water alkalinity. These systems will accomplish this removal by enhancing their coagulation or softening capability, unless certain alternative criteria are met. This treatment technique requirement only applies to systems that already have the treatment infrastructure in place in order to minimize compliance costs.

Most of the capital costs faced by systems will be generated by installing, operating, and maintaining treatment technologies to comply with the MCLs for DBPs. Most small water systems will only have to meet the MCLs for TTHMs and HAA5 and the MRDLs for chlorine and chloramines. EPA estimates that most water systems out of compliance with an MCL will either install enhanced coagulation technology, modify the chlorine/chloramine disinfection process, or do both (see Figure 5). Some ground water systems may install membrane filters to control DBP levels. As shown in Figure 6, the total capital and annual O & M costs for small systems to install and run membrane filtration or ozonation treatment is much more expensive than enhancing existing coagulation technology and/or modifying the chlorine or chloramines process.

Figure 6: Representative Annual Compliance Costs for Systems Serving Populations of 101-500 (in thousands of 1998 \$)



Note: All costs are based on average flow (8 million gallons) for the median population. Capital costs are total (not annualized). O & M costs are annualized at a 3% discount rate.

HOW CAN THE DWSRF ASSIST SYSTEMS?

States use DWSRF capitalization grant monies to provide low-interest loans to publicly- and privately-owned public water systems for infrastructure improvements needed to continue to ensure safe drinking water. States may offer principal forgiveness, reduced interest rates, or extended loan terms to systems identified by the state as serving disadvantaged communities. States also have the ability to reserve a portion of their grants (i.e., set-asides) to finance activities that encourage enhanced water system management and help to prevent contamination problems through source water protection measures. Based on the fiscal year 2002 appropriation of \$850 million, capitalization grants ranged from \$8.0 million to \$82.4 million per state.

Most capital projects – including adding new technologies and upgrading existing technologies – needed to comply with the Stage 1 DBPR are eligible for funding under the DWSRF (see Exhibit 3). Consolidation and restructuring of systems can be a cost-effective alternative to treatment for small systems that are affected by the Stage 1 DBPR. The DWSRF can fund consolidation, including situations where the quality of a supply source has deteriorated or a system is unable to maintain compliance for technical, financial, or managerial reasons.

States can use set-aside funds from the DWSRF to assist systems directly as well as to enhance their own program management activities (see Exhibit 3). A state may use set-asides to make administrative improvements to the entire drinking water program, which faces increased costs in implementing the Stage 1 DBPR. States can provide training to small systems on meeting the requirements of the Stage 1

DBPR as well as technical assistance in identifying appropriate technologies. In addition, states can provide assistance to small systems to cover the costs of project planning and design for infrastructure improvements.

Since the DWSRF program is managed by states, project and set-aside funding varies according to the priorities, policies, and laws within each state. Given that each state administers its own program differently, the first step in seeking assistance is to contact the state DWSRF representative which can be found on the EPA DWSRF website.

Pascagoula, Mississippi

The water system serving the Gulf Coast City of Pascagoula, Mississippi was having trouble meeting the MCL for TTHMs. To address this issue, the city decided to build three reverse osmosis water treatment plants with ozone filters to serve its 35,000 residents. DWSRF loans were made in the amount of \$1.3 million for the first plant, \$1.2 million for the second, and \$1.5 million for the third. With two of the three plants operational, the water in Pascagoula is now in compliance.

Exhibit 3: Projects/Activities Eligible for DWSRF Funding to Comply With Stage 1 DBPR

Type of Project/Activity	Eligible Under Infrastructure Fund	Eligible Under Set-Asides
Treatment		
Enhanced Coagulation	Yes	No
Ozone	Yes	No
Modified Chlorine/Chloramine Disinfection Process	Yes	No
Membrane Filtration	Yes	No
Granular Activated Carbon	Yes	No
Planning & Design Activities	Yes	Yes*
System Consolidation	Yes	No
System Restructuring	Yes	Yes
System Administrative Improvements		
Hire Staff	No	No
Staff Training	No	Yes
Public Outreach	No	Yes
Monitoring	No	No
Rate Increase Process	No	Yes
State Administrative Improvements		
Hire Staff	No	Yes
Staff Training	No	Yes
Public Outreach	No	Yes
Compliance Oversight	No	Yes
Enforcement	No	Yes
Pilot Studies	No	Yes

*For small systems only.

FOR MORE INFORMATION...

DWSRF and Stage 1 DBPR

DWSRF Website:
<http://www.epa.gov/safewater/dwsrf.html>

Microbial & DBP Website:
<http://www.epa.gov/safewater/mdbp.html>

General Information

SDWA Hotline
 1-800-426-4791

EPA's Ground Water & Drinking Water Website:
<http://www.epa.gov/safewater/>

Office of Ground Water and Drinking Water (4606M)

EPA 816-F-02-007

May 2002