Stage 2 Disinfection Byproduct Rule: What Does It Mean for You?

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The U.S. Environmental Protection Agency (EPA) finalized the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) in January 2006. The objective of the rule is to lower consumer health risks from high levels of disinfection byproducts (DBPs) in the distribution system.

The rule applies to all community water systems and to those non-transient non-community water systems serving at least 10,000 people. It requires systems to establish a new set of compliance monitoring sites and changes the way DBP compliance is calculated.

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If you are this kind of system:	You are on schedule:
Serve ≥100,000 OR are part of a Combined Distribution System where the largest system serves > 100,000	1
Serve 50,000 – 99,999 OR are part of a Combined Distribution System where the largest system serves 50,000 – 99,999	2
Serve 10,000 – 49,999 OR are part of a Combined Distribution System where the largest system serves 10,000 – 49,999	3
Serve < 10,000 and not connected to a larger system	4

Table 1. IDSE Schedule Numbers

If you serve this population…	Must submit standard monitoring plan or system specific study plan or 40/30 certification to EPA by…	Must complete standard monitoring or system specific study by…	Must submit IDSE report to state by…
Systems that are not part of a combined distribution system and systems that serve the largest population in the combined distribution system			
Schedule 1: ≥100,000	October 1, 2006	September 30, 2008	January 1, 2009
Schedule 2: 50,000 - 99,999	April 1, 2007	March 31, 2009	July 1, 2009
Schedule 3: 10,000 - 49,999	October 1, 2007	September 30, 2009	January 1, 2010
Schedule 4: < 10,000 (CWS Only)	April 1, 2008	March 31, 2010	July 1, 2010
Other systems that are a part of a combined distribution system			
Wholesale system or consecutive system	At the same time as the system with the earliest compliance date in the combined distribution system	At the same time as the system with the earliest compliance date in the combined distribution system	At the same time as the system with the earliest compliance date in the combined distribution system

Table 2. IDSE Compliance Dates

Initial Distribution System Evaluation

In order to establish permanent DBP monitoring sites, utilities are required to complete an Initial Distribution System Evaluation (IDSE), a one-time study conducted to identify monitoring locations within the distribution system that represent high total trihalomethane (TTHM) and haloacetic acid (HAA_5) concentrations. Systems will use the results of the IDSE along with Stage 1 compliance data to select compliance monitoring locations for the Stage 2 DBPR.

Two categories of systems are exempt from the IDSE requirement (unless EPA or the state notifies a utility otherwise):

- Very Small System Waiver—A waiver for IDSE monitoring will be issued for small systems serving less than 500 people that have existing TTHM and HAA_5 data. If your system has existing data, there are no other IDSE requirements. A Stage 2 monitoring plan is required and is similar to the Stage 1 monitoring plan.
- 40/30 Certification—Systems with low historic DBP concentrations may be granted a certificate in lieu of monitoring under the IDSE requirement. Stage 1 compliance data must demonstrate that all TTHM and HAA_5 results are less than 40 µg/L and 30 µg/L, respectively, for eight consecutive calendar quarters during a specified period. The system must have no DBP monitoring violations. A 40/30 Certification Letter must be submitted to the EPA on the appropriate date and there are no further IDSE requirements.

All other systems are required to complete an IDSE. The EPA has established four schedules for completing the IDSE and for compliance with the Stage 2 MCLs at new monitoring sites. Utilities must first establish their schedule using the information in Table 1. The compliance dates for the IDSE are shown in Table 2, and the compliance date for meeting MCLs at Stage 2 sampling sites can be found in Table 3.

The IDSE may be completed using one

If you are this type of system serving…	You must comply with Subpart V monitoring by[1]…
Systems that are not part of a combine distribution system and systems that serve the largest population in the combined distribution system	
Schedule 1: ≥100,000 people	April 1, 2012
Schedule 2: 50,000 to 99,999 people	October 1, 2012
Schedule 3: 10,000 to 49,999 people	October 1, 2013
Schedule 4: < 10,000 people	October 1, 2013 OR October 1, 2014, if Cryptosporidium monitoring is required
Other systems that are a part of a combined distribution system	
Wholesale system or consecutive system	At the same time as the system with the earliest compliance date in the combined distribution system

[1] The state may grant up to an additional 24 months for compliance with MCLs and operational evaluation levels if you require capital improvements to comply with an MCL.

Table 3. Compliance Monitoring Dates

of two options: the Standard Monitoring Plan approach or the System Specific Study. The EPA expects most systems to use the Standard Monitoring Plan (SMP) approach. Extensive details for both options can be found in the IDSE Guidance Document (EPA Web site at **http://www.epa.gov/safewater/disinfection/stage2**).

Standard Monitoring Plan

The SMP approach requires one year of distribution system monitoring on a specified schedule throughout the distribution system. The frequency and number of samples required are determined by the system size and the source water type as shown in Table 4.

Every system performing an IDSE must submit an IDSE plan that includes the population served, system type (Subpart H or groundwater), the number of required IDSE sampling sites, the location of each sampling site, a schematic of the distribution system showing major facilities and the IDSE sampling sites, a rationale for having selected each sampling site, and a sampling schedule that includes the peak historic month for DBP levels in the system.

The IDSE Plan can be submitted electronically to EPA using the IDSE Tool which is available at the http://ww.epa.gov/safewater/disinfection/stage2 Web site. The guidance manual provides sampling site selection advice for meeting IDSE requirements.

Site selection is expected to rely on numerous information sources such as water quality data, operating data, tracer studies, hydraulic models, GIS information, maps and others as necessary. The evaluation of selection sites must demonstrate adequate consideration of system information necessary to identify and select appropriate monitoring sites.

To avoid confusion about monitoring requirements and the number of sites, remember that there are really three iterations of monitoring site selection:

1. ***Preliminary site selection for IDSE monitoring.*** Picking double the required number to start with is recommended. Then trimming the set down to the number required in Table 4 will allow the utility to take into considering geographic distribution and any other system specific conditions that make sense.
2. ***IDSE monitoring sites.*** The required number specified in Table 4 is more than needed for Stage 2 compliance sites.
3. ***Stage 2 monitoring sites.*** These sites are selected based on data from the IDSE and Stage 1 compliance data and must meet the requirements listed in Table 5.

The EPA has built into the schedule a year for review of the IDSE plans. Once the plan is approved, the utility must carry out the plan and complete the sampling.

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Source Water Type	System Size (Population Served)	# of Monitoring Periods (Frequency of Sampling)	Distribution System Monitoring Locations				
			Total per monitoring period	Near Entry Point	Average Residence Time	High TTHM	High HAA_5
Subpart H	< 500 consecutive systems	One (during peak historical month)	2	1		1	
	< 500 non-consecutive		2	-	-	1	1
	500-3,300 consecutive	Four (every 90 days)	2	1	-	1	
	500-3,300 non-consecutive		2	-	-	1	1
	3,301-9,999	Six (every 60 days)	4	-	1	2	1
	10,000-49,999		8	1	2	3	2
	50,000-249,999		16	3	4	5	4
	250,000-999,999		24	4	6	8	6
	1,000,000-4,999,999		32	6	8	10	8
	≥ 5,000,000		40	8	10	12	10
Ground Water	< 500 consecutive systems	One (during peak historical month	2	1		1	
	< 500 non-consecutive	Four (every 90 days)	2			1	1
	500 – 9,999		2			1	1
	10,000 – 99,999		6	1	1	2	2
	100,000 – 499,999		8	1	1	3	3
	≥ 500,000		12	2	2	4	4

Table 4. IDSE Sampling Requirements

Water Type	Population Size Category	Monitoring Frequency	Distribution System Monitoring Location			
			Total per Monitoring Period	Highest TTHM Locations	Highest HAA_5 Locations	Existing Stage 1 DBPR Compliance Location
Subpart H	<500	Per year	2	1	1	
	500-3,300	Per Quarter	2	1	1	
	3,301-9,999	Per Quarter	2	1	1	
	10,000-49,999	Per Quarter	4	2	1	1
	50,000-249,000	Per Quarter	8	3	3	2
	250,000-999,999	Per Quarter	12	5	4	3
		Per Quarter	16	6	6	4
	≥5,000,000	Per Quarter	20	8	7	5
Ground Water	<500	Per year	2	1	1	
	500-9,999	Per year	2	1	1	
	10,000-99,999	Per Quarter	4	2	1	1
		Per Quarter	6	3	2	1
	≥500,000	Per Quarter	8	3	3	2

Table 5. Requirements for Stage 2 DBPR Compliance Monitoring Sites

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Analysis must be conducted by a certified laboratory.

When all the sampling is complete, assemble both the IDSE data and Stage 1 compliance data into a spreadsheet. Calculate the locational running annual average for each site and sort the sites in order of the highest to lowest LRAA for TTHMs and for HAA_5s. Using this sorted list, follow the protocol in the guidance document to select new Stage 2 compliance sites. The required number and type of Stage 2 compliance sites is shown in Table 5.

The final IDSE Report can be submitted electronically, similar to the IDSE Plan, from the EPA Web site using the IDSE tool. The final report must contain explanations for any deviation from the IDSE Plan, TTHM and HAA_5 data from the IDSE sampling and Stage 1 compliance sampling, recommendations and justification of Stage 2 DBPR compliance monitoring sites, and their locations and sampling dates. If anything has changed since the IDSE Plan was submitted, include a system schematic with appropriate sample locations identified.

After the final IDSE Report is submitted, the state or the EPA will have three months to review it. If no answer is received within three months of submission, the utility must assume the report is accepted and proceed to monitor for Stage 2 compliance at the new sampling locations.

System-Specific Study

Another option for conducting an IDSE is to perform a System-Specific Study (SSS) using historical DBP data or water distribution system modeling. Any results from an SSS must produce equal or superior identification of sites containing high DBP concentrations as would be identified through the SMP.

To qualify for the historical data option, a system must have data that is equivalent to what would be developed by performing an SMP. Municipalities lacking extensive historical data sufficient to satisfy IDSE requirements may benefit from the development of an IDSE hydraulic model. The cost of SMP sampling and lab analysis can outweigh the investment cost in developing an SSS model, especially for systems that have an existing hydraulic model that can be updated and calibrated to meet IDSE requirements.

The objective of an SSS model is to define water movement patterns and residence time within the distribution system. In order to satisfy IDSE requirements, models must meet a number of benchmark criteria. They must be capable of accurately simulating water quality and system operations over extended periods. This requires a detailed model with accurately distributed consumption demands; appropriate diurnal usage patterns; and adequate steady-state, extended-period, and water-quality calibration. The model must be detailed enough to represent at least 50 percent of the total system pipe length and 75 percent of the total system pipe volume.

Geo-coded water billing records are the recommended method for distributing consumptive demands. Diurnal patterns must vary demands each hour for a week or more during the model simulations. Calibration is expected to address system flows, pressures, and tank levels and to verify model-predicted water age with measured system samples. The model must be calibrated to the typical operational scenario during the peak historic month.

Although the effort necessary to develop an SSS model for most systems is not negligible, substantial benefits in addition to the IDSE can be realized. Practical uses for a developed model include master planning, design, operations optimization, water-chemistry changes, and energy efficiency. As a result of the required IDSE, municipalities with an existing system model may have good justification for developing a high-caliber, extended-period, water-quality model that will benefit the utility into the future.

The process for doing an IDSE using the SSS approach is similar to the SMP approach in that an IDSE Plan must be submitted to the EPA, which can be done electronically. The SSS Plan must include information about the utility and a description of how the model has been or will be calibrated to meet the requirements in the guidance manual.

Once the plan is approved, model runs must be documented, IDSE sample sites must be selected, and one round of samples must be collected from the proposed IDSE sites during the peak historical month. The analytical results at each site must then be reconciled with the predictions from the model for high TTHM and HAA_5 sites. Assuming the laboratory results support the original selection of sites, then the SSS can be completed as an SSS Report.

Stage 2 Compliance Monitoring

Compliance monitoring starts on the dates listed in Table 3 according to system size. The frequency of monitoring is established in Table 5, based on system size and source water. Compliance is based on the locational running annual average (LRAA) at individual monitoring sites selected from the IDSE.

The LRAA at each location must meet the MCLs. The TTHM MCL is 80 mg/L and the HAA_5 MCL is 60 mg/L. This shift in the method of calculating compliance effectively trims the peak DBP levels in the distribution system.

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