



Complying with the Stage 2 Disinfectant and Disinfection Byproducts Rule: Small Entity Compliance Guide

One of the Simple Tools for
Effective Performance (STEP) Guide Series



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NOTICE

This guide was prepared pursuant to section 212 of the Small Business Regulatory Enforcement Act of 1996 ("SBREFA"), Pub.L. 104-121. The statements in this document are intended solely as a guide to aid you in complying with the Stage 2 Disinfectant and Disinfection Byproduct Rule (71 FR 388, January 4, 2006). In any civil or administrative action against a small business, small government, or small non-profit organization for a violation of the Stage 2 Disinfectant and Disinfection Byproduct Rule, the content of this guide may be considered as evidence of the reasonableness or appropriateness of proposed fines, penalties, or damages. EPA may decide to revise this guide without public notice to reflect changes to EPA's approach to implementing the Stage 2 Disinfectant and Disinfection Byproduct Rule or to clarify or update text. To determine if EPA has revised this guide and/or to obtain copies, contact EPA's Small Business Ombudsman Office at 1-800-368-5888 or 202-566-2822 (Washington DC metropolitan calling area) or the Office of Ground Water and Drinking Water Safe Drinking Water Hotline at 1-800-426-4791 (e-mail: hotline-sdwa@epa.gov).

The statutory provisions and EPA regulations presented in this document contain legally binding requirements. This document is not a regulation itself, nor does it change or substitute for those provisions and regulations. It does not impose legally binding requirements on EPA, States or public water systems. While EPA has made every effort to ensure the accuracy of the discussion in this guidance, the obligations of the regulated community are determined by States, regulations or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this would not be controlling.

Primacy Agency

The primacy agency for almost all drinking water systems is the State drinking water or health agency. In some cases, however, EPA or tribal governments are the primacy agency. For example, as of the publication of this guide, the primacy agency for systems located in the Navajo Nation is the tribal office, and the primacy agency for systems located on other Tribal lands, in Wyoming, or in the District of Columbia is the EPA Regional office for that geographic area. **For the remainder of this document we will refer to the primacy agency as the “State,” but this also refers to EPA and any tribal government for systems that have one of them as a primacy agency.**

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Additional copies of this guide are available from the Safe Drinking Water Hotline at (800) 426-4791. Please reference document number EPA 815-R-07-014. You can also download the guide from EPA's Safe Drinking Water Web site at www.epa.gov/safewater/smallsys/ssinfo.htm

Acronyms

ART:	Average residence time	LRAA:	Locational running annual average
BAT:	Best available technology	LT1ESWTR:	Long Term 1 Enhanced Surface Water Treatment Rule
CWS:	Community water system	LT2ESWTR:	Long Term 2 Enhanced Surface Water Treatment Rule
DBP:	Disinfection byproducts	MCL:	Maximum contaminant level
DBPR:	Disinfectants and Disinfection Byproducts Rule	MCLG:	Maximum contaminant level goal
DWSRF:	Drinking Water State Revolving Fund	M-DBP:	Microbial and Disinfectants/Disinfection Byproducts
EPA:	United States Environmental Protection Agency	mg/L:	Milligrams per liter
FACA:	Federal Advisory Committee Act	MRDL:	Maximum residual disinfectant level
FR:	Federal Register	MRT:	Maximum residence time
GAC10:	Granular activated carbon with ten minute empty bed contact time and 180 day reactivation frequency	NOM:	Natural organic matter
GAC20:	Granular activated carbon with twenty minute empty bed contact time and 240 day reactivation frequency	NTNCWS:	Nontransient noncommunity water system
GWR:	Groundwater Rule	PWS:	Public water system
GWUDI:	Gound water under the direct influence of surface water	SBREFA:	Small Business Regulatory Enforcement Fairness Act
HAA5:	Haloacetic acids (five) (sum of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid)	SDWA:	Safe Drinking Water Act, as amended in 1986 and 1996
ICR:	Information Collection Rule	SWTR:	Surface Water Treatment Rule
IDSE:	Initial distribution system evaluation	TCR:	Total Coliform Rule
IESWTR:	Interim Enhanced Surface Water Treatment Rule	TOC:	Total organic carbon
		TTHM:	Total trihalomethanes
		UV:	Ultraviolet light
		VSS:	Very small system

STEP #1 - Is this Guide for Me?

This guide is designed for owners and operators of small community water systems (CWSs) and non-transient non-community water systems (NTNCWSs) serving fewer than 10,000 people that are required to comply with the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR). The Stage 2 DBPR applies to systems that meet all of the following four criteria:

Systems: All CWSs and NTNCWSs, including consecutive systems

Sources: All sources (surface water, ground water, ground water under the direct influence, and purchased water)

Population Served: All sizes, and

Treatment: Systems that disinfect or deliver water that has been disinfected using anything other than ultraviolet light (UV).

Systems that will typically find this guide useful include:

- Small towns
- Rural water districts
- Tribal systems
- Manufactured housing
- Homeowners associations
- Small private systems
- Factories, schools, and religious institutions that have their own water supplies

Note: If you are a consecutive system, meaning that you receive some or all of your water from another water system (see definition on page 3), you may also want to refer to EPA's *Consecutive Systems Guidance Manual* for more information on operational and capital changes and strategies that will enable consecutive systems to comply with the Stage 2 DBPR. See Appendix B for how to get copies of this or other guidance manuals and information about the Stage 2 DBPR.



Community water systems (CWSs) include all systems (regardless of ownership) that serve at least 25 year-round residents or 15 year-round service connections.

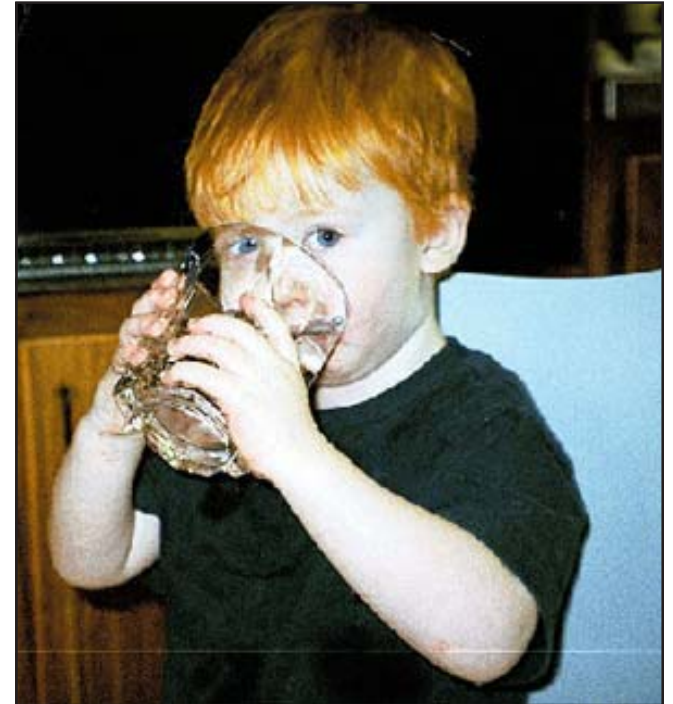
Non-transient non-community water systems (NTNCWSs) include all systems (regardless of ownership) that are not CWSs and that regularly serve at least 25 of the same people for at least 6 months of the year.

STEP #2 - What Will I Learn?

As a drinking water system's owner or operator, your most important job is protecting the health of your customers. This guide will help you by providing information about the following:

- How the Stage 2 DBPR affects your system
- Why high levels of disinfection byproducts (DBPs) may affect the health of your customers
- Your monitoring responsibilities under the Stage 2 DBPR, including worksheets to help you track your progress
- What to report to your State (or EPA) and customers
- The Compliance Assurance Process
- How to determine if your system has high levels of DBPs
- Strategies to reduce high levels of DBPs in your drinking water
- Sources of funding for your Stage 2 DBPR compliance strategy
- How to prepare for the Stage 2 DBPR compliance dates

Appendix A contains a glossary of terms used both in the rule and in this guide. Appendix B lists additional resources on the Stage 2 DBPR that you might find helpful and detailed instructions on how to order them, including how to get a complete copy of the rule. Appendix C lists contacts for States and Tribes. Appendix D identifies other STEP guides that EPA has developed to assist small systems.



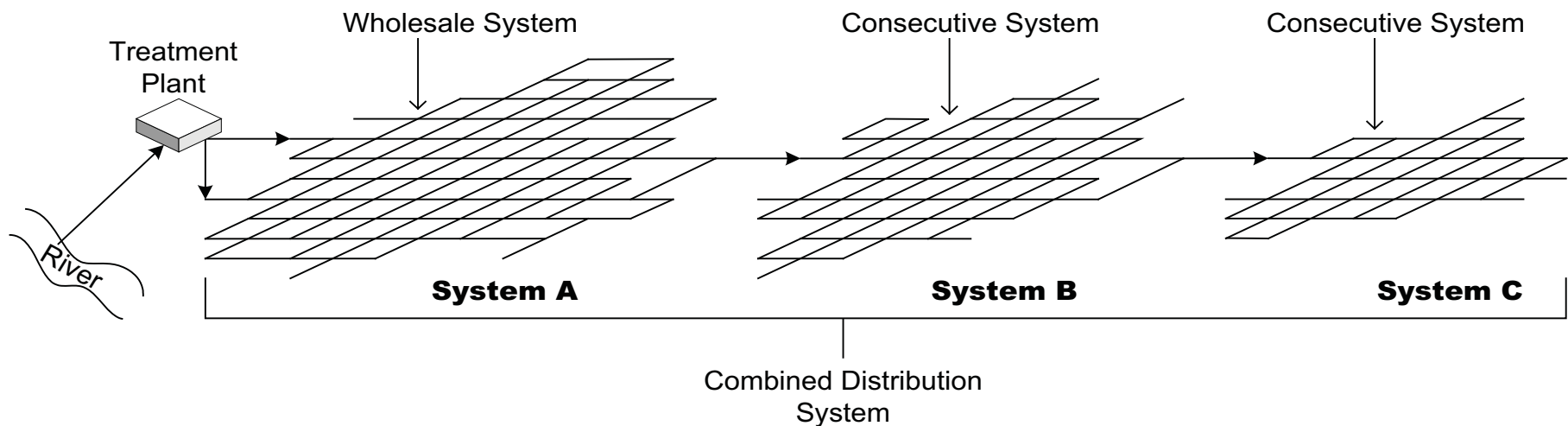
Some Important Definitions for Understanding the Stage 2 DBPR

Consecutive systems include all systems that receive some or all of their finished water from another public water system on a regular basis.

Finished water is water that has been introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as necessary to maintain water quality in the distribution system (e.g., booster disinfection, addition of corrosion control chemicals).

A **wholesale system** is a public water system that treats source water as necessary and then delivers finished water to another public water system. Delivery may be through a direct connection or through the distribution system of another consecutive system.

The **combined distribution system** is defined as the interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive finished water from those wholesale system(s).



STEP #3 - What is the Stage 2 DBPR?

EPA finalized the Stage 2 Disinfectants and Disinfection Byproduct Rule (DBPR) to reduce potential health risks from DBPs. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) is being finalized and implemented at the same time as the Stage 2 DBPR to ensure that drinking water is safe from both microbial pathogens and DBPs.

General Requirements

To comply with the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR), published on January 4, 2006 (71 FR 388) systems must do the following:

- **Conduct an Initial Distribution System Evaluation (IDSE)** to find locations in the distribution system that have high levels of TTHM and HAA5 and that can be used as compliance monitoring sites for the Stage 2 DBPR.
Note: This guide is the second of two small system guidance manuals for the Stage 2 DBPR. For information on how small systems should conduct an IDSE, see the *Initial Distribution System Evaluation Guide for Systems Serving < 10,000*. This guide covers all remaining Stage 2 requirements, including LRAAs, Stage 2 compliance monitoring, and operational evaluations.
- **Use a locational running annual average (LRAA) calculation to determine compliance** with the Stage 2 DBPR maximum contaminant levels (MCLs) of:
 - 0.080 mg/L for total trihalomethanes (TTHM), and
 - 0.060 mg/L for five haloacetic acids (HAA5).**Note:** The MCL values are the same as the Stage 1 MCLs; only the calculation method changes.
- **Monitor for Stage 2 compliance** at the required number of locations for each system's retail population
- **Identify when TTHM or HAA5 levels exceed the operational evaluation level** and, when this happens, look at source water, operational practices, and treatment to find ways to reduce TTHM and HAA5 concentrations in the distribution system.



Each of these general requirements are covered in more detail in the rest of this guidance manual.

The Stage 2 DBPR is an extension of the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR). Systems must also continue to comply with the other requirements of the Stage 1 DBPR in addition to meeting the requirements of the Stage 2 DBPR. This includes compliance with the MCLs for bromate (for systems using ozone) and chlorite (for systems using chlorine dioxide), the MRDLs for chlorine or chloramine (depending on the residual disinfectant used), as well as TOC removal requirements.

Compliance Timeline

Your compliance schedule for the Stage 2 DBPR are based on whether your system is part of a **combined distribution system**:

- If your system **is** part of a combined distribution system, you must comply with the revised MCLs by the same date as required for the largest system in your combined distribution system.

Example: if your system serves 8,000 people, but you purchase water from a system that serves 250,000 people, you must comply by the dates shown for Schedule 1 in the compliance timeline on the next page.

- If your system **is not** part of a combined distribution system, compliance dates are based on the population served by your system.

If you are using this guidance manual, you likely serve fewer than 10,000 people and you must comply by the dates shown for Schedule 4 in the compliance timeline on the next page.

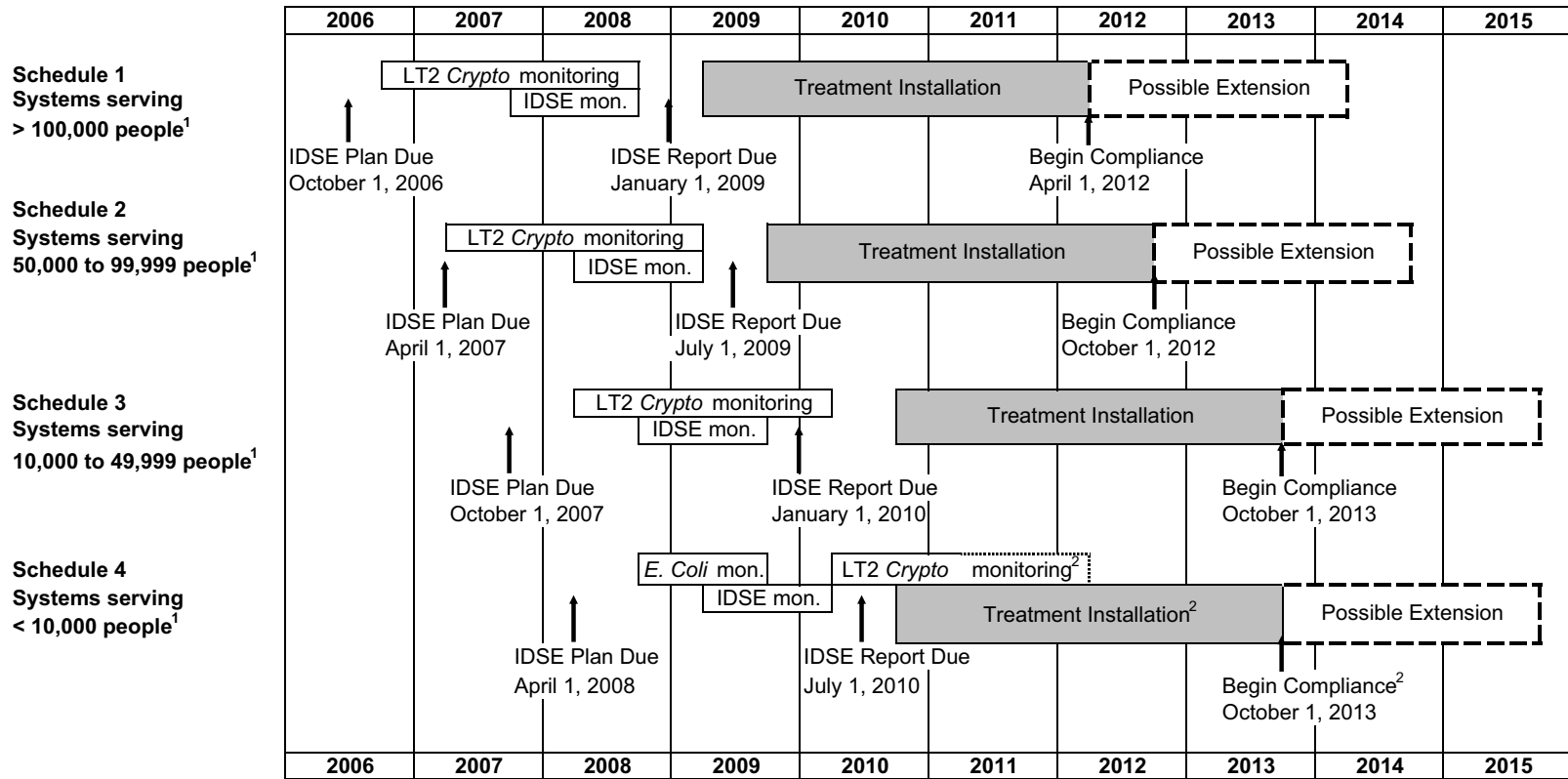
Definition of population served:

The total number of people served directly by a water system. Systems typically work with their State to determine population served for compliance purposes.

Your State (or EPA) should have sent you a letter telling you what schedule you are on. If you did not receive this letter or you have questions about your schedule, contact your State (contact information is listed in Appendix C). Note: You are on the same schedule for Stage 2 DBPR compliance as you were on for the IDSE.

The timeline on the next page shows important dates for the Stage 2 DBPR as well as periods for *Cryptosporidium* and *E. coli* required under the LT2ESWTR.

Note: The figure shows the 2-year period after systems must begin compliance as a “possible extension.” States may give you up to an additional 2 years to comply if you need time to install capital improvements.



¹ Includes systems that are part of a combined distribution system in which the largest system serves this population.

² Subpart H systems serving fewer than 10,000 that must conduct *Crypto* monitoring have an additional 12 months to comply with Stage 2 DBPR MCLs.

How Does this Rule Relate to Other Federal, State, and Local Requirements?

As noted earlier, the Stage 2 DBPR is an extension of the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR). The Stage 2 DBPR and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) were published together to address the balance between protection from microbial pathogens and the potential health effects from disinfectants and their byproducts. You are still required to continue to meet all existing federal requirements. You may call the Safe Drinking Water Hotline at (800) 426-4791 (e-mail: hotline-sdwa@epa.gov) for more information on other drinking water rules.

This guide explains your federal requirements for the Stage 2 DBPR. There may be additional State or local drinking water regulations for DBPs that apply to your system and that are different from, or more stringent than, the federal requirements explained here. For more information on your State's requirements, please contact your State drinking water office. State contacts are listed in Appendix C or are available through the Safe Drinking Water Hotline at (800)426-4791 (e-mail: hotline-sdwa@epa.gov).

Where do DBPs come from?

Chlorine and other chemical disinfectants have been widely used by public water systems (along with filtration) to protect the public from microbial pathogens in drinking water. DBPs are formed when certain disinfectants react with DBP precursors (organic and inorganic materials) in source waters. In most cases, natural organic matter (NOM) is an important factor that affects the levels of DBPs that form (NOM is usually measured as TOC). The levels of DBPs in drinking water can vary significantly from one point in a distribution system to another, as many continue to form in the distribution system. DBP levels are generally higher in surface water systems because surface water usually contains higher DBP precursor levels and requires stronger disinfection.

Please see Appendix B for a list of references that provide more information on DBP formation.

Ensuring Safe Drinking Water

All drinking water systems want to provide water that is safe. One aspect of providing safe drinking water is limiting the levels of DBPs in it. Long-term exposure to DBPs has been linked to bladder cancer, and possibly colon and rectal cancers. More recent studies have shown that shorter-term exposure to high levels of DBPs may be associated with adverse reproductive and developmental health effects.

Limiting the levels of DBPs in your drinking water may require you to make some adjustments to your current operations, such as:

- Making operational improvements at the plant or in the distribution system (see page 34 for more information)
- Modifying current treatment operations to remove more DBP precursors or form lower levels of DBPs (Page 34 has more information)
- Upgrading or installing a new treatment technology (see page 35 for more information)

STEP #4 - What Does Compliance Monitoring Involve?

Monitoring requirements for TTHM and HAA5 are based on your source water type and the population your system serves. Note that this is different than the Stage 1 DBPR monitoring requirements that were based on the number of treatment plants in your system.

With population-based monitoring, there are five categories of small systems under the Stage 2 DBPR:

- Subpart H systems that serve fewer than 500 people.
- Subpart H systems that serve 500 to 3,300 people.
- Subpart H systems that serve 3,301 to 9,999 people.
- Ground water systems that serve fewer than 500 people.
- Ground water systems that serve 500 to 9,999 people.

If you do not know what type of system you are, you should contact your State to confirm this information.



Subpart H systems are systems that use surface water or ground water under the direct influence of surface water (GWUDI) as their source water. **If any of your water is from a surface water or GWUDI source, you are a Subpart H system.** This includes systems that purchase surface water or GWUDI as well as systems that have mixed surface water and ground water sources.



Routine Compliance Monitoring Requirements

The locations and frequencies required for routine compliance monitoring requirements for your system are listed in the table below. For all systems, at least one sample must be taken during the month of highest DBP concentration or warmest water temperature.

- **Subpart H systems serving 3,301-9,999 and Ground water systems serving 500-999:**

You are required to take dual samples (one for TTHM and one for HAA5) at the locations and frequencies listed in the table on this page.

- **Subpart H systems serving up to 3,300 people and Ground water systems serving fewer than 500 people:**

You are required to take individual samples (instead of a dual sample set) at the locations and frequencies shown in the table below, so you will sample for TTHM at the location with representative high TTHM concentrations and sample for HAA5 at the location with representative high HAA5 concentrations. However, if the highest TTHM and HAA5 concentrations occur at the same location in your distribution system, you can collect a dual sample set at one location per monitoring period (see table footnote).

Source Water Type	Population Size Category	Monitoring Frequency ¹	Distribution System Monitoring Location		
			Total per monitoring period	Highest TTHM Locations	Highest HAA5 Locations
Subpart H	<500	yearly	2 ²	1	1
	500 - 3,300	every 90 days	2 ²	1	1
	3,301 - 9,999	every 90 days	2	1	1
Ground Water	<500	yearly	2 ²	1	1
	500 - 9,999	yearly	2	1	1

¹All systems must take at least one dual sample set during the month of highest DBP concentrations or warmest water temperature.

²System is required to take individual TTHM and HAA5 samples (instead of dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. Only one location with a dual sample set per monitoring period is needed if highest TTHM and HAA5 concentrations occur at the same location.

Monitoring Plan

If you conducted standard monitoring or a system specific study for the IDSE, the locations and schedule for your Stage 2 compliance monitoring were submitted as part of your IDSE report. You should follow your approved Stage 2 monitoring plan. You can skip this next section and go to page 21 to continue learning about Stage 2 compliance monitoring.

If you received a 40/30 certification for the IDSE, or if you were not required to conduct an IDSE, you must develop a monitoring plan that includes:

- When and where you intend to monitor TTHM and HAA5 for Stage 2 DBPR compliance.
- What compliance calculation procedures you intend to use.
- Monitoring plan for any other systems in the combined distribution system if your State has reduced monitoring requirements under §141.16(m). You should contact your State if you are uncertain of these requirements.

If you received a very small system (VSS) waiver for the IDSE,

you should continue to monitor at the same location for Stage 2 DBPR compliance monitoring unless you have data showing that your highest TTHM and HAA5 concentrations occur at a different location.

If you are a Subpart H system and you serve more than 3,300 people, you must submit a copy of your monitoring plan to your State for review before you take your first Stage 2 compliance sample. All other systems must keep the monitoring plan on file for State and public review.

If you have not developed a Stage 2 DBPR monitoring plan, continue reading the next section to learn how to choose your monitoring locations and schedule.

REMINDER

The following types of systems should have conducted an IDSE or received a 40/30 certification or very small system waiver:

- All CWS that deliver water disinfected with anything other than UV.
- All NTNCWS that serve at least 10,000 people and deliver water disinfected with anything other than UV.

For more information on IDSE requirements for small systems, see the *Initial Distribution System Evaluation Guide for Systems Serving < 10,000*.

Monitoring Locations

You can determine the appropriate Stage 2 monitoring locations by using TTHM and HAA5 data. If you haven't collected TTHM and HAA5 data before, you will need to use other knowledge about your system to select appropriate sites.

Selecting your Stage 2 Monitoring Sites from TTHM and HAA5 Data

If you monitored at several locations under the Stage 1 DBPR, you can use your existing TTHM and HAA5 data to determine where you should monitor. Start by calculating the LRAA for TTHM and HAA5 at each Stage 1 DBPR monitoring site.

If you were not required to monitor under Stage 1 or monitored at fewer locations than you will need for Stage 2 compliance monitoring, turn to page 17 to learn how to select your Stage 2 monitoring sites.

Stage 2 Monitoring Site Selection Worksheet

The following worksheet is provided to help you organize your existing data. Several copies of the worksheet are provided. The first copy is followed by instructions on how to complete it. The second copy is an example. The third is a blank worksheet that you can use or photocopy.

If you prefer, an electronic form is also available that allows you to enter your data and calculates your LRAAs for you. You can find this form on EPA's Web site at <http://www.epa.gov/safewater/stage2/index.html>. If you choose not to use this form, you could consider using a spreadsheet (such as Microsoft Excel or Lotus 123) to store your data and calculate your LRAA.

TTHM Worksheet - Stage 2 DBPR								
Sampling Site	Site Type	Quarter 1	Quarter 2	Quarter 3	Quarter 4	LRAA	Is this the highest TTHM site?	Site Selection
1	2		3			4	5	6

HAA5 Worksheet - Stage 2 DBPR								
Sampling Site	Site Type	Quarter 1	Quarter 2	Quarter 3	Quarter 4	LRAA	Is this the highest HAA5 site?	Site Selection
1	2		3			4	5	6

Using the TTHM and HAA5 Planning Worksheets for the Stage 2 DBPR

This section provides step-by-step instructions on how to use the TTHM and HAA5 planning worksheet. Each step corresponds to a numbered section of the sample worksheet. Note that you are not required to use this worksheet, it is simply provided to help you organize your monitoring results.

Step #1

Enter location of the sampling sites, including:

- All Stage 1 DBPR sampling sites
- Any additional TTHM or HAA5 locations sampled

Step #2

Enter the type of sampling site.

For Stage 1 DBPR (all plants):

- Maximum Residence Time, or
- Additional Monitoring Site

Step #3

Enter the four most recent monitoring results for each location.

- If you have older data, you may also want to look at years with high TTHM and HAA5 levels (which often occur during warm weather or periods with high TOC) on another copy of this worksheet.
- Do not look at data collected earlier than the last treatment/distribution system change.
- If you monitor yearly, you will be looking at just one location.

Step #4

Calculate the LRAA for each sampling site.

The LRAA calculation is the running annual average at each sampling location.

$$\text{LRAA} = \frac{Q1+Q2+Q3+Q4}{4}$$

Step #5

Note which location has the highest LRAA.

- Enter “Yes” in this column if that site has the highest LRAA for TTHM or HAA5, otherwise enter “No.”

Step #6

Select Stage 2 Compliance Monitoring Sites.

- Select the location with the highest TTHM LRAA (Yes in Step 5) as your High TTHM site.
- Select the location with the highest HAA5 LRAA (Yes in Step 5) as your High HAA5 site.
- If your highest TTHM and HAA5 LRAAs occur at the same site, choose your second highest HAA5 LRAA as your High HAA5 site.
- Subpart H systems $\leq 3,300$ and ground water systems < 500 can take a dual sample set at one location if highest TTHM and HAA5 LRAAs occur at the same site (otherwise take one sample at two separate locations for High TTHM and High HAA5).

TTHM Worksheet - Stage 2 DBPR								
Sampling Site	Site Type	Quarter 1	Quarter 2	Quarter 3	Quarter 4	LRAA	Is this the highest TTHM site?	Site Selection
Stage 1 #1	MRT	0.048	0.054	0.087	0.063	0.063	No	
Stage 1 #2	MRT	0.068	0.081	0.090	0.074	0.078	Yes	High TTHM Site
Extra Monitoring site	ART	0.036	0.068	0.065	0.055	0.056	No	
HAA5 Worksheet - Stage 2 DBPR								
Sampling Site	Site Type	Quarter 1	Quarter 2	Quarter 3	Quarter 4	LRAA	Is this the highest HAA5 site?	Site Selection
Stage 1 #1	MRT	0.024	0.024	0.035	0.045	0.032	No	
Stage 1 #2	MRT	0.012	0.035	0.032	0.034	0.028	No	
Extra Monitoring site	ART	0.035	0.046	0.061	0.054	0.049	Yes	High HAA5 Site

Explanation of Example TTHM and HAA5 Worksheet

This system is a NTNCWS that treats surface water at two plants and serves 5,000 people. Since the system is a NTNCWS that serves fewer than 10,000 people, it did not conduct an IDSE. Under Stage 1 DBPR, this system is required to take two samples per quarter at maximum residence time locations (one sample for each plant during each quarter).

On the example worksheet, the system recorded all the monitoring results from the last year. The system also included monitoring results from a third location that they sampled last year as part of a research project.

The system then calculated the LRAA for TTHM and HAA5 at each different monitoring site. For example:

$$\text{Stage 1 \#1 TTHM: } \text{LRAA} = \frac{Q1+Q2+Q3+Q4}{4}$$

$$\text{LRAA} = \frac{(0.048+0.054+0.087+0.063)}{4}$$

$$\text{LRAA} = \frac{0.252}{4}$$

$$\text{LRAA} = 0.063 \text{ mg/L}$$

The system then compared the LRAA results for each site and noted which site had the highest LRAA.

The LRAA at Stage 1 site #2 was highest for TTHM, so the system will use this location as the Stage 2 High TTHM compliance monitoring site. The highest HAA5 LRAA was at the extra monitoring site, so the system will use this location as the Stage 2 High HAA5 compliance monitoring site.

TTHM Worksheet - Stage 2 DBPR

Sampling Site	Site Type	Quarter 1	Quarter 2	Quarter 3	Quarter 4	LRAA	Is this the highest TTHM site?	Site Selection

HAA5 Worksheet - Stage 2 DBPR

Sampling Site	Site Type	Quarter 1	Quarter 2	Quarter 3	Quarter 4	LRAA	Is this the highest HAA5 site?	Site Selection

Selecting your Stage 2 Monitoring Sites without Previous Data

If you do not have TTHM or HAA5 data or if you need to select more monitoring sites for Stage 2 DBPR than you have data for, you will have to use other knowledge about your system to identify one high TTHM and one high HAA5 location in your distribution system that are appropriate monitoring sites. Each site type has certain characteristics that will help you locate appropriate monitoring sites. You may also want to consider the following when selecting your Stage 2 monitoring sites:

- Geographic distribution of monitoring sites.
- Sites that are already used for compliance with other rules (e.g., Total Coliform Rule [TCR]).
- Site accessibility.

High TTHM Site

You should choose your high TTHM site to represent areas in the distribution system where you expect to find higher levels of TTHM throughout the year as compared to other sites. Higher temperatures and increased residence time typically lead to higher TTHM concentrations. Low disinfectant residual usually indicates longer residence time sites.

Characteristics of High TTHM Sites

High TTHM sites are often located:

- Near the ends of the distribution system, at or before the last group of customers.
- In mixing zones where water from different sources combine within the distribution system.
- Downstream of storage facilities - especially those with a common inlet and outlet prior to the last fire hydrant.

Sample sites should **not** be located:

- At a dead-end where there are no customers.
- Immediately prior to booster disinfection.

High HAA5 Site

Your high HAA5 site should be chosen to represent areas in the distribution system where you expect to find higher levels of HAA5 throughout the year as compared to other sites. Higher temperatures and increased residence time can lead to higher HAA5 concentrations. However, HAA5 can biodegrade when disinfectant residual levels are low or non-existent. Therefore, a high HAA5 site will not necessarily be the site with the longest residence time.

Monitoring Schedule

If you conducted standard monitoring or a system specific study for the IDSE, the schedule for your Stage 2 compliance monitoring was submitted as part of your IDSE report. You should follow your approved Stage 2 monitoring plan. You can skip this next section and go to page 21 to continue learning about Stage 2 compliance monitoring.

If you received a 40/30 certification or a very small system (VSS) waiver for the IDSE, or if you were not required to conduct an IDSE, you must develop a monitoring schedule for Stage 2 DBPR compliance. The Stage 2 DBPR requires that systems conduct monitoring during the peak historical month for TTHM levels or HAA5 levels or the month of warmest water temperature. This is referred to as the "Controlling Month." It is meant to represent the "worst case" conditions when DBPs are expected to be at the highest levels during the year.

Characteristics of High HAA5 Sites

High HAA5 sites are often located:

- In areas with low but existing disinfectant residual (generally, disinfectant residual levels should be consistently above 0.2 mg/L for chlorine or 0.5 mg/L for chloramine).
- Near the ends of the distribution system, at or before the last group of customers.
- In mixing zones where water from different sources combines within the distribution system..
- Downstream of storage facilities.
- Prior to the last fire hydrant.

Sample sites should **not** be located:

- At a dead-end where there are no customers.
- Immediately prior to booster disinfection.
- Where no disinfectant residual exists.
- Areas with biofilm problems.

Since most small systems do not have TTHM or HAA5 data more than quarterly, it is recommended that you use water temperature to determine your controlling month. Although there are no regulations that require you to measure water temperature in your distribution system or sources, many systems collect this information for process control. Other systems may have temperature data at different points in the treatment plant. If your system measures the temperature of water leaving the treatment plant, consider averaging these data for each summer month to identify the month of warmest water temperature. No matter which data you use, calculate the average for each summer month to identify the month of warmest temperature. This is your controlling month.

All systems are required to monitor during their controlling month, regardless of system size or monitoring frequency. If you monitor yearly, you will sample yearly during this month. If you monitor quarterly, you will sample during this month and every 90 days before and/or after the peak historical month to meet your monitoring requirements.

Note: You do not have to sample at exactly the frequency required for your system. Sampling within the same week during each required month is sufficient. For example, if you are required to sample every 90 days, you could sample during the second week of every third month. If you are required to sample yearly, you could sample each year during the first week of your controlling month.

Monitoring Plan Template

The following template is provided to help you organize your Stage 2 monitoring plan.

Stage 2 DBPR Monitoring Plan

Stage 2 Compliance Monitoring Site ID	Site Type	Justification	Projected Sampling Date (month/day/year) *			
			Period 1	Period 2	Period 3	Period 4
	<input type="checkbox"/> Highest TTHM <input type="checkbox"/> Highest HAA5 <input type="checkbox"/> Stage 1 DBPR <input type="checkbox"/> Other					
	<input type="checkbox"/> Highest TTHM <input type="checkbox"/> Highest HAA5 <input type="checkbox"/> Stage 1 DBPR <input type="checkbox"/> Other					

* Period = monitoring period. Complete for the number of monitoring periods required for your system.

Compliance Calculation Procedures

- Monitor yearly, compliance calculated as sample result < MCL for each location
- Monitor quarterly, compliance calculated as $LRAA = (Q1+Q2+Q3+Q4)/4 < MCL$ for each location
- Monitor more frequently than quarterly. Compliance calculated as follows:

Combined Distribution System Information

This PWS is part of a combined distribution system

If Checked: Monitoring Requirements have been reduced by State and monitoring plans for other systems are attached.

Reduced Monitoring

Your system can qualify for reduced monitoring if you **meet all three** of the following criteria:

- The LRAA is ≤ 0.040 mg/L for TTHM at **all** monitoring locations,
- The LRAA is ≤ 0.030 mg/L for HAA5 at **all** monitoring locations, and
- The source water annual average TOC level (before any treatment) is ≤ 4.0 mg/L at each treatment plant treating surface water or ground water under the direct influence of surface water.

Reduced monitoring requirements:

Source Water Type	Population Size Category	Reduced Monitoring Frequency	Distribution System Monitoring Location per Monitoring Period
Subpart H	<500	-	Monitoring may not be reduced.
	500 - 3,300	yearly	One TTHM and One HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 measurement; one dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	3,301 - 9,999	yearly	Two dual sample sets: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement.
Ground Water	<500	every third year	One TTHM and One HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; one dual sample set if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	500 - 9,999	yearly	One TTHM and one HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; one dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.

You may remain on reduced monitoring as long as samples remain below the following levels:

- Each TTHM sample is less than or equal to 0.060 mg/L, and
- Each HAA5 sample is less than or equal to 0.045 mg/L, and
- The source water annual average TOC level (before any treatment) is <4.0 mg/L at each treatment plant treating surface water or ground water under the direct influence of surface water.

Increased Monitoring

If you monitor yearly (or less frequently if on reduced monitoring), you must begin increased monitoring and sample every 90 days if:

- Any TTHM sample > 0.080 mg/L, or
- Any HAA5 sample is > 0.060 mg/L.

Note that this is not an immediate violation. However, your system is in violation of the Stage 2 MCLs if the TTHM or HAA5 LRAA exceeds the MCL after four quarters of sampling.

You may return to **routine monitoring** from increased monitoring when all of the following criteria are met:

- You have conducted increased monitoring for at least four quarters, and
- LRAA for **every** monitoring location is ≤ 0.060 mg/L for TTHM, and
- LRAA for **every** monitoring location is ≤ 0.045 for HAA5.

Compliance Determination and MCL Violations

Compliance with the TTHM and HAA5 MCLs for Stage 2 DBPR is based on your monitoring results at each monitoring location.

If you monitor once per quarter:

- Compliance is based on the LRAA of monitoring results, calculated quarterly (see example on the next page).
- You must make compliance calculations beginning with the end of the fourth quarter of monitoring and continue calculations after each quarter.
- If you fail to complete four consecutive quarters of monitoring, you must calculate compliance with the MCL based on the average of the available data from the most recent four quarters.
- If you take more than one sample per quarter at a monitoring location, you must average all samples taken in the quarter at that location to determine a quarterly average to be used in the LRAA calculation.
- If the LRAA at any location exceeds the MCL, you are in violation.
- Failure to monitor will be treated as a monitoring violation for the entire period covered by a locational running annual average compliance calculation for the Stage 2 MCLs.

If you monitor once per year:

- Compliance is based on the value of the yearly samples at each location.
- You must make compliance calculations beginning with the first compliance sample taken after the compliance date.
- If any sample exceeds the MCL, you are not immediately in violation. You must begin increase monitoring immediately (monitor quarterly at each location).
- If any sample exceeds the MCL and you are on reduced monitoring, you must begin increased monitoring immediately (monitor quarterly at each location).
- Failure to monitor will be treated as a monitoring violation for the entire period covered by a locational running annual average compliance calculation for the Stage 2 MCLs.

NOTE: Some States require you to submit your analytical results and the State will calculate compliance for you.

Examples of Calculating Compliance

Example Compliance Calculation for Systems Monitoring Quarterly

Date	TTHM result mg/L	LRAA for TTHM	TTHM MCL Violation?	HAA5 Result mg/L	LRAA for HAA5	HAA5 MCL Violation?
8/15/2013	0.096	$(0.096+0+0+0)/4 = 0.024$ mg/L	No	0.044	$(0.044+0+0+0)/4 = 0.011$ mg/L	No
11/14/2013	0.072	$(0.096+0.072+0+0)/4 = 0.042$ mg/L	No	0.020	$(0.044+0.020+0+0)/4 = 0.016$ mg/L	No
2/15/2014	0.060	$(0.096+0.072+0.060+0)/4 = 0.057$ mg/L	No	0.024	$(0.044+0.020+0.024+0)/4 = 0.022$ mg/L	No
5/12/2014	0.088	$(0.096+0.072+0.060+0.088)/4 = 0.079$ mg/L	No	0.030	$(0.044+0.020+0.024+0.030)/4 = 0.030$ mg/L	No
8/16/2014	0.120	$(0.072+0.060+0.088+0.120)/4 = 0.085$ mg/L	Yes	0.050	$(0.020+0.024+0.030+0.050)/4 = 0.031$ mg/L	No
11/12/2014	0.060	$(0.060+0.088+0.120+0.060)/4 = 0.082$ mg/L	Yes	0.024	$(0.024+0.030+0.050+0.024)/4 = 0.032$ mg/L	No
2/15/2015	0.048	$(0.088+0.120+0.060+0.048)/4 = 0.079$ mg/L	No	0.012	$(0.030+0.050+0.024+0.012)/4 = 0.029$ mg/L	No

What if I use Chlorine Dioxide or Ozone?

If you use chlorine dioxide as your disinfectant, your requirements under the Stage 1 DBPR have not changed.

If you use ozone, you will now qualify for reduced bromate monitoring based on finished water bromate levels instead of source water bromide levels. Systems with a bromate running annual average less than or equal to 0.0025 mg/L (based on monthly monitoring) qualify for reduced bromate monitoring. The effective date for this change is March 31, 2009. In order to meet this deadline, you will need to start monitoring for bromate using the new method by March 2008. All other requirements remain the same as under the Stage 1 DBPR.

For more information, see the *Small System Requirements for the Stage 1 DBPR: Small Entity Compliance Guide*.

Bromide (Br⁻) occurs naturally in some source waters. Higher levels of bromide may be caused by brine or salt water intrusion. Bromide is a precursor to bromate (along with other brominated DBPs).

Bromate (BrO₃⁻) is a disinfection byproduct that is present in some finished water and forms when ozone reacts with bromide during treatment.

STEP #5 - What Else Does the Stage 2 DBPR Require?

Laboratory Methods and Certification

Approved analytical methods must be used to for all monitoring requirements, including TTHM and HAA5. There are several new approved methods available since the Stage 1 DBPR. Consistent with current regulations, only certified laboratories can analyze samples for compliance with the MCLs. For more information on approved methods or to find a certified lab, call the Safe Drinking Water Hotline at (800) 426-4791 (e-mail: hotline-sdwa@epa.gov).

Operational Evaluations

A system that is in full compliance with the Stage 2 DBPR LRAA MCL may still have individual DBP measurements above 0.080 mg/L for TTHM and 0.060 mg/L for HAA5 since compliance is based on a four-quarter average. Because of concerns that high levels of DBPs can occur even when the system is in compliance, there is an additional requirement in the Stage 2 DBPR for operational evaluations.

If your operational evaluations levels (according to the equation to the right) are higher than the MCL at any location in the distribution system, you must conduct an operational evaluation. Your operational evaluation must include:

- An examination of system treatment and distribution operational practices, including:
 - Storage tank operations
 - Excess storage capacity
 - Distribution system flushing
 - Changes in sources or source water quality
 - Treatment changes
 - Any problems that may contribute to TTHM and HAA5 formation
- What steps could be considered to minimize future exceedances

Operational evaluation levels (calculated at each monitoring location):

$$\text{IF } \frac{Q_1 + Q_2 + 2Q_3}{4} > 0.080 \text{ mg/L for TTHM} \\ \text{or } 0.060 \text{ mg/L for HAA5}$$

where

Q_3 = current quarter measurement

Q_2 = previous quarter measurement

Q_1 = quarter before previous quarter measurement

then the system must conduct an operational evaluation

You must submit your operational evaluation report to the State for review within 90 days after being notified of the high TTHM or HAA5 analytical result that causes the operational evaluation level to exceed the MCL.

Note: If you know the cause of the operational evaluation level, you can ask your State to limit the scope of your evaluation. Requesting approval to limit the scope of the operational evaluation does not extend the schedule for submitting the operational evaluation report, which is still due 90 days after notification of the high analytical result.

For more detailed information on operational evaluations, refer to the *Operational Evaluations Guidance Manual*.

Operational Evaluation Levels Worksheet

The following worksheet will help you organize your existing TTHM and HAA5 results to determine your operational evaluation levels. If you prefer, an electronic form is also available that allows you to enter your data and calculates your operational evaluation levels for you. You can find this form on EPA's Web site at <http://www.epa.gov/safewater/stage2/index.html>. If you choose not to use this form, you could consider using a spreadsheet to store your data and calculate your operational evaluation levels.

Operational Evaluation Levels Worksheet

TTHM Data					
	Results from 2 Quarters Ago	Results from Last Quarter	Results from Current Quarter	Operational Evaluation Level	Need to conduct evaluation? (Yes if D > 0.080 mg/L)
Stage 2 DBPR Location	A	B	C	$D = (A+B+C+C)/4$	
TTHM Example #1	0.065 mg/L	0.074 mg/L	0.087 mg/L	0.078 mg/L	No
TTHM Example #2	0.068 mg/L	0.075 mg/L	0.093 mg/L	0.082 mg/L	Yes

HAA5 Data					
	Results from 2 Quarters Ago	Results from Last Quarter	Results from Current Quarter	Operational Evaluation Level	Need to conduct evaluation? (Yes if D > 0.080 mg/L)
Stage 2 DBPR Location	A	B	C	$D = (A+B+C+C)/4$	
HAA5 Example #1	0.050 mg/L	0.062 mg/L	0.070 mg/L	0.063 mg/L	Yes
HAA5 Example #2	0.033 mg/L	0.041 mg/L	0.050 mg/L	0.044 mg/L	No

Reporting and Recordkeeping Requirements

The State needs to know if the water in your system poses any health risks so it can help you protect your customers. You must report the following information for each monitoring location to the State within 10 days of the end of any quarter in which monitoring is required:

- Number of samples taken during the last quarter.
- Date and result of each sample was taken during the last quarter.
- LRAA for each monitoring location (unless your State calculates this for you).
- Whether the MCL was violated at any monitoring location.
- Any operational evaluation levels that were exceeded during the quarter and, if so, the location and date, and the calculated TTHM and HAA5 levels.

You must also keep a copy of your Stage 2 monitoring plan and all monitoring results for 10 years.

In addition, you must continue to report the information required under Stage 1. For more information on Stage 1 reporting requirements, see the *Small System Requirements for the Stage 1 DBPR: Small Entity Compliance Guide*. These requirements include monitoring results, arithmetic averages, and violations for:

- TOC monitoring (required if you are a Subpart H system that uses conventional treatment, optional if you want to qualify for reduced TTHM and HAA5 monitoring).
- Disinfectant residual (chlorine, chloramine, or chlorine dioxide) monitoring (required for all systems).
- Chlorite monitoring (required if you use chlorine dioxide).
- Bromate monitoring (required if you use ozone).



Public Notice

Keeping your customers informed of their water quality is part of your responsibility as a water system. Informed customers are more likely to understand the need for a new treatment system, infrastructure changes, and rate increases if they become necessary.

In both cases where public notice is required, you must also send a copy to your State.

Consumer Confidence Reports

If you are a CWS, you must include the following information in your annual consumer confidence report:

- Highest overall LRAA for both TTHM and HAA5.
- LRAA for all locations where the MCL is exceeded.
- Range of individual sample results for all monitoring locations.

If you:	You must notify your customers within:	Additional Notes:
Fail to monitor or report results	1 year	You may be able to incorporate this information into your CCR instead of having a separate notification.
Exceed the MCL for either TTHM or HAA5 as an LRAA at any location in the distribution system	30 days	

Step #6 - What is the Compliance Assurance Process?

The process for calculating compliance and determining when MCL violations occur is explained on page 23.

Monitoring and Reporting Violations

You have committed a monitoring and reporting (M&R) violation if:

- You fail to take a sample;
- You do not sample at the required number of locations;
- You fail to monitor when your monitoring plan calls for monitoring; or,
- You do not report your results to the State on time.

Compliance Assistance

If you discover that you have violated the Stage 2 DBPR, you should call your primacy agency to discuss the situation (see Appendix C for contact information). Although you are ultimately responsible for resolving any violations or compliance problems, your State may work with you to determine the best way to correct the violation and create a long-term compliance solution. If you are a consecutive system, you may also want to work with your wholesale system to lower DBP levels in your system.

Compliance assistance information and technical advice is available to help small systems understand and meet their requirements. In addition, EPA has established compliance assistance centers to serve over a million small businesses. For more information on these and other programs for small businesses, please contact the Small Business Ombudsman Clearinghouse/Hotline at (800)368-5888 (or [202] 566-2822 from the Washington, DC metropolitan calling area). You may also want to look at the following Web sites for more information:

- Technical Assistance Center Network: <http://www.tacnet.info>
- National Drinking Water Clearinghouse: <http://www.nesc.wvu.edu/ndwc/>
- Rural Community Assistance Partnership: <http://www.rcap.org/resources/waterlinks.html>



STEP #7 - Does My System Have High Levels of DBPs?

Planning

Recall that under the Stage 2 DBPR, the MCLs are 0.080 mg/L TTHM and 0.060 mg/L HAA5, based on a locational running annual average (LRAA) calculation. This means that the MCLs must be met at each monitoring site.

Recall that the compliance dates for the revised MCLs for TTHM and HAA5 are based on whether your system is part of a combined distribution system:

- If your system **is** part of a combined distribution system, you must comply with the revised MCLs by the same date as required for the largest system in your combined distribution system.
- If your system **is not** part of a combined distribution system, compliance dates are based on the population served by your system. If you are a small system that serves less than 10,000 people, you are on schedule 4.

See the compliance schedule on page 6 to determine the date you must start to comply with the Stage 2 MCLs.

You should immediately begin to make sure you can meet the revised MCLs by your compliance date. If your system's TTHM or HAA5 levels exceed the Stage 2 DBPR MCLs, you may need several years to make the necessary changes to be able to comply. The best way to evaluate compliance is to conduct a self-audit prior to the compliance date. Since all non-consecutive (and some consecutive) small systems are already monitoring under the Stage 1 DBPR, you may have TTHM and HAA5 data to evaluate if you will have compliance issues.



Testing

To assess whether you have high levels of DBPs, ask yourself:

1. What are the TTHM and HAA5 LRAAs at each sampling point?
 - Look at monitoring results from Stage 1 DBPR and your IDSE, if you were required to do one.
 - Calculate the LRAA at each monitoring site (you may want to refer to the planning worksheets in step 4 or your IDSE report).
 - Take additional samples, if necessary.
 - Be aware that a single sample may not provide you with enough information to determine if your system will exceed the MCLs.

2. What is the risk that your TTHM and HAA5 levels could exceed the Stage 2 DBPR MCLs?
 - TTHM and HAA5 levels can vary from sample to sample.
 - You may want to give yourself a margin of safety to assure compliance with the TTHM and HAA5 MCLs. As a rule of thumb, some systems plan for TTHM and HAA5 LRAAs to be below the MCLs to account for seasonal, year-to-year, source water, and treatment variability.

STEP #8 - If a Problem Exists, What are my Options?

If TTHM and/or HAA5 levels in your system are too high, you may need to make some adjustments, such as:

- Make operational improvements in the treatment train or distribution system.
- Upgrade or install new treatment technology.
- Work with your wholesale system (if you are a consecutive system).
- Partner with other water systems.
- Change source water.

Operational Improvements

There are several treatment and operational factors that affect DBP formation. Major factors that affect DBP formation are listed in the table to the right. By making adjustments to your current operations, you may be able to reduce levels of DBPs in your systems. More information on operational improvements to reduce DBP levels can be found in the following guidance manuals (see Appendix B for instructions on how to get copies):

- *Microbial and Disinfection Byproduct Rules Simultaneous Compliance Guidance Manual* (EPA 815-R-99-015, August 1999).
- *Simultaneous Compliance Guidance Manual* (EPA-817-D-06-003, June 2006).
- *Enhanced Coagulation and Enhanced Precipitative Softening Guidance Manual* (EPA-815-R-99-012, May 1999) (for Subpart H systems that use conventional filtration).
- *Alternative Disinfectants and Oxidants Guidance Manual* (EPA-815-R-99-014, April 1999).

Factor	Relationship	Possible Improvement
Disinfectant dose and residual concentration	In general, the more disinfectant that is added and the earlier in the treatment process it is added, the higher the levels of DBPs formed. Dose has a greater impact during primary disinfection than secondary infection.	You may be able to better control the amount of disinfectant you add either at the plant or at booster stations. However, it is important to balance your disinfection needs to control microbial pathogens with the risk of forming DBPs.
Contact time and mixing conditions	The longer the contact time between the disinfectant and NOM, the greater the amount of DBPs that can be formed. High TTHM values usually occur where water age is the oldest. High HAA5 values usually occur where water age is old and disinfectant residual is low but present.	Regularly flushing your system or adjusting operations of storage tanks can help reduce water age and may lower levels of TTHMs and HAA5.
Concentration of DBP precursors	Greater DBP levels are formed in waters with higher concentrations of TOC.	Adjust current treatment practices to remove more TOC prior to disinfection

Upgrading or Installing New Treatment Technologies

You may need to change treatment to reduce formation of TTHM and HAA5 to below the MCLs if more cost-effective alternatives are not available. You should contact your State if you plan to modify your disinfection system or change your treatment process to ensure the modifications or new treatment will meet the State's requirements.

For the Stage 2 DBPR, EPA has identified best available technologies (BATs) for reducing TTHM and HAA5 in drinking water. BATs are technologies that have proven effective for reducing levels of TTHM and HAA5. You are not required to use any specific technology. You can use any State-approved technology as long as you meet all drinking water standards. Installing a BAT makes a system eligible for a general variance if, due to source water conditions, the system cannot achieve compliance. A general variance, if approved by the State, would allow the system to supply water with TTHM and HAA5 levels above the MCLs for a certain period of time.

Technologies Likely to be Used by Small Systems

- Chloramination
- Ultraviolet Light (UV)
- Granular Activated Carbon Adsorption with at least 20 minutes of empty bed contact time and an annual average reactivation/replacement frequency no greater than 240 days(GAC 20) (BAT)

Other Technologies

- Granular Activated Carbon Adsorption with at least 10 minutes of empty bed contact time and an annual average reactivation/replacement frequency no greater than 120 days (GAC 10) plus enhanced coagulation or softening (BAT)
- Nanofiltration (BAT)
- Microfiltration and Ultrafiltration
- Ozone
- Chlorine Dioxide
- Membranes

EPA anticipates that most small systems that are required to make treatment changes will use chloramines, ultraviolet light (UV), or granular activated carbon (as GAC 20) to comply with the Stage 2 DBPR. Short descriptions of each of these technologies are given below. For more information on these and other technologies available to comply with the Stage 2 DBPR and the LT2ESWTR, see the *Simultaneous Compliance Guidance Manual*. See Appendix B for instructions on how to get a copy and for a list of other technical resources.

Chloramination

One of the least expensive methods for controlling DBP formation is the use of monochloramine, instead of free chlorine, to maintain a disinfectant residual in the distribution system. After the appropriate free chlorine contact time for source water primary disinfection, ammonia is added to form chloramine and to slow DBP formation. This reduces the free chlorine contact time and, thus, DBP formation, without compromising microbial protection. The initial free chlorine contact time and chloramine together provide sufficient disinfection.

The formation of DBPs resulting from chloramination is influenced by the following treatment variables:

- Contact time and chloramine dosage.
- Point of ammonia application.
- pH and temperature.
- Total organic carbon.
- Chlorine-to-ammonia ratio.
- Mixing and reaction time for chloramine formation.

For more information on chloramines and other alternative disinfectants, see the *Alternative Disinfectants and Oxidants Guidance Manual*. (See Appendix B for instructions on how to get a copy.)

Ultraviolet Light (UV)

The use of UV light for disinfection of drinking water has recently received much attention because of new developments regarding *Cryptosporidium* inactivation at low UV light doses and because it creates very few DBPs. Disinfection is accomplished by irradiating water with UV light. However, UV does not provide any residual disinfectants, so you may be required to use chlorine or chloramine in addition to UV. For more information, see the *Ultraviolet Disinfection Guidance Manual*. (see Appendix B for instructions on how to get a copy.)



Granular Activated Carbon Adsorption (GAC)

Removal of TOC from water supplies can be achieved through adsorption onto solids. Granular Activated Carbon (GAC) is used in water treatment to adsorb a variety of organic and inorganic compounds. The BATs for the Stage 2 DBPR include two design options for GAC operational parameters, which are optimized for DBP precursor removal:

1. GAC adsorbers with at least 10 minutes of empty bed contact time and an annual average reactivation/replacement frequency no greater than 120 days, plus enhanced coagulation or enhanced softening (for subpart H systems with conventional filtration).
2. GAC adsorbers with at least 20 minutes of empty bed contact time and an annual average reactivation/replacement frequency no greater than 240 days. Small systems may find this option more affordable because of the longer replacement interval.

For more information on GAC, see the *Simultaneous Compliance Guidance Manual*.

Working with your Wholesale System (if you are a consecutive system)

Small consecutive systems may have difficulty remaining in compliance, especially if the finished water delivered by the wholesale system is near the MCL. If this is true for your system, you should work with your wholesale system to identify the best ways to meet TTHM and HAA5 MCLs in your distribution system. You may want to form a contract with your wholesale system that addresses both finished water quantity and quality issues, such as meeting all primary drinking water standards or delivering water that is some amount below the DBP MCLs. You should also evaluate what you can do within your own distribution system to control DBP formation.

Note: Under the Stage 2 DBPR, your system is ultimately responsible for assuring that TTHM and HAA5 levels are below the MCLs in your distribution system.

Partnerships with Other Water Systems

Small water systems face many of the same technical problems larger systems face, but they often lack the financial resources or technical expertise. Working with other water systems may allow you to lower costs, simplify management, and provide your customers with safe drinking water. By reducing costs and the administrative burden of compliance, forming partnerships may enable you to comply more easily with the revised MCL than if you “go it alone.”

There are several ways to form partnerships to receive some or all of your water, including:

- 1. Cooperative Management.** Small systems isolated from other systems cannot physically interconnect, but they can share management, operators, and technical staff. They may also form bulk-purchasing agreements. Sharing staff may enable systems to use operators and engineers who have the expertise to adjust the treatment trains to ensure compliance. In addition, the money saved by sharing staff and buying supplies in bulk may help systems be able to afford other necessary compliance measures like new treatment technologies.
- 2. Joining with one or more communities to form a consolidated system.** Two or more systems can physically interconnect to form a larger system.
- 3. Purchasing water from another established water system (and becoming a consecutive system).** If your water source or treatment facility is inadequate, you may want to purchase water from a neighboring system that has a history of providing safe water.



Changing Source Water

If TOC or bromide levels are high in your existing water source, you may want to consider blending water from a source with lower levels of these DBP precursors with your current source. Having lower TOC and bromide in your source water may help you comply with the TTHM and HAA5 MCLs. Generally, groundwater sources have lower levels of TOC than surface water.

An alternative to blending source water is abandoning your source and developing a new one. Developing a new water source is expensive, but this may be the most cost-effective way to lower TTHM and HAA5 levels in the long run. Remember that a new water source may have lower levels of DBP precursors, but higher levels of other contaminants.



STEP #9 - How Will I Implement the Option I Have Selected?

Financial Assistance

Modifying or installing treatment, consolidating with another water system, and developing a new water source can be expensive. System improvements can be funded by raising rates, issuing bonds, or by successfully applying for loans or grants. The tables below provide information on some programs that may provide financial assistance to help you comply with the Stage 2 DBPR.

Major Providers of Financial Assistance to Drinking Water Systems		
Name of Program	Description	Contact Information
Drinking Water State Revolving Fund (DWSRF)	The DWSRF makes low-interest and interest-free loans to water systems to finance infrastructure improvements. States can “set aside” funds from their annual EPA grant to provide technical assistance to small systems.	www.epa.gov/safewater/dwsrf/contacts.html Safe Drinking Water Hotline at 1-800-426-4791
Rural Utilities Service (RUS) Water and Waste Disposal Loan and Grant Program	This program offers loans and grants to rural areas to develop water and waste-disposal systems and to reduce the user costs of these systems.	www.usda.gov/rus/water/states/usamap.htm (202) 720-9540
State-specific Programs	Your State may offer additional funding programs.	See Appendix C
Tribal-specific Programs	EPA makes direct grants (not loans) to Tribes through the DWSRF Tribal Set-Aside Program for improvements to water systems that serve Tribes. States and the Indian Health Service may provide additional financial assistance.	See Appendix C

Other Potential Sources of Financing or Financial Assistance to Drinking Water Systems		
Name of Program	Description	Contact Information
Community Development Block Grants (CDBG)	This program offers grants to disadvantaged cities, urban counties, and states to develop viable urban communities.	www.hud.gov/offices/cpd/communitydevelopment/programs/stateadmin/stateadmincontact.cfm (202) 708-1112
Public Works and Infrastructure Development Grants	These grants help distressed communities overcome barriers that inhibit the growth of their local economies.	www.doc.gov/eda/HTML/1c_regloffices.htm (202) 482-5081
National Bank for Cooperatives Loan Program (CoBank)	CoBank provides loans to larger, creditworthy and rural utilities	www.cobank.com (800) 542-8072
Rural Community Assistance Corporation (RCAC)	RCAC provides loans to rural utilities in 11 western states to help meet the financing needs of rural communities and disadvantaged populations	www.rcac.org/programs/serv-financial.html (916) 447-2854

Extensions for Systems that Need More Time to Comply

Systems should start planning now to meet the MCLs as LRAAs. Some systems having difficulty meeting the LRAAs may need extra time to comply. States may grant up to an additional 24 months for compliance with the MCLs and operational evaluation levels to systems that require capital improvements to meet the MCLs.

Exemptions

Your system should start planning now to meet the revised MCL. Some systems having difficulty meeting the revised MCL may need extra time to comply. States may grant exemptions to eligible systems of any size that cannot comply with the revised MCL by their compliance deadline. An exemption provides a system with 3 additional years to comply with the revised MCL, while continuing to protect public health. If your system serves fewer than 3,300 people, the initial exemption may be extended. At the end of the exemption period, your system must be in compliance with the MCLs for the Stage 2 DBPR.

Systems should request an exemption from their State as soon as they determine that compliance by their required deadline is not feasible. If granted an exemption, the State will establish a compliance schedule that allows the system time to secure financing and implement a compliance strategy.

Systems must meet certain criteria to be eligible for an exemption. Check with your State to see if you are eligible. In addition, a system still must be taking all practicable steps to meet the revised MCL, and either must: (1) need capital improvements that cannot be completed before the compliance deadline; (2) need financial assistance to complete capital improvements that will not be available by the compliance deadline but is reasonably likely to be available during the exemption; or (3) have agreed to become part of a regional PWS. More information about exemptions can be found at <http://www.epa.gov/safewater/standard/ve-fs.html>.

APPENDIX A: Glossary of Terms Used in this Guide

Community water system means a public water system which serves at 15 service connections used by year-round residents or regularly serves at least 25 year round residents.

Consecutive systems include all systems that buy or otherwise receive some or all of their finished water from another public water system on a regular basis.

Combined distribution system the interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive finished water from those wholesale system(s)

Finished water is water that has been introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as necessary to maintain water quality in the distribution system (e.g., booster disinfection, addition of corrosion control chemicals).

Ground water under the direct influence of surface water (GWUDI) means any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium* or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions. States were required to determine whether ground water was under the influence of surface water for all systems by 1999.

Haloacetic acids (five) (HAA5) means the sum of the concentrations in milligrams per liter of the haloacetic acid compounds (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid), rounded to two significant figures after addition.

Non-transient non-community water systems (NTNCWSs) include all systems (regardless of ownership) that are not CWSs and that regularly serve at least 25 of the same people for more than 6 months of the year.

Primacy agency is the agency with primary enforcement authority for the Safe Drinking Water Act. Primacy agency is referred to as the "State" in this document but this also refers to EPA and any tribal government for systems that have one of them as a primacy agency.

Subpart H system is a public water system serving surface water or ground water under the influence of surface water. These systems are subject to the filtration and disinfection requirements of 40 CFR Subpart H.

Total Organic Carbon (TOC) means total organic carbon in mg/L measured using heat, oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants that convert organic carbon to carbon dioxide, rounded to two significant figures.

UV disinfection is a disinfection process exposing the water supply to ultraviolet light (irradiation) to provide pathogen inactivation.

Wholesale system is a public water system that treats source water as necessary and then delivers finished water to another public water system. Delivery may be through a direct connection or through the distribution system of another consecutive system.

APPENDIX B: Sources for More Information on Stage 2 and Disinfection Byproducts

EPA has developed a series of guidance manuals to support the Stage 2 Disinfectants and Disinfection Byproducts Rule. These manuals will aid you, EPA, and State agencies in implementing the rule, and will help to ensure that implementation is consistent.

- Stage 2 Disinfectants and Disinfection Byproducts Rule (71 FR 388, January 4, 2006)
- Initial Distribution System Evaluation Guidance Manual (EPA-815-B-06-002, January 2006)
- Initial Distribution System Evaluation Guide for Systems Serving <10,000 (EPA-815-B-06-001, January 2006)
- Operational Evaluation Guidance Manual (coming soon)
- Microbial and Disinfection Byproduct Rules Simultaneous Compliance Guidance Manual (EPA-815-R-99-015, August 1999)
- Simultaneous Compliance Guidance Manual for the Long Term 2 and Stage 2 DBP Rules (EPA-817-D-06-003, June 2006)
- Consecutive Systems Guidance Manual (coming soon)
- Stage 2 DBPR Implementation Guidance (EPA-816-R-06-002, June 2006)
- Alternative Disinfectants and Oxidants Guidance Manual (EPA-815-R-99-014, April 1999)
- Enhanced Coagulation and Enhanced Precipitative Softening Guidance Manual (EPA-815-R-99-012, May 1999)
- Ultraviolet Disinfection Guidance Manual (EPA-R-06-007, November 2006)
- Quick Reference Guides (EPA-816-F-06-001 to 004 for all four schedules, June 2006)

To obtain a copy of these manuals or for technical assistance:

- Visit the Stage 2 DBPR website at: <http://www.epa.gov/safewater/stage2/index.html>
- Visit the Microbial and Disinfection Byproduct Rules website at: <http://www.epa.gov/safewater/mdbp/implement.html>
- Call the Safe Drinking Water Hotline at 1-800-426-4791.

APPENDIX C: SDWA Primacy Agencies and Tribal Contacts

State Contact Information	Website	Phone Number
Alabama Department of Environmental Management: Water Division	www.adem.state.al.us/WaterDivision/WaterDivisionPP.htm	(334) 271-7823
Alaska Department of Environmental Conservation: Drinking Water Program	www.state.ak.us/dec/eh/dw/index.htm	(907) 269-7647
American Samoa Environmental Protection Agency: American Samoa	www.epa.gov/Region9/cross_pr/islands/samoa.html	(415) 972-3767
Arizona Department of Environmental Quality: Drinking Water Monitoring and Assessment Division	www.adeq.state.az.us/enviro/water/dw/index.html	(602) 771-2303
Arkansas Department of Health and Human Services: Division of Engineering	www.healthyarkansas.com/eng/index.html	(501) 661-2623
California Department of Health Services: Division of Drinking Water and Environmental Management	www.dhs.ca.gov/ps/ddwem/	(916) 449-5577
Colorado Department of Public Health and Environment: Drinking Water Program	www.cdph.state.co.us/wq/wqhom.asp	(303) 692-3500
Connecticut Department of Public Health: Drinking Water Division	www.dph.state.ct.us/BRS/water/dwd.htm	(860) 509-7333
Delaware Delaware Health and Social Services: Division of Public Health	www.state.de.us/dhss/dph	(302) 744-4700
District of Columbia Environmental Protection Agency: Mid-Atlantic Drinking Water	www.epa.gov/reg3wapd/drinkingwater/	(215) 814-5806
Florida Department of Environmental Protection: Drinking Water Program	www.dep.state.fl.us/water/drinkingwater/index.htm	(850) 245-8624
Georgia Department of Natural Resources: Water Resources Branch	www.gaepd.org/Documents/index_water_wrb.html	(404) 656-4807

State Contact Information	Web site	Phone Number
Guam Environmental Protection Agency: Guam	www.epa.gov/region09/cross_pr/islands/guam.html	(415) 972-3770
Hawaii Department of Health: Environmental Management Division	www.hawaii.gov/health/environmental/water/sdwb/index.html	(808) 586-4258
Idaho Department of Environmental Quality: Water Quality Division	www.deq.state.id.us/water/prog_issues.cfm	(208) 373-0502
Illinois Environmental Protection Agency: Division of Public Water Supply	www.epa.state.il.us/water/index-pws.html	(217) 785-8653
Indiana Department of Environmental Management: Drinking Water Branch	www.ai.org/idem/owm/dwb/index.html	(317) 232-8603
Iowa Department of Natural Resources: Water Supply Sections	www.iowadnr.com/water/drinking/index.html	(515) 725-0275
Kansas Department of Health and Environment: Public Water Supply Section	www.kdhe.state.ks.us/pws/	(785) 296-5503
Kentucky Department for Environmental Protection: Drinking Water Branch	www.water.ky.gov/dw/	(502) 564-3410
Louisiana Department of Health and Hospitals: Division of Environmental and Health Services	www.oph.dhh.state.la.us/engineerservice/safewater/index.html	(225) 765-5038
Maine Department of Health and Human Services: Division of Environmental Health	www.maine.gov/dhhs/eng/water/index.htm	(207) 287-2070
Maryland Department of the Environment: Water Programs	www.mde.state.md.us/Programs/WaterPrograms/index.asp	(410) 537-3000
Massachusetts Department of Environmental Protection: Drinking Water Program	www.mass.gov/dep/water/drinking.htm	(617) 292-5770
Michigan Department of Environmental Quality: Water Bureau	www.michigan.gov/deq	(517) 335-4176

State Contact Information	Web site	Phone Number
Minnesota Department of Health: Drinking Water Protection Section	www.health.state.mn.us/divs/eh/water/index.html	(651) 215-0770
Mississippi Department of Health: Water Supply Division	www.msdh.state.ms.us/msdhsite/index.cfm	(601) 576-7518
Missouri Department of Natural Resources: Water Protection Program	www.dnr.state.mo.us/wpscd/wpcp/index.html	(573) 751-5331
Montana Department of Environmental Quality: Public Water Supply Section	www.deq.mt.gov/wqinfo/pws/index.asp	(406) 444-3080
Nebraska Health and Human Services System: Department of Regulation and Licensure	www.hhs.state.ne.us/enh/enhindex.htm	(402) 471-2541
Nevada Health Division: Bureau of Health Protection Services	www.health2k.state.nv.us/BHPS	(775) 687-6353
New Hampshire Department of Environmental Services: Water Supply Engineering Bureau	www.des.state.nh.us/wseb/	(603) 271-2513
New Jersey Department of Environmental Protection: Water Supply Administration	www.state.nj.us/dep/watersupply/safedrnk.htm	(609) 292-5550
New Mexico Environment Department: Drinking Water Bureau	www.nmenv.state.nm.us/dwb/dwbtop.html	(505) 476-8625
New York Department of Health: Drinking Water Protection Program	www.health.state.ny.us/nysdoh/water/main.htm	(518) 402-7650
North Carolina Department of Environment and Natural Resources: Public Water Supply Section	www.deh.enr.state.nc.us/pws	(919) 733-2321
North Dakota Department of Health: Division of Municipal Facilities	www.health.state.nd.us/mf/	(701) 328-5211
Ohio Environmental Protection Agency: Division of Drinking and Ground Waters	www.epa.state.oh.us/ddagw/	(614) 644-2752

State Contact Information	Web site	Phone Number
Oklahoma Department of Environmental Quality: Water Quality Division	www.deq.state.ok.us/WQDnew/index.htm	(405) 702-8100
Oregon Department of Human Services: Drinking Water Program	oregon.gov/DHS/ph/dwp/index.shtml	(971) 673-0405
Pennsylvania Department of Environmental Protection: Office of Water Management	www.dep.state.pa.us/dep/deputate/watermgt/wsm/wsm.htm	(717) 787-5017
Puerto Rico Department of Health: Public Water Supply Supervision Program	www.epa.gov/region02/cepd/prlink.htm	(787) 977-5870
Rhode Island Department of Health: Office of Drinking Water Quality	www.health.ri.gov/environmental/dwq/index.php	(401) 222-6867
South Carolina Department of Health and Environmental Control: Bureau of Water	www.scdhec.net/water/index.html	(803) 898-4300
South Dakota Department of Environment and Natural Resources: Drinking Water Program	www.state.sd.us/denr/des/drinking/dwprg.htm	(605) 773-3754
Tennessee Department of Environment and Conservation: Division of Water Supply	www.state.tn.us/environment/dws/	(615) 532-0191
Texas Texas Commission on Environmental Quality: Water Supply Division	www.tceq.state.tx.us/subject/subject_water.html	(512) 239-4691
Utah Department of Environmental Quality: Division of Drinking Water	www.drinkingwater.utah.gov	(801) 536-4200
Vermont Department of Environmental Conservation: Water Supply Division	www.vermontdrinkingwater.org	(802) 241-3400
Virgin Islands Department of Planning and Natural Resources: Division of Environmental Protection	www.epa.gov/region02/cepd/vilink.htm	(340) 773-1082

State Contact Information	Web site	Phone Number
Virginia Department of Health: Office of Drinking Water	www.vdh.state.va.us/dw	(804) 864-7500
Washington Department of Health: Office of Drinking Water	www.doh.wa.gov/ehp/dw/	(360) 236-3100
West Virginia Department of Health and Human Resources: Environmental Engineering Division	www.wvdhhr.org/oehs/eed/	(304) 558-6715
Wisconsin Department of Natural Resources: Bureau of Drinking Water and Groundwater	www.dnr.state.wi.us/org/water/dwg/index.htm	(608) 266-6669
Wyoming EPA Region 8: Wyoming Drinking Water Program	www.epa.gov/region08/water/dwhome/wycon/wycon.html	(303) 312-6312

Tribal Contacts

US EPA Headquarters		
American Indian Environmental Office	www.epa.gov/indian	(202) 564-0303

US EPA Tribal Coordinators		
EPA Region 1	www.epa.gov/region01/govt/tribes/index.html	(888) 372-7341
EPA Region 2	www.epa.gov/region02/nations/index.html	(212) 637-3000
EPA Region 4	www.epa.gov/region04/ead/indian/index.htm	(404) 562-6939
EPA Region 5	www.epa.gov/region5/water/stpb	(312) 353-2123
EPA Region 6	www.epa.gov/region06/6xa/tribal.htm	(800) 887-6063
EPA Region 7	www.epa.gov/region07/government_tribal/index.htm	(913) 551-7003
EPA Region 8	www.epa.gov/region08/tribes	(303) 312-6312
EPA Region 9	www.epa.gov/region09/cross_pr/indian/index.html	(415) 947-8704
EPA Region 10	yosemite.epa.gov/r10/tribal.NSF	(206) 553-4011

Other Contacts		
Administration for Native Americans	www.acf.dhhs.gov/programs/ana/	(877) 922-9262
Bureau of Indian Affairs	www.doi.gov/bureau-indian-affairs.html	(202) 208-3710
Indian Health Service	www.ihs.gov	(301) 443-3024
Native American Water Association	www.nawainc.org	(775) 782-6636

APPENDIX D: Other STEP Documents Available from EPA

This guide is one in a series of Simple Tools for Effective Performance (STEP) documents for small drinking water systems. Several other available STEP Guides are listed below. To obtain currently available STEP documents or to check on the availability of documents listed as under development, call the Safe Drinking Water Hotline at 1-800-426-4791 or go to <http://www.epa.gov/safewater/smallsys/ssinfo.htm>.

TOOLS TO HELP IMPLEMENT REGULATIONS

A Small Systems Guide to the Total Coliform Rule

Publication number: EPA 816-R-01-017A, June 2001

<http://www.epa.gov/safewater/smallsys/small-tcr.pdf>

Complying with the Revised Drinking Water Standard for Arsenic

Publication number: EPA 816-R-02-008A, August 2002

http://www.epa.gov/safewater/arsenic/pdfs/ars_final_app_f.pdf

Complying with the Stage 1 Disinfectants and Disinfection Byproducts Rule: Basic Guide

(This guide also includes supplements A and B)

Publication number: EPA 816-B-05-004, March 2006

http://www.epa.gov/safewater/mbdp/pdfs/guide_stage1_basic_final.pdf

Small Systems Guide to Safe Drinking Water Regulations

Publication number: EPA 816-R-03-017, September 2003

http://www.epa.gov/safewater/smallsys/pdfs/guide_smallsystems_sdwa.pdf

TOOLS TO HELP MANAGE SMALL SYSTEMS

Strategic Planning: A handbook for small water systems

Publication number: EPA 816-R-02-005, September 2003

http://www.epa.gov/safewater/smallsys/pdfs/guide_smallsystems_stratplan.pdf

Asset Management: A handbook for small water systems

Publication number: EPA 816-K-02-006, September 2003

http://www.epa.gov/safewater/smallsys/pdfs/guide_smallsystems_asset_mgmnt.pdf

Sources of Technical and Financial Assistance

Publication number: EPA 816-K-02-005, July 2002

http://www.epa.gov/safewater/smallsys/pdfs/tfa_sdws.pdf