CHAPTER

10

Stage 2 Disinfectants and Disinfection Byproducts Rule

The Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR) rule is intended to reduce potential cancer and reproductive and developmental health risks from disinfection byproducts (DBPs) in drinking water. DBPs are formed when disinfectants are used to control microbial pathogens. The use of these disinfectants is considered a major advancement in public health in the 20th century. Since the addition of chlorine to drinking water at the beginning of the 20th century, the occurrence of cholera and typhoid outbreaks has been essentially eliminated.

While disinfectants are effective in controlling many harmful microorganisms, they react with organic and inorganic matter in water to form DBPs. Several epidemiological studies suggest a weak association between certain cancers and reproductive and developmental effects and exposure to chlorinated water. Disinfectants themselves may cause health problems if people are exposed to high levels over long periods of time. These health problems include neurological damage to the nervous system and damage to the blood and kidneys. More than 200 million people in this country consume water that is disinfected. Because of the large population exposed, potential health risks associated with DBPs and disinfectants are taken seriously.

Illinois EPA Assistance

In most cases, as a monitoring requirement approaches for a community water system (CWS), the Illinois EPA will send reminder notifications that detail the requirement and specific timeline for completion. Please remember that these are "reminder" notifications and does not relieve the CWS in meeting the monitoring schedule deadlines. If a CWS is unsure of its schedule or timeframe described in any Illinois EPA notification, it is very important that the CWS contact the Drinking Water Compliance Unit at 217/785-0561 for clarification. All DBP correspondence should be sent to:

DBP Coordinator
Illinois EPA /BOW/CAS #19
P.O. Box 19276
Springfield, IL 62794-9276
Telephone: 217-785-0561
Fax 217-782-0075

Sample Bottles

If your supply participates in the Community Water Supply Testing Fund (CWSTF), sample containers will be sent to your supply during the monitoring period. If your supply does **not** participate in the CWSTF, it is your responsibility to have all testing completed by an Illinois EPA certified laboratory and submitted on the correct reporting forms. The DBP certified laboratory reporting form is available on the Internet (see next page) and in **Appendix A**. This form must be submitted within 10 days after the end of a monitoring period. If the laboratory you choose submits data electronically, it is not necessary to submit a paper copy. However, it is the responsibility of the CWS to insure data reaches the Illinois EPA within 10 days of the end of the monitoring period.

Acronyms

CMP	Compliance Monitoring Plan
CWS	Community Water System
GWUNDI	Ground Water under the Influence of Surface Water
HAA5	Haloacetic Acids
IDSE	Initial Distribution System Evaluation
LRAA	Locational Running Annual Average
MCL	Maximum Contaminant Level
NTNCWS	Nontransient noncommunity water systems
OEL	Operational Evaluation Level
SMP	Standard Monitoring Plan
SSS	System Specific Study
Subpart H	Surface Water and GWUNDI systems
SW	Surface Water
SWP	Surface Water Purchase
TOC	Total Organic Carbon
TTHM	Total Trihalomethanes
VSS	Very Small System Waiver

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Certified Laboratory Result Reporting Forms can be downloaded at:

http://www.epa.state.il.us/water/forms.html#compliance-and-enforcement-drinking-water

If Internet access is unavailable, please contact the DBP Coordinator at 217-785-0561 for a copy of this form.

Stage 2 DBP Regulatory Background

Disinfectants are an essential element of drinking water treatment because of the barrier they provide against waterborne disease-causing microorganisms. However, disinfection byproducts (DBPs) form when disinfectants used to treat drinking water react with naturally occurring materials in the water (e.g., decomposing plant material). Total trihalomethanes (TTHM – chloroform, bromoform, bromodichloromethane, and dibromochloromethane) and haloacetic acids (HAA5 – monochloro-, dichloro-, trichloro-, monobromo-, dibromo-) are widely occurring classes of DBPs formed during disinfection with chlorine and chloramine. These DBPs generally form at much lower levels when chloramine is used instead of chlorine. The amount of trihalomethanes and haloacetic acids in drinking water from one water system can change from day to day, depending on the season, water temperature, amount of chlorine added, the amount of plant material in the water, and a variety of other factors.

At this time, EPA believes that the best way to control DBPs is both to regulate known byproducts and to limit the quantity of disinfection byproduct precursors (e.g., decomposing plant material) allowed to react with disinfectants. TTHM and HAA5 are useful indicators for measuring DBPs in chlorinated drinking water because they commonly occur at levels that can be easily measured.

The Stage 2 DBP rule builds incrementally on existing DBP rules. Many systems have already made significant progress in lowering their DBP levels. The Stage 2 DBP rule takes a risk-based targeted approach to require treatment changes by only those public water systems that are identified as having the greatest remaining risk. The first step is a multi-year process for systems to determine where higher levels of DBPs are likely to occur in their distribution system. These locations will become the system's new DBP monitoring sites. Under the Stage 2 DBP rule, systems will conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation (IDSE), to identify the locations with high disinfection byproduct concentrations. These locations will then be used by the systems as the sampling sites for Stage 2 DBP rule compliance monitoring.

The Stage 2 DBP rule strengthens public health protection for customers of systems that deliver disinfected water by requiring such systems to meet maximum contaminant levels as an average at each compliance monitoring location (instead of as a system-wide average as in previous rules) for two groups of DBPs, trihalomethanes (TTHM) and five haloacetic acids (HAA5). The rule targets systems with the greatest risk and builds incrementally on existing rules. This regulation will reduce DBP exposure and related potential health risks while providing more equitable public health protection. The Stage 2 DBPR is being released simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule to address concerns about risk tradeoffs between pathogens and DBPs.

The remainder of the chapter details requirements for the most recent DBP rule, or the Stage 2 DBP Rule. If you have questions concerning the Stage 1 DBP Rule, please contact the DBP Coordinator at 217-785-0561.

Early Implementation

Initial Distribution System Evaluation (IDSE)
All community systems were required to do an evaluation to determine their best sampling locations. An IDSE is a study of DBP levels throughout the distribution system, based on source type, population, and historical TTHM & HAA5 results.

The Initial Distribution System Evaluation steps were to prepare/submit IDSE SMP or SSS (or apply for IDSE 40/30 or VSS waiver), conduct IDSE monitoring, then submit IDSE Report.

Standard Monitoring (SMP)
Standard monitoring is one year of increased monitoring for TTHM and HAA5 in addition to the data being collected under Stage 1 DBPR. This data will be used with Stage 1 DBPR data to select Stage 2 DBPR TTHM and HAA5 compliance monitoring locations. Any system may conduct standard monitoring to meet the IDSE requirements of the Stage 2 DBPR.

An IDSE report is required to fulfill the IDSE requirements.

System Specific Study (SSS)
Systems that have extensive TTHM and HAA5 data (Including Stage 1 DBPR compliance data) or technical expertise to prepare a hydraulic model may choose to conduct a system specific study to select Stage 2 DBPR compliance monitoring locations.

An IDSE report is required to fulfill the IDSE requirements.

Very Small System Waiver (VSS)
Systems that serve fewer than 500 people and have eligible TTHM and HAA5 data can qualify for a VSS waiver and would not be required to conduct IDSE monitoring. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.

Systems serving fewer than 500 people that receive a waiver for the IDSE from the IEPA must comply by submitting a Stage 2 Compliance Monitoring Plan (CMP).

40/30 Waiver
The term "40/30" refers to a system that during a specified time period has all individual Stage 1 DBPR compliance samples less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 and has no monitoring violations during the same time period. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.

Systems that qualified for the 40/30 waiver from the IEPA should submit a Stage 2 Compliance Monitoring Plan (CMP).

Systems that completed an IDSE report should base their monitoring plan on the IDSE and any state modifications. Systems may revise their monitoring plan to reflect changes in treatment, distribution system operations and layout, or other factors that may affect TTHM or HAA5 formation. If there are any changes to the monitoring locations, systems must replace existing compliance monitoring locations with expected high TTHM or HAA5 levels.

Selecting Sampling Locations

Under the Stage 2 DBP rule, most systems will conduct an evaluation of their distribution systems, Initial Distribution System Evaluation (IDSE), to identify the locations with high disinfection byproduct concentrations. These locations will then be used by the systems to determine the sampling sites for Stage 2 DBP rule compliance monitoring. Systems that completed a System Specific Study (SSS) or Standard Monitoring Plan (SMP) did not need to complete a Compliance Monitoring Plan. Systems that received a Very Small System (VSS) Waiver or a 40/30 Waiver were required to submit a Compliance Monitoring Plan to determine sampling sites and dates.

Initial Distribution System Evaluation (IDSE)

The purpose of the IDSE was to help systems acquire adequate information about their distribution systems and DBP levels to select stage 2 DBPR compliance monitoring sites that represent high TTHM and HAA5 levels throughout the distribution center. There were a few IDSE options that all had different processes for selecting sampling locations.

For the Standard Monitoring Plan (SMP) systems were required to conduct standard monitoring by selecting a standard monitoring location and using the results and the final plan to justify the selection of the location. For the System Specific Study (SSS) there was an option to use existing DBP monitoring results (Existing Monitoring Plan) or an extended period simulation hydraulic model (Hydraulic Modeling Plan). For the Existing Monitoring Plan systems were required to provide a certain amount of past data that was determined by water system type and population and that was representative of the entire system to show that the selected sites should continue to be the sampling locations. For the Hydraulic Modeling Plan systems were required to simulate a 24-hour variation in demand and that this was a repeating pattern. From here the system had to justify their selected timing and number of samples based on the acquired data.

Compliance Monitoring Plan (CMP)

All systems that received a Very Small System (VSS) Waiver or a 40/30 Waiver had to submit a compliance monitoring plan within a time frame that was a determined by their population and treatment. This purpose of this plan was to determine the best sites to sample and their peak historical month (PHM) to determine their schedule for DBP sampling.

If a system makes any changes in treatment, distribution system operations and layout, or other factors that may affect TTHM and HAA5 formation, these changes may warrant a modification to their monitoring locations. In this case the system must revise their compliance monitoring plan. Templates for the Compliance Monitoring Plan can be found **in Appendix B**. The system must consult with the IEPA regarding the need for changes and the most appropriate modifications. Modifications may be initiated by the water system or IEPA.

Listed below are some tips for determining the best available sites for TTHM and HAA5 sampling:

Selecting High TTHM sites:	**Selecting High HAA5 Sites:**
• TTHM formation – Advanced residence time is primary factor • Good TTHM sites – Downstream of tanks and booster chlorination – Hydraulic and geographic dead ends (prior to last customer) – Sites with difficulty maintaining residual – Areas with low water use – Areas of high historic levels • Avoid – Dead ends with no users – Sites after the last hydrant or blowoff – Sites upstream of booster chlorination – The *last house* on a dead end	• HAA5 formation – Residence time, but also consider biodegradation • Good HAA5 sites – Downstream of booster chlorination – Sites with low but detectable residual – Areas of high historic levels – Areas with high residence time • Avoid – Areas with known biofilm growth – Areas with difficulty maintaining a residual – The *last house* on a dead end

The minimum number of compliance monitoring locations and the minimum monitoring frequency for Subpart H systems (surface water/surface water purchase) and groundwater systems complying with the Stage 2 DBPR are listed in the tables below.

Minimum number of locations, samples, and frequency for **Subpart H systems:**

Population Size Category	**Monitoring Frequency**[1]	**Total Monitoring Locations per Period**	**Highest TTHM locations**	**Highest HAA5 locations**	**Existing compliance locations**
< 500	Per year	2[2]	1	1	
500 – 3,300	Every 90 days	2[2]	1	1	
3,301 – 9,999		2	1	1	
10,000 – 49,999		4	1	1	1
50,000 – 249,999		8	2	3	2
250,000 – 999,999		12	3	4	3
1,000,000 – 4,999,999		16	6	6	4
≥ 5,000,000		20	8	7	5

Minimum locations and monitoring frequencies for **ground water systems**:

Population Size Category	**Monitoring Frequency**[1]	**Monitoring Locations per Period**	**Highest TTHM locations**	**Highest HAA5 locations**	**Existing compliance locations**
< 500	Per year	2[2]	1	1	
500 – 9,999		2	1	1	
10,000 – 99,999	Every 90 days	4	2	1	1
100,000 – 499,999		6	3	2	1
≥ 5,000,000		8	3	3	2

[1] All systems must take at least one dual sample set during the month of highest DBP concentration. Systems on quarterly monitoring must take dual sample sets every 90 days.
[2] System is required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentration, 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 Requirements / Effective Dates

The Stage 2 DBP rule applies to all community and non-transient non-community water systems that add and/or deliver water that is treated with a primary or residual disinfectant other than ultraviolet light. The scheduling and monitoring for Stage 2 is different than that of Stage 1 in some major ways:

- **Stage 1 DBPR**
  - Scheduling based on source water type and population served
  - Monitoring based on source water type, population served, *and number of treatment plants/wells*

- **Stage 2 DBPR**
  - Scheduling based on source water type, population served, *and population of the largest system in combined distribution system (CDS)*
  - A combined distribution system (CDS) is the interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive finished water
  - Monitoring based on source water type and population served (excluding CDS)
  - Consecutive systems must comply

If you are this kind of system:	***Comply with Stage 2 DBPR Monitoring by:***
Systems serving 100,000 or more people OR belonging to a CDS in which the largest system serves 100,000 or more	Schedule 1: April 1, 2012
Systems serving 50,000 to 99,999 people OR belonging to a CDS in which the largest system serves 50,000 to 99,999	Schedule 2: October 1, 2012
Systems serving 10,000 to 49,999 people OR belonging to a CDS in which the largest system serves 10,000 to 49,999	Schedule 3: October 1, 2013
Systems serving fewer than 10,000 and not connected to a larger system	October 1, 2013 (if not monitoring for *Crypto*) October 1, 2014 (if monitoring for *Crypto*)

If your water system switches its source type, your new monitoring will begin with routine monitoring for the new source type at the beginning of the next sampling schedule. Please contact IEPA at 217-785-0561 for assistance or with any additional questions.

Minimum number of samples and monitoring frequencies for **ground water** systems:

Population Size Category	Monitoring Frequency[1]	Monitoring Locations per Period
< 500	Per year	2[2]
500 – 9,999		2
10,000 – 99,999	Per quarter	4
100,000 – 499,999		6
> 5,000,000		8

Minimum samples and monitoring frequencies for **Subpart H (SW/SWP and GWUNDI)** systems:

Population Size Category	Monitoring Frequency[1]	Monitoring Locations per Period
< 500	Per year	2[2]
500 – 3,300	Per quarter	2[2]
3,301 – 9,999		2
10,000 – 49,999		4
50,000 – 249,999		8
250,000 – 999,999		12
1,000,000 – 4,999,999		16
> 5,000,000		20

[1] All systems must take at least one dual sample set during the month of highest DBP concentration. Systems on quarterly monitoring must take dual sample sets every 90 days.
[2] System is required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentration, 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.

Please remember that several factors influence monitoring requirements; such as, violation of regulations, new regulations, and/or contaminant detections. It is recommended that each CWS water operator and/or sample collector periodically (at least quarterly) download a new schedule since monitoring schedules change frequently. A CWS can download their most current monitoring schedule at:

http://www.epa.state.il.us/water/compliance/drinking-water/sdwis/index.html

Reduced Monitoring

In order to be eligible for reduced monitoring the LRAA's at all monitoring locations must be less than or equal to 0.040 mg/L for TTHM and less than or equal to 0.030 mg/L for HAA5. In addition, subpart H systems must maintain annual average TOC levels less than or equal to 4.0 mg/L in source water at each treatment plant in order to qualify.

Once on reduced monitoring, systems on quarterly reduced monitoring LRAAs for TTHMs and HAA5 must stay below or equal to 0.040 mg/L and 0.030 mg/L, respectively in order to remain on reduced monitoring. Meanwhile systems on annual or less frequent monitoring LRAAs for TTHMs and HAA5 must be less than or equal to 0.060 mg/L and 0.045 mg/L, respectively.

In addition, subpart H systems must monitor TOC levels every 90 days and maintain annual average levels of less than or equal to 4.0 mg/L in source water at each treatment plant. In order to qualify for Reduced monitoring you must monitor for TOC every 30 days to qualify for reduced monitoring for at least 12 months. See below.

If reduced monitoring results indicate that the system is no longer eligible for the reduced monitoring, the system must resume routine monitoring the quarter immediately following the monitoring period in which the system exceeded the specified levels for reduced monitoring. Note that reduced monitoring is not allowed on a location-by-location basis. All sites must meet the criteria in order for the system to reduce monitoring.

Source Water TOC for reduced monitoring for DBPs

The Stage 2 DBPR specifies a sampling frequency for all systems taking TOC source water samples. Systems must take TOC samples every 30 days at a location prior to treatment to qualify for reduced monitoring. These samples must be averaged quarterly for the most recent 4 quarters, which are used to calculate an RAA. If the system's RAA for TOC is 4.0 mg/L or lower and it meets the criteria listed above for TTHM and HAA5, then the system qualifies for reduced monitoring.

Subpart H systems on a reduced Stage 1 DBPR monitoring schedule will need to conduct Stage 2 DBPR compliance monitoring on a routine monitoring schedule until they have collected sufficient TOC data to qualify for reduced monitoring.

Once the system is on reduced monitoring, it can reduce its TOC monitoring to every 90 days to remain on reduced monitoring.

Stage 2 DBPR Reduced Monitoring Requirements for All Systems

Source Water Type	Population Size Category	Monitoring Frequency[1]	Distribution System	Monitoring Location per Monitoring Period
Subpart H (Surface Water and Ground Water Under the Direct Influence of Surface Water)	<500	-	monitoring may not be reduced	
	500-3,300	per year	1 TTHM and 1 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; 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter. [2]	
	3,301-9,999	per year	2 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	
	10,000-49,999	per quarter	2 dual sample sets at the locations with the highest TTHM and highest HAA5 LRAAs	
	50,000-249,999	per quarter	4 dual sample sets - at the locations with the two highest TTHM and two highest HAA5 LRAAs	
	250,000-999,999	per quarter	6 dual sample sets - at the locations three highest HAA5 and with the three highest TTHM LRAAs	
	1,000,000-4,999,999	per quarter	8 dual sample sets - at the locations with the four highest TTHM and four highest HAA5 LRAAs	
	≥ 5,000,000	per quarter	10 dual sample sets - at the locations with the five highest TTHM and five highest HAA5 LRAAs	
Ground Water	<500	Every third year	1 TTHM and 1 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; 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter. [2]	
	500-9,999	per year	1 TTHM and 1 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; 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter. [2]	
	10,000-99,999	per year	2 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.	
	100,000-499,999	per quarter	2 dual sample sets; at the locations with the highest TTHM and highest HAA5 LRAAs.	
	≥ 500,000	per quarter	4 dual sample sets at the locations with the two highest TTHM and two highest HAA5 LRAAs	

[1] All systems must take at least one dual sample set during the month of highest DBP concentration. Systems on quarterly monitoring must take dual sample sets every 90 days.

[2] System is required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentration, 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.

Increased monitoring

Systems with routine annual sampling must increase to quarterly if:

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

Systems on quarterly monitoring are not subject to increased monitoring and will instead complete an OEL report (see next page).

System is in violation of MCL if:

- TTHM or HAA5 LRAA exceeds MCL after 4 quarters of samples

System may return to routine monitoring if it conducts increased monitoring for at least 4 consecutive quarters and the LRAA for every monitoring location is less than or equal to 0.060 mg/L for TTHM and less than or equal to 0.045 mg/L for HAA5.

Systems on Stage 1 DBPR increased monitoring must remain on increased monitoring for Stage 2

- Must sample at frequency and locations required by increased Stage 2 DBPR
- Must remain on increased monitoring until Stage 2 DBPR requirements for returning to routine monitoring are met

If a system that is required to monitor annually or less frequently on routine monitoring exceeds the TTHM and HAA5 MCL at any location, this system must go to increased monitoring, dual sample sets every 90 days at all locations, in the quarter immediately following the monitoring period in which the system exceeded the MCL.

Compliance with the DBP Maximum Contaminant Levels (MCL) and Operational Evaluation Level (OEL)

Compliance with the maximum contaminant levels for two groups of disinfection byproducts (TTHM and HAA5) will be calculated for each monitoring location in the distribution system. This approach, referred to as the locational running annual average (LRAA), differs from current requirements, which determine compliance by calculating the running annual average of samples from all monitoring locations across the system.

The Stage 2 DBP rule also requires each system to determine if they have exceeded an operational evaluation level (OEL), which is identified using their compliance monitoring results. The operational evaluation level provides an early warning of possible future MCL violations, which allows the system to take proactive steps to remain in compliance. A system that exceeds an operational evaluation level is required to review their operational practices and submit a report to the state that identifies actions that may be taken to mitigate future high DBP levels, particularly those that may jeopardize their compliance with the DBP MCLs.

Once a system receives the third quarter of TTHM and HAA5 results they begin the process of calculating the OELs for **each** monitoring location. Thereafter, the determination of OELs will be completed with receipt of each subsequent set of results. A system will have exceeded the OEL if at any monitoring location where the sum of the two previous quarters' TTHM results plus twice the current quarter's TTHM result, divided by four to determine an average, exceeds 0.080 mg/L, or where the sum of the two previous quarters' HAA5 results plus twice the current quarter's HAA5 result, divided by four to determine an average, exceeds 0.060 mg/L.

Formula: 1Q + 2Q + (2 X 3Q)/4

Below is an example of the OEL calculation of 4 sites:

Stage 2 DBPR Location	**February**	**May**	**August**	**Operational Evaluation Value:**
	A	**B**	**C**	**D = (A+B+(2*C))/4**
#1	0.065 mg/L	0.074 mg/L	0.087 mg/L	0.078 mg/L
#2	0.064 mg/L	0.072 mg/L	0.084 mg/L	0.076 mg/L
#3	0.068 mg/L	0.075 mg/L	0.093 mg/L	**0.082 mg/L**
#4	0.066 mg/L	0.070 mg/L	0.082 mg/L	0.075 mg/L

Example for location #3:

[0.068+0.075+ (0.093x2)]/ 4 = 0.329/4 **OEL**= 0.329/4 = 0.08225

This is NOT a violation of the TTHM MCL, but 0.08225 mg/L exceeds the operational evaluation level.

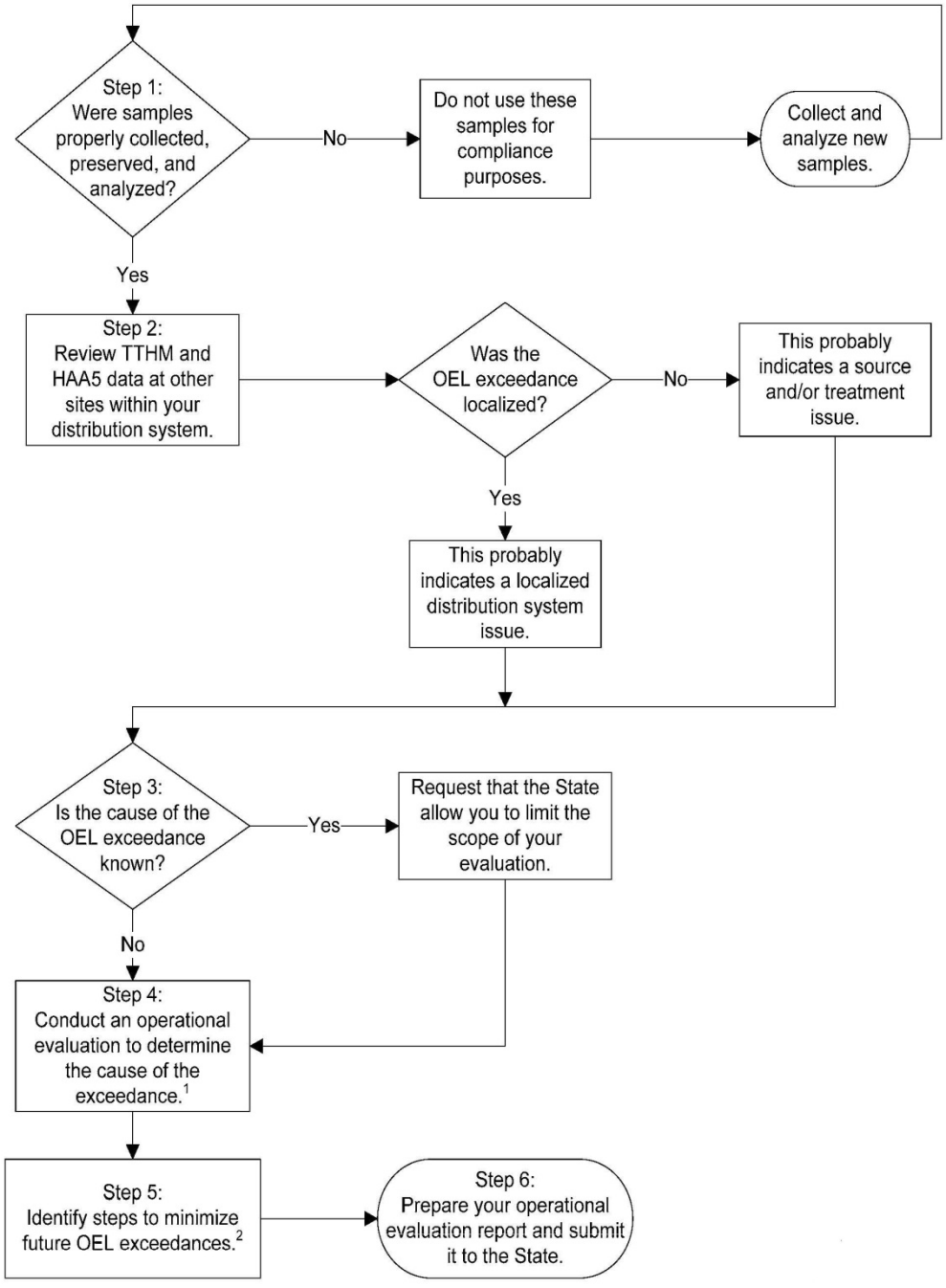
If your water system exceeds the OEL, you must conduct an operational evaluation and submit a written report of the evaluation to the Illinois EPA no later than 90 days after being notified of the analytical result that causes it to exceed the OEL. This written report must also be made available to the public upon request. The 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, and treatment changes or problems that may contribute to TTHM and HAA5 formation and what steps could be considered to minimize future exceedence.

A water system may request to limit the scope of their evaluation if they are able to identify the cause of the operational evaluation level exceedence. The request to limit the scope of the evaluation does not extend the schedule for submitting the written report and the Illinois EPA must approve this limited scope of evaluation in writing.

- **Step 1:** Confirm that samples were properly collected, preserved, and analyzed
- **Step 2:** Report any operational evaluation level exceedances that occurred during the quarter to the State within 10 days of the end of the quarter
- **Step 3:** Determine whether exceedance is system-wide or localized by reviewing data at other sites
- **Step 4:** Request to limit scope of the evaluation, if cause of exceedance is known
- **Step 5:** Conduct operational evaluation
- **Step 6:** Identify steps to minimize exceedances and implement these recommendations
- **Step 7:** Prepare report and submit to state

OEL forms and additional information can be found in **Appendix B** or online at http://www.epa.state.il.us/water/forms.html#compliance-and-enforcement-drinking-water.

Suggested Steps for Performing an Operational Evaluation



Bromate and Chlorite

Different disinfectants form different byproducts. Chlorine and chloramines react with Natural Organic Material (NOM) to form TTHM and HAA5. Using ozone to disinfect (or oxidize) water containing bromide ions can form the byproduct bromate. Chlorine dioxide is unstable in water and rapidly dissociates into chlorite when mixed with NOM. The higher the dose, the more disinfectant is available for reaction with precursors. These disinfectants can react to form DBPs even if they are added to oxidize materials in water rather than to disinfect. Therefore, regardless of whether systems use these chemicals for disinfection or oxidation, they must comply with the applicable standards

Chlorite

Systems using chlorine dioxide, for disinfection or oxidation, must conduct monitoring for chlorite. Daily samples must be taken at the entrance to the distribution system. A 3-sample set each month in the distribution system.

Routine Monitoring that must be conducted from Stage 1 DBPR

Chemical	Frequency	Where monitoring must be conducted
Chlorite	Daily	Entrance to the distribution system
	One 3-sample set per month analyzed by a certified laboratory	Near first customer, location representative of average residence time, location representative of maximum residence time in distribution system.
	Additional: On any day following any daily sample that exceeds 1.0 mg/L, system must take 3 samples	Near first customer, location representative of average residence time, location representative of maximum residence time in distribution system. The system may use results to meet monthly 3-sample set monitoring requirement if the monthly 3- sample set has not yet been taken.
Chlorine Dioxide	Daily	Entrance to the distribution system
	Additional: For any daily sample that exceeds the Maximum Residual Disinfectant Level (MRDL) system must take 3 samples	For chlorine dioxide, chloramines, or chlorine used to maintain disinfectant residual and **NO booster chlorination**: all samples should be taken as close as possible to the first customer at intervals of at least 6 hours. If chlorine is used to maintain disinfectant residual **AND** booster chlorination: as close as possible to the first customer, location representative of average residence time, as close as possible to the end of the distribution.

Bromate

CWSs using ozone are required to conduct bromate monitoring. The MCL for bromate for systems using ozone remains 0.010 mg/L (measured as RAA) for samples taken at the entrance to the distribution system as established by the Stage 1 DBPR.

The criterion, however, for a system using ozone to qualify for reduced bromate monitoring has changed from demonstrating low levels of bromide in the source water, a precursor to bromate when ozonation is used, to demonstrating low levels of bromate in the finished water. Under the Stage 2 DBPR, reduced monitoring criteria are based on RAA of 0.0025 mg/L or less. New analytical methods that are more sensitive than older methods have become available, allowing bromate to measured to levels of 0.001 mg/L or lower.

Reduced Monitoring for Bromate

Under the Stage 2 DBPR, systems must have 1 year of data with bromate samples analyzed using the new analytical method to qualify for reduced bromate monitoring, now that more sensitive methods are available. Starting in 2009 systems were required to have a bromate RAA of 0.0025 mg/L or less based on 1 year of monthly data to qualify for reduced monitoring. Therefore systems sampling for bromate under Stage 1 needed to collect new data to qualify for reduced monitoring under Stage 2 DBPR.

Stage 1 Disinfectants and Disinfection Byproducts Rule

The Stage 2 DBPR does not replace Stage 1 DBPR in its entirety. There are some requirements that were set up in the original Stage 1 DBPR that are unchanged in Stage 2.

- Systems using chlorine dioxide, for disinfection or oxidation, must conduct monitoring for chlorite. Daily samples must be taken at the entrance to the distribution system. In addition a 3-sample set each month in the distribution system.

- Systems using ozone for disinfection or oxidation under routine monitoring must take one bromate sample per month for each treatment plant.

- There are specific monitoring requirements for Chlorite and Bromate, see page 10-17 and 10-18 for further instruction.

- Subpart H systems using conventional filtration treatment must operate with enhanced coagulation or enhanced softening to achieve the TOC percent removal levels unless at least one alternative compliance criteria is met.

- Systems must continue to monitor for and meet maximum residual disinfection levels. Chlorine and chloramine residuals must be measured in the distribution systems at the same point and time total coliform samples are collected. CWS and NTNWCS using chlorine dioxide must take daily distribution system entry point samples.

MRDLs

Disinfectant	MRDL
Chlorine	4.0 mg/L
Chloramines	4.0 mg/L
Chlorine Dioxide	0.8 mg/L

MCLs

Disinfection Byproduct	MCL
Bromate	0.010 mg/L
Chlorite	1.0 mg/L
TTHM	0.080 mg/L
HAA5	0.060 mg/L

DBP Sample Collection – Things to Remember

ATTENTION: THE BOTTLES CONTAIN PRESERVATIVES IN EITHER CRYSTAL OR LIQUID FORM. TO ENSURE PROPER SAMPLE PRESERVATION, PLEASE DO NOT DUMP, SPILL, OR OVERFLOW BOTTLES WHEN COLLECTING A SAMPLE.

SAMPLING PROCEDURE FOR EACH SAMPLING LOCATION

1. **Remove ice-packs and freeze 24 hours prior to sample collection.** Thorough freezing of the ice packs will help to ensure the integrity of your sample.

2. **Three sixty mL amber vials for HAAS.** The sampling source must not be connected to an aerator. If an aerator is present, it must be removed before the sample is collected.
   A) Allow the cold water to run until the temperature is as cold as it will get (approximately 3-5 min). Adjust to low flow. Do Not adjust flow while collecting sample. Open one sample vial. Tip vial slightly so that water flows down wall of container. Bring vial to upright position as it fills. Bottle must be filled completely. Do not overflow.
   B) Seal vial so that no air bubbles are trapped in it. Make sure that the Teflon side (shinny side) of the cap is in contact with the water. The Teflon side should be in the correct position upon the arrival of the bottle.
   C) Turn vial upside down and gently tap on solid surface. Observe for air bubbles. If air bubbles are present then remove cap and add more water. Repeat steps B & C.
   D) Repeat steps B & C for remaining vials.

3. **Three forty mL clear vials for THMS.** The sampling source must not be connected to an aerator. If an aerator is present, it must be removed before the sample is collected.
   A) Allow the cold water to run until the temperature is as cold as it will get (approximately 3-5 min). Adjust to low flow. Do Not adjust flow while collecting sample. Open one sample vial. Tip vial slightly so that water flows down wall of container. Bring vial to upright position as it fills. Bottle must be filled completely. Do not overflow.
   B) Seal vial so that no air bubbles are trapped in it. Make sure that the Teflon side (shinny side) of the cap is in contact with the water. The Teflon side should be in the correct position upon the arrival of the bottle.
   C) Turn vial upside down and gently tap on solid surface. Observe for air bubbles. If air bubbles are present then remove cap and add more water. Repeat steps B & C.
   D) Repeat steps B & C for remaining vials.

4. Replace the filled sample vials in the foam block, place foam block in the cooler with frozen ice-packs on the side.

5. Place **completed analytical form sheet** in plastic sleeve and place on the top of the ice- packs. Secure lid with box tape.

6. Return the collected sample to the laboratory the same day it was collected. Use a mailing service that will get the sample to the laboratory the day after it is collected. It is recommended (not required) that you **refrigerate the filled sample bottles** (do not freeze) for two to three hours before shipping. Your refrigerator must be free of any volatile organic compounds i.e. gasoline petroleum products.

7. Do not ship the sample(s) to the laboratory on Fridays or the day before holiday. If samples sit over weekends or holidays, they will become too warm and need to be resampled.

SPECIAL NOTES

A. All of the information must be completed on the analytical form sheet.

B. Samples must be collected within the prescribed sample period. If samples cannot be collected during this period due to an unavoidable circumstance (such as a well being temporarily out of service), an extension of the period must be obtained by calling (217) 785-0561.

C. Please remember to return analysis form and instruction sheet with samples.

D. Any questions regarding this program can be answered by calling the Compliance Assurance Section at (217) 785-0561. Any questions about sampling and analytical results can be answered by calling the IEPA Laboratory at (217) 782-9780 or 557-0274 if your water system is in Community Water Supply Testing Fund, if not call your contract laboratory.