

# **Stage 2 Disinfectants and Disinfection Byproduct Rule Monitoring Plan\***

Groundwater systems serving 25-9,999 people and using chlorine or chloramines

**Name of Public Water Supply:** \_\_\_\_\_

**City:** \_\_\_\_\_

**Date Plan Prepared:** \_\_\_\_\_

**The plan must be reviewed every three (3) years and updated as needed.**

**Date Reviewed:** \_\_\_\_\_

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## **Table of Contents**

1. General Water System Information
2. Plant Description and Summary of Normal Operating Characteristics
3. Sampling Plan
4. Calculations for Determining Compliance
5. Reporting Requirements and Forms
6. Violations

\*Note: This plan replaces the Disinfectants/Disinfection Byproducts Monitoring Plan (Stage 1)

## **1. General Water System Information**

PWS Name: \_\_\_\_\_ PWSID: IA \_ \_ \_ \_ \_

PWS Mailing Address: \_\_\_\_\_

PWS City, State, Zip Code: \_\_\_\_\_

Population Served: \_\_\_\_\_ Source Water Type: Groundwater

System Type: (circle) Community or Nontransient Noncommunity

PWS Contact Name: \_\_\_\_\_ Title: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_ Residual Disinfectant: ☐ Chlorine ☐ Chloramines

Relationship to another PWS: ☐ Consecutive (buys from)\* ☐ Wholesale (sells to) ☐ Neither

*\*If you are a consecutive system, list name of producing system:* \_\_\_\_\_

Source Entry Point ID & Name: \_ \_ \_

*(include all source entry points if system has more than one)*

## **2. Plant Description & Summary of Normal Operating Characteristics**

Briefly describe the normal operating conditions including all chemicals and treatment, source rotation, alternative sources, storage, seasonal operation, etc. Consecutive systems must list any additional treatment provided within its system, such as booster chlorination.

### **3. Sampling Plan**

Sampling is required in the distribution system for the disinfection byproducts (DBPs) of total trihalomethanes (TTHM) and haloacetic acids (HAA5), and the chlorine disinfectant residual.

#### **A. Disinfection Byproducts (TTHM & HAA5)**

Disinfection byproducts form in the treatment plant and distribution system through contact between organic compounds in the water and the disinfectant. Two types of byproducts must be monitored:

- Total Trihalomethanes (TTHM), which is the sum of these four compounds:  
Chloroform, bromoform, chlorodibromomethane, bromodichloromethane
- Haloacetic Acids (HAA5), which is the sum of these five compounds:  
Monochloro-, dichloro-, trichloro-, monobromo-, and dibromo- acetic acid

**Peak Month:** \_\_\_\_\_

*This is the month with the warmest water temperature or highest TTHM results. The sample(s) must be collected this month, as listed in your operation permit.*

#### **Complete both the ROUTINE and REDUCED sampling sections:**

**ROUTINE sampling requirement:** The routine sampling requirement is two samples each year during the chosen sampling month. Each sample is analyzed for both TTHM and HAA5.

**High TTHM location:** \_\_\_\_\_ **Sample Point ID: DB01**

*This is the maximum residence time location, where the water is in contact with the disinfectant for the longest period of time in the system before it's consumed. This is likely the same location that's been used in the past for DBP sampling (MRT location). List the street address or unique site identifier. Use this address, the sample point ID DB01, and the distribution system Facility ID (three-digit, starting with 9, usually 950 for most systems) for the facility code to identify the sample when submitting it to the lab.*

**High HAA5 location:** \_\_\_\_\_ **Sample Point ID: DB02**

*This is usually an average residence time location, where the water is in contact with the disinfectant for an average period of time in the system before it's consumed. List the street address or unique site identifier. Use this address, the sample point ID DB02, and the distribution system Facility ID (three-digit, starting with 9, usually 950 for most systems) for the facility code to identify the sample when submitting it to the lab.*

**REDUCED sampling requirement:** Your system may qualify for reduced monitoring, based on previous sampling results. You'll be notified of this status change by the DNR if your system meets the criteria. The reduced sampling requirement is one sample each year during the peak sampling month (selected above), if the TTHM and HAA5 levels are the highest at the same location and during the same quarter from historical data. The single sample is analyzed for both TTHM and HAA5. In addition, systems serving fewer than 500 people may be allowed to reduce the frequency to one sample every three years. Your operation permit will list the appropriate sampling frequency for your system, based upon the previous DBP results. The location must be the site with the highest TTHM, which should be the same as the high TTHM location under routine monitoring previously described under "Routine sampling requirement."

**Reduced TTHM & HAA5 location:** \_\_\_\_\_ **Sample Point ID:** DB01

**INCREASED sampling requirement:** If a single sample result is at or above 0.080 mg/L for TTHM or 0.060 mg/L for HAA5, the system must sample every quarter for at least one year. If this occurs in your system, your operation permit will be revised to require the quarterly sampling. The quarterly samples must be collected in the same month each quarter (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> month of the specific quarter). Collect the sample on any day in that month. Use the peak month selected above to select the series:

**First month of each quarter:** January, April, July, October

**Second month of each quarter:** February, May, August, November

**Third month of each quarter:** March, June, September, December

*Example: A TTHM result of 0.087 mg/L is the result of an August sample. This triggers quarterly sampling for at least one year (including the quarter of the original sample). The system will sample in the "Second month of each quarter," and will collect its next sample in November, then February, and then May. (Results are evaluated after the 4<sup>th</sup> sample to see if system can return to Routine sampling.)*

**CHANGE OF SAMPLING SITE:** If you need to change a sampling site, the replacement site must meet the same targeting criteria as the original site (either high TTHM or high HAA5). Complete the "Change of Sampling Site for DBPs" form located at this website: Send a copy to DNR, and attach the form to this plan:

[www.iowadnr.gov/InsideDNR/RegulatoryWater/DrinkingWaterCompliance/Forms.aspx](http://www.iowadnr.gov/InsideDNR/RegulatoryWater/DrinkingWaterCompliance/Forms.aspx)

**LAB INFORMATION:** All samples must be collected in the bottles provided by the laboratory and as directed by the laboratory. Samples must be placed in coolers and shipped to the certified laboratory as soon as practical. The laboratory currently used for analysis of your system's DBP samples is:

**Lab Name:** \_\_\_\_\_

**Lab Shipping Address:** \_\_\_\_\_

**Lab Phone Number:** \_\_\_\_\_ **Contact Person:** \_\_\_\_\_

## General Sampling Procedure for TTHM and HAA5

Samples for TTHM and HAA5 must be collected at the appropriate sample location(s) previously listed. The laboratory instructions should be followed for each sample. These samples are collected in 40 or 60 mL vials with no headspace (no air bubble). These bottles will contain a preservative which may appear as a drop of liquid, powder, or may not be apparent. Some labs may require additional preservative to be added after collection.

General sample collection instructions:

1. Run water for at least two minutes or until water is cool.
2. Carefully fill each vial by allowing the water to slowly run down the inside of the vial.
3. Overfill each vial so that a bead of water forms above the lip of the vial and there are no air bubbles in the sample vial.
4. Add preservative if required.
5. Carefully screw on the cap.
6. Tip the vials upside down to check that no air bubble remains in the vial. If an air bubble does appear, unscrew the cap and add more water (DO NOT DUMP out the sample and start over).
7. Fill out the sample information forms. List the street address or unique site identifier for the sample.
8. Carefully pack the samples and ship or deliver to the lab.

## B. Maximum Residual Disinfectant Level (Residual Chlorine)

Because this system uses chlorine or chloramines for oxidation and/or disinfection, the compliance with the Maximum Residual Disinfectant Level or MRDL is based on the total chlorine residual measured in the distribution system. Systems must measure the total chlorine residual to determine compliance with the MRDL. **At a minimum, the total residual chlorine level must be measured when coliform bacteria samples are collected at the locations specified by the bacterial sampling plan.** This includes any additional repeat or routine coliform bacteria samples required by the DNR. These chlorine residual results must be reported on the laboratory sheet with the bacteria sample. These are the results that you will use to calculate compliance with the MRDL.

Some systems switch between chlorine and chloramines throughout the year. You must record which disinfectant is being used on any particular day. The calculation for the running annual average includes all chlorine and chloramine data collected during the year according to your monitoring plan.

Usually a system will only use the total chlorine residual levels measured when the routine and repeat coliform samples are collected for determining compliance with the MRDL. For systems serving 25 – 9,999 people, this ranges from a single sample each

quarter (most NTNC systems) to 1 – 10 samples each month (most Community Water Supply systems).

*Note: A system is allowed to use its daily total chlorine distribution samples in the MRDL calculation, too, but that decision must be delineated in this sampling plan and the failure to collect even a single total chlorine sample will trigger a monitoring violation.*

#### **4. Calculations for Determining Compliance**

##### **A. Disinfection Byproducts (TTHM & HAA5) MCL**

The compliance calculations for TTHM and HAA5 are shown below. The DNR will normally calculate the locational running annual average (LRAA) for each site from the data reported directly to it by the laboratory. The LRAA will be compared to the MCL value and compliance determined.

- TTHM Maximum Contaminant Level: 0.080 mg/L
- HAA5 Maximum Contaminant Level: 0.060 mg/L
- For systems on annual sampling frequency, (collecting one sample at either one or two locations each year), the locational running annual average (LRAA) is the value of the single sample at each location. If a single sample result is at or above the maximum contaminant level (MCL) of 0.080 mg/L for TTHM or 0.060 mg/L for HAA5, it is not an MCL violation but the system must now sample every quarter for at least one year.
- For systems collecting a quarterly sample, the locational running annual average is calculated each quarter by adding the results of each of the four most recent quarters at a single location and dividing the sum by four. This value is the LRAA for that specific sampling site. For each new quarter, the oldest quarterly value is dropped and the most recent quarterly value is included in the sum. If a sample was not collected in one quarter, the data for the most recent three quarters is used and the sum divided by 3. If the analytical result is “less than” or “not detected,” a zero is used in the calculation.

For example: At a single location, add each quarterly result and divide by 4.

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

Next quarter:

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

##### **B. Residual Chlorine or Chloramine MRDL (MRDL = 4.0 mg/L as a RAA)**

The total chlorine residual results for each month must be averaged to determine the monthly average for each month. At the end of each calendar quarter, the Running Annual Average (RAA) must be calculated. To do this, add the monthly averages of the last 12 months and divide this sum by 12. This value is the running annual average.

This calculation must be done at the end of each calendar quarter and reported to the DNR on the Monthly Operation Report (MOR), in the MRDL chart. Also include the number of results used to calculate each monthly average on the MOR.

*Example: A system collects 3 coliform bacteria samples each month, so it has 3 chlorine residual results to average in a routine month.*

Then, sum each monthly average and divide by 12.

$$\frac{M1 + M2 + M3 + M4 + M5 + M6 + M7 + M8 + M9 + M10 + M11 + M12}{12} = \text{RAA}$$

Next quarter, delete the first three months, and add the most recent 3 months:

$$\frac{M4 + M5 + M6 + M7 + M8 + M9 + M10 + M11 + M12 + M1 + M2 + M3}{12} = \text{RAA}$$

### C. Operational Evaluation Level or OEL

The Operational Evaluation Level is a calculation required when a system is approaching the MCL. The purpose is to take action to reduce the disinfection byproduct levels in the system before a DBP MCL violation occurs. This is how it is calculated, but as with the DBP monitoring, the DNR will calculate the OEL and notify the system if a report is required.

- If a system is on annual monitoring, calculating compliance with the OEL is not required.
- For systems on quarterly monitoring, if a single quarterly result is at or above 0.080 mg/L for TTHM or 0.060 mg/L for HAA5, the Operational Evaluation Level (OEL) must be calculated for that quarter and for the next three quarters. The calculation is as follows:

$$\text{OEL} = \frac{(2 \times \text{current quarter's result}) + \text{last two quarterly results}}{4}$$

If the OEL calculated value exceeds the MCL, the system has exceeded the OEL for that sample location and must conduct the following:

1. Conduct an operational evaluation to determine the cause of the exceedances;
2. Submit a written report of that evaluation to the DNR within 90 days of being notified of the OEL exceedances by DNR; and
3. Keep a copy of the operational evaluation report and make it available to the public upon request.

**Required OEL Report elements:** The report must contain an examination of the system treatment and distribution operational practices that may contribute to TTHM and HAA5 formation, including:

- Storage tank operations;
- Excess storage capacity;
- Distribution system flushing practices;
- Source water quality;
- Sources of supply;

- Treatment processes; and
- Finished water quality.

The report must also include what steps could be considered to minimize future exceedances.

The system may make a request to DNR to limit the scope of the examination if the cause(s) of the OEL exceedances is identified. The 90-day period cannot be extended. The DNR must approve the limited scope allowance in writing and the written approval must be kept with the completed report.

An OEL exceedance is not a health-based standard violation, although failure to conduct the required actions or submit the OEL are reporting violations.

The EPA Guidance Manual for Conducting the Operational Evaluation is available at this website:

[http://www.epa.gov/ogwdw/disinfection/stage2/pdfs/draft\\_guide\\_stage2\\_operationalevaluation.pdf](http://www.epa.gov/ogwdw/disinfection/stage2/pdfs/draft_guide_stage2_operationalevaluation.pdf)

## **5. Reporting Requirements and Forms**

The Monthly Operation Reports (MORs) must be submitted to the Field Office by the 10<sup>th</sup> of the following month.

All required self-monitoring must be included on the MOR.

Electronic MORs are available at this website:

[www.iowadnr.gov/InsideDNR/RegulatoryWater/DrinkingWaterCompliance/Forms.aspx](http://www.iowadnr.gov/InsideDNR/RegulatoryWater/DrinkingWaterCompliance/Forms.aspx)

Make sure you choose the correct MOR form: either GW or GW-consecutive.

The Monitoring Plans and Change of Sampling Site Form are also available at the same website.

## **6. Violations**

Listed below are the types of violations that can be incurred for TTHM, HAA5, chlorine, or chloramines. Each violation requires public notification and must be included in the annual Consumer Confidence Report.

MCL	A violation of the maximum contaminant level (MCL) for the TTHM or HAA5 occurs when the locational running annual average of the quarterly samples exceeds 0.080 mg/L for TTHM or 0.060 mg/L for HAA5.
MRDL	A violation of the maximum residual disinfectant level (MRDL) for chlorine or chloramines occurs when the running annual average exceeds 4.0 mg/L.



- Monitoring     A monitoring violation for TTHM or HAA5 occurs when the sample is not collected according to the operation permit.  
Examples of common violation reasons: sample was never collected, sample was not collected from the approved location, or sample was not collected in the correct time period.
- A monitoring violation for MRDL occurs when the sampling plan is not followed.  
Examples of common violation reasons: chlorine residual not measured when bacteria sample was collected, bacteria sample not collected (and so no chlorine residual measured), samples not collected in accordance with the sampling plan, samples not collected from the correct locations, samples not collected when a repeat total coliform set of samples is required.
- Reporting     A reporting violation occurs when a required report is either not sent to the DNR by the deadline or is sent but is incomplete.
- The monthly operation report (MOR) is due by the 10<sup>th</sup> of the following month.
  - The operational evaluation report is due within 90 days of the date the system was notified that the OEL report was required.