Stage 2 Disinfectants and Disinfection Byproduct Rule Monitoring Plan*

Surface water/Influenced Groundwater (SW/IGW) systems serving 50,000-249,999 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: _____	**Date Reviewed:** _____
Date Reviewed: _____	**Date Reviewed:** _____
Date Reviewed: _____	**Date Reviewed:** _____
Date Reviewed: _____	**Date Reviewed:** _____
Date Reviewed: _____	**Date Reviewed:** _____
Date Reviewed: _____	**Date Reviewed:** _____

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*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: Surface water or Influenced 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: __ __ _____

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 eight samples each quarter. 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.

High TTHM location: _____ Sample Point ID: DB03

This is another 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. List the street address or unique site identifier. Use this address, the sample point ID DB03, and the distribution system Facility ID code to identify the sample when submitting it to the lab.

High HAA5 location: _____ Sample Point ID: DB04

This is another 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 DB04, and the distribution system Facility ID code to identify the sample when submitting it to the lab.

High TTHM location: _____ Sample Point ID: DB05

This is another 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. List the street address or unique site identifier. Use this address, the sample point ID DB05, and the distribution system Facility ID code to identify the sample when submitting it to the lab.

High HAA5 location: _____ Sample Point ID: DB06

This is another 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 DB06, and the distribution system Facility ID code to identify the sample when submitting it to the lab.

High TTHM location: _____ Sample Point ID: DB07

This is another 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. List the street address or unique site identifier. Use this address, the sample point ID DB07, and the distribution system Facility ID code to identify the sample when submitting it to the lab.

High HAA5 location: _____ Sample Point ID: DB08

This is another 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 DB08, and the distribution system Facility ID code to identify the sample when submitting it to the lab.

The quarterly samples must be collected in the same month each quarter (1st, 2nd, or 3rd month of the specific quarter). Use the peak sampling month selected above to select the series and check the appropriate box. This is your sampling schedule. Collect the sample(s) on any day in that month.

Example: The peak sampling month for a system is July. The "First month of each quarter" is selected because that series contains the month of July. The routine sampling schedule for the system is January, April, July, and October.

☐ **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

REDUCED sampling requirement: Your system may qualify for reduced monitoring, based on previous DBP sampling results that are at or below half of the MCL (LRAA) and total organic carbon (TOC) results in the source water (RAA). You'll be notified of this status change by the DNR if your system meets the criteria and your operation permit will list the appropriate sampling frequency for your system.

The reduced sampling requirement is four samples each quarter, collecting one sample at each of the two highest TTHM LRAA locations and the two highest HAA5 LRRA locations.

Each DBP sample is analyzed for both TTHM and HAA5.

Reduced high TTHM location: _____ **Sample Point ID is DB0** __

Reduced high HAA5 location: _____ **Sample Point ID is DB0** __

Reduced high TTHM location: _____ **Sample Point ID is DB0** __

Reduced high HAA5 location: _____ **Sample Point ID is DB0** __

RETURN TO ROUTINE sampling requirement:
If any of the following occur, the system must return to Routine quarterly sampling beginning the next quarter:

- A single sample result is at or above 0.080 mg/L for TTHM or 0.060 mg/L for HAA5;
- The LRAA exceeds 0.040 mg/L for TTHM or 0.030 mg/L for HAA5; or
- The source water TOC RAA exceeds 4.0 mg/L

Your operation permit will be revised to require the quarterly sampling. The quarterly samples must be collected as described in the Routine sampling requirement, in the same month each quarter (1st, 2nd, 3rd month of the specific quarter).

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

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 CWS systems serving 50,000 – 249,999 people, this ranges from 60 to 150 samples each month.

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 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 collecting quarterly samples, 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 70 coliform bacteria samples each month, so it has 70 chlorine residual results to average in a routine month.

Then, sum each monthly average and divide by 12.

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

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

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

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:

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

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

5. Reporting Requirements and Forms

The Monthly Operation Reports (MORs) must be submitted to the Field Office by the 10th 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
Make sure you choose the correct MOR form: either SW/IGW <10,000 or Consecutive SW/IGW.

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 10th 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.