

Disinfectants and
Disinfection Byproducts

Sample Monitoring Plan
Instructions & Template
for
Public Water Systems
Using Surface Water



Division of Drinking and
Ground Waters

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Sample Monitoring Plan Instructions

Introduction

Welcome to one of the requirements stemming from the changes to the rules covering disinfectants and disinfection byproducts (D/DBPR). The D/DBPR is a complex rule, but these instructions and this template are designed to make it easier for you to remain in compliance. We encourage you to complete your sample monitoring plan as soon as possible and to contact your district representative if you have any questions about how to use this template. Additional information regarding this rule is available from Ohio EPA at:

- <http://www.epa.state.oh.us/ddagw/pubs.html#factsht>

and from U.S. EPA at:

- <http://www.epa.gov/safewater/mdbp/implement.html>



This template is for systems that use **surface water**, including those that **purchase** surface water. Use only need to use the template pages that are pertinent to your

How to use this document:

1. Read the first box on this page.
2. Go to the Template Sections Checklist on page vi and identify the template pages you actually need.
3. Select your template pages. You *should* fill in all the shaded areas, but you **must** fill in the required information indicated in **bold**.
4. Make the map of your distribution system showing where you're going to take your samples and their sample monitoring point IDs (see page vii).
5. Send the map to your Ohio EPA district office representative.

Reporting your sampling results to Ohio EPA is discussed on page v.

If you get stuck, check out the rest of these instructions. If you're still stuck after that, call your district office representative.

Applicability

Rules 3745-81-23, 3745-81-24, 3745-81-70 and 3745-81-77 of the Ohio Administrative Code require community and non-transient non-community public water systems (PWSs) to develop sample monitoring plans for **bromate and chlorite; total trihalomethanes and haloacetic acids 5; disinfectant residuals and total organic carbon and alkalinity**. These sample monitoring plans must address at least the following:

- ✓ locations where samples will be taken,
- ✓ schedules for sampling,
- ✓ how compliance with maximum contaminant levels (MCLs) and maximum disinfectant residual levels (MRDLs) will be calculated, and
- ✓ must reflect the entire distribution system for PWSs that are consecutive systems or provide water to consecutive systems (where the provider agrees to conduct the monitoring for the consecutive system).

You may address all the disinfectants and disinfection byproducts pertinent to your facility with a single plan.

This sampling monitoring plan template shows in **bold** the elements required by the Ohio Administrative Code. At a minimum, any plan you create must include these elements, which are what Ohio EPA will be looking for when we review your plan (this includes the cover page). “Fill in the blank” information is indicated with shading. This template also has additional information you may choose to include to make your final document more user-friendly for you and your staff.

Each constituent is covered separately—and for total trihalomethanes and haloacetic acids 5, by population also--so you only have to use the pages that are pertinent to your facility. For example, if you do not use ozone, you do not need to include the pages for bromate. All of the sections included in the template are listed at the end of these instructions so you can see what all is available to you. And there is a check box for each section on the list to make it easier for you to track the sections you need. These boxes are already checked for information that every system would need to provide.

You must develop and include at least one **map** showing your sampling locations and the associated sample identifiers. You may indicate sampling locations for more than one sample constituent on a single map. You can also include more than one map if you find that helpful (for example, to improve clarity or because the distribution system will not fit conveniently on a single page, etc.).

If you operate a surface water plant using conventional filtration, you are also subject to OAC rule 3745-81-77, which covers treatment techniques for control of disinfection byproduct precursors. We have included a section in the template on the sampling, analysis, and calculations associated with this rule.

Completing and Submitting the Plan

You must have your plan completed within 30 days of when your system is first scheduled to monitor for disinfectants and disinfection byproducts. Systems serving greater than 3,300 persons are required to submit their plan to their district office by 10 days after the end of the first quarter in which monitoring was scheduled. Smaller systems are not required to submit a copy of the plan to your district office unless your district office representative has requested it; in fact, for now you are only being requested to provide a copy of the map to your district office. But you must maintain a copy of the entire plan on-site and have it available for Ohio EPA review during the sanitary survey. The plan must also be available for review by the general public.

Changes to Your Plan

The requirements for trihalomethanes and haloacetic acids depend on the size of the population your system serves. So if your population changes, you may need to update your plan and monitoring practices. If your population goes over 3,300 and you use surface water, in whole or in part (including ground water designated as being under the direct influence of surface water), you'll also need to submit your plan to Ohio EPA.

You might also need to change your sampling frequency due to an exceedence of an MCL. If this occurs, update your plan to reflect the change. And if you had been required to submit your plan to Ohio EPA, you'll need to send in copies of any revised pages.

Compliance with Maximum Contaminant Levels or Maximum Residual Disinfectant Levels

Instructions for determining compliance with maximum contaminant levels (MCLs) or maximum residual disinfectant levels (MRDLs) are also given in this template, including figuring out any arithmetic that may be involved. In some cases all that is needed is a direct comparison between the sample concentration and the applicable standard. For others, you'll compare the standard to the average concentration of all the samples collected during the past year. If the latter, you will need to provide an example calculation.

One exception is that Ohio EPA will determine your compliance with the MCLs for total trihalomethanes and haloacetic acids, so this step is not shown in bold as a required element for your plan. But the calculation methodology is included in the plan if you choose to determine compliance with these MCLs yourself. If so, you will need to include sample calculations.

Average and Maximum Residence Times

These apply to chlorite, chlorine dioxide, total trihalomethanes, and haloacetic acids 5. You will need to give some thought to the layout of your distribution system and provide a brief explanation of why you believe the locations you selected represent the average residence time and the maximum residence time. You may select more than one location to represent each; in fact, Ohio EPA recommends selecting more than one location. That way, if your **primary** sampling site is not available during your sampling round, you can go to another. Please make sure that you will be able to access your sampling sites year round. You will have to give each location a unique sample monitoring point identification and indicate it on your map(s). And the particular identification must be unique, even if you have more than one STU. The convention for sample monitoring point identification is discussed in more detail later in these instructions.

Violation Types and Public Notices

Other things to keep in mind, although they are not specifically addressed in this template, are violations and occurrences that may cause you to have to post a public notice.

Violations include, but are not limited to:

- not developing a sample monitoring plan,
- not following your sample monitoring plan,
- exceeding an MCL or MRDL, and
- not reporting your disinfectant and disinfection byproducts data (includes skipping the reporting entirely or reporting after the deadline).

A public notice would be required as a result of:

- exceeding an MCL,
- exceeding the MRDL for chlorine dioxide,
- not monitoring,
- not using the appropriate monitoring methodology, or
- not reporting until after the deadline.

This list is not exhaustive. See also Ohio Administrative Code rule 3745-81-32.

Sample Submission Reports and Monthly & Quarterly Operating Reports

In most cases, the rate at which you report will be no more often than quarterly. Your laboratory data will be reported on Reports 5114, 5115, 5116, and/or 5022, which Ohio EPA has recently created or modified to capture data associated with the D/DBPR. Your certified laboratory is required to submit the total trihalomethanes and five haloacetic acids data to Ohio EPA Central Office on the 5022 form. Public water systems will submit monthly and quarterly operating reports to the appropriate Ohio EPA District Office. Certified drinking water labs are **not** required to submit individual results for TOC, DOC, UV254, Alkalinity and SUVA on the 5022 form.

Most systems will determine compliance quarterly, whether they are conducting sampling on a monthly or quarterly basis. You will report your compliance determinations on the appropriate monthly or quarterly operating reports.

Note that some systems will qualify for sampling for trihalomethanes and haloacetic acids 5 only once per year. This information will be due by the tenth of October.

Surface Water Systems using Conventional Filtration

Compliance with the Step 1 requirements for percent total organic carbon removal and use of the alternative compliance criteria for Step 1 are covered in detail in the template. You do not need special permission from Ohio EPA to use the alternative compliance criteria, but you will need to submit the alternative compliance criteria documentation **at the same time** you submit the total organic carbon removal quarterly operating report.

If you cannot meet the Step 1 TOC removal requirements or alternative compliance criteria, you will have to comply with the Step 2 (jar testing) requirements. If you find yourself in this situation, contact your district representative. Ohio EPA will be dealing with these instances on a case-by-case basis.

Template Sections Checklist

Table 1

Section	Constituent/Topic	Applicability	Include?
1	Cover Page	all systems	Y
2	Public Water System Information	all systems	Y
3	Map and Addresses	all systems	Y
4	Sample Collection and Analysis Personnel acceptable to perform DPD test kit analyses	all systems	Y
5	Bromate (OAC rule 3745-81-23) • Location and Schedule/Frequency • Compliance with the MCL	systems using ozone	
6	Chlorite (OAC rule 3745-81-23) • Location and Schedule/Frequency • Compliance with the MCL	systems using chlorine dioxide	
7	Total Chlorine (OAC rule 3745-81-70), • Location and Schedule/Frequency • Compliance with the MRDL	all systems	Y
8	Chlorine Dioxide (OAC rule 3745-81-70) • Location and Schedule/Frequency • Compliance with the MRDL	systems using chlorine dioxide	
9A	Total Trihalomethanes and Haloacetic Acids 5 (OAC rule 3745-81-24) • Location and Schedule/Frequency • Compliance with the MCLs	Surface Water* systems serving populations $\geq 10,000$	
9B	Total Trihalomethanes and Haloacetic Acids 5 (OAC rule 3745-81-24) • Location and Schedule/Frequency • Compliance with the MCLs	Surface Water* systems serving populations between 500 and 9,999	
9C	Total Trihalomethanes and Haloacetic Acids 5 (OAC rule 3745-81-24) • Location and Schedule/Frequency • Compliance with the MCLs	Surface Water* systems serving populations < 500	

Section	Constituent/Topic	Applicability	Include?
10	Total Organic Carbon Removal (OAC rule 3745-81-77) <ul style="list-style-type: none"> • Locations and Schedule/Frequency • Step 1 Compliance with TOC percent removal • Compliance with Alternative Criteria for TOC percent removal • Calculating a running annual average, once per quarter 	Surface Water* systems using Conventional Filtration Treatment	

* "Surface Water" includes blended surface water, ground water systems and surface water consecutive systems, and ground water systems under the direct influence of surface water.

Sample Monitoring Point Identifiers

Table 2

ID	Meaning	Analyte
MRxxx*	Maximum residence time**	TTHMs and HAA5
RDxxx	Representative of distribution	TTHMs and HAA5
RSxxx	Raw source	raw TOC; raw alkalinity
FExxx	Filter effluent	finished water TOC
EPxxx	Entry point	bromate; daily routine chlorite and chlorine dioxide
DSxxx	Distribution system	distribution system total chlorine
FCxxx	Near first customer	distribution system chlorite and chlorine dioxide
ATxxx	Average residence time	distribution system chlorite and chlorine dioxide
MTxxx	Maximum residence time**	distribution system chlorite and chlorine dioxide
IPxxx	Intermediate plant***	as needed

* An example format is "MR001" or "MR002." You may have several locations representative of the maximum residence time, near the first customer, etc., so use a **different** number for each location. Show each on your map.

Do not repeat any sample monitoring point identification, even if you have more than one STU. For example, if you have two STUs with three possible sampling locations for average residence time for each STU, you will have sample monitoring point identifications "AT001" through "AT006."

Do not reuse any sample monitoring point identification, even if a sampling location ceases to be available. For example, if you started with "AT001" through "AT006" but you can no longer get to "AT005," your new replacement location becomes "AT007."

** "Maximum residence time" has two possible sample monitoring point IDs. **Use "MRxxx" for total trihalomethanes and haloacetic acids 5 only.** "MTxxx" is only for chlorite and chlorine dioxide.

*** Intermediate plant is used for any location in the plant between the raw and finished water.

The **Template** follows....

Disinfectants/Disinfection Byproducts Sample Monitoring Plan

for

System:

PWSID:
STUID(s):

Date:

Drafted by:

Date Compliance was Required:

Section 2. Public Water System Information

A. **Address:**

B. **Person in Responsible Charge:**

C. **Personnel responsible for D/DBP sampling:**

D. **Source Water (check appropriate box):**

- Surface Water only
- Consecutive Surface Water
- Blended Surface Water and Ground Water

E. **Population Served:**

Section 4. Sample Collection and Analysis for D/DBPR

OAC rule 3745-81-27 Analytical techniques.

Constituent	Jar type*	Jar size*	Preservative	Holding time	Analytical Method(s)	
Bromate	G or P	100 mL	none	28 days	U.S. EPA Method 300.1	
Bromide	G or P	100 mL	none	28 days	U.S. EPA Method 300.0 U.S. EPA Method 300.1	
Chlorite at entry point	G or P	500 mL	none	analyze immediately	S.M., 19th ed, Section 4500-ClO ₂ E	
Chlorite in distribution	G or P	500 mL	none, 4°C	analyze immediately	U.S. EPA Method 300.0 U.S. EPA Method 300.1	
			ethylene-diamine (EDA)	14 days		
Chlorine residuals	G or P	500 mL	none	analyze immediately	free or total	S.M., 19th ed, Section 4500-Cl D, F, or CCR group, Janet Barth, G
					total	S.M., 19th ed, Section 4500-Cl E or I
					free	S.M., 19th ed, Section 4500-Cl H
					free, total, or combined	ASTM Method D 1253-86 S.M., 19th ed, Section 4500-Cl D, F, or G
Chlorine Dioxide	G or P	500 mL	none	analyze immediately	S.M., 19th ed, Section 4500-ClO ₂ D or E	
Total trihalomethanes**	two 40- or 60-mL VOC vials, lids with TFE-lined septa		Na ₂ S ₂ O ₃ , 4°C	14 days	U.S. EPA Method 502.2 U.S. EPA Method 524.2 U.S. EPA Method 551.1	

Constituent	Jar type*	Jar size*	Preservative	Holding time	Analytical Method(s)
Haloacetic acids**		two 40- or 60-mL amber VOC vials, lids with TFE-lined septa	100 mg/L NH ₄ Cl, 4°C	14 days to extraction, 7 days to analysis (or 14 days to analysis at -10°C)	U.S. EPA Method 552.1 U.S. EPA Method 552.2
			65 mg NH ₄ Cl, 4°C	9 days to extraction, 21 days to analysis (at -11°C)	S.M., 19th ed, Section 6251B
Total organic carbon	G	100 mL	none	7 days	S.M., 19th ed, Section 5310B, C, or D
			H ₃ PO ₄ or H ₂ SO ₄ to pH <2, 4°C	28 days	
Dissolved organic carbon	G	100 mL	none	7 days	S.M., 19th ed, Section 5310B, C, or D
			H ₃ PO ₄ or H ₂ SO ₄ to pH <2, 4°C	28 days	
Alkalinity	G or P	200 mL	4°C	24 hours	S.M., 19th ed, Section 2320B USGS Method I-1030-85
Magnesium hardness	G or P	100 mL	HNO ₃ to pH <2	6 months	S.M. Section 31111B S.M. Section 3120B S.M. Section 3500-Mg U.S. EPA Method 200.7
UV ₂₅₄ (ultraviolet absorption at 254 nm)	G	100 mL	none	48 hours (check with Lab Cert for longer holding times)	S.M., 19th ed, Section 5910B

G Glass
P Polyethylene

* Information on sample containers is provided as a guideline. Check with your certified laboratory for appropriate sample containers. The sample cell with you DPD colorimeter is an acceptable container for total chlorine analysis.

** Flush tap for about 10 minutes prior to sample collection, reduce flow to about 500 mL/min for sample collection, do not rinse vials with sample, no air bubbles in vials for total trihalomethanes.

S.M. Standard Methods for Examination of Water and Wastewater (either 18th or 19th edition, unless specified)

ASTM American Society for the Testing of Materials

USGS United States Geological Survey

U.S. EPA Methods can be found in:

Methods for the Determination of Inorganic Substances in Environmental Samples

Methods for the Determination of Metals in Environmental Samples—Supplement I

Methods for the Determination of Organic and Inorganic Compounds in Drinking Water

Methods for the Determination of Organic Compound in Drinking Water—Supplements I, II, III

Personnel acceptable to perform test kit analysis:

Laboratory(ies):

Section 5. Bromate, for systems using Ozone
 OAC rule 3745-81-23(L)

Locations and Schedule/Frequency

Check: **routine (monthly)** or **reduced (quarterly)** monitoring for bromate.

Monitoring Type	Frequency	Location
Routine	one sample per <i>month</i> for each treatment plant in the system using ozone	entry to the distribution system (while the ozonation system is operating under normal conditions)
Reduced	one sample per <i>quarter</i> for each treatment plant in the system using ozone	entry to the distribution system (while the ozonation system is operating under normal conditions)

For reduced monitoring, determine the annual average source water bromide concentration (add together the last 12 consecutive months of *bromide* results. Then divide by 12). If the average bromide concentration is less than 0.05 mg/L, this system qualifies for reduced monitoring. A sample calculation of the average, showing all results used, is provided below:

$$(0.05+ 0.04+ 0.05+ 0.06+ 0.03+ 0.02+ 0.02+ 0.01+ 0.03+ 0.02+ 0.01+ 0.01) \div 12 = 0.03 \text{ mg/L Br}^-$$

Compliance with the MCL for Bromate

1. Determine average concentration for each month.
Add together the concentrations of all bromate samples per plant during the month*. Divide by the total number of samples. An example calculation, using all results available, is provided below:

Monthly average =

$$(0.012 + 0.009) \div 2 = 0.011 \text{ mg/L bromate}$$

If you are only sampling once per month, the monthly average is the result of the individual sample.

2. Determine the average concentration for the year.
Have available the averages for the twelve most recent consecutive months. Add them together. Divide by 12. An example calculation is provided below:

Running annual average =

$$(0.011 + 0.012 + 0.009 + 0.007 + 0.013 + 0.005 + 0.006 + 0.011 + 0.005 + 0.012 + 0.005 + 0.008) \div 12 = 0.009$$

3. Compare the annual average from Step 2 to the MCL of 0.01 mg/L.

* The average includes all samples taken, even if the number of samples taken is greater than that required by the OAC. Any value that is less than the detection limit is treated as a zero for the compliance calculations.

Section 6. Chlorite, for systems using Chlorine Dioxide
OAC rule 3745-81-23(M)

Entrance to the Distribution System

Location: Shown on map.

Schedule/Frequency: Daily.*

- * If the concentration of a daily sample exceeds the MCL,
- a. sample the **next day** in the distribution system at the locations described below and as shown on the map;
 - b. **monthly** sampling in the distribution system will be required.

In the Distribution System

Location: Shown on map at these 3-sample set locations:

- a. near the first customer,
- b. a location representative of the distribution (average residence time), and
- c. a location representative of the maximum residence time.

The **justification** for the selection of the locations representing the average and maximum residence time is:

**Average residence time takes into account number of persons served, different sources of water, and different treatment methods. Ohio EPA recommends selecting more than one location for both the maximum and average residence times, although the back-up locations are only to be used when the primary site is unavailable.

Schedule/Frequency: Check [] routine (monthly) or [] reduced (quarterly).

To *qualify* for reduced monitoring in the distribution system, there must be one year's worth of samples in which no concentrations exceed the MCL, at either the entrance to the distribution system or within the distribution system. (Daily monitoring at the entrance to the distribution system cannot be reduced).

To *remain* on reduced monitoring, all individual sample concentrations must be less than the MCL, at both the entrance to the distribution system and within the distribution system.

Compliance with the MCL for Chlorite

Compliance with the MCL for chlorite is based on the arithmetic average of any three sample set in the distribution system. A system is in compliance if the average is less than or equal to the MCL of 1.0 mg/L.

Section 7. Total Chlorine, all systems; OAC rule 3745-81-70

Location(s): As shown on map, within the distribution system at the same place where routine and repeat (but not special purpose) samples for total coliform are taken.

Schedule/Frequency: At the same time as all routine and repeat (but not special purpose) total coliform samples.

Compliance with the MRDL for Total Chlorine

1. Each month, add together the chlorine concentrations of all samples taken during the month at the total coliform sampling locations.* Divide by the total number of samples. An example calculation in which total chlorine was determined five times in a month is provided below:

Monthly average =

$$(0.9+ 1.1+ 0.2+ 0.8 + 1.8) \div 5 = 0.96 \text{ mg/L Cl}_2$$

2. At the end of each quarter, determine the quarterly average. Add together the averages for the three months in the quarter. Divide by 3. An example calculation is provided below.

Quarterly average =

$$(1.0+ 1.2+ 0.6) \div 3 = 0.9 \text{ mg/L Cl}_2$$

3. At the end of each quarter, determine the running annual average. Have available the averages for the four most recent consecutive quarters. Add them together. Divide by 4. An example calculation is provided below.

Running annual average =

$$(0.9+ 1.2+ 1.9+ 1.5) \div 4 = 1.4 \text{ mg/L Cl}_2$$

4. Compare the annual average for Total Chlorine to the MRDL of 4.0 mg/L.

* The average includes all samples taken, even if the number of samples taken is greater than that required by the OAC. Any value that is less than the detection limit is treated as a zero for the compliance calculations.

Section 8. Chlorine Dioxide, for systems using Chlorine Dioxide
OAC rule 3745-81-70

Entrance to the Distribution System

Location: Shown on map.

Schedule/Frequency: Daily.*

* If the concentration of a daily sample exceeds the MRDL, sample the **next day** in the distribution system at the locations described below and as shown on the map.

In the Distribution System, as needed

Location: Shown on map. Sampling locations are based on the use of chlorine dioxide or chloramines, or chlorine with or without booster chlorination.

Schedule/Frequency:

Check as appropriate:

- A. Chlorine dioxide or chloramines are used to maintain a disinfectant residual in the distribution system.
- B. Chlorine is used to maintain a disinfectant residual in the distribution system and there is **no** booster chlorination.

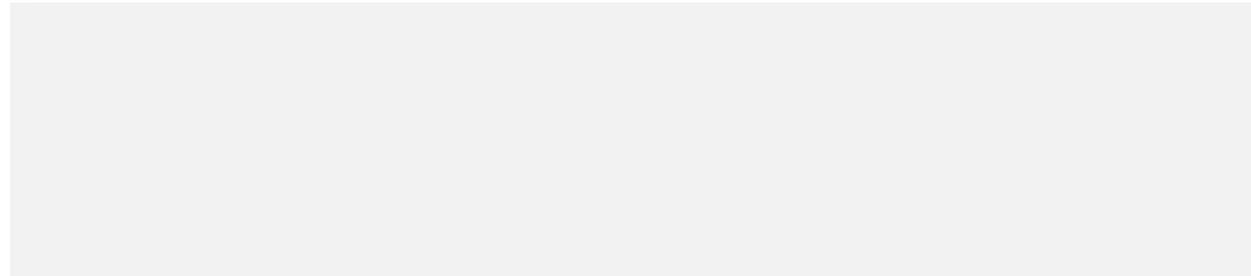
If A or B is checked, **three** samples will be taken the next day **near the first customer**. Samples will be taken at intervals of at least 6 hours.

- C. Chlorine is used to maintain a disinfectant residual in the distribution system and there is booster chlorination.

If C is checked, samples will be taken in **3-sample sets** at these locations the next day:

- a. near the first customer,
- b. a location representative of the distribution (average residence time), and
- c. a location representative of the maximum residence time.

The **justification** for the selection of the locations representing the maximum and average residence time is:



**Average residence time takes into account number of persons served, different sources of water, and different treatment methods. Ohio EPA recommends selecting more than one location for both the average and maximum residence times, although the back-up locations are only to be used when the primary site is unavailable.

Compliance with the MRDL for Chlorine Dioxide

Compliance is maintained when:

- A. No **two** consecutive daily sample concentrations, taken at the entrance to the distribution, exceed the MRDL of 0.8 mg/L (as ClO₂).
- B. No **one** distribution system sample concentration exceeds the MRDL when the concentration of the previous day's entry point sample exceeds the MRDL.

**Section 9A. Total Trihalomethanes and Haloacetic Acids 5
for Surface Water Systems serving Populations of at least 10,000**
OAC rule 3745-81-24(D)

Locations and Schedule/Frequency

Check: [] **routine** or [] **reduced** monitoring for TTHMs and HAA5.

Number of treatment plants or bulk suppliers:

Monitoring Type	Frequency	Location
Routine	four samples per quarter per treatment plant or bulk supplier	As shown on the map(s), 25% or more of all samples will be taken at locations in the distribution system representing maximum residence time (MRT). Remainder of samples will be taken at locations representative of the distribution system (average residence time).*
Reduced	one sample per quarter per treatment plant or bulk supplier	As shown on the map(s), at locations in the distribution system representing maximum residence time.

The **justification** for the selection of the locations representing the maximum (and average) residence time is:

[Empty space for justification]

*Average residence time takes into account number of persons served, different sources of water, and different treatment methods. Ohio EPA recommends selecting more than one location for both the average and maximum residence times, although the back-up locations are only to be used when the primary site is unavailable.

To *qualify* for reduced monitoring, the running annual average concentration of TTHMs must be less than or equal to 0.040 mg/L, the running annual average concentration of HAA5 must be less than or equal to 0.030 mg/L and the source water TOC must be less than or equal to 4.0 mg/L.

To *remain* on reduced monitoring, the running annual average concentration of TTHMs must be less than or equal to 0.060 mg/L and the running annual average concentration of HAA5 must be less than or equal to 0.045 mg/L.

Compliance with the MCLs for TTHMs and HAA5 for Surface Water Systems serving Populations of at least 10,000

Ohio EPA will calculate compliance with the MCLs. The methodology is described below if you choose to calculate it yourself and is the same for either TTHMs or HAA5. You are not required to report these calculations to Ohio EPA.

1. Determine the quarterly average.
Add together the concentrations of all samples taken during the quarter (per treatment plant or bulk supplier). Divide by the total number of samples.

Quarterly average =

2. Determine the average concentration for the year.
Have available the averages for the four most recent consecutive quarters. Add them together. Divide by 4.

Running annual average =

3. Compare the annual average for TTHM to 0.080 mg/L.
Compare the annual average for HAA5 to 0.060 mg/L.

MCL Violation (OAC rule 3745-81-24(D)(13) and (14))

If either of the running annual averages exceeds its respective MCL, you will have to issue a public notice and notify the director of Ohio EPA.

Monitoring Violation (OAC rule 3745-81-24(D)(14))

A monitoring violation will occur if monitoring is not conducted according to this sample monitoring plan. Failure to follow this plan for a particular quarter will affect the entire year.

**Section 9B. Total Trihalomethanes and Haloacetic Acids 5
for Surface Water Systems serving Populations
between 500 and 9,999**

OAC rule 3745-81-24(D)

Locations and Schedule/Frequency

Check: [] **routine** or [] **reduced** monitoring for TTHMs and HAA5.

Number of treatment plants or bulk suppliers (= number of samples/quarter):

Monitoring Type	Frequency	Location
Routine	one sample per quarter per treatment plant or bulk supplier	As shown on the map(s), at locations in the distribution system representing maximum residence time.
Reduced	one sample per year per treatment plant or bulk supplier, during August	As shown on the map(s), at locations in the distribution system representing maximum residence time.

The **justification** for the selection of the location(s) representing the maximum residence time is:

[Empty box for justification text]

To *qualify* for reduced monitoring, the running annual average concentration of TTHMs must be less than or equal to 0.040 mg/L, the running annual average concentration of HAA5 must be less than or equal to 0.030 mg/L and the source water TOC must be less than or equal to 4.0 mg/L.

To *remain* on reduced monitoring, the running annual average concentration of TTHMs must be less than or equal to 0.060 mg/L and the running annual average concentration of HAA5 must be less than or equal to 0.045 mg/L.

Compliance with the MCLs for TTHMs and HAA5 for Surface Water Systems serving Populations between 500 and 9,999

Ohio EPA will calculate compliance with the MCLs. The methodology is described below if you choose to calculate it yourself and is the same for either TTHMs or HAA5. You are not required to report these calculations to Ohio EPA.

1. Determine the quarterly average.
Have available the concentrations for **all** samples collected during the current quarter (per treatment plant or bulk supplier). Add them together. Divide by the total number of samples.

Quarterly average =

2. Determine the average concentration for the year.
Add the results for the four most recent consecutive quarters. Divide by 4.

Running annual average =

3. Compare the annual average for TTHM to 0.080 mg/L.
Compare the annual average for HAA5 to 0.060 mg/L.

MCL Violation (OAC rule 3745-81-24(D)(13) and (14))

If either of the running annual averages exceeds its respective MCL, you will have to issue a public notice and notify the director of Ohio EPA.

Monitoring Violation (OAC rule 3745-81-24(D)(14))

A monitoring violation will occur if monitoring is not conducted in accordance with this sample monitoring plan. Failure to follow this plan for a particular quarter will affect the entire year.

Section 9C. Total Trihalomethanes and Haloacetic Acids 5 for Surface Water Systems serving Populations fewer than 500

OAC rule 3745-81-24(D)

Location(s): As shown on map, at location(s) representing the maximum residence time.

The **justification** for the selection of the location(s) representing the maximum residence time is:

Ohio EPA recommends selecting more than one location for the maximum residence time, although the back-up locations are only to be used when the primary site is unavailable.

Schedule/Frequency: One sample per year* per treatment plant, taken between July 1 and September 30.

Number of treatment plants (= number of samples/year):

* If the sample concentration for either TTHMs or HAA5 exceeds its respective MCL, then quarterly sampling will be required and initiated for both.

Compliance with the MCLs for TTHMs and HAA5 for Surface Water Systems serving Populations fewer than 500

Ohio EPA will determine compliance with the MCLs for systems monitoring with one sample per year by comparing the annual average (per treatment plant or bulk supplier) for TTHM to 0.080 mg/L and the annual average for HAA5 to 0.060 mg/L.

If you are required to conduct quarterly monitoring due to an exceedence of the MCL for either TTHMs or HAA5, and you choose to calculate compliance, the methodology is described below (it's the same for either TTHMs or HAA5). You are not required to report these calculations to Ohio EPA.

1. For **annual** sampling, compare the sample concentrations (per treatment plant or bulk supplier) for TTHM to 0.080 mg/L and the annual average for HAA5 to 0.060 mg/L.
2. a. For **quarterly** monitoring, begin by determining the average concentration for the quarter. Have available the concentrations for **all** samples collected during the four most recent consecutive quarters (per treatment plant or bulk supplier). Add them together. Divide by the total number of samples.

Annual average =

- b. Compare the annual average for TTHM to 0.080 mg/L.
Compare the annual average for HAA5 to 0.060 mg/L.

- b. Compare the annual average for TTHM to 0.080 mg/L.
Compare the annual average for HAA5 to 0.060 mg/L.

Section 10. Total Organic Carbon Removal and Alkalinity for Surface Water Systems using Conventional Filtration Treatment

OAC rule 3745-81-77

Locations: Shown on map.

Paired samples for **total organic carbon** (TOC) and **alkalinity** will be taken as follows:

- A. Source water samples will be collected at locations **prior** to any treatment.*
- B. A treated water sample will be collected from **each treatment plant** no later than the point of combined filter effluent turbidity monitoring and will be representative of the treated water.

* If you have a tap in your plant dedicated to raw water, you can use that--but the restriction on treatment includes conditions like adding potassium permanganate to control zebra mussels. Your sampling should also reflect any changes in the amounts of water drawn from your various sources during the monitoring period. So if you decrease the percentage of water drawn from reservoir 1 and increase the percentage of water drawn from reservoir 2, you need another set of paired samples.

OAC rule 3745-81-77(G) Compliance Samples

- C. Samples for source water **alkalinity** will be taken from the same location and at the same time as the TOC source water sample.
- D. Samples for UV_{254} and dissolved organic carbon in the source water are subject to the same restrictions regarding treatment as the source water TOC sample, described in A.

Schedule/Frequency:

Check: [] **routine** (monthly) or [] **reduced** (quarterly) monitoring.

Alkalinity samples will be taken at a time representative of normal operating conditions and influent water quality. **All** source water samples will be taken as close to the same time as possible; the same for all finished water samples. The time between collecting source water and finished water samples should take into account how long it takes for water to travel through the treatment train.

To qualify for reduced monitoring, the annual average treated water TOC must be *either* less than 2.0 mg/L for eight consecutive quarters *or* less than 1.0 mg/L for four consecutive quarters.

Routine monthly sampling will resume in the month following a quarter in which the running annual average concentration of the treated water TOC is greater than or equal to 2.0 mg/L.

Compliance with Step 1 TOC Percent Removal

Required removal of TOC by enhanced coagulation and enhanced softening:

Source water TOC (mg/L)	For source water alkalinity of (mg/L, as CaCO ₃):		
	0 - 60	>60 - 120	>120
	Achieve TOC removal of (percent):		
>2.0 - 4.0	35.0	25.0	15.0
>4.0 - 8.0	45.0	35.0	25.0
>8.0	50.0	40.0	30.0

Systems meeting at least one of the conditions in paragraphs (D)(1) to (D)(7) of OAC rule 3745-81-77 are not required to operate with enhanced *coagulation*.

Softening systems meeting one of the alternative compliance criteria in paragraphs (E)(1) and (E)(2) of OAC rule 3745-81-77 are not required to operate with enhanced softening.

Systems practicing softening **must** meet the TOC removal requirements in the last column of this table.

You will need this table to do the calculations described on the next two pages.

Compliance with Step 1 TOC Percent Removal, continued

Calculations for systems collecting samples **monthly** (one set of calculations per treatment plant)

For each of the last four quarters,

1. Determine the **actual** monthly TOC percent removal:
 - a. divide each treated water TOC concentration by **its paired** source water TOC concentration,
 - b. subtract this value from 1,
$$\left(1 - \frac{Conc_{treatedTOC}}{Conc_{sourceTOC}}\right) \times 100$$
 - c. multiply by 100;
 - d. add together these results for each set of samples taken during the month and divide by the number of pairs.
2. Use the *source* water TOC and alkalinity concentrations and the table above to determine the **required** monthly TOC percent removal.
3. Divide the actual removal (from 1) by the required removal (from 2).
$$\frac{removal_{actual}}{removal_{required}}$$
4. Add together the results of paragraph 3 for the last twelve months and divide by twelve.
5. If the annual average calculated in paragraph 4 is less than 1.00, the system is **not** in compliance with the TOC percent removal requirements.

Compliance with Step 1 TOC Percent Removal, continued

Calculations for systems collecting samples **quarterly** (one set of calculations per treatment plant)

For each of the last four quarters,

1. Determine the **actual** quarterly TOC percent removal:
 - a. divide each treated water TOC concentration by **its paired** source water TOC concentration,
 - b. subtract this value from 1,
$$\left(1 - \frac{Conc_{treatedTOC}}{Conc_{sourceTOC}}\right) \times 100$$
 - c. multiply by 100;
 - d. add together these results for each set of samples taken during the quarter and divide by the number of pairs.
2. Use the *source* water TOC and alkalinity concentrations and the table above to determine the **required** monthly TOC percent removal.
3. Divide the actual removal (from 1) by the required removal (from 2).
$$\frac{removal_{actual}}{removal_{required}}$$
4. Determine the annual average by adding together the results from paragraph 3 for the last four quarters and dividing by four.
5. If the annual average calculated in paragraph 4 is less than 1.00, the system is **not** in compliance with the TOC percent removal requirements.

Alternative Compliance Criteria for TOC percent removal

If your system did not meet the Step 1 criteria, you may use any of the following to demonstrate compliance.

All determinations are based on a running annual average calculated once per quarter.

1. If the treated or source water TOC concentration is less than 2.0 mg/L.
2. If
 - the source water TOC concentration is less than 4.0 mg/L,
 - the source water alkalinity is greater than 60 mg/L,
 - the TTHM concentration is less than or equal to 0.040 mg/L, and
 - the HAA5 concentration is less than or equal to 0.030 mg/L.
3. If
 - the source water TOC concentration is less than 4.0 mg/L,
 - the source alkalinity is greater than 60 mg/L, and
 - the system has made a clear and irrevocable financial commitment to later than the effective date of compliance to meet the TOC percent removal criteria to use technologies that will reduce to TTHM concentrations to less than 0.040 mg/L and HAA5 concentrations to less than 0.030 mg/L.*
4. If
 - the TTHM concentration is less than or equal to 0.040 mg/L,
 - the HAA5 concentration is less than or equal to 0.030 mg/L, and
 - the system uses only chlorine for primary disinfection and maintenance of a residual in the distribution system.
5. If the source water or finished water SUVA is less than or equal to 2.0 L/mg-m.
6. For systems practicing softening, if at least 10 mg/L of magnesium hardness measured monthly (as CaCO₃) is removed.
7. For systems practicing enhanced softening, if the treated water alkalinity measured monthly (as CaCO₃) is reduced to less than 60 mg/L.

* Systems must submit evidence of a clear and irrevocable financial commitment, in addition to a schedule containing milestones and periodic progress reports for installation and operation of appropriate technologies, to the director for approval not later than the effective date for compliance in paragraph (A) of OAC rule 36745-81-77. These technologies must be installed and operating not later than June 30, 2005.

Calculating a running annual average, once per quarter

1. Determine the quarterly average.
Add together the concentrations of the samples taken during the quarter. ***Divide by the total number of samples.*** An example calculation is provided below:

Quarterly average =

2. Determine the average concentration for the year.
Have available the averages for the four most recent consecutive quarters. Add them together. Divide by 4. An example calculation is provided below:

Annual average =

3. Compare the annual average to the standard associated with the constituent (SUVA, alkalinity, etc.).