

**Disinfectant Byproduct (DBP), Total Organic Carbon (TOC), Bromate and Chlorine Maximum Residual Disinfectant Levels (MRDL) Monitoring and Results.**

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**DBP**

**Applicability:**

DBP Monitoring applies to Community Water Systems and Non-Transient Non-Community water systems that add a chemical disinfectant (excluding U/V disinfection) to their water or that purchase from a system that adds a chemical disinfectant.

**Description:**

Disinfectant Byproducts (DBPs) include Total Trihalomethanes (TTHM) and Haloacetic Acids (HAA5). These byproducts are formed when chemical disinfectants react with organic compounds (such as TOC). DBPs are a health concern because they may cause cancer, as well as liver, kidney, and central nervous system problems.

**Monitoring:**

DBP Monitoring applies to Community Water Systems and Non-Transient Non-Community water systems that add a chemical disinfectant (excluding U/V disinfection) to their water or that purchase from a system that adds a chemical disinfectant.

Monitoring is summarized in the table below:

Monitoring for Total Trihalomethanes & Haloacetic Acids

<b>System Type</b>	<b>Routine Monitoring</b>	<b>Reduced Monitoring</b>
Surface Water with Population 10,000 & Up	4 Samples per Plant per Quarter	1 Sample per Plant per Quarter
Surface Water with Population 500 – 9,999	1 Sample per Plant per Quarter	1 Sample per Plant per Year
Surface Water with Population less than 500	1 Sample per Plant per Year	No reduction
Groundwater with Population 10,000 & Up	1 Sample per Plant per Quarter	1 Sample per Plant per Year
Groundwater with Population less than 10,000	1 Sample per Plant per Year	1 Sample per Plant per 3 Year Cycle (Jan 1 – Dec 31)

*Note: Water systems are eligible for reduced monitoring frequency when both DBP levels are ≤ to 50% of the MCL and source water TOC running annual average is ≤ 4.0 mg/l. Groundwater systems are eligible for reduced monitoring based on disinfection byproduct monitoring alone. A “Plant” can be a treatment facility, entry point, well, or a wellfield and is the point at which a disinfectant is added (refer to your water system info page to view a list of your active treatment plants and which plants include adding a disinfectant as a treatment process).*

Monitoring schedules for your particular system will be available in the coming months.

**Sample Points:**

Sample sites for your water system are listed below. DBP<sub>MAX</sub> refers to the point of maximum residence time in the distribution system and generally, this is the point

farthest from the point of disinfection. DBP without the “MAX” designation refers to points within the distribution that represent an average disinfectant level.

<b>PWS ID</b>	<b>Sample Point ID</b>	<b>Sample Location</b>
99999	DBPMAX01	800 NE Oregon Street
99999	DBP01	1501 N Vancouver
99999	DBP02	803 N Interstate
99999	DBP03	3456 NE Halsey

**Results:**

All Results will be entered and taken into consideration when setting monitoring schedules and will be available in the coming months.

**Maximum Contaminant Levels:**

<b>Disinfection Byproduct</b>	<b>Maximum Contaminant Level (mg/l)</b>
Total Trihalomethanes (TTHM)	0.080 as a Running Annual Average
Haloacetic Acids (five) (HAA5)	0.060 as a Running Annual Average

**Determining Compliance with the Maximum Contaminant Levels:**

A running annual average is the arithmetic average of results and is calculated at the end of every quarter for the previous consecutive four-quarter period. Compliance is achieved when the running annual average of TTHM results are less than 0.080 mg/L and the running annual average of HAA5 results are below 0.060 mg/L.

**Fact Sheets:**

[Flow Chart](#) (doc)

[Trihalomethanes Health Effects](#) *(PDF)*

*(PDF)* [Quick Reference Guide](#) (2 pages)

*(PDF)* [General M-DBP Fact Sheet](#) (5 pages)

[Stage 1 DBPR Fact Sheet](#) (4 pages)

[EPA Microbial and Disinfectant Byproduct Rules Simultaneous Compliance Guidance Manual](#) *(PDF)* (150 pages)

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**TOC**

**Applicability:**

TOC monitoring applies to Community and Non-Transient Non-Community systems using surface water or groundwater under the direct influence of surface water and that add a chemical disinfectant and use conventional filtration (2.5-log) or softening. Monitoring also applies to any system seeking a reduction in DBP monitoring, but does not meet the applicability requirements described above, however, only raw water TOC sampling applies in this case.

**Bend Water Dept (PWS ID #00100)  
Is (Is not) required to sample  
Raw water TOC, raw water Alkalinity, and Filtered Water TOC**

**Description:**

Total Organic Carbon (TOC) is naturally found in water and can react with disinfectants to produce DBPs. Reduction of TOC limits the formation of DBPs.

**Monitoring:**

Community and Non-Transient Non-Community Systems  
For Surface Systems with Conventional Treatment Plants (2.5-log) Only

<b>Parameter</b>	<b>Routine Monitoring</b>	<b>Reduced Monitoring</b>
Raw water TOC	1 Sample per month	1 Sample per quarter
Filtered water TOC	1 Sample per month	1 Sample per quarter
Raw water alkalinity	1 Sample per month	1 Sample per quarter

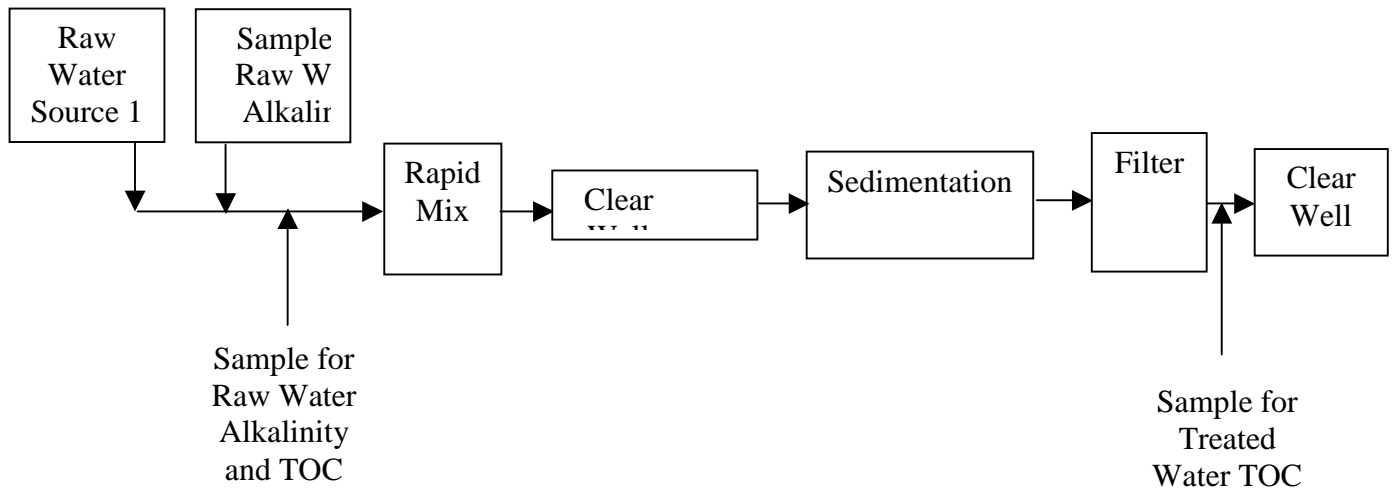
Note: Water systems are eligible for reduced monitoring frequency when the average treated TOC for 1 year is < 1.0 mg/l or the average treated TOC for 2 years is < 2.0 mg/l.

Sampling for both raw and filtered water parameters should occur on the same day.

Monitoring schedules for your particular system will be available in the coming months.

**Sample Points:**

Sample sites for your water system should include a site at the raw water source coming into the treatment plant and the combined filter effluent. Example:



**Results:**

All Results will be entered and taken into consideration when setting monitoring schedules and will be available in the coming months.

**Minimum Treatment Technique Required (Equivalent to Maximum Contaminant Level):**

The Minimum Treatment Technique Required is based on whether enhanced coagulation is required and on a ratio of the percent of TOC actually removed to the percent of TOC that should have been removed.

The running annual average of ratios must be greater than or equal to 1.00 (i.e. the amount of TOC that was actually removed must be equal to or greater than the TOC that should have been removed). A running annual average is the arithmetic average of a year's worth of monthly TOC results and is calculated at the end of every quarter.

**Determining Compliance with the Minimum Treatment Technique Required:**

Compliance is based upon if you need enhanced coagulation. Answer the following six questions in the order that they are listed to determine if you need enhanced coagulation. (If you answer any of the questions with “Yes”, you do not need to answer the rest of the questions).

Question #	Question	Answer (Yes/No)
1	Is the current Raw Water Running Annual Average (RAA) TOC (the average of the prior 12 months worth of raw water TOC data) less than or equal to 2.0 mg/L?	
2	Is the Filtered Water RAA TOC (average of the prior 12 months worth of combined filter effluent TOC data) less than or equal to 2.0 mg/L?	
3	Is the current Raw Water RAA TOC $\leq$ 4.0 mg/L, and the current Raw Water RAA Alkalinity $>$ 60 mg/L, and the current RAA for HAA5 $\leq$ .030 mg/L, and the current RAA for TTHM $\leq$ .040 mg/L?	
4	Is Chlorine the only disinfectant used and is the current RAA for HAA5 $\leq$ .030 mg/L and current RAA for TTHM $\leq$ .040 mg/L?	
5	If you conduct source water specific UV light absorbance (SUVA) monitoring, is the current RAA SUVA $<$ 2.0 L/mg-m? (your answer should be “No” if you do not conduct this monitoring)	
6	If you conduct filtered water SUVA monitoring, is the current RAA SUVA $<$ 2.0 L/mg-m? (your answer should be “No” if you do not conduct this monitoring)	

*If you **answered “Yes” to any of the previous six questions**, you are qualified to opt out of enhanced coagulation and you will not need to comply with the Minimum Treatment Technique Requirements (i.e. you do not need to use the Minimum Treatment Technique Requirement Compliance Calculations described below), however, the monitoring requirements still apply and all results must still be submitted to the Drinking Water Program.*

*If you **did not answer “Yes” to any of the six questions**, you cannot opt out of enhanced coagulation and compliance is based on a ratio of the percent of TOC actually removed to the percent of TOC that should have been removed. Use the following compliance calculations to determine compliance with the Minimum Treatment Technique Requirement:*

### Minimum Treatment Technique Requirement Compliance Calculations

In order to achieve compliance, the running annual average of the ratio of the percent of TOC actually removed to the percent of TOC that should have been removed must be greater than or equal to 1.00 (i.e. the amount of TOC that was actually removed must be equal to or greater than the TOC that should have been removed). A running annual average is the arithmetic average of results and is calculated at the end of every quarter.

Where:

TOC Actually Removed = TOC concentration (in mg/L) of raw water before filtration divided by the TOC concentration (in mg/L) of the combined filter effluent water.

TOC that should have been removed is based on the raw water TOC and the raw water alkalinity according to the following:

Source Water TOC (mg/l)	Source Water Alkalinity, mg/l as CaCO <sub>3</sub>		
	0 - 60	61 - 120	> 120*
> 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 using enhanced softening must use the TOC removal percentages in this column.

Example: if the raw water alkalinity = 65 mg/L and the raw water TOC = 9.0 mg/L, then the required removal percentage = 40.0%.

Note: It is important to recognize that this percentage can change from month to month depending on the actual raw water TOC and Alkalinity.

Example:

Calculations to Determine Compliance with the Required Removal Ratio of 1.00

Source of Data	Parameter	Results
Raw Water Sampling Data	Source (Raw) Water Alkalinity	65 mg/L
Raw Water Sampling Data	Raw Water TOC	9.0 mg/L
Table of Required Removal Percentages (shown above)	Required Removal Percentage	40.0%
Treated Water Sampling Data	Treated Water TOC	4.0 mg/L
Calculated as Shown	TOC Removed (Raw Water TOC – Treated Water TOC)	$9.0 - 4.0 = 5.0$ mg/L
Calculated as Shown	Actual Removal Percentage (TOC Removed/Raw Water TOC)	$5.0 / 9.0 = 0.556$ (or 55.6%)
Calculated as Shown	Calculation of Removal Ratio (Actual Removal Percentage / Required Removal Percentage)	$55.6 / 40.0 = 1.39$
Calculated as Shown	Ultimate Removal Ratio	1.39 (which is greater than 1.00 therefore, compliance is achieved)

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## Bromate

**Applicability:**

Bromate monitoring applies to Community and Non-Transient Non-Community systems using ozone as a disinfectant or oxidant.

**Description:**

Bromate is disinfectant byproduct that is formed when ozone is used as a disinfectant in the presence of bromide, which is a naturally occurring element found in ground and surface water sources. Some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.

**Monitoring:**

Monitoring for Bromate for Systems Using Ozone

Location	Routine Monitoring	Reduced Monitoring
Entry Point for the WTP with Ozone	1 Sample per Month	1 Sample per Quarter

Note: Water systems are eligible for reduced monitoring frequency when the average source water bromide concentration is < 0.05 mg/l based on monthly bromide samples for one year and verified as a running annual average that is computed quarterly after the initial year.

Monitoring schedules for your particular system will be available in the coming months.

**Sample Points:**

Sampling for your water system should be at the entry point to the distribution system.

**Results:**

All Results will be entered and taken into consideration when setting monitoring schedules and will be available in the coming months.

**Maximum Contaminant Level:**

The maximum contaminant level for Bromate is 0.010 mg/L.

**Determining Compliance with the Maximum Contaminant Level:**

Compliance with the MCL is based on a running annual average. A running annual average is the arithmetic average of results and is calculated at the end of every quarter.

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## **Chlorine Residual Disinfectant Level**

### **Applicability:**

Chlorine Residual monitoring is applicable to all Community and Non-Transient Non-Community water systems that use chlorine or chloramines as a disinfectant.

### **Description:**

Chlorine is a disinfectant that is used to control microbes. Some people who use water containing chlorine well in excess of the Maximum Residual Disinfectant Level could experience irritating effects to their eyes and nose and could experience stomach discomfort and anemia.

### **Monitoring:**

Systems must monitor for chlorine and chloramines every time they sample for total coliform - this includes repeat sampling.

### **Sample Points:**

Samples must be taken at the same location in the distribution system as those locations used for total coliform sampling.

### **Results:**

Results may be submitted on the coliform sampling form (or on the coliform sampling summary forms) that each system currently uses. All Results will be entered and taken into consideration when setting monitoring schedules and will be available in the coming months. Schedules will reflect the current coliform monitoring schedules already available on-line at the following link located at the bottom of your water system's info page:

[Sampling Schedule-Coliform](#)

### **Maximum Residual Disinfectant Level (MRDL):**

The MRDL for chlorine is 4.0 mg/L (measured as free chlorine).

### **Determining Compliance with the MRDL:**

Compliance with the MRDL is based on a running annual average of monthly averages. Any running annual average that exceeds the MRDL is a violation.

## **Frequently Asked Questions**

**Q:** How do I determine the maximum residence site in the distribution system?

**A:** The maximum residence site is typically the point in the distribution system furthest from the point of disinfection. In some cases the maximum residence site will be located not at the end of the distribution system, but in a reservoir located in the middle of the distribution system. A reasonable approach would be to measure chlorine residuals at various points in the distribution system and pick the point at which the chlorine residual is the lowest.

**Q:** I take 4 samples per plant per quarter and so far sample results indicate that the highest HAA5 readings occur at one of the average sample points (not at what one would expect to be the maximum residence site) and the highest TTHM sample results occur at another sample point. Wouldn't I get the highest TTHM and HAA5 readings at the same site?

**A:** Not necessarily. DBP concentration curves indicate that in many cases, HAA5 formation reaches it's highest concentration earlier in the distribution system (closer to the point of disinfection) than the highest TTHM formation concentrations.

**Q:** I have a conventional treatment plant, however, the plant is not rated at 2.5 log Giardia removal. Do I have to sample for TOC and Alkalinity?

**A:** No, only conventional treatment plants that are rated at least 2.5 log Giardia removal must sample for raw water TOC, raw water Alkalinity, and post-filtration TOC. If you are seeking a reduction for TTHM/HAA5 monitoring you are required to sample for raw water TOC only (no finished water TOC or alkalinity) once per quarter per treatment plant. In general, water systems are eligible for reduced monitoring frequency when both DBP levels are  $\leq$  to 50% of the MCL and source water TOC running annual average is  $\leq$  4.0 mg/l. - see the section on [DBP's](#) or the [DBP flow chart](#) for further details.

**Q:** Do I have to take the TTHM and HAA5 samples at the same sites and at the same time?

**A:** Yes, TTHM and HAA5 samples should be considered to be paired samples that must be taken at the same time and at the same sites.

**Q:** My water system does not have a conventional treatment plant, however, I am seeking a reduction in DBP monitoring. Am I required to sample for TOC?

**A:** Yes, you are required to sample for raw water TOC only (no finished water TOC or alkalinity) once per quarter per treatment plant. In general, water systems are eligible for reduced monitoring frequency when both DBP levels are  $\leq$  to 50% of the MCL and source water TOC running annual average is  $\leq$  4.0 mg/l. - see the section on [DBP's](#) or the [DBP flow chart](#) for further details.

**Q:** Do I have to take the raw water TOC samples at the same time as the filtered water TOC samples?

**A:** Yes. Raw Water TOC/Raw Water Alkalinity and the Filtered Water TOC samples should be considered paired samples and should be taken at the same time. The Raw Water TOC and the Raw Water Alkalinity should be taken at the same time and at the same site (at the raw water inlet to the first treatment process). The Finished water TOC should be taken just after the filters (at the combined filter effluent) as shown below:

