



# Surface Water Treatment Rules

What Do They Mean to You?

Office of Water (4606M)  
EPA 816-R-11-009  
October 2011  
<http://water.epa.gov/drink/>

# Table of Contents

1. Introduction.....	1
Purpose of the Guide .....	1
Background.....	1
2. Applicability and Compliance Schedules .....	2
3. Summary of Regulatory Requirements.....	3
Disinfection profiling and benchmarking.....	3
<i>Cryptosporidium</i> .....	4
Turbidity and disinfection requirements.....	4
Combined filter effluent monitoring requirements.....	4
Individual filter effluent monitoring requirements .....	5
Recycling of filter backwash requirements .....	5
Uncovered finished water storage facilities.....	5
Sanitary surveys.....	5
Unfiltered Subpart H systems .....	6
PWS recordkeeping and reporting requirements .....	6
4. Additional Information .....	7
5. Detailed Regulatory Requirements .....	7
Attachment 1: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 1, 2, or 3.....	1-1
Attachment 2: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 4 .....	2-1
Attachment 3: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 1, 2, or 3.....	3-1
Attachment 4: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 4.....	4-1
Attachment 5: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 1, 2, or 3.....	5-1
Attachment 6: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 4 .....	6-1
Attachment 7: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 1, 2, or 3.....	7-1
Attachment 8: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 4.....	8-1
Attachment 9: I operate a consecutive water system that: purchases finished water from a Subpart H water system and does not have a surface water or GWUDI source of my own.....	9-1
Attachment 10: I operate a Subpart H water system that: must implement a Microbial Toolbox Option under the LT2ESWTR.....	10-1



## Glossary and Abbreviations

Comprehensive performance evaluation (CPE) —thorough review and analysis of a treatment plant's performance-based capabilities and associated administrative, operation and maintenance practices. It is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements.

Combined distribution system — the interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive some or all of their finished water from those wholesale systems.

Disinfection profile —summary of *Giardia lamblia* inactivation through the treatment plant.

Dual sample set — a set of two samples collected at the same time and same location, with one sample analyzed for TTHM and the other sample analyzed for HAA5.

Enhanced coagulation — the addition of sufficient coagulant for improved conventional treatment removal of disinfection byproduct precursors by conventional filtration treatment.

Enhanced softening — the removal of disinfection byproduct precursors by precipitative softening.

Filter profile —graphical representation of individual filter performance, based on continuous effluent turbidity measurements or total particle counts versus time for an entire filter run, from startup to backwash inclusively, that includes an assessment of filter performance while another filter is being backwashed.

Locational running annual average (LRAA) — the average of analytical results for samples taken at a particular monitoring location during the previous four calendar quarters.

Log Inactivation — logarithm of  $(N_0/N_t)$ , where  $N_0$  is the number of *Cryptosporidium* oocysts in a system's untreated source water and  $N_t$  is the number of *Cryptosporidium* oocysts in system's finished water after treatment.

Maximum contaminant level (MCL) — the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

Maximum contaminant level goal (MCLG) — the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

Maximum residual disinfectant level (MRDL) — the maximum level of a disinfectant added for water treatment that may not be exceeded without an unacceptable possibility of adverse health effects. MRDLs are enforceable standards analogous to MCLs.

Maximum residual disinfectant level goal (MRDLG) — the maximum level of a disinfectant added for water treatment at which no known or anticipated health effects occur, and which allows an adequate margin of safety. MRDLGs are nonenforceable health goals and do not reflect the benefit of the addition of the disinfectant for control of waterborne microbial contaminants.

Running annual average (RAA) — the average of all sample analytical results taken during the previous four calendar quarters.

Specific Ultraviolet Absorption (SUVA) — Specific Ultraviolet Absorption at 254 nanometers (nm), an indicator of the humic content of water. It is a calculated parameter obtained by dividing a sample's ultraviolet absorption at a wavelength of 254 nm (UV 254) (in  $m^{-1}$ ) by its concentration of dissolved organic carbon (DOC) (in mg/L).

Subpart H — PWS using surface water or ground water under the direct influence of surface water.

Total Organic Carbon (TOC) — total organic carbon in mg/L measured using heat, oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants that convert organic carbon to carbon dioxide, rounded to two significant figures.

Uncovered finished water storage facility — tank, reservoir, or other facility used to store water that will undergo no further treatment except residual disinfection and is open to the atmosphere.

## Abbreviations

---

CCP:	Composite Correction Program
CDC:	Centers for Disease Control
CDS:	Combined Distribution System
CPE:	Comprehensive Performance Evaluation
CTA:	Comprehensive Technical Assistance
CWS:	Community Water System
DBP:	Disinfection Byproducts
DBPP:	Disinfection Byproducts Precursors
DBPR:	Disinfectants/Disinfection Byproducts Rule
EC:	Enhanced Coagulation
EPA:	United States Environmental Protection Agency
ES:	Enhanced Softening
FACA:	Federal Advisory Committee Act
FBRR:	Filter Backwash Recycling Rule
FR:	Federal Register
GAC10:	Granular activated carbon with ten minute empty bed contact time and 180 day reactivation frequency
GWR:	Ground Water Rule
GWUDI:	Ground Water Under the Direct Influence of Surface Water
HAA5:	Haloacetic acids (Monochloroacetic, Dichloroacetic, Trichloroacetic, Monobromoacetic and Dibromoacetic Acids)
HPC	Heterotrophic Bacteria Plate
hrs:	Hours
ICR:	Information Collection Rule
IESWTR:	Interim Enhanced Surface Water Treatment Rule
Log:	Logarithm (common, base 10)
LT1ESWTR:	Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR:	Long Term 2 Enhanced Surface Water Treatment Rule
LTESWTR:	Long Term Enhanced Surface Water Treatment Rule
MCL:	Maximum Contaminant Level
MCLG:	Maximum Contaminant Level Goal
M-DBP:	Microbial and Disinfectants/Disinfection Byproducts
MR:	Monitoring/Reporting
MRDL:	Maximum Residual Disinfectant Level
MRDLG:	Maximum Residual Disinfectant Level Goal
NCWS:	Non-Community Water System
NSCEP:	National Service for Environmental Publications
NTIS:	National Technical Information Service
NTNCWS:	Non-Transient Non-Community Water System
NTU:	Nephelometric Turbidity Unit
PWS:	Public Water System
RegNeg.:	Regulatory Negotiation
SDWA:	Safe Drinking Water Act

SDWIS:	Safe Drinking Water Information System
SUVA:	Specific Ultraviolet Absorption
SWTR:	Surface Water Treatment Rule
TNCWS:	Transient Non-Community Water System
TOC:	Total Organic Carbon
TTHM:	Total Trihalomethanes
x log removal:	Reduction to $1 / 10^x$ of original concentration



# 1. Introduction

## Purpose of the Guide

---

The purpose of this guide is to detail the regulatory requirements of the Surface Water Treatment Rules (SWTRs), which include:

- Surface Water Treatment Rule – June 1989
- Interim Enhanced Surface Water Treatment Rule (IESWTR) – December 1998
- Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) – January 2002
- Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) – January 2006
- Filter Backwash Recycling Rule (FBRR) – June 2001

The SWTRs are developed with the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules (DBPRs). These series of rules are known as the Microbial/Disinfection Byproduct (M-DBP) Cluster and are intended to reduce microbial contaminants in the water and, at the same time, minimize the risks posed by disinfectants and disinfection byproducts (DBPs). Both the Stage 1 and Stage 2 DBPRs set enforceable limits for disinfectants and disinfection byproducts (DBPs), create monitoring requirements, and specify reporting procedures; the Stage 2 DBPR added specific monitoring requirements for consecutive systems.

This guide presents an overview of the SWTRs requirements as well as attachments that provide a detailed description of the rule requirements for water systems according to system size and filtration status. System operators and other readers should look at the short overview sections at the beginning of the guide and then turn to the specific attachments that apply to their water system. A companion guide to this document – *Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – addresses the required Stage 1 and Stage 2 DBPR disinfectant and disinfection byproduct monitoring.

The EPA Web site provides links to the original rule language as well as the most recent guidance documents and other information (<http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/index.cfm>).

## Background

---

The 1974 Safe Drinking Water Act (SDWA) authorized EPA to regulate drinking water. Although the SDWA was amended slightly in 1977, 1979, and 1980, the most significant changes occurred when the SDWA was reauthorized in 1986. To safeguard public health, the 1986 Amendments required EPA to set health goals, or maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for 83 contaminants. EPA was also required to establish regulations, require disinfection of all public water supplies, specify filtration requirements for nearly all water systems that draw their water from surface sources, and develop additional programs to protect ground water supplies.

In 1990, EPA's Science Advisory Board, an independent panel of experts established by Congress, cited drinking water contamination as one of the most important environmental risks and indicated that disease-causing microbial contaminants (*i.e.*, bacteria, protozoa, and viruses) are the greatest remaining health-risk challenge for drinking water suppliers. The 1989 Surface Water Treatment Rule required most surface water and ground water under the direct influence of surface water (GWUDI) systems (also known as Subpart H systems) to remove microbial contaminants physically through filtration. The 1989

Surface Water Treatment Rule set MCLGs for *Legionella*, *Giardia lamblia*, and viruses at zero since any exposure to these contaminants presents some level of health risk. Specifically, the 1989 Surface Water Treatment Rule requires that a Subpart H system have sufficient treatment to reduce the source water concentration of *Giardia lamblia* and viruses by at least 99.9 percent (3 log) and 99.99 percent (4 log), respectively. A detectable disinfectant residual must be maintained throughout the entire distribution system. The 1989 Surface Water Treatment Rule does not specifically control for *Cryptosporidium*.

The 1989 Surface Water Treatment Rule uses turbidity to measure the performance of filtration systems. In order to reduce the public health risk associated with *Cryptosporidium* in finished water, the IESWTR requires improved filtration performance by lowering the turbidity standard at Subpart H systems that serve 10,000 or more people. The LT1ESWTR extends this requirement to systems serving fewer than 10,000 persons. The LT2ESWTR requires additional treatment for *Cryptosporidium* at those surface water or GWUDI systems with significant levels of *Cryptosporidium* in their source waters. Finally, the FBR is intended to reduce pathogen concentrations in the finished water by properly managing the backwash water and waste streams at water treatment plants.

## 2. Applicability and Compliance Schedules

The SWTRs apply to public water systems (PWSs) that use surface water or ground water under the direct influence of surface water (GWUDI) as a source (also known as Subpart H systems). The 1989 Surface Water Treatment Rule applies to all Subpart H systems. The IESWTR generally only applies to Subpart H systems serving 10,000 or more persons, although the requirement for states to conduct sanitary surveys applies to all Subpart H systems. The LT1ESWTR extends the IESWTR's requirements to Subpart H systems that serve fewer than 10,000 persons. The LT2ESWTR applies to all Subpart H systems, and wholesale PWSs must comply with the rule based on the population of the largest PWS in their combined distribution system (CDS). A CDS is an interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive some or all of their finished water from those wholesale systems.

<b>If you have a Subpart H source and are this kind of system:</b>	<b>You are on LT2ESWTR Schedule:</b>
System serving 100,000 or more people OR a wholesale system in a CDS that contains a system serving >100,000	1
System serving 50,000 to 99,999 people OR a wholesale system in a CDS that contains a system serving 50,000 to 99,999	2
System serving 10,000 to 49,999 people OR a wholesale system in a CDS that contains a system serving 10,000 to 49,999	3
System serving fewer than 10,000 and not a wholesale system in a CDS that contains a system serving at least 10,000	4

EPA has developed compliance requirements for different filtration types (i.e., standards for systems that use conventional filtration are different than standards for systems using slow sand filtration or for systems that are unfiltered). IESWTR and LT1ESWTR compliance dates depended on the size of the population served by the system.

## 3. Summary of Regulatory Requirements

### Disinfection profiling and benchmarking

---

A disinfection benchmark is an indicator of disinfection effectiveness and depends on the inactivation of *Giardia lamblia* and viruses. The disinfection profiling and benchmarking requirement in LT2ESWTR requires a Subpart H system that intends to make a significant change to its disinfection practice to evaluate its disinfection practice and work with the state to assure there are no unintended reductions in microbial protection when the system changes how it disinfects its water. The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

Some PWSs have already prepared a disinfection profile to comply with the requirements of the IESWTR or LT1ESWTR. Under these rules, if a PWS had an annual average level of total trihalomethanes (TTHM) greater than 0.064 mg/L or of haloacetic acids (HAA5) greater than 0.048 mg/L, the system was required to develop a disinfection profile. Of these systems, those that served 10,000 or more persons had to complete their disinfection profile by April 2001; those serving 10,000 and fewer persons had to complete their disinfection profile by the end of 2004. Systems can use disinfection profiles developed under IESWTR or LT1ESWTR to satisfy the LT2ESWTR requirement as long as the system has not significantly changed its treatment or its source(s) and the disinfection profile was for *Giardia lamblia* and viruses.

The disinfection profile is developed by compiling *Giardia lamblia* and virus log inactivation values computed over a period of at least 12 months. For systems that were required to comply with the disinfection profiling requirements of the IESWTR, disinfection profile log inactivation values were calculated using daily measurements of operational data collected during peak-hour flows. All other systems developing a disinfection profile are required to calculate their disinfection profile log inactivation values using weekly measurements of operational data collected during peak-hour flows. If a system is using profiling and benchmarking information originally gathered for IESWTR or LT1ESWTR compliance and that system did not calculate a benchmark for viruses, the system must use the same monitoring data on which the *Giardia lamblia* disinfection profile is based to develop the disinfection profile for viruses.

PWSs that were required to prepare a disinfection profile under the IESWTR or LT1ESWTR must keep their disinfection profiles on file to be reviewed during their sanitary surveys.

A PWS that decides to make a significant modification to its disinfection practice (e.g., changing the disinfectants used in the treatment plant, moving the point of disinfection) may calculate a disinfection benchmark and consult with the state prior to implementing such a change. The state consultation process helps assure that the PWS will meet all of the standards for *Giardia lamblia*, viruses, disinfection byproducts, and *Cryptosporidium*.

The benchmark is determined by calculating the average inactivation value for each of 12 consecutive months. The lowest monthly average inactivation value becomes the disinfection benchmark. If a system is using monitoring data from more than one year, it repeats the calculation for each year for which data

are available. The benchmark then becomes the average of the lowest monthly average values for each year.

## ***Cryptosporidium***

---

EPA set a maximum contaminant level goal (MCLG) of zero for the protozoan *Cryptosporidium*. It also established a requirement for 2-log (99 percent) removal of *Cryptosporidium* for systems that must currently filter under the 1989 Surface Water Treatment Rule. Systems that use conventional or direct filtration meet this requirement if they are in compliance with the strengthened turbidity performance standards for combined filter effluent set in the IESWTR and LT1ESWTR. Systems that use slow sand or diatomaceous earth filtration meet the 2-log removal requirement if they are in compliance with the existing turbidity performance standards under the 1989 Surface Water Treatment Rule.

In the LT2ESWTR, EPA required all Subpart H filtered systems, including wholesale systems, to characterize their source water and determine what, if any, additional treatment is necessary to reduce *Cryptosporidium*. Subpart H unfiltered systems are required to determine what additional treatment must be provided to reduce *Cryptosporidium*. Systems must conduct source water monitoring to determine an average *Cryptosporidium* concentration. Based on that average, filtered systems will be classified into one of four possible risk categories (bins). Depending on the bin in which they are placed, the systems may or may not be required to provide additional treatment to remove or inactivate *Cryptosporidium*. Filtered systems on Schedule 4<sup>1</sup> can sample for *E. coli* instead of sampling for *Cryptosporidium* during source water monitoring. If the *E. coli* sampling results exceed a trigger, depending on type of source water, the system would then need to conduct *Cryptosporidium* sampling.

These new provisions, along with the new turbidity requirements, will better protect consumers from *Cryptosporidium* and other pathogens.

## **Turbidity and disinfection requirements**

---

The SWTRs establish requirements for the control of turbidity and require disinfection of Subpart H systems. Subpart H systems are required to meet specific removal and/or inactivation criteria. To meet these requirements Subpart H systems must measure the finished water turbidity as well as the disinfection residual entering the distribution system and must maintain a detectable disinfectant residual in the distribution system. The turbidity limits and monitoring requirements depend on whether or not the Subpart H system is filtered and the type of filtration process that is utilized.

### ***Combined filter effluent monitoring requirements***

Pathogens in source water can travel through the treatment plant processes and eventually reach customers, creating a health risk. *Cryptosporidium* is of particular concern because it is resistant to commonly used disinfectants, such as chlorine. The IESWTR and LT1ESWTR established combined filter effluent turbidity requirements to accomplish a 2-log removal of *Cryptosporidium*. Combined filter effluent is generated when the effluent water from individual filters in operation is combined into one stream.

---

<sup>1</sup> See Section 2 of this document for more information about Schedules.

## ***Individual filter effluent monitoring requirements***

Filtration is one of the most critical treatment processes for particle and pathogen removal. Subpart H systems using conventional or direct filtration must also conduct continuous monitoring of the turbidity in the effluent from individual filters to provide information about each filter's performance. This requirement allows systems to identify filters whose poor performance might be masked by lower turbidity combined filter effluent. Individual filter performance problems, indicated by an exceedance of certain turbidity limits for specified time periods, trigger follow-up actions.

## **Recycling of filter backwash requirements**

---

EPA established filter backwash requirements for Subpart H systems that meet the following criteria:

- The system treats water by conventional or direct filtration processes; and
- The system recycles one or more of the following: spent filter backwash water, thickener supernatant or liquids from dewatering processes.

These systems were required to notify the state about their recycling practices by December 8, 2003. They are also required to return spent filter backwash, thickener supernatant, or liquids from dewatering processes through all the processes of a system's existing conventional or direct filtration system (if the system recycles). Systems can receive state approval to recycle at an alternate location. Systems must collect and retain recycling information.

## **Uncovered finished water storage facilities**

---

Subpart H systems are prohibited from building any new uncovered finished water storage facilities (reservoir, holding tank, or other storage facility). Subpart H systems that have existing uncovered finished water storage facilities must notify the state of any uncovered finished water storage facilities and must either:

- Cover any uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a state-approved protocol.

These provisions will help limit re-contamination of treated water.

## **Sanitary surveys**

---

Conducting sanitary surveys on a routine basis is an important element of preventing contamination of drinking water supplies. EPA recognizes the importance of sound sanitary surveys in helping water systems protect public health. Sanitary surveys are an opportunity to work and communicate with water systems in a preventative mode. These surveys are structured to determine whether a system's source, facilities, equipment, operation and maintenance (O&M), and management are effective in producing safe drinking water. Sanitary surveys also evaluate a system's compliance with federal drinking water regulations, as well as state regulations and operational requirements. EPA requires that a sanitary survey

address each of the following eight elements: source; treatment; distribution system; finished water storage; pumps, pump facilities, and controls; monitoring and reporting and data verification; system management and operation; and operator compliance with state requirements.

States must conduct sanitary surveys for all Subpart H systems every 3 years for community water systems and every 5 years for noncommunity water systems. For community water systems determined by the state in previous sanitary surveys to have “outstanding performance,” successive sanitary surveys may be conducted at up to 5-year intervals. Conducting sanitary surveys on a regular basis is an effective way to identify potential problems and possible reasons for trends in finished water quality and demand that may need to be addressed.

## Unfiltered Subpart H systems

---

In order to protect public health, unfiltered Subpart H systems are required to meet stringent source water quality requirements. EPA requires unfiltered Subpart H systems to meet the 1989 Surface Water Treatment Rule source water and site-specific requirements in order to remain unfiltered. In addition, unfiltered systems must include *Cryptosporidium* in their watershed control programs and must meet all Stage 1 DBPR MCLs and MRDLs to remain unfiltered. Like filtered systems, they are subject to disinfection profiling and benchmarking and sanitary surveys.

In the LT2ESWTR, EPA requires all unfiltered Subpart H systems, including wholesale systems, to characterize their source water and determine what additional treatment is necessary to reduce *Cryptosporidium*. Systems must conduct source water monitoring to determine a mean *Cryptosporidium* concentration. Unfiltered Subpart H systems are required to provide two forms of disinfection. They must meet the combined *Cryptosporidium* inactivation requirements of the LT2ESWTR and *Giardia lamblia* and virus inactivation requirements of the 1989 Surface Water Treatment Rule using a minimum of two disinfectants, and each of the two disinfectants must separately achieve the total inactivation required for *Cryptosporidium*, *Giardia lamblia*, or viruses.

## PWS recordkeeping and reporting requirements

---

Subpart H filtered systems must submit combined filter effluent monitoring and compliance data and report that they have conducted individual filter turbidity monitoring to states within 10 days after the end of each month the system serves water to the public. Additionally, Subpart H filtered systems must report to the state if certain individual filter monitoring trigger levels are exceeded. In this case, systems must report turbidity measurements and report that filter profiles, filter self-assessments, or Comprehensive Performance Evaluation (CPE) reports have been produced or conducted when instances of poor filter performance occur or persist based on monitoring of individual filter performance. Systems must maintain the results of individual filter monitoring for at least three years.

Subpart H unfiltered systems must submit source water quality conditions (e.g. fecal and/or total coliform samples and turbidity) compliance data and monitoring to states within 10 days after the end of each month the system serves water to the public. In addition, Subpart H unfiltered systems must report disinfection residual levels to the state within 10 days after the end of each month the system serves water to the public.

## 4. Additional Information

A series of guidance manuals have been developed to support the SWTRs. They are available on EPA's Web site and may be available free of charge through the National Service Center for Environmental Publications, or may be purchased through National Technical Information Service (NTIS). The manuals can help water system operators, state agencies, and EPA implement drinking water regulations consistently and effectively.

You may download an electronic version of available guidance documents online at EPA's Web site: <http://water.epa.gov/lawsregs/rulesregs/sdwa/mbp/index.cfm>.

You also may order copies of these guidance manuals by calling

- Safe Drinking Water Hotline – 1.800.426.4791
- National Service Center for Environmental Publications (NSCEP) – 1.800.490.9198
- National Technical Information Service (NTIS) – 1.800.553.6847

## 5. Detailed Regulatory Requirements

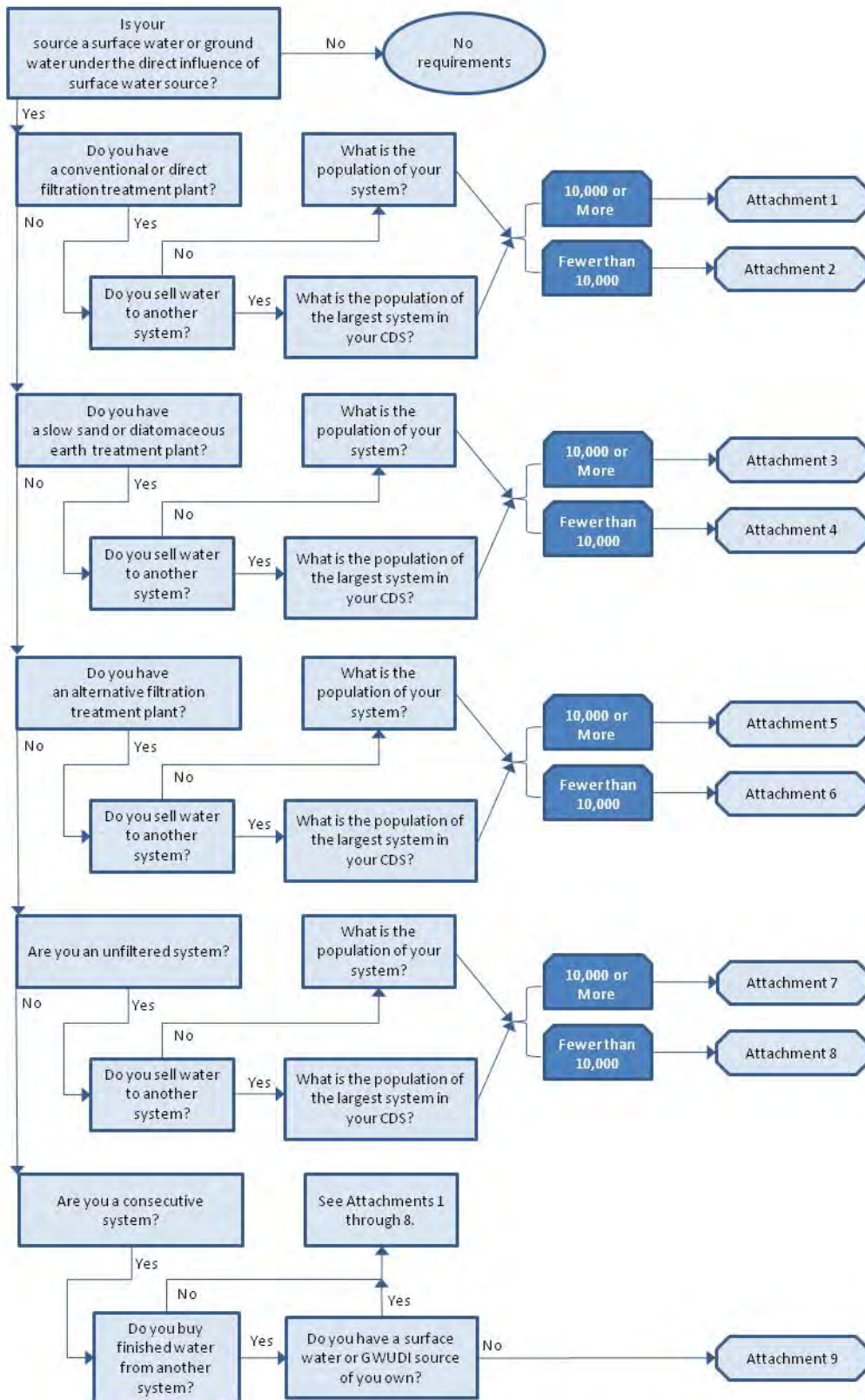
EPA has developed compliance requirements for different filtration types (i.e., standards for systems that use conventional filtration are different than standards for systems using slow sand filtration or for systems that are unfiltered). IESWTR and LT1ESWTR compliance dates depended on the size of the population served by the system. LT2ESWTR compliance dates depend on the size of the population served by the system or, if the system sells water, the population of the largest system in the CDS. The flowchart on the following page will assist you in determining which attachment best applies to your system.

This section is organized so that specific categories of systems can turn directly to their specific requirements. The categories of systems are:

Attachment 1: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 1, 2, or 3 .....	1-1
Attachment 2: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 4 .....	2-1
Attachment 3: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 1, 2, or 3 .....	3-1
Attachment 4: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 4 .....	4-1
Attachment 5: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 1, 2, or 3 .....	5-1
Attachment 6: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 4 .....	6-1
Attachment 7: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 1, 2, or 3 .....	7-1

Attachment 8: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 4 8-1  
Attachment 9: I operate a consecutive water system that: purchases finished water from a Subpart H water system and does not have a surface water or GWUDI source of my own ..... 9-1  
Attachment 10: I operate a Subpart H water system that: must implement a Microbial Toolbox Option under the LT2ESWTR ..... 10-1







# Attachment 1: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 1, 2, or 3<sup>2</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses
- *Giardia lamblia*
- *Cryptosporidium*

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are filtered using conventional or direct filtration and:**

- 1) serve 10,000 or more persons and do not sell water; or
- 2) sell water, and the largest system in their CDS serves more than 10,000 persons.

## REQUIREMENTS

### REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log)

---

<sup>2</sup> See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR) and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010]] which addresses those rules requirements. This document is available on EPA's Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

## TURBIDITY

Turbidity is measured in two ways: Combined Filter Effluent (CFE) and Individual Filter Effluent (IFE). CFE is generated when the effluent water from individual filters is combined into one stream. The CFE turbidity results may mask the poor performance of an individual filter. The performance of each individual filter is critical to controlling pathogen breakthrough. Due to this, IFE performance is also measured in systems using conventional or direct filtration.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for conventional and direct filtration systems:

- Must be less than or equal to 0.3 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and
- Can at no time exceed 1 NTU.

If you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

IFE must be monitored continuously using an approved method and systems must calibrate turbidimeters using the procedure specified by the manufacturer. You must record the results of IFE turbidity monitoring every 15 minutes. If the individual filter is not providing water which contributes to the CFE, (i.e., it is not operating, is filtering to waste, or recycled) you do not need to record or monitor the turbidity for that specific filter.

If there is a failure in continuous IFE turbidity monitoring equipment, you must conduct grab sampling every 4 hours in lieu of continuous monitoring, but must return to 15 minute monitoring no more than 5 working days following the failure of the equipment.

Additionally, you must report IFE turbidity measurements to the state if the measurements demonstrate one of the following:

- **Any individual filter has a measured turbidity level greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart.** You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must produce a filter profile within 7 days of the exceedance (if you are not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced or report the obvious reason for the exceedance. **(IF YOU SERVE FEWER THAN 10,000 PERSONS, YOU DO NOT NEED TO PRODUCE A FILTER PROFILE.)**
- **Any individual filter has a measured effluent turbidity greater than 0.5 NTU in two consecutive measurements taken 15 minutes apart at the end of the first 4 hours of continuous filter operation after the filter has been backwashed or otherwise taken offline.**

You must report the filter number, the turbidity, and the date(s) on which the exceedance occurred. In addition, you must either produce a filter profile for the filter within 7 days of the exceedance (if you are not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced or report the obvious reason for the exceedance. **(THIS ONLY APPLIES TO YOU IF YOU DIRECTLY SERVE 10,000 OR MORE PERSONS.)**

- **Any individual filter has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 3 consecutive months.** You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must conduct a self assessment of the filter within 14 days. **(IF YOU SERVE FEWER THAN 10,000 PERSONS AND HAVE TWO FILTERS THAT MONITOR CFE IN LIEU OF IFE, YOU MUST INCLUDE BOTH FILTERS IN THE SELF ASSESSMENT.)**
- **Any individual filter has a measured turbidity level of greater than 2.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 2 consecutive months.** You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must contact the state or a third party approved by the state to conduct a comprehensive performance evaluation. Systems serving 10,000 or more persons must arrange for the CPE within 30 days and submit the report within 90 days. For systems serving fewer than 10,000 persons they must make arrangements for the CPE within 60 days and submit the report within 120 days.

## **FILTER BACKWASH RECYCLING**

Under the SWTRs' Filter Backwash Recycling Rule (FBRR) additional requirements were established for Subpart H systems that use conventional or direct filtration and recycle spent filter backwash, thickener supernatant, or liquids from dewatering processes. The purpose of the FBRR is to improve public health protection by assessing and changing, where needed, recycle practices for improved contaminant control, particularly microbial contaminants. Subpart H systems that recycle are required to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or to an alternative location approved by the state. These systems must collect recycle flow information and retain it on file. If applicable, you must have completed all capital improvements associated with relocating recycle return location by June 8, 2006.

## **RESIDUAL DISINFECTANT MONITORING**

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if your serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if your serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if your serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if your serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

## REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
<b>CFE 95 Percent Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95 <sup>th</sup> percentile limit.
<b>CFE Maximum Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
<b>IFE Monitoring – Monitored continuously and recorded every 15 minutes</b>	10 <sup>th</sup> day of the following month that you served water to the public	IFE monitoring conducted and any follow-up actions.
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual* – EPA 815-R-99-013, August, 1999). This document is available on EPA's Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/mdbptg.cfm>.

## **SANITARY SURVEYS**

The SWTRs require that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## **FINISHED RESERVOIRS/WATER STORAGE FACILITIES**

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.

- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at <http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## LT2ESWTRSOURCE WATER MONITORING

You were subject to initial source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You must monitor for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 2 years. You can monitor more frequently, but the samples must be evenly spaced throughout the monitoring period and more frequent sampling might change the calculation used to determine bin classification. If you have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, then you are not required to conduct source water monitoring.

You must conduct a second round of source water monitoring six years after the required date of initial bin classification determination. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

## BIN CLASSIFICATION

Upon completing initial source water monitoring you must calculate your bin classification. The first step in determining your bin classification is to calculate your *Cryptosporidium* concentration. How you calculate your *Cryptosporidium* concentration will vary depending on the number of samples taken.



- Filtered systems that collect at least 48 *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied).
- Filtered systems that collected at least 24, but no more than 47, *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied) in any 12 consecutive months during which *Cryptosporidium* samples were collected.
- For filtered systems with treatment plants that are only in operation for part of the year that monitor fewer than 12 months per year, the plant's bin concentration is determined by the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

Before calculating bin concentrations, systems whose monthly sampling frequency varied must first calculate monthly averages.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their initial bin classification.

<b>Bin</b>	<b><i>Cryptosporidium</i> Concentration (oocysts/L):</b>
<b>1</b>	Less than 0.075 oocysts/L
<b>2</b>	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
<b>3</b>	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
<b>4</b>	3.0 oocysts/L or higher

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* you are required to provide at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

<b>Bin</b>	<b>Conventional Filtration (incl. softening)</b>	<b>Direct Filtration</b>
<b>1</b>	None	None
<b>2</b>	1-log	1.5-log
<b>3</b>	2-log	2.5-log
<b>4</b>	2.5-log	3-log

## **MICROBIAL TOOLBOX**

If your bin classification puts you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Turbidity.
- Filter backwash recycling.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of Initial <i>Cryptosporidium</i> Bin Classification was due no later than:	Add Additional Treatment or Control Processes for Systems in Bin 2, 3, and 4 by1:	Second Round of Source Water Monitoring begun by:
1	September 2008	March 2009	April 1, 2012	April 1, 2015
2	March 2009	September 2009	October 1, 2012	October 1, 2015
3	March 2010	September 2010	October 1, 2013	October 1, 2016

1. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.

# Attachment 2: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 4<sup>3</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are filtered using conventional or direct filtration and:**

- 1) **serve fewer than 10,000 persons and do not sell water; or**
- 2) **sell water, and the largest system in their CDS serves fewer than 10,000 persons.**

## REQUIREMENTS

### REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log)

Compliance with the log removal/inactivation requirements for viruses and *Giardia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR)

---

<sup>3</sup> See Section 2 of this document for more information about Schedules.

and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010] which addresses those rules requirements. This document is available on EPA's Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

## TURBIDITY

Turbidity is measured in two ways: Combined Filter Effluent (CFE) and Individual Filter Effluent (IFE). CFE is generated when the effluent water from individual filters is combined into one stream. The CFE turbidity results may mask the poor performance of an individual filter. The performance of each individual filter is critical to controlling pathogen breakthrough. Due to this, IFE performance is also measured in systems using conventional or direct filtration.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for conventional and direct filtration systems:

- Must be less than or equal to 0.3 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and
- Can at no time exceed 1 NTU (based on turbidity measurements recorded every 4 hours).

If you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

IFE must be monitored continuously using an approved method and systems must calibrate turbidimeters using the procedure specified by the manufacturer. You must record the results of IFE turbidity monitoring every 15 minutes. If the individual filter is not providing water which contributes to the CFE, (i.e., it is not operating, is filtering to waste, or recycled) you do not need to record or monitor the turbidity for that specific filter.

If there is a failure in continuous IFE turbidity monitoring equipment, you must conduct grab sampling every 4 hours in lieu of continuous monitoring, but must return to 15 minute monitoring no more than 5 working days following the failure of the equipment.

Additionally, you must report IFE turbidity measurements to the state if the measurements demonstrate one of the following:

- **Any individual filter has a measured turbidity level greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart.** You must report the filter number, the turbidity measurement(s), the date(s) on which the exceedance occurred, and the cause (if known) for the exceedance(s).
- **Any individual filter has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 3 consecutive months.** You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must conduct a self assessment of the filter within 14 days. **(IF YOU HAVE TWO FILTERS THAT MONITOR CFE IN LIEU OF IFE, YOU MUST INCLUDE BOTH FILTERS IN THE SELF ASSESSMENT.)**
- **Any individual filter has a measured turbidity level of greater than 2.0 NTU in 2 consecutive measurements taken 15 minutes apart at any time in each of 2 consecutive**

**months.** You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must contact the state or a third party approved by the state to conduct a comprehensive performance evaluation (CPE). You must make arrangements for the CPE within 60 days and submit the report within 120 days.

## **FILTER BACKWASH RECYCLING**

Under the SWTRs' Filter Backwash Recycling Rule (FBRR) additional requirements were established for Subpart H systems that use conventional or direct filtration and recycle spent filter backwash, thickener supernatant, or liquids from dewatering processes. The purpose of the FBRR is to improve public health protection by assessing and changing, where needed, recycle practices for improved contaminant control, particularly microbial contaminants. Subpart H systems that recycle are required to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or to an alternative location approved by the state. These systems must collect recycle flow information and retain it on file. If applicable, you must have completed all capital improvements associated with relocating recycle return location by June 8, 2006.

## **RESIDUAL DISINFECTANT MONITORING**

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if you serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if you serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if you serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if you serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual."

## **REPORTING AND RECORDKEEPING**

<b>Monitoring</b>	<b>Report by:</b>	<b>What to Report</b>
<b>CFE 95 Percent Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95 <sup>th</sup> percentile limit.
<b>CFE Maximum Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.

Monitoring	Report by:	What to Report
<b>IFE Monitoring – Monitored continuously and recorded every 15 minutes</b>	10 <sup>th</sup> day of the following month that you served water to the public	IFE monitoring conducted and any follow-up actions.
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual* – EPA 815-R-99-013, August, 1999). This document is available on EPA’s Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mbp/mbptg.cfm>.

## SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## **FINISHED RESERVOIRS/WATER STORAGE FACILITIES**

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at

<http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## LT2ESWTR SOURCE WATER MONITORING

You were subject to initial source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You should collect *E. coli* samples at least once every 2 weeks for 12 months. You will then be required to monitor for *Cryptosporidium* at least twice per month for 12 months, or at least once per month for 24 months, if either of the following conditions are met:

- For systems using lakes or reservoirs, if the mean annual *E. coli* concentration is greater than 10 *E. coli*/100 mL. This also applies to GWUDI systems if the nearest surface water body is a lake or reservoir, or if there is no nearby surface water.
- For systems using flowing stream sources, if the mean annual *E. coli* concentration is greater than 50 *E. coli*/100 mL. This also applies to GWUDI systems if the nearest surface water body is a flowing stream.

In the preamble to the final LT2ESWTR, EPA stated that it would issue guidance to states on alternate *E. coli* trigger levels used to determine *Cryptosporidium* monitoring requirements. The alternative trigger levels suggested were intended as guidance for states. Your state may choose to allow these alternative levels to be used or may propose other alternative levels. The alternative *E. coli* trigger levels are 100 *E. coli*/100 mL for both lake/reservoir and flowing streams. You should check with your state to determine what trigger level you should be using.

A system may choose to notify EPA or the state if it will not collect the *E. coli* samples, but you will collect *Cryptosporidium* samples at least twice per month for 12 months, or at least once per month for 24 months. If you have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, then you are not required to conduct source water monitoring.

You must conduct a second round of source water monitoring six years after the required date of initial bin classification determination. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

## BIN CLASSIFICATION

If you are required to conduct *Cryptosporidium*, upon completing initial source water monitoring you must calculate your bin classification. The first step in determining your bin classification is to calculate



your *Cryptosporidium* concentration. How you calculate your *Cryptosporidium* concentration will vary depending on the number of samples taken.

- Filtered systems that collect at least 48 *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied).
- Filtered systems that collected at least 24, but no more than 47, *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied) in any 12 consecutive months during which *Cryptosporidium* samples were collected.
- For filtered systems with treatment plants that are only in operation for part of the year that monitor fewer than 12 months per year, the plant's bin concentration is determined by the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

Before calculating bin concentrations, systems whose monthly sampling frequency varied must first calculate monthly averages.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their initial bin classification.

<b>Bin</b>	<b>Cryptosporidium Concentration (oocysts/L):</b>
<b>1</b>	Less than 0.075 oocysts/L
<b>2</b>	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
<b>3</b>	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
<b>4</b>	3.0 oocysts/L or higher

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* you are required to provide at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

<b>Bin</b>	<b>Conventional Filtration (incl. softening)</b>	<b>Direct Filtration</b>
<b>1</b>	None	None
<b>2</b>	1-log	1.5-log
<b>3</b>	2-log	2.5-log
<b>4</b>	2.5-log	3-log

## MICROBIAL TOOLBOX

If your bin classification puts you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Turbidity.
- Filter backwash recycling.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified operators.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

As a Schedule 4 system, you should be finished with your *E. coli* initial source water monitoring (due date September 2009). By October 1, 2017 you must begin the second round of 2-year source water monitoring.

If you are required to conduct *Cryptosporidium* monitoring you must have begun that monitoring by April 1, 2010. If, after you calculate your initial *Cryptosporidium* bin classification, you are in bin 2, 3, or 4, you have until October 1, 2014 (with a possible 2-year extension) to complete any additional treatment or control processes. No later than April 1, 2019, you must begin the second round of 2-year source water monitoring.

# Attachment 3: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 1, 2, or 3<sup>4</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are filtered using slow sand or diatomaceous earth filtration and:**

- 1) serve 10,000 or more persons and do not sell water; or
- 2) sell water, and the largest system in their CDS serves more than 10,000 persons.

## REQUIREMENTS

### REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log)

---

<sup>4</sup> See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR) and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010] which addresses those rules requirements. This document is available on EPA's Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

## **TURBIDITY**

Turbidity is measured as Combined Filter Effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for slow sand or diatomaceous earth filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and
- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

If you use slow sand or diatomaceous earth filtration and you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

## **RESIDUAL DISINFECTANT MONITORING**

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if you serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if you serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if you serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if you serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

## REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
<b>CFE 95 Percent Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95 <sup>th</sup> percentile limit.
<b>CFE Maximum Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual – EPA 815-R-99-013*, August, 1999). This document is available on EPA's Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mbdp/mbdptg.cfm>.

## SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at

<http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## LT2ESWTR SOURCE WATER MONITORING

You were subject to initial source water monitoring requirements if you do not have prior monitoring data that meets grandfathering requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You must monitor for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 2 years. You can monitor more frequently, but the samples must be evenly spaced throughout the monitoring period and more frequent sampling might change the calculation used to determine bin classification. If you have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, then you are not required to conduct source water monitoring.

You must conduct a second round of monitoring six years after the required date of initial bin classification determination. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

## BIN CLASSIFICATION

Upon completing initial source water monitoring you must calculate your bin classification. The first step in determining your bin classification is to calculate your *Cryptosporidium* concentration. How you calculate your *Cryptosporidium* concentration will vary depending on the number of samples taken.

- Filtered systems that collect at least 48 *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied).
- Filtered systems that collected at least 24, but no more than 47, *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied) in any 12 consecutive months during which *Cryptosporidium* samples were collected.

- For filtered systems with treatment plants that are only in operation for part of the year that monitor fewer than 12 months per year, the plant's bin concentration is determined by the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

Before calculating bin concentrations, systems whose monthly sampling frequency varied must first calculate monthly averages.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their initial bin classification.

<b>Bin</b>	<b>Cryptosporidium Concentration (oocysts/L):</b>
<b>1</b>	Less than 0.075 oocysts/L
<b>2</b>	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
<b>3</b>	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
<b>4</b>	3.0 oocysts/L or higher

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* you are required to provide at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

<b>Bin</b>	<b>Slow Sand Filtration</b>	<b>Diatomaceous Earth Filtration</b>
<b>1</b>	None	None
<b>2</b>	1-log	1-log
<b>3</b>	2-log	2.-log
<b>4</b>	2.5-log	2.5-log

## **MICROBIAL TOOLBOX**

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The



state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of Initial Cryptosporidium Bin Classification was due no later than:	Add Additional Treatment or Control Processes for Systems in Bin 2, 3, and 4 by1:	Second Round of Source Water Monitoring begun by:
1	September 2008	March 2009	April 1, 2012	April 1, 2015
2	March 2009	September 2009	October 1, 2012	October 1, 2015
3	March 2010	September 2010	October 1, 2013	October 1, 2016

1. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.



# Attachment 4: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 4<sup>5</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are filtered using slow sand or diatomaceous earth filtration and:**

- 1) serve fewer than 10,000 persons and do not sell water; or
- 2) sell water, and the largest system in their CDS serves fewer than 10,000 persons.

## REQUIREMENTS

### REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log) (removal only)

---

<sup>5</sup> See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR) and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010] which addresses those rules requirements. This document is available on EPA's Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

## **TURBIDITY**

Turbidity is measured as Combined Filter Effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for slow sand or diatomaceous earth filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and
- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

If you use slow sand or diatomaceous earth filtration and you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

## **RESIDUAL DISINFECTANT MONITORING**

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if you serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if you serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if you serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if you serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

## REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
<b>CFE 95 Percent Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95 <sup>th</sup> percentile limit.
<b>CFE Maximum Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual – EPA 815-R-99-013*, August, 1999). This document is available on EPA's Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mbp/mbpbtg.cfm>.

## SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at <http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## LT2ESWTR SOURCE WATER MONITORING

You were subject to initial source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You must collect *E. coli* samples at least once every 2 weeks for 12 months. You will then be required to monitor for *Cryptosporidium* at least twice per month for 12 months, or at least once per month for 24 months, if either of the following conditions are met:

- For systems using lakes or reservoirs, if the mean annual *E. coli* concentration is greater than 10 *E. coli*/100 mL. This also applies to GWUDI systems if the nearest surface water body is a lake or reservoir, or if there is no nearby surface water.
- For systems using flowing stream sources, if the mean annual *E. coli* concentration is greater than 50 *E. coli*/100 mL. This also applies to GWUDI systems if the nearest surface water body is a flowing stream.

In the preamble to the final LT2ESWTR, EPA stated that it would issue guidance to states on alternate *E. coli* trigger levels used to determine *Cryptosporidium* monitoring requirements. The alternative trigger levels suggested were intended as guidance for states. Your state may choose to allow these alternative levels to be used or may propose other alternative levels. The alternative *E. coli* trigger levels are 100 *E. coli*/100 mL for both lake/reservoir and flowing streams. You should check with you state to determine what trigger level you should be using.

A system may choose to notify EPA or the state it will not collect the *E. coli* samples, but you will collect *Cryptosporidium* samples at least twice per month for 12 months, or at least once per month for 24 months. If you have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, then you are not required to conduct source water monitoring.

You must conduct a second round of monitoring 6 years after the required date of initial bin classification determination. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

## BIN CLASSIFICATION

If you are required to conduct *Cryptosporidium*, upon completing initial source water monitoring you must calculate your bin classification. The first step in determining your bin classification is to calculate your *Cryptosporidium* concentration. How you calculate your *Cryptosporidium* concentration will vary depending on the number of samples taken.

- Filtered systems that collect at least 48 *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied).
- Filtered systems that collected at least 24, but no more than 47, *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied) in any 12 consecutive months during which *Cryptosporidium* samples were collected.
- For filtered systems with treatment plants that are only in operation for part of the year that monitor fewer than 12 months per year, the plant's bin concentration is determined by the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

Before calculating bin concentrations, systems whose monthly sampling frequency varied must first calculate monthly averages.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their initial bin classification.

<b>Bin</b>	<b>Cryptosporidium Concentration (oocysts/L):</b>
<b>1</b>	Less than 0.075 oocysts/L
<b>2</b>	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
<b>3</b>	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
<b>4</b>	3.0 oocysts/L or higher

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* you are required to provide at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

<b>Bin</b>	<b>Slow Sand Filtration</b>	<b>Diatomaceous Earth Filtration</b>
<b>1</b>	None	None
<b>2</b>	1-log	1-log
<b>3</b>	2-log	2-log
<b>4</b>	2.5-log	2.5-log



## MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

As a Schedule 4 system, you should be finished with your *E. coli* initial source water monitoring (due date September 2009). By October 1, 2017 you must begin the second round of 2-year source water monitoring.

If you are required to conduct *Cryptosporidium* monitoring you must have begun that monitoring by April 1, 2010. If, after you calculate your initial *Cryptosporidium* bin classification, you are in bin 2, 3, or 4, you have until October 1, 2014 (with a possible 2-year extension) to complete any additional treatment or control processes. No later than April 1, 2019, you must begin the second round of 2-year source water monitoring.



# Attachment 5: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 1, 2, or 3<sup>6</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are filtered using alternative filtration and:**

- 1) serve 10,000 or more persons and do not sell water; or
- 2) sell water, and the largest system in their CDS serves more than 10,000 persons.

## REQUIREMENTS

### REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

In order to use an alternative filtration type you must demonstrate to the state, either through a pilot plant studies or other means determined by the state, that the alternative filtration technology along with the disinfection treatment meet the removal and inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log)

---

<sup>6</sup> See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR) and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010] which addresses those rules requirements. This document is available on EPA’s Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

## **TURBIDITY**

Turbidity is measured as Combined Filter Effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity level for alternative filtration systems is set by the state based on the results of the systems demonstration of the technology. However the CFE turbidity for alternative filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and
- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

If you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

## **RESIDUAL DISINFECTANT MONITORING**

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if you serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if you serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if you serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if you serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

## REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
<b>CFE 95 Percent Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95 <sup>th</sup> percentile limit.
<b>CFE Maximum Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual – EPA 815-R-99-013*, August, 1999). This document is available on EPA's Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mbbp/mbbptg.cfm>.

## SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at

<http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## LT2ESWTR SOURCE WATER MONITORING

You were subject to initial source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You must monitor for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 2 years. You can monitor more frequently, but the samples must be evenly spaced throughout the monitoring period and more frequent sampling might change the calculation used to determine bin classification. If you have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, then you are not required to conduct source water monitoring.

You must conduct a second round of monitoring 6 years after the required date of the initial bin classification determination. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

## BIN CLASSIFICATION

Upon completing initial source water monitoring you must calculate your bin classification. The first step in determining your bin classification is to calculate your *Cryptosporidium* concentration. How you calculate your *Cryptosporidium* concentration will vary depending on the number of samples taken.

- Filtered systems that collect at least 48 *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied).
- Filtered systems that collected at least 24, but no more than 47, *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied) in any 12 consecutive months during which *Cryptosporidium* samples were collected.

- For filtered systems with treatment plants that are only in operation for part of the year that monitor fewer than 12 months per year, the plant's bin concentration is determined by the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

Before calculating bin concentrations, systems whose monthly sampling frequency varied must first calculate monthly averages.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their initial bin classification.

Bin	<i>Cryptosporidium</i> Concentration (oocysts/L):
1	Less than 0.075 oocysts/L
2	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
3	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
4	3.0 oocysts/L or higher

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* you are required to provide at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

Bin	Alternative Filtration Treatment Requirement
1	None
2	As determined by the state so that the total <i>Cryptosporidium</i> removal and inactivation at the treatment plant is at least 4.0-log
3	As determined by the state so that the total <i>Cryptosporidium</i> removal and inactivation at the treatment plant is at least 5.0-log
4	As determined by the state so that the total <i>Cryptosporidium</i> removal and inactivation at the treatment plant is at least 5.5-log

## MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for



treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of Initial Cryptosporidium Bin Classification was due no later than:	Add Additional Treatment or Control Processes for Systems in Bin 2, 3, and 4 by1:	Second Round of Source Water Monitoring begun by:
<b>1</b>	September 2008	March 2009	April 1, 2012	April 1, 2015
<b>2</b>	March 2009	September 2009	October 1, 2012	October 1, 2015
<b>3</b>	March 2010	September 2010	October 1, 2013	October 1, 2016

1. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.



# Attachment 6: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 4<sup>7</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are filtered using alternative filtration and:**

- 1) serve fewer than 10,000 persons and do not sell water; or
- 2) sell water, and the largest system in their CDS serves fewer than 10,000 persons.

## REQUIREMENTS

### REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

In order to use an alternative filtration type you must demonstrate to the state, either through a pilot plant studies or other means determined by the state, that the alternative filtration technology along with the disinfection treatment meet the removal and inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log)

---

<sup>7</sup> See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR) and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010] which addresses those rules requirements. This document is available on EPA's Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

## **TURBIDITY**

Turbidity is measured as Combined Filter Effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity level for alternative filtration systems is set by the state based on the results of the systems demonstration of the technology. However the CFE turbidity for alternative filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and
- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

Your frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

## **RESIDUAL DISINFECTANT MONITORING**

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if you serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if you serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if you serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if you serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

## REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
<b>CFE 95 Percent Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95 <sup>th</sup> percentile limit.
<b>CFE Maximum Value – Recorded every 4 hours</b>	10 <sup>th</sup> day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual – EPA 815-R-99-013*, August, 1999). This document is available on EPA's Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mbp/mbpbtg.cfm>.

## SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at

<http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## LT2ESWTR SOURCE WATER MONITORING

You were subject to initial source water monitoring requirements if you do not have prior monitoring data that meets grandfathering requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You should collect *E. coli* samples at least once every 2 weeks for 12 months. You will then be required to monitor for *Cryptosporidium* at least twice per month for 12 months, or at least once per month for 24 months, if either of the following conditions are met:

- For systems using lakes or reservoirs, if the mean annual *E. coli* concentration is greater than 10 *E. coli*/100 mL. This also applies to GWUDI systems if the nearest surface water body is a lake or reservoir, or if there is no nearby surface water.
- For systems using flowing stream sources, if the mean annual *E. coli* concentration is greater than 50 *E. coli*/100 mL. This also applies to GWUDI systems if the nearest surface water body is a flowing stream.

In the preamble to the final LT2ESWTR, EPA stated that it would issue guidance to states on alternate *E. coli* trigger levels used to determine *Cryptosporidium* monitoring requirements. The alternative trigger levels suggested were intended as guidance for states. Your state may choose to allow these alternative levels to be used or may propose other alternative levels. The alternative *E. coli* trigger levels are 100 *E. coli*/100 mL for both lake/reservoir and flowing streams. You should check with you state to determine what trigger level you should be using.

A system may choose to notify EPA or the state it will not collect the *E. coli* samples, but you will collect *Cryptosporidium* samples at least twice per month for 12 months, or at least once per month for 24 months. If you have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, then you are not required to conduct source water monitoring.

You must conduct a second round of monitoring 6 years after the required date of initial bin classification determination. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

## **BIN CLASSIFICATION**

If you are required to conduct *Cryptosporidium*, upon completing initial source water monitoring you must calculate your bin classification. The first step in determining your bin classification is to calculate your *Cryptosporidium* concentration. How you calculate your *Cryptosporidium* concentration will vary depending on the number of samples taken.

- Filtered systems that collect at least 48 *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied).
- Filtered systems that collected at least 24, but no more than 47, *Cryptosporidium* samples must determine the bin classification for each treatment plant by calculating the arithmetic mean of all sample concentrations (or the mean of all monthly averages, if sampling frequency varied) in any 12 consecutive months during which *Cryptosporidium* samples were collected.
- For filtered systems with treatment plants that are only in operation for part of the year that monitor fewer than 12 months per year, the plant's bin concentration is determined by the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

Before calculating bin concentrations, systems whose monthly sampling frequency varied must first calculate monthly averages.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their initial bin classification.

<b>Bin</b>	<b>Cryptosporidium Concentration (oocysts/L):</b>
<b>1</b>	Less than 0.075 oocysts/L
<b>2</b>	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
<b>3</b>	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
<b>4</b>	3.0 oocysts/L or higher

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* you are required to provide at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.



Bin	Alternative Filtration Treatment Requirements
1	None
2	As determined by the state so that the total <i>Cryptosporidium</i> removal and inactivation at the treatment plant is at least 4.0-log
3	As determined by the state so that the total <i>Cryptosporidium</i> removal and inactivation at the treatment plant is at least 5.0-log
4	As determined by the state so that the total <i>Cryptosporidium</i> removal and inactivation at the treatment plant is at least 5.5-log

## MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

As a Schedule 4 system, you should be finished with your *E. coli* initial source water monitoring (due date September 2009). By October 1, 2017 you must begin the second round of 2-year source water monitoring.

If you are required to conduct *Cryptosporidium* monitoring you must have begun that monitoring by April 1, 2010. If, after you calculate your initial *Cryptosporidium* bin classification, you are in bin 2, 3, or 4, you have until October 1, 2014 (with a possible 2-year extension) to complete any additional treatment or control processes. No later than April 1, 2019, you must begin the second round of 2-year source water monitoring.

# Attachment 7: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 1, 2, or 3<sup>8</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are unfiltered and:**

- 1) serve 10,000 or more persons and do not sell water; or
- 2) sell water, and the largest system in their CDS serves more than 10,000 persons.

## REQUIREMENTS

### INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

You must comply with the inactivation requirements established for regulated pathogens. The inactivation requirements are as follows:

Microbial	MCLG	Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log) (through watershed control), and
		99% (2-log) removal of <i>Cryptosporidium</i> for systems reporting less than or equal to 0.01 oocysts/L in initial source water monitoring or
		99.9% (3-log) removal of <i>Cryptosporidium</i> for systems reporting more than 0.01 oocysts/L in initial source water monitoring

---

<sup>8</sup> See Section 2 of this document for more information about Schedules.

You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR) and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010] which addresses those rules requirements. This document is available on EPA's Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

You must include in your watershed control programs steps to minimize the potential for contamination by *Cryptosporidium*. Your watershed control program must also minimize the potential for contamination by *Giardia* and viruses in source water. If you fail to meet *Cryptosporidium* site-specific requirements, you must install filtration within 18 months.

## **FILTRATION AVOIDANCE CRITERIA**

In order to remain unfiltered you must meet certain source water quality and site specific conditions. If any of the Filtration Avoidance Criteria are not met you must install filtration within 18 months of the failure.

### **Source Water Quality Conditions**

You must measure your source water turbidity. This sample must be taken prior to the first point of disinfection. You must collect a representative grab sample of your source water at least every 4 hours, and the turbidity cannot exceed 5 NTU. You must also monitor fecal coliform or total coliform concentrations in representative samples of source water immediately prior to the first point of disinfection. The number of samples you must take depends on your system size and the turbidity of your source water. If you serve:

- Less than or equal to 500 persons, you must take 1 sample per week.
- 501 to 3,300 persons, you must take 2 samples per week taken on separate days.
- 3,301 to 10,000 persons, you must take 3 samples per week taken on separate days.
- 10,001 to 25,000 persons, you must take 4 samples per week taken on separate days.
- More than 25,000 persons, you must take 5 samples per week taken on separate days.

You must also monitor on any day in which your turbidity sample exceeds 1 NTU.

Fecal coliform density must be less than or equal to 20/100 mL or your total coliform density must be less than or equal to 100/100mL. You must meet one of these criteria in at least 90 percent of the measurements from the previous 6 months.

### **Site Specific Conditions**

You must calculate your system's total inactivation ratio daily and provide 3-log *Giardia* and 4-log virus inactivation daily except any 1 day each month in 11 of 12 months (on an ongoing basis). You must take daily measurements before or at the first customer at each residual disinfectant concentration sampling point and must measure:

- Temperature.
- pH (if chlorine is used).
- Disinfection contact time (at peak hourly flow).
- Residual disinfectant concentration (at peak hourly flow).

You must comply with the MCL for total coliforms as required by the Total Coliform Rule in 11 of 12 previous months, and you must meet the requirements of the Stage 1 DBPR and Stage 2 DBPR.

You must have:

- Adequate entry point residual disinfectant concentration.
- Detectable residual disinfectant concentration in the distribution system.
- Redundant disinfection components or automatic shut-off whenever the residual disinfectant concentration is less than 0.2 mg/L.
- A watershed control program minimizing the potential for contamination by *Cryptosporidium*, *Giardia*, and viruses in source water.
- An annual on-site inspection by state or an approved third party, with reported findings.
- Not been identified as a source of a waterborne disease outbreak.

## RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

You must meet the combined *Cryptosporidium*, *Giardia*, and virus inactivation requirements (specified in the Inactivation Requirements table at the beginning of this attachment) using a minimum of two disinfectants. Each disinfectant must be able to achieve the total inactivation required for *Cryptosporidium*, *Giardia*, or viruses. For example, a system may use UV to meet *Cryptosporidium* and *Giardia* inactivation requirements and chlorine to meet virus inactivation requirements. To meet the *Cryptosporidium* inactivation requirements, systems must use chlorine dioxide, ozone, or UV.

## REPORTING AND RECORDKEEPING

Disinfection requirements are more stringent for unfiltered systems than filtered systems. You will receive a treatment technique violation if:

- You are using chlorine dioxide or ozone that fails to achieve the *Cryptosporidium* log inactivation on more than 1 day in the calendar month.
- You are using UV light and fail to treat in at least 95 percent of the water that is delivered to the public during each calendar month within validated conditions.

Monitoring	Report by:	What to Report
<b>Source Water Quality Conditions</b>	10 <sup>th</sup> day of the following month	<p>The cumulative number of months for which results are reported.</p> <p>The number of fecal and/or total coliform samples (if a system monitors for both, only fecal coliforms must be reported), the dates of sample collection, and the dates when the turbidity level exceeded 1 NTU.</p> <p>The number of samples during the month that had equal to or less than 20/100 mL fecal coliforms and/or equal to or less than 100/100 mL total coliforms, whichever are analyzed.</p> <p>The cumulative number of fecal or total coliform samples, cumulative number of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, percentage of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, during the previous 6 months the system served water to the public.</p> <p>The maximum turbidity level measured during the month, the date for any measurement that exceeded 5 NTU, and the date the occurrence was reported to the state.</p> <p>The dates and number of times the turbidity exceeded 5 NTU in the previous 12 months.</p> <p>For the first 120 months of recordkeeping, the dates and total number of events during which the turbidity exceeded 5 NTU, and after 10 years of recordkeeping for turbidity measurements, the dates and total number of events during which the turbidity exceeded 5 NTU in the previous 120 months the system served water to the public.</p>
<b>Site Specific Conditions</b>	By October 10 of each year	<p>Compliance with all watershed control program requirements.</p> <p>Report on the on-site inspection, unless the state conducted the inspection.</p>
	Within 24 hours	Any turbidity exceedances of 5 NTU or waterborne disease outbreaks.
	ASAP but no later than the end of the next business day	Any instance where the residual disinfectant level entering the distribution systems was less than 0.2 mg/L.
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	<p>Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.</p> <p>The daily residual disinfectant concentration (in mg/L) and disinfection contact time (in minutes) used for calculating the CT value.</p> <p>If chlorine is used, the daily measurement of pH of disinfected water</p>

Monitoring	Report by:	What to Report
		<p>following each point of chlorine disinfection.</p> <p>The daily measurement of water temperature in degrees C following each point of disinfection.</p> <p>The daily CT<sub>calc</sub> and CT<sub>calc</sub>/CT<sub>99,9</sub> values for each disinfectant measurement or sequence and the sum of all CT<sub>calc</sub>/CT<sub>99,9</sub> values before or at the first customer.</p> <p>The daily determination of whether disinfection achieves adequate <i>Giardia</i> and virus inactivation.</p>
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements being undetectable in any 2 consecutive months.
<b>Source Water Monitoring</b>	10 <sup>th</sup> day of the following month	Monitoring results for <i>Cryptosporidium</i> .

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual – EPA 815-R-99-013*, August, 1999). This document is available on EPA’s Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mbp/mbpbtg.cfm>.

## SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:



- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008 and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at

<http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## SOURCE WATER MONITORING

You were subject to initial source water monitoring requirements if you do not have prior monitoring data that meets grandfathering requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You must sample for *Cryptosporidium* at least monthly for 24 months. Alternatively, you may notify the EPA or the state that you elect not to conduct source water monitoring and commit to providing the maximum treatment of 3-log inactivation for unfiltered systems. You must begin a second round of monitoring 6 years after the required date of determination of the mean *Cryptosporidium* level. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

Upon completing this monitoring you must calculate your mean *Cryptosporidium* concentration. If you took:

- Only one *Cryptosporidium* sample per month, you must calculate the mean using all samples.
- More than one sample per month, you must first calculate the mean *Cryptosporidium* level for each month, and then use those monthly averages to calculate the overall mean *Cryptosporidium* concentration for that treatment plant.

Note that unfiltered systems are not required to determine the highest 12-month mean; the mean *Cryptosporidium* concentration is always based on all samples taken during the initial or second source water monitoring round.

The mean *Cryptosporidium* level is used to determine the level of *Cryptosporidium* inactivation that unfiltered systems are required to provide at each treatment plant. If the mean *Cryptosporidium* level is:

- Less than or equal to 0.01 oocysts/L, the system must provide at least 2-log *Cryptosporidium* inactivation at that treatment plant.

- Greater than 0.01 oocysts/L, the system must provide at least 3-log *Cryptosporidium* inactivation at that treatment plant.

## MICROBIAL TOOLBOX

As an unfiltered system you will need to meet any additional treatment requirements using the inactivation options from the Microbial Toolbox.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Filtration Avoidance Criteria.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates depend on the size of the population served by your system, or the number of persons served by the largest system in your CDS, whichever is greater.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of mean <i>Cryptosporidium</i> concentration was due no later than:	Add Additional Treatment or Control Processes for Systems in Bin 2, 3, and 4 by1:	Second Round of Source Water Monitoring begun by:
1	September 2008	March 2009	April 1, 2012	April 1, 2015
2	March 2009	September 2009	October 1, 2012	October 1, 2015
3	March 2010	September 2010	October 1, 2013	October 1, 2016

1. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.

# Attachment 8: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 4<sup>9</sup>

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

**This attachment applies to systems that use surface water or GWUDI and are unfiltered and:**

- 1) They serve fewer than 10,000 persons and do not sell water; or
- 2) They sell water, and the largest system in their CDS serves fewer than 10,000 persons.

## REQUIREMENTS

### INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA*, AND *CRYPTOSPORIDIUM*

You must comply with the inactivation requirements established for regulated pathogens. The inactivation requirements are as follows:

Microbial	MCLG	Inactivation Requirements
Viruses		99.99% (4-log)
<i>Giardia lamblia</i>	Zero	99.9% (3-log)
<i>Cryptosporidium</i>	Zero	99% (2-log) (through watershed control) and,
		99% (2-log) removal of <i>Cryptosporidium</i> for systems reporting less than or equal to 0.01 oocysts/L in initial source water monitoring or,
		99.9% (3-log) removal of <i>Cryptosporidium</i> for systems reporting more than 0.01 oocysts/L in initial source water monitoring

---

<sup>9</sup> See Section 2 of this document for more information about Schedules.

You must also comply with the maximum residual disinfection level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR) and Stage 2 DBPR. EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – EPA 816-R-11-010] which addresses those rules requirements. This document is available on EPA's Web site (<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm>).

You must include in your watershed control programs steps to minimize the potential for contamination by *Cryptosporidium*. Your watershed control program must also minimize the potential for contamination by *Giardia* and viruses in source water. If you fail to meet *Cryptosporidium* site-specific requirements, you must install filtration within 18 months.

## **FILTRATION AVOIDANCE CRITERIA**

In order to remain unfiltered you must meet certain source water quality and site specific conditions. If any of the Filtration Avoidance Criteria are not met you must install filtration within 18 months of the failure.

### **Source Water Quality Conditions**

You must measure your source water turbidity. This sample must be taken prior to the first point of disinfection. You must collect a representative grab sample of your source water at least every 4 hours, and the turbidity cannot exceed 5 NTU. You must also monitor fecal coliform or total coliform concentrations in representative samples of source water immediately prior to the first point of disinfection. The number of samples you must take depends on your system size and the turbidity of your source water. If you serve:

- Less than or equal to 500 persons, you must take 1 sample per week.
- 501 to 3,300 persons, you must take 2 samples per week taken on separate days.
- 3,301 to 10,000 persons, you must take 3 samples per week taken on separate days.
- 10,001 to 25,000 persons, you must take 4 samples per week taken on separate days.
- More than 25,000 persons, you must take 5 samples per week taken on separate days.

You must also monitor on any day in which your turbidity sample exceeds 1 NTU.

Fecal coliform density must be less than or equal to 20/100 mL or your total coliform density must be less than or equal to 100/100mL. You must meet one of these criteria in at least 90 percent of the measurements from the previous 6 months.

### **Site Specific Conditions**

You must calculate your system's total inactivation ratio daily and provide 3-log *Giardia* and 4-log virus inactivation daily except any 1 day each month in 11 of 12 months (on an ongoing basis). You must take daily measurements before or at the first customer at each residual disinfectant concentration sampling point and must measure:

- Temperature.
- pH (if chlorine is used).
- Disinfection contact time (at peak hourly flow).
- Residual disinfectant concentration (at peak hourly flow).

You must comply with the MCL for total coliforms as required by the Total Coliform Rule in 11 of 12 previous months, and you must meet the requirements of the Stage 1 DBPR and Stage 2 DBPR.

You must have:

- Adequate entry point residual disinfectant concentration.
- Detectable residual disinfectant concentration in the distribution system.
- Redundant disinfection components or automatic shut-off whenever the residual disinfectant concentration is less than 0.2 mg/L.
- A watershed control program minimizing the potential for contamination by *Cryptosporidium*, *Giardia*, and viruses in source water.
- An annual on-site inspection by state or an approved third party, with reported findings.
- Not been identified as a source of a waterborne disease outbreak.

## RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

You must meet the combined *Cryptosporidium*, *Giardia*, and virus inactivation requirements (specified in the Inactivation Requirements table at the beginning of this attachment) using a minimum of two disinfectants. Each disinfectant must be able to achieve the total inactivation required for *Cryptosporidium*, *Giardia*, or viruses. For example, a system may use UV to meet *Cryptosporidium* and *Giardia* inactivation requirements and chlorine to meet virus inactivation requirements. To meet the *Cryptosporidium* inactivation requirements, systems must use chlorine dioxide, ozone, or UV.

## REPORTING AND RECORDKEEPING

Disinfection requirements are more stringent for unfiltered systems than filtered systems. You will receive a treatment technique violation if:

- You are using chlorine dioxide or ozone that fails to achieve the *Cryptosporidium* log inactivation on more than 1 day in the calendar month.
- You are using UV light and fail to treat at least 95 percent of the water that is delivered to the public during each calendar month within validated conditions.

Monitoring	Report by:	What to Report
<b>Source Water Quality Conditions</b>	10 <sup>th</sup> day of the following month	<p>The cumulative number of months for which results are reported.</p> <p>The number of fecal and/or total coliform samples (if a system monitors for both, only fecal coliforms must be reported), the dates of sample collection, and the dates when the turbidity level exceeded 1 NTU.</p> <p>The number of samples during the month that had equal to or less than 20/100 mL fecal coliforms and/or equal to or less than 100/100 mL total coliforms, whichever are analyzed.</p> <p>The cumulative number of fecal or total coliform samples, cumulative number of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, percentage of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, during the previous 6 months the system served water to the public.</p> <p>The maximum turbidity level measured during the month, the date for any measurement that exceeded 5 NTU, and the date the occurrence was reported to the state.</p> <p>The dates and number of times the turbidity exceeded 5 NTU in the previous 12 months.</p> <p>For the first 120 months of recordkeeping, the dates and total number of events during which the turbidity exceeded 5 NTU, and after 10 years of recordkeeping for turbidity measurements, the dates and total number of events during which the turbidity exceeded 5 NTU in the previous 120 months the system served water to the public.</p>
<b>Site Specific Conditions</b>	By October 10 of each year	<p>Compliance with all watershed control program requirements.</p> <p>Report on the on-site inspection, unless the state conducted the inspection.</p>
	Within 24 hours	Any turbidity exceedances of 5 NTU or waterborne disease outbreaks.
	ASAP but no later than the end of the next business day	Any instance where the residual disinfectant level entering the distribution systems was less than 0.2 mg/L.

Monitoring	Report by:	What to Report
<b>Disinfection Residual – Entry to the distribution system</b>	10 <sup>th</sup> day of the following month	<p>Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.</p> <p>The daily residual disinfectant concentration (in mg/L) and disinfectant contact time (in minutes) used for calculating the CT value.</p> <p>If chlorine is used, the daily measurement of pH of disinfected water following each point of chlorine disinfection.</p> <p>The daily measurement of water temperature in degrees C following each point of disinfection.</p> <p>The daily CT<sub>calc</sub> and CT<sub>calc</sub>/CT<sub>99,9</sub> values for each disinfectant measurement or sequence and the sum of all CT<sub>calc</sub>/CT<sub>99,9</sub> values before or at the first customer.</p> <p>The daily determination of whether disinfection achieves adequate <i>Giardia</i> and virus inactivation.</p>
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.
<b>Source Water Monitoring</b>	10 <sup>th</sup> day of the following month	Monitoring results for <i>Cryptosporidium</i> .

## DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state about making the disinfection change. You are required to consult with the state **before** making a significant change to a disinfection practice.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

EPA has developed a guidance manual that will provide guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Guidance Manual* – EPA 815-R-99-013, August, 1999). This document is available on EPA’s Web site <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/mdbptg.cfm>.

## **SANITARY SURVEYS**

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA’s guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state’s request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## **FINISHED RESERVOIRS/WATER STORAGE FACILITIES**

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.



- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir that was built before February 16, 1999, must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that this type of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at

<http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## SOURCE WATER MONITORING

You are subject to initial source water monitoring requirements if you do not have prior monitoring data that meets grandfathering requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R06-005 February 2006), available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm>.

You must sample for *Cryptosporidium* at least twice per month for 12 months, or at least once per month for 24 months. Alternately, you may notify the EPA or the state that you elect not to conduct source water monitoring and commit to providing the maximum treatment of 3-log inactivation for unfiltered systems. You must conduct a second round of monitoring 6 years after the required date of the determination of the mean *Cryptosporidium* level. You must submit a sampling schedule for this round of monitoring and report the monitoring results to the state.

Upon completing this monitoring you must calculate your mean *Cryptosporidium* concentration. If you took:

- Only one *Cryptosporidium* sample per month, you must calculate the mean using all samples.

- More than one sample per month, you must first calculate the mean *Cryptosporidium* level for each month, and then use those monthly averages to calculate the overall mean *Cryptosporidium* concentration for that treatment plant.

Note that unfiltered systems are not required to determine the highest 12-month mean; the mean *Cryptosporidium* concentration is always based on all samples taken during the initial or second source water monitoring round.

The mean *Cryptosporidium* level is used to determine the level of *Cryptosporidium* inactivation that unfiltered systems are required to provide at each treatment plant. If the mean *Cryptosporidium* level is:

- Less than or equal to 0.01 oocysts/L, the system must provide at least 2-log *Cryptosporidium* inactivation at that treatment plant.
- Greater than 0.01 oocysts/L, the system must provide at least 3-log *Cryptosporidium* inactivation at that treatment plant.

## MICROBIAL TOOLBOX

As an unfiltered system you will need to meet any additional treatment requirements using the inactivation options from the Microbial Toolbox.



Go to Attachment 10 for more information.

## COMPLIANCE DATES

The majority of the requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia*, and *Cryptosporidium*.
- Filtration Avoidance Criteria.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates for the LT2ESWTR requirements is based on the schedules described in section 2 (Applicability and Compliance Dates) of this document.

You must have begun *Cryptosporidium* monitoring by April 1, 2010. If, after you calculate your initial *Cryptosporidium* bin classification, you are in bin 2, 3, or 4, you have until October 1, 2014 (with a possible 2-year extension) to complete any additional treatment or control processes. No later than April 1, 2019, you must begin the second round of 2-year source water monitoring.

# Attachment 9: I operate a consecutive water system that: purchases finished water from a Subpart H water system and does not have a surface water or GWUDI source of my own

---

## BACKGROUND

The purpose of the Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Legionella* bacteria.
- *Giardia lamblia*.
- *Cryptosporidium*.

The SWTRs apply to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as “Subpart H systems.” Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

**This attachment applies to consecutive systems that purchase finished water from a Subpart H water system and does not have a surface water or GWUDI source of their own.**

## REQUIREMENTS

### RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving fewer than 3,300 persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Total Coliform Rule (TCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a “detectable residual.”

### SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for noncommunity water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Treatment (if applicable).
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.

- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system [*Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI)* – EPA 815-R-99-016, April 1999]. This document is available at <http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/lt1/lt1eswtr.cfm> and from the Safe Drinking Water Hotline (800) 426-4791.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

## **FINISHED RESERVOIRS/WATER STORAGE FACILITIES**

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as trihalomethanes (THMs).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

## **QUALIFIED PERSONNEL**

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the

states' discretion. Information about state operator certification programs can be accessed through EPA's Web site at

<http://water.epa.gov/infrastructure/drinkingwater/pws/dwoperatorcert/certificaitoncontacts.cfm>.

## REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
<b>Disinfection Residual – In the distribution system</b>	10 <sup>th</sup> day of the following month	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable in any 2 consecutive months.

## COMPLIANCE

All of the SWTRs requirements for consecutive systems are in effect, and you must be in compliance with these requirements. This includes the requirements for:

- Residual disinfectant monitoring.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified operators.



# Attachment 10: I operate a Subpart H water system that: must implement a Microbial Toolbox Option under the LT2ESWTR

---

## MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4, you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

Unfiltered systems will need to meet additional treatment requirements using the inactivation options from the Microbial Toolbox.

## SOURCE PROTECTION AND MANAGEMENT OPTIONS

### Microbial Toolbox – Watershed control program

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>1. Source Protection and Management Options</b>	
Watershed control program	0.5-log credit

The watershed control plan must:

- Identify an “area of influence” outside of which *Cryptosporidium* or fecal contamination is not likely to affect the treatment plant intake. This defined “area of influence” will be evaluated in future watershed surveys.
- Identify potential and actual source(s) of *Cryptosporidium* contamination.
- Include assessment of the impact of contamination source on source water quality.
- Assess the relative impact of these sources on the system’s source water quality.
- Analyze the effectiveness and feasibility of control measures that could reduce *Cryptosporidium* contamination.
- State goals and specific actions the system will take to reduce source water *Cryptosporidium* levels, explain how actions are expected to contribute to specific goals, identify watershed partners and their roles, identify resource requirements and commitments, and include a schedule for plan implementation with deadlines for specific actions identified in the plan.

If a system does not hear back from the state, they may assume that their plan was approved, and a 0.5-log credit was awarded unless the state subsequently rescinds approval. Systems with existing watershed control plans may apply for this credit.

The state may withdraw the 0.5-log credit if it determines that the system is not carrying out its watershed control plan. The watershed control plan and the sanitary survey results must be made available to the public.

### Microbial Toolbox Reporting and Recordkeeping – Watershed control program

Systems receiving *Cryptosporidium* treatment credit for watershed control programs must report their intent to the state 2 years before the applicable treatment compliance date and must submit a watershed control plan 1 year before the applicable treatment compliance date. Systems must submit a program status report every 12 months, and must undergo a watershed sanitary survey every 3 years (CWSs) or 5 years (NCWSs).

### Microbial Toolbox – Alternative source/intake management

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>1. Source Protection and Management Options</b>	
Alternative source/intake management	No prescribed credit

If a system determines its bin classification using alternative source water monitoring results, the system must relocate the intake or permanently adopt the alternative withdrawal procedure no later than the applicable treatment compliance date.

A system may conduct source water monitoring at an alternative intake location (in the same source or in a different source) or using a different procedure for timing or level of withdrawal from the source. If the state approves, the system may determine its bin classification based on the alternative source’s monitoring results. A system must concurrently conduct source water monitoring at the original source. Systems must report alternative source water monitoring results to the state, along with information describing the operating conditions under which the samples were collected. If a system determines its bin classification using alternative source water monitoring results that reflect a different intake location or a different procedure for managing the timing or level of withdrawal from the source, the system must relocate the intake or permanently adopt the alternative withdrawal procedure no later than the applicable treatment compliance date.

### Microbial Toolbox Reporting and Recordkeeping – Alternative source/intake management

Systems must verify the relocation of their intake or the adoption of alternative withdrawal procedures by the applicable treatment compliance date. If a system determines its bin classification using alternative source water monitoring results, the system must relocate the intake or permanently adopt the alternative withdrawal procedure no later than the applicable treatment compliance date.

## PRE-FILTRATION OPTIONS

### Microbial Toolbox – Presedimentation basin with coagulation

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>2. Pre Filtration Options</b>	
Presedimentation basin with coagulation	0.5-log credit

Systems may receive a 0.5-log *Cryptosporidium* treatment credit for a presedimentation basin that meets certain requirements.



- The presedimentation basin must be in continuous operation.
- The presedimentation basin must treat the entire plant flow taken from a Subpart H source.
- The system must continuously add coagulant to the presedimentation basin.
- The presedimentation basin must demonstrate at least a 0.5-log reduction of influent turbidity.
  - This reduction must be determined using daily turbidity measurements and must be calculated as follows:  $\log_{10}(\text{monthly mean of daily influent turbidity}) - \log_{10}(\text{monthly mean of daily effluent turbidity})$  or,
  - The presedimentation basin must comply with state-approved performance criteria that demonstrate at least a 0.5-log mean removal of micron-sized particulate material.

### Microbial Toolbox Reporting and Recordkeeping – Presedimentation basin with coagulation

Systems receiving *Cryptosporidium* treatment credit for a presedimentation basin must report monthly that the basin was in continuous operation, the basin treated the entire plant flow taken from a Subpart H source, coagulant was continuously added, and the basin caused at least a 0.5-log reduction of turbidity or complied with alternative state-approved performance criteria. Monthly results must be submitted within the first 10 days of the following month.

### Microbial Toolbox – Two-stage lime softening

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>2. Pre Filtration Options</b>	
Two-stage lime softening	0.5-log credit

Systems may receive a 0.5-log credit for two-stage lime softening that meets certain requirements.

- Chemical addition and hardness precipitation must occur in two separate and sequential softening stages prior to filtration.
- Both softening stages must treat the entire plant flow taken from a Subpart H source.

### Microbial Toolbox Reporting and Recordkeeping – Two-stage lime softening

Systems receiving a 0.5-log credit for two-stage lime softening must verify that chemical addition and hardness precipitation occurred in two separate steps and that both stages treated the entire plant flow taken from a Subpart H source. Systems must report this information to the state monthly, beginning on the applicable treatment compliance date. Monthly results must be submitted within the first 10 days of the following month.

### Microbial Toolbox – Bank filtration

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>2. Pre Filtration Options</b>	
Bank filtration	0.5-log credit for 25-foot setback 1.0-log credit for 50-foot setback

Systems may receive a 0.5-log credit for a bank filtration process with at least a 25-foot ground water flow path or a 1.0-log credit for a bank filtration process with at least a 50-foot ground water flow path, if the system meets certain requirements. Systems using bank filtration when they begin the source water monitoring process are not eligible for this credit.

The state may approve *Cryptosporidium* treatment credit for bank filtration based on a demonstration of performance study that meets certain requirements.

Springs and infiltration galleries, which are not eligible for treatment credit under the bank filtration option, are eligible for demonstration of performance credit.

### Microbial Toolbox Reporting and Recordkeeping – Bank Filtration

Systems receiving *Cryptosporidium* treatment credit for bank filtration must verify their aquifer type and their setback distance by the applicable treatment compliance date. Systems must also submit an assessment of daily turbidity measurements over 1 NTU and the turbidity results within 30 days following any month when an exceedance occurs.

## TREATMENT PERFORMANCE OPTIONS

### Microbial Toolbox – Combined filter performance

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>3. Treatment Performance Options</b>	
Combined filter performance	0.5-log credit

Systems may receive a 0.5-log *Cryptosporidium* treatment credit for combined filter performance that meets certain requirements. Systems using conventional or direct filtration treatment receive this credit during any month when the system’s CFE turbidity is less than or equal to 0.15 NTU in at least 95 percent of measurements.

### Microbial Toolbox Reporting and Recordkeeping – Combined filter performance

Systems receiving the 0.5-log combined filter performance *Cryptosporidium* treatment beginning on the applicable compliance date. Monthly results must be submitted within the first 10 days of the following month

### Microbial Toolbox – Individual filter performance

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>3. Treatment Performance Options</b>	
Individual filter performance	0.5-log credit

Systems may receive a 0.5-log *Cryptosporidium* treatment credit for individual filter performance that meets certain requirements. Systems using conventional or direct filtration may receive this credit, which is in addition to the 0.5-log combined filter performance credit.

- Filtered water turbidity for each individual filter must be less than or equal to 0.15 NTU in at least 95 percent of the measurements recorded each month.

- No individual filter may have a measured turbidity greater than 0.3 NTU in two consecutive measurements taken 15 minutes apart.

### Microbial Toolbox Reporting and Recordkeeping – Individual filter performance

Systems receiving the 0.5-log individual filter performance *Cryptosporidium* treatment credit verify that no individual filter exceeded 0.3 NTU in two consecutive readings, beginning on the applicable compliance date. Monthly results must be submitted within the first 10 days of the following month. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

### Microbial Toolbox – Demonstration of performance

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>3. Treatment Performance Options</b>	
Demonstration of performance	Determined by state

Systems may receive *Cryptosporidium* treatment credit for drinking water treatment processes based on a demonstration of performance study. The study must follow a state-approved protocol and must demonstrate the level of *Cryptosporidium* reduction the treatment process will achieve under the full range of expected operating procedures. State approval must be in writing and may include monitoring and treatment performance criteria that the system must demonstrate and report on an ongoing basis to remain eligible for the treatment credit.

### Microbial Toolbox Reporting and Recordkeeping – Demonstration of performance

Systems receiving demonstration of performance *Cryptosporidium* treatment credit must submit initial testing results by the applicable treatment compliance date and must verify and report that operating conditions are within state-approved limits monthly. Monthly results must be submitted within the first 10 days of the following month. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

## ADDITIONAL FILTRATION OPTIONS

### Microbial Toolbox – Bag or cartridge filters (individual or in series)

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>4. Additional Filtration Options</b>	
Bag or cartridge filters (individual)	Up to 2.0-log
Bag or cartridge filters (in series)	Up to 2.5-log

Systems may receive up to a 2.0-log *Cryptosporidium* treatment credit for individual bag or cartridge filters and up to a 2.5-log treatment credit for bag or cartridge filters in series that meet certain requirements. The exact log credit is determined by removal efficiency during challenge testing.

Systems must treat the entire plant flow taken from a Subpart H source and must conduct challenge testing to be eligible for this credit.

## Microbial Toolbox Reporting and Recordkeeping – Bag or cartridge filters (individual or in series)

Systems receiving *Cryptosporidium* treatment credit for bag or cartridge filters must verify that their process meets the definition of bag or cartridge filtration and must report their removal efficiency (determined during challenge testing) to the state by the applicable treatment compliance date. Systems must also report monthly to the state that they treat the entire plant flow taken from a Subpart H source. Monthly results must be submitted within the first 10 days of the following month.

### Microbial Toolbox – Membrane filtration

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>4. Additional Filtration Options</b>	
Membrane filtration	Equivalent to removal efficiency

Systems may receive *Cryptosporidium* treatment credit for membrane filtration that meets certain requirements. The level of *Cryptosporidium* treatment credit a system receives is equal to the lower value of the removal efficiency determined during challenge testing or the removal efficiency determined during direct integrity testing.

The system must report results of challenge testing to the state. Systems must also conduct direct integrity testing in a manner that demonstrates a removal efficiency equal to or greater than the removal credit awarded to the membrane filtration process.

### Microbial Toolbox Reporting and Recordkeeping – Membrane filtration

Systems receiving *Cryptosporidium* treatment credit for membrane filtration must conduct challenge testing and integrity testing by the applicable treatment compliance date. Systems must also report any direct integrity tests that triggered the control limit monthly. Monthly results must be submitted within the first 10 days of the following month.

### Microbial Toolbox – Second stage filtration

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>4. Additional Filtration Options</b>	
Second stage filtration	0.5-log

Systems may receive a 0.5-log *Cryptosporidium* treatment credit for second stage filtration that meets certain requirements. The second stage must consist of sand, dual media, GAC, or other fine grain media approved by the state. The first stage of filtration must be preceded by a coagulation step, and both filtration stages must treat the entire plant flow taken from a Subpart H source. The state must approve the treatment credit based on an assessment of the design characteristics of the filtration process.

### Microbial Toolbox Reporting and Recordkeeping – Second stage filtration

Systems receiving *Cryptosporidium* treatment credit for second stage filtration must report monthly that second stage filtration is preceded by coagulation and that both stages of filtration treat the entire plant flow taken from a Subpart H source. Monthly results must be submitted within the first 10 days of the following month. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

## Microbial Toolbox – Slow sand filters

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>4. Additional Filtration Options</b>	
Slow sand filters	2.5-log as secondary filtration 3.0-log as primary filtration

Systems may receive a 3.0-log *Cryptosporidium* credit for slow sand filters used as a primary process. Systems may receive a 2.5-log *Cryptosporidium* credit for slow sand filters used as a secondary process, if they meet certain conditions. When used as a secondary process, both steps of filtration must treat the entire plant flow taken from a Subpart H source and no disinfectant residual may be present in the influent water. The state must approve the treatment credit based on an assessment of the design characteristics of the filtration process.

Note: Water systems that use slow sand filters as their primary filtration process received 3-log *Cryptosporidium* credit under 40 CFR 141.711(a). If a system runs two slow sand filters in series it could receive a total of 5.5 log *Cryptosporidium* removal credit.

## Microbial Toolbox Reporting and Recordkeeping – Slow sand filters

Systems receiving *Cryptosporidium* treatment credit for secondary slow sand filters must report monthly that the slow sand filter was preceded by a separate step of filtration and that both steps treated 100 percent of plant flow taken from a Subpart H sources. Monthly results must be submitted within the first 10 days of the following month.

## INACTIVATION OPTIONS

Unfiltered systems will need to meet any additional treatment requirements using the inactivation options from the Microbial Toolbox.

## Microbial Toolbox – Chlorine dioxide

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>5. Inactivation Options</b>	
Chlorine dioxide	Based on CT

Systems may receive *Cryptosporidium* treatment credit for chlorine dioxide inactivation. *Cryptosporidium* treatment credit is determined by calculating the CT value (product of contact time in minutes and concentration in mg/L) for the disinfection segment. Systems with several disinfection segments may calculate CT for each segment and sum these values to determine the total CT for the treatment plant. Systems must calculate CT at least once a day during peak hourly flow.

## Microbial Toolbox Reporting and Recordkeeping – Chlorine dioxide

Systems receiving *Cryptosporidium* treatment credit for inactivation with chlorine dioxide must report a monthly summary of daily CT values. Monthly results must be submitted within the first 10 days of the following month.

## Microbial Toolbox – Ozone

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>5. Inactivation Options</b>	
Ozone	Based on CT

Systems may receive *Cryptosporidium* treatment credit for ozone inactivation. *Cryptosporidium* treatment credit is determined by calculating the CT value (product of contact time in minutes and concentration in mg/L) for the disinfection segment. Systems with several disinfection segments may calculate CT for each segment and sum these values to determine the total CT for the treatment plant. Systems must calculate CT at least once a day during peak hourly flow.

## Microbial Toolbox Reporting and Recordkeeping – Ozone

Systems receiving *Cryptosporidium* treatment credit for inactivation with ozone must report a monthly summary of daily CT values. Monthly results must be submitted within the first 10 days of the following month.

## Microbial Toolbox – UV

Toolbox Option	<i>Cryptosporidium</i> Treatment Credit
<b>5. Inactivation Options</b>	
UV	Based on UV dose

Systems may receive *Cryptosporidium*, *Giardia lamblia*, and virus treatment credit for UV inactivation if they meet certain requirements.

- Systems must validate and monitor UV reactors to determine the operating conditions under which the reactor delivers the UV dose required to achieve treatment credit.
- These operating conditions must include flow rate, UV intensity as measured by a UV sensor, and UV lamp status.
- Validation testing must include a full scale testing of the reactor and inactivation of a test microorganism whose dose response characteristics have been quantified with a low pressure mercury vapor lamp.
- Systems must also monitor their UV reactors to determine if the reactors are operating within validated conditions.
- To receive treatment credit, systems must treat at least 95 percent of the water delivered to the public during each month by UV reactors operating within validated conditions for the required UV dose.

## Microbial Toolbox Reporting and Recordkeeping – UV

Systems receiving *Cryptosporidium* treatment credit for UV inactivation must submit validation test results by the applicable treatment compliance date and must submit a monthly report summarizing the percentage of water entering the distribution system that was not treated by UV light. Monthly results must be submitted within the first 10 days of the following month.