

Section I

Rule Requirements

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1.1 Introduction

The Long-Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was published in the *Federal Register* on January 14, 2002 [67 FR 1812; See www.epa.gov/safewater/mdbp/lt1eswtr.html]. This rule is part of a series of rules, the “Microbial-Disinfectants/Disinfection Byproducts Cluster” (M-DBP Cluster), to be published over several years. The rule cluster is intended to improve control of microbial pathogens while minimizing the public health risks of disinfectants and disinfection byproducts (DBPs). The LT1ESWTR is designed to address the health risks from microbial contaminants, specifically *Cryptosporidium*, in public water systems (PWSs) serving fewer than 10,000 people without significantly increasing the potential risks from chemical contaminants. It utilizes the same framework as the Interim Enhanced Surface Water Treatment Rule (IESWTR), that applies to systems serving 10,000 or more people. The LT1ESWTR was proposed concurrently with the Filter Backwash Recycling Rule (FBRR), which addresses the recycle of filter backwash within the treatment process. The Filter Backwash Recycling Rule was finalized as a separate rule [66 FR 31086; See www.epa.gov/safewater/filterbackwash.html].

1.1.1 History

The 1974 Safe Drinking Water Act (SDWA) called for EPA to regulate drinking water by creating the national interim primary drinking water regulations (NIPDWR). In 1979, the first interim standard addressing DBPs was set for total trihalomethanes (TTHMs), a group of four volatile organic chemicals which form when disinfectants react with natural organic matter in the water.

Although the SDWA was amended slightly in 1977, 1979, and 1980, the most significant changes to the 1974 law occurred when the SDWA was reauthorized in 1986. Waterborne disease outbreaks of giardiasis demonstrated that disease-causing microbial contamination had not been sufficiently controlled under the original Act. In addition, several hundred chemical contaminants were known to occur in the environment, but few were regulated in public water systems. 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 named contaminants. EPA was also required to establish additional regulations within certain time frames, 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 1989, EPA issued two important National Primary Drinking Water Regulations (NPDWR): The Total Coliform Rule (TCR) and the Surface Water Treatment Rule (SWTR). The TCR and SWTR provide the foundation for the M-DBP Cluster and are summarized below.

The TCR covers all public water systems. Coliforms are easily detected in water and are used to indicate a water system’s vulnerability to pathogens. In the TCR, EPA set a MCLG of zero for total coliforms. EPA also set a MCL for total coliforms and required testing of total-coliform positive cultures for the presence of *E. coli* or fecal coliforms, these latter indicating more immediate health risks from sewage or fecal contamination. In addition, the TCR required sanitary surveys every five years (or ten years for non-community systems using a disinfected and protected ground water) for every system that collects fewer than five routine total coliform samples per month (typically systems that serve less than 4,100 people).

Public water systems using surface water or ground water under the direct influence of surface water are prone to microbial contamination of their source water. Pathogenic microorganisms contaminating source water are removed during the water treatment plant sedimentation and/or filtration processes. Disinfection is effective for some but not all pathogens which may be present. EPA issued the SWTR in response to Congress' mandate requiring disinfection, and filtration where necessary, of systems that use surface water sources. The SWTR applies to all systems that use surface water or ground water under the direct influence of surface water (GWUDI). The rule sets MCLGs for *Legionella*, *Giardia lamblia*, and viruses at zero since any exposure to these contaminants presents some level of health risk. The SWTR applies a treatment technique requirement for inactivation, or removal and inactivation, of these organisms.

Specifically, the SWTR rule requires that a surface water 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. In addition, a detectable disinfection residual must be maintained throughout the distribution system. For systems that filter, the adequacy of the filtration process is determined by the treatment technology used and the turbidity of the treated water, since high levels of turbidity often indicate that the filtration process is not working properly. The goal of the SWTR is to reduce the public health risk for infection by *Giardia lamblia*, *Legionella* or viruses to less than one infection per year per 10,000 people. However, the SWTR does not account for systems with high pathogen concentrations in source water that, when treated at the levels required under the rule, still may not meet this health goal. The SWTR also does not specifically control for the protozoan *Cryptosporidium*, as sufficient information about its removal or disinfection was not available at the time the SWTR was finalized. Over the past 10 years, much has been learned about this organism. Most notably, *Cryptosporidium* is particularly resistant to disinfection practices commonly employed by public water systems. Therefore, physical removal of *Cryptosporidium* is the most effective method of public health protection.

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 probably the greatest remaining health-risk management challenge for drinking water suppliers. Data from the Centers for Disease Control (CDC) confirm this concern and indicate that between 1980 and 1994, 379 waterborne disease outbreaks were reported, with over 500,000 cases of disease. During this period, a number of agents were implicated as the cause, including protozoa, viruses, bacteria, and several chemicals. Most of the cases (but not the outbreaks) were associated with surface water, including a single outbreak of over 400,000 cases of cryptosporidiosis in Milwaukee.

The SDWA was further amended in 1996 to improve public health protection. The 1996 Amendments incorporated new data on the adverse health effects of contaminants, the occurrence of contaminants in public water systems, and the estimated reduction in health risks that would result from further regulation. The amendments also increased scientific research requirements and emphasized cost-benefit analyses in the regulatory decision process.

Following the 1996 SDWA Amendments, the Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 DBPR) and Interim Enhanced Surface Water Treatment Rule (IESWTR) were published in December 1998. These rules expand on the foundation of the TCR, SWTR, and TTHM standards to target health risk outliers unaddressed by prior regulations.

All systems using surface water or GWUDI, and many systems using groundwater rely on a chemical disinfectant to inactivate pathogens. The public health benefits of common disinfection practices are significant and well-recognized; however, disinfection poses risks of its own. While disinfectants are effective in controlling many harmful microorganisms, they react with organic and inorganic matter (disinfection byproduct precursors—DBPPs) in the water and form DBPs, some of which pose health risks at certain levels. Since the discovery of chlorination byproducts in drinking water in 1974, numerous toxicological studies have been conducted that show some DBPs to be carcinogenic and/or cause reproductive or developmental effects in laboratory animals. Additionally, exposure to high levels of disinfectants over long periods of time may cause health problems, including damage to blood and kidneys. While many of these studies have been conducted at high contaminant doses, the weight-of-evidence indicates that DBPs present a potential public health problem that must be addressed, even at low levels. One of the most complex questions facing water supply professionals is how to reduce risks from disinfectants and DBPs while providing adequate protection against microbial contaminants. Much of the population is exposed to these risks; therefore, a substantial concern exists.

To address this concern, the Stage 1 DBPR updates and supersedes the 1979 TTHM standard. The Stage 1 DBPR lowers the MCL for TTHMs and establishes maximum residual disinfection level (MRDL) limits for chlorine, chloramines, and chlorine dioxide and new MCLs for chlorite, bromate, and five haloacetic acids (HAA5). It applies to all community water systems and nontransient noncommunity water systems that add a chemical disinfectant for either primary or residual treatment. In addition, the Stage 1 DBPR requires conventional filtration systems to remove specified percentages of organic materials measured as total organic carbon (TOC) that may react with disinfectants to form DBPs.

The IESWTR builds on the SWTR by adding protection from *Cryptosporidium* through strengthened combined filter effluent turbidity performance standards and individual filter turbidity provisions. It applies to systems that serve greater than 10,000 people. For unfiltered systems, *Cryptosporidium* must be included in watershed control requirements. In addition, the IESWTR builds on the TCR by requiring sanitary surveys for all public water systems using surface water or ground water under the direct influence of surface water. The IESWTR also requires covers for all new finished water storage facilities and includes disinfection profiling and benchmarking provisions to ensure systems provide continued levels of microbial protection while taking the necessary steps to comply with the DBP standards.

The provisions in the LT1ESWTR address the concerns covered by the IESWTR as they apply to small systems (i.e., systems serving less than 10,000 people) using surface water or ground water under the direct influence of surface water (GWUDI). Collectively, the SWTR, IESWTR, and LT1ESWTR place stringent treatment requirements on systems using surface water as a source.

The FBRR complements the surface water rules by reducing the potential for microbial pathogens, particularly *Cryptosporidium* oocysts, to pass through the filters into the finished water of systems that use conventional and direct filtration. The FBRR requires affected systems to report recycle practices to the State, maintain specific records, and return recycle to an appropriate location.

By building on the foundation set forth by the original SDWA, subsequent amendments to the Act have improved the quality of drinking water and increased public health protection. The LT1ESWTR is part of a series of rules which expand on the foundation of prior rulemaking efforts. By encompassing previously unaddressed health risks from microbials and disinfection byproducts, the M-DBP Cluster continues to maximize drinking water quality and public health protection.

1.1.2 Development of the LT1ESWTR

The 1996 SDWA Amendments required EPA to develop rules to balance the risks between microbial pathogens and disinfection byproducts. In 1997, a Federal Advisory Committees Act (FACA) process was implemented with the Microbial-Disinfectants/Disinfection Byproducts (M-DBP) Advisory Committee. The M-DBP Committee Negotiations resulted in the following three proposals:

- An Information Collection Rule (ICR) to collect information necessary to reduce many key uncertainties prior to subsequent negotiations for the Stage 2 Disinfection Byproducts Rule (Stage 2 DBPR). Systems affected by the ICR were also required to report whether recycle is practiced and to sample spent filter backwash water (i.e., recycle flow) between the backwash water treatment plant (if one existed) and the point at which recycle is added to the treatment process. Sampling of plant recycle flow was required prior to blending with the plant influent flow;
- A companion Enhanced Surface Water Treatment Rule (proposed in three stages) and the FBRR; designed to improve control of microbial pathogens and prevent inadvertent reductions in microbial safety as a result of DBP control efforts; and,
- A staged approach to regulation of DBPs (referred to as the Stage 1 and Stage 2 DBPRs) incorporating Maximum Contaminant Levels (MCLs), Maximum Residual Disinfectant Levels (MRDLs), and treatment technique requirements.

EPA began outreach efforts to develop the LT1ESWTR in the summer of 1998. In addition, several formal and informal meetings on the LT1ESWTR were held with stakeholders, trade associations, and environmental groups. Small entity representatives also contributed valuable input as part of the Small Business Regulatory Enforcement Fairness Act (SBREFA) panel process. In early June 1999, EPA mailed an informal draft of the LT1ESWTR preamble to approximately 100 stakeholders. EPA received valuable suggestions and stakeholder input from 15 State representatives, trade associations, environmental groups, and individual stakeholders. The proposed LT1ESWTR was published in the Federal Register on April 10, 2000 (65 FR 19046). EPA held a public meeting in Washington, DC on April 14, 2000 to discuss the proposed rule. Additionally, the proposed rule was either presented or discussed in nearly 50 meetings across the U.S., including a May 30, 2000 meeting in Washington, DC. Finally, EPA requested comments by mailing approximately 200 copies of the proposed rule to stakeholders. These comments were reviewed and evaluated while developing the final rule. Responses to all of the comments are found in EPA's *Public Comment and Response Summary for the Long Term 1 Enhanced Surface Water Treatment Rule* (EPA Doc #815-R-01026, October 26, 2001).

1.1.3 Benefits of the LT1ESWTR

The LT1ESWTR will improve public health by increasing the level of protection from exposure to *Cryptosporidium* and other pathogens in drinking water supplies through filtration improvements at small water systems. Based on the risk assessment performed for the Regulatory Impact Analysis, the LT1ESWTR is expected to reduce the mean annual number of endemic illnesses (constant, low-level presence of a disease or infection) from *Cryptosporidium* by 12,000 to 41,000 cases. Based on these values, the mean estimated annual benefits of reducing the illness range from \$9.5 million to \$58.3

million per year. This calculation is based on a valuation of \$796 to \$1,411 per incidence of cryptosporidiosis prevented. The LT1ESWTR will also reduce the risk of more severe health impacts on sensitive populations, including the risk of mortality. Additionally, the LT1ESWTR will reduce the likelihood of outbreaks of giardiasis and its associated costs by providing a larger margin of safety against such outbreaks in some systems.

1.2 Summary of Action Dates

1.2.1 Applicability and Compliance Dates

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was published in the *Federal Register* on January 14, 2002 [67 FR 1812]. It applies 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) and serve fewer than 10,000 people. The LT1ESWTR is the small system counterpart to the Interim Enhanced Surface Water Treatment Rule (IESWTR) which applies to systems serving 10,000 or more people. Most LT1ESWTR provisions become effective three years after publication of the final rule or by January 14, 2005, except where noted below. Table 1.1 summarizes key compliance dates required by the LT1ESWTR (in bold) as well as suggested timeframes for certain implementation activities.

Table 1.1: Summary of Action Dates for the LT1ESWTR

Date	LT1ESWTR Action
January 14, 2002	Rule is published in <i>Federal Register</i> .
March 15, 2002	60-day legal challenge period ends and the rule becomes effective.
March 15, 2002	Beginning construction of uncovered finished water reservoirs is prohibited [40 CFR §§141.503(a) and 141.511].
March 2002	States are encouraged to communicate LT1ESWTR requirements to affected systems.
June 2002- October 2002	Systems have the option to collect TTHM <u>and</u> HAA5 samples in the month with the warmest water temperature and at the point of maximum residence time in the distribution system to determine whether they are qualified to forgo disinfection profiling. (Systems with warmest water temperature other than late summer/early fall should collect their samples in the corresponding month but prior to July, 2003 or January 2004, depending on system size.)
July 1, 2003	No later than this date systems serving between 500 and 9,999 persons must begin developing a disinfection profile – unless the system has adequately demonstrated that their TTHM and HAA5 levels are less than 0.064 mg/L and 0.048 mg/L, respectively, or a more representative data set has been approved by the State– and notify the State to this effect [40 CFR §141.532].

Date	LT1ESWTR Action
June 2003- October 2003	Last opportunity for systems serving fewer than 500 persons to collect optional TTHM <u>and</u> HAA5 samples to determine whether they are qualified to forgo disinfection profiling (if the month of warmest water temperature is in the summer/fall time frame. Systems with warmest water temperature in other months must collect their samples in the corresponding month but prior to January, 2004.)
October 2003	States are encouraged to submit final primacy applications or extension requests to EPA.
January 1, 2004	No later than this date systems serving fewer than 500 persons must begin developing a disinfection profile – unless the system has demonstrated that their TTHM and HAA5 levels are less than 0.064 mg/L and 0.048 mg/L, respectively, or a more representative data set has been approved by the State– and notify the State to this effect [40 CFR §141.532].
January 14, 2004	Final primacy applications must be submitted to EPA unless granted an extension [40 CFR §142.12(b)(1)].
June, 2004	Systems using alternative filtration technology are encouraged to submit demonstration data confirming that their system consistently achieves adequate removal and/or inactivation of <i>Cryptosporidium</i> , <i>Giardia lamblia</i> , and viruses.
June, 2004	Unfiltered systems are encouraged to begin developing appropriate watershed control provisions to limit potential contamination by <i>Cryptosporidium</i> oocysts.
June 30, 2004	Systems serving between 500 and 9,999 persons must complete the disinfection profile [40 CFR §141.530-141.536] unless the State has determined it is unnecessary. Profile must be kept on file indefinitely.
July, 2004	Conventional and direct filtration systems are encouraged to have the appropriate individual turbidimeters in place to ensure compliance with IFE monitoring requirements.
October, 2004	States are encouraged to complete reviews of demonstration data for systems using alternative filtration and make determinations regarding combined filter effluent limits.
December 31, 2004	Systems serving fewer than 500 persons must complete the disinfection profile [40 CFR §141.530-141.536], unless the State has determined it is unnecessary. Profile must be kept on file indefinitely.
January 14, 2005	<p>Systems that are required to filter and use conventional/direct filtration must:</p> <ul style="list-style-type: none"> • Use a technology that reliably achieves 99 percent removal of <i>Cryptosporidium</i> oocysts, and • Meet the combined filter effluent (CFE) turbidity requirements of 40 CFR §141.551: <ul style="list-style-type: none"> ▸ ≤0.3 NTU CFE 95 percent of the time, and ▸ At no time exceed 1 NTU

Date	LT1ESWTR Action
January 14, 2005	<p>Systems using slow sand or diatomaceous earth filtration must:</p> <ul style="list-style-type: none"> • Use a technology that reliably achieves 99 percent removal of <i>Cryptosporidium</i> oocysts, and • Continue to meet the CFE turbidity requirement limits in 40 CFR §141.73 of the SWTR: <ul style="list-style-type: none"> ▶ ≤1 NTU CFE 95 percent of the time, and ▶ At no time exceed 5 NTU
January 14, 2005	<p>Systems using alternative filtration technologies (other than conventional, direct, slow sand, or diatomaceous earth filtration) must:</p> <ul style="list-style-type: none"> • Demonstrate the technology consistently achieves 99 percent removal of <i>Cryptosporidium</i> oocysts, and • Meet State-established alternative CFE turbidity requirements based on a demonstration by the system as described in §141.552.
January 14, 2005	<p>Systems using conventional or direct filtration must conduct continuous monitoring of turbidity (recorded at least every 15 minutes) for each individual filter in the system [40 CFR §141.560]. Systems with two or fewer filters may conduct continuous monitoring of CFE turbidity in lieu of individual filter effluent (IFE) turbidity monitoring.</p>
January 14, 2005	<p>Systems must comply with the CFE, IFE, and disinfection profile and benchmark reporting and recordkeeping requirements of 40 CFR §141.570, when applicable.</p>
January 14, 2005	<p>Subpart H systems that do not provide filtration must modify existing watershed control programs to minimize the potential for contamination by <i>Cryptosporidium</i> oocysts in the source water [40 CFR §141.521].</p>
October 2005	<p>States with approved 2-year extension agreements are encouraged to submit final primacy applications to EPA.</p>
January 14, 2006	<p>Final primacy revisions applications from States with approved 2-year extension agreements must be submitted to EPA [40 CFR §142.12(b)(2)].</p>

Please note: to forgo profiling, systems are encouraged to conduct optional TTHM and HAA5 monitoring after January 1998 and before they are required to begin profiling. Systems serving between 500 and 9,999 persons must begin profiling no later than July 1, 2003. Systems serving fewer than 500 persons must begin profiling no later than January 1, 2004.

1.2.2 Timeline for the Long Term 1 Enhanced Surface Water Treatment Rule

Figure 1.1, below, depicts the LT1ESWTR requirements and implementation timeline for States and systems. The flowchart on the next page (Figure 1.2) shows the requirements of the LT1ESWTR.

Figure 1.1: LT1ESWTR Requirements and Implementation Timeline

(Dates are not to scale with the calendar year)

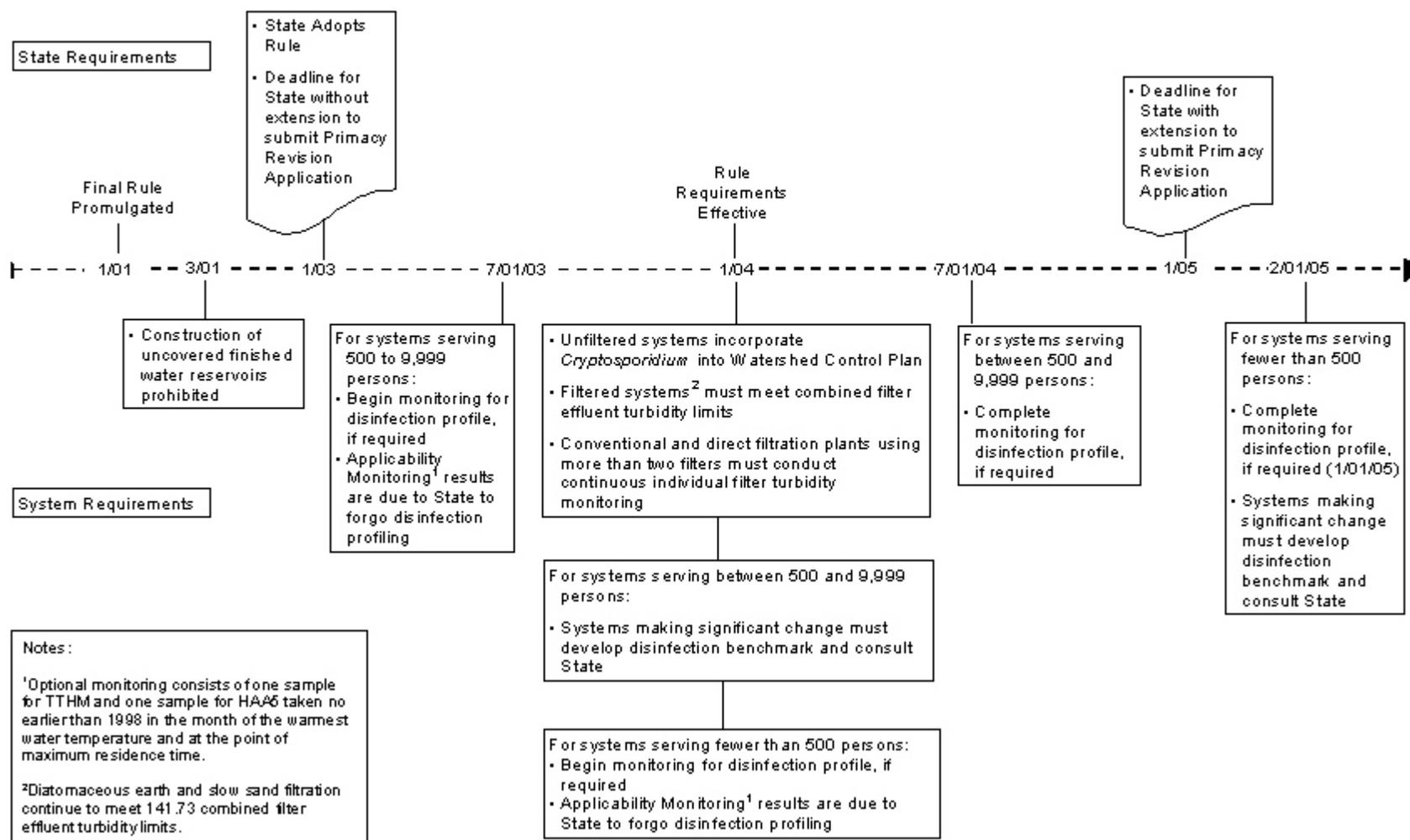
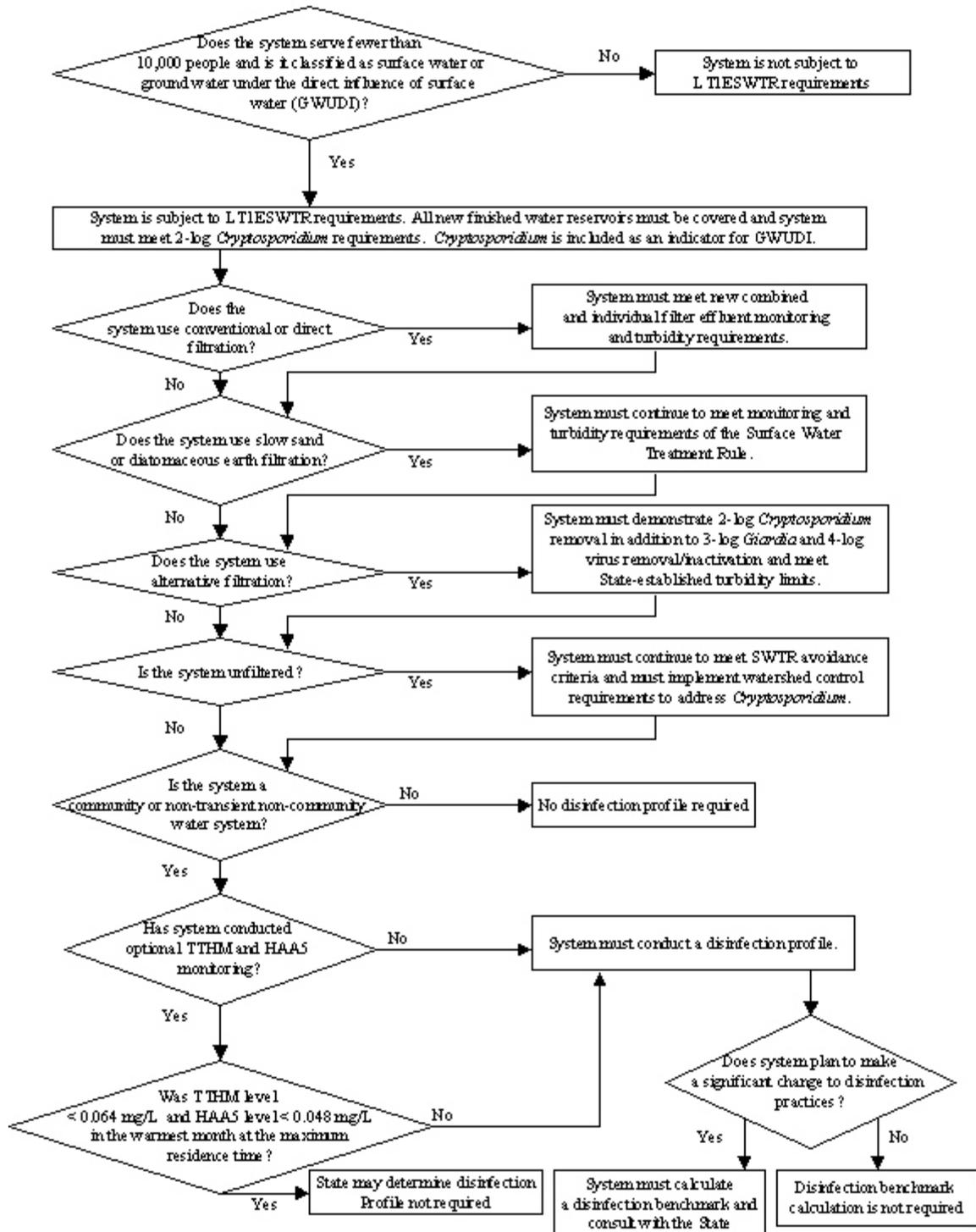


Figure 1.2: General Requirements of the LT1ESWTR



1.3 Requirements of the Rule: Public Water Systems

The following rule requirements are from the LT1ESWTR published in the Federal Register on January 14, 2002 [67 FR 1812]. For a copy of the actual rule language, see Appendix B, or visit EPA's website at www.epa.gov/safewater/mdbp/lt1eswtr.html for a copy of the Federal Register notice.

1.3.1 Applicability and Compliance Dates

1.3.1.1 Who does this rule apply to?

The LT1ESWTR applies to any public water system (PWS) that uses surface water or ground water under the direct influence of surface water (GWUDI) as a source, also known as a Subpart H system, and serves fewer than 10,000 people.

1.3.1.2 What are the compliance dates?

Systems must comply with the turbidity and monitoring requirements no later than January 14, 2005. In addition, affected PWSs that have not selected to adequately demonstrate to the State that their total trihalomethanes (TTHM) and five haloacetic acids (HAA5) levels are below 0.064 mg/L and 0.048 mg/L, respectively, are required to develop an evaluation of their existing disinfection practices—referred to as a *disinfection profile*. Systems serving between 500 and 9,999 people must begin collecting data for the disinfection profile no later than July 1, 2003. Systems serving less than 500 people must begin to collect data for the disinfection profile no later than January 1, 2004. Finally, the construction of new uncovered finished water storage reservoirs is prohibited on or after March 15, 2002.

1.3.2 Disinfection Profiling and Disinfection Benchmarking Requirements

Disinfection profiling and benchmarking helps to ensure that systems do not jeopardize microbial protection when making changes in disinfection practices to comply with the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR).

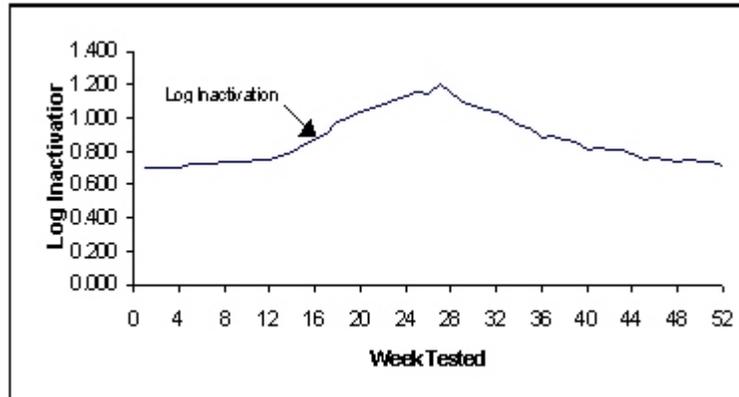
1.3.2.1 Who must develop a disinfection profile?

Under the LT1ESWTR, surface water or GWUDI community and non-transient non-community systems serving fewer than 10,000 people must develop a *disinfection profile*, unless the State determines that the system's profile is unnecessary or approves a more representative data set for disinfection profiling.

1.3.2.2 What is a disinfection profile?

A disinfection profile is a graphic representation that shows how inactivation varies at a given plant over time. Figure 1.3 depicts an example profile. For systems serving fewer than 10,000 people, it is a compilation of weekly log inactivation of *Giardia lamblia* (and viruses for systems using chloramines, ozone, or chlorine dioxide for primary disinfection). The log inactivation values are calculated from operational data that affect the disinfection process using the Surface Water Treatment Rule CT Tables. Each log inactivation serves as a data point in your disinfection profile.

Figure 1.3: Example Disinfection Profile



The following data must be collected over the period of one year (52 weeks) on the same calendar day each week during peak hourly flow:

- The disinfectant residual concentration (“C”, in mg/L) collected before or at the first customer and prior to each additional point of disinfection;
- Contact time (“T,” in minutes); AND
- Data collected at each residual disinfectant concentration sampling point:
 - ▶ Water temperature (in degrees Celsius) and
 - ▶ pH (for systems using chlorine).

Example of Disinfection Profile

1.3.2.3 When is a disinfection profile unnecessary?

The State may determine that a disinfection profile is unnecessary if the system adequately demonstrates that its TTHM level is <0.064 mg/L and HAA5 level is <0.048 mg/L by collecting one TTHM and one HAA5 sample after January 1, 1998 but before the dates required to begin profiling. Both of these samples must be taken during the month with the warmest water temperature and at the point of maximum residence time in the distribution system. These levels represent 80 percent of the TTHM and HAA5 MCLs systems are required to meet as part of the Stage 1 DBPR. Systems which have TTHM or HAA5 concentrations above these levels are likely to consider changes to their disinfection practices to maintain compliance. These changes may impact their current level of microbial protection. Systems which can demonstrate that their DBPs are under the levels described above are less likely to make changes to their disinfection practices and thus, are not required to create a profile.

1.3.2.4 When would a State approve a more representative data set for disinfection profiling?

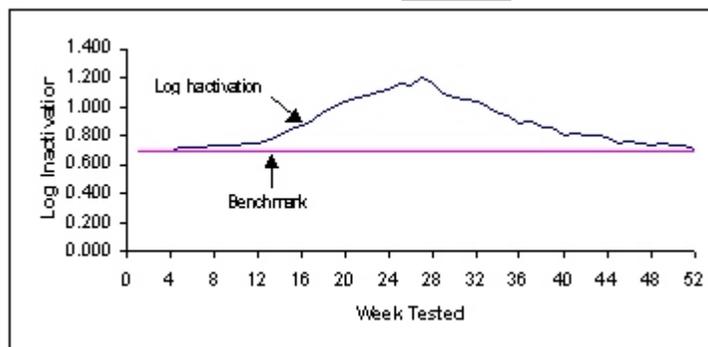
The State would determine whether a more representative data set for disinfection profiling could be used on a case-by-case basis. One example of when a system may request to use a more representative data set is if they have been collecting the data necessary as described in Section 1.3.2.2, but they collect

the data daily rather than weekly. The system may wish to base their profile on the daily data collected rather than just the weekly data. States should examine the requests on a case-by-case basis and ensure that the profile that results from the more representative data set accurately represent the operating conditions of the system and the level of microbial inactivation achieved.

1.3.2.5 What is a disinfection benchmark?

If a system that was required to profile subsequently wishes to make a significant change to its disinfection practices, it must establish a *disinfection benchmark* and consult with the State prior to implementing such modifications. A disinfection benchmark is calculated by averaging the microbial inactivation for each month from the disinfection profile. The lowest monthly average inactivation becomes the disinfection benchmark. This is the lowest level of inactivation achieved by the system over the course of the year. Figure 1.4 is an illustration of a disinfection profile with the benchmark identified.

Figure 1.4: Disinfection Profile with Benchmark



The disinfection benchmarking provisions provide a process whereby a PWS and the State, working together, assure that there will be no significant reduction in microbial protection as a result of significant disinfection practice changes systems may make to meet the more restrictive maximum contaminant levels (MCLs) for disinfection byproducts established in the Stage 1 DBPR.

1.3.2.6 What are considered significant disinfection practice changes?

Significant changes to disinfection practices include:

- ▶ Changes to the point of disinfection;
- ▶ Changes to the disinfectant(s) used in the treatment plant;
- ▶ Changes to the disinfection process; and/or
- ▶ Any other modification identified by the State.

1.3.2.7 What information must be submitted to the State if a system wishes to modify its disinfection practices?

In addition to the disinfection profile and disinfection benchmark, the system must submit the following information to the State as part of the consultation and approval process:

- A description of the proposed change;
- An analysis of how the proposed change will affect the current levels of disinfection; and
- Any additional information requested by the State.

1.3.2.8 What are the disinfection profiling and benchmarking recordkeeping requirements?

PWSs must keep the disinfection profile and disinfection benchmark on file indefinitely for the State to review during their sanitary surveys.

1.3.2.9 What if the disinfection profile and/or benchmark is not developed?

Failure to develop a disinfection profile and/or benchmark, when required, is a treatment technique (TT) violation and will require Tier 3 notification (See Section 1.3.9 below).

1.3.3 Requirements for *Cryptosporidium* Control

The LT1ESWTR extends the requirements of the Interim Enhanced Surface Water Treatment Rule (IESWTR) to systems serving fewer than 10,000 people. Specifically, it sets a maximum contaminant level goal (MCLG) of zero for the protozoan *Cryptosporidium*. In addition, the definition of ground water under the direct influence of surface water (GWUDI) now specifies that the presence of *Cryptosporidium* must be included as an indication that a ground water source is under the direct influence of surface water.

1.3.3.1 What are the requirements for *Cryptosporidium* control for filtered systems?

The LT1ESWTR establishes a requirement for 2-log removal of *Cryptosporidium* for systems that must filter under the SWTR. Systems that use conventional or direct filtration are assumed to meet this requirement if they are in compliance with the strengthened turbidity performance standards for combined filter effluent in the LT1ESWTR (discussed below). Systems that use slow sand or diatomaceous earth filtration are assumed to meet the 2-log removal requirement if they are in compliance with the existing turbidity performance standards under the SWTR. Systems that use alternative filtration technologies must comply with State-determined turbidity performance standards (see Section 1.3.4.3 below).

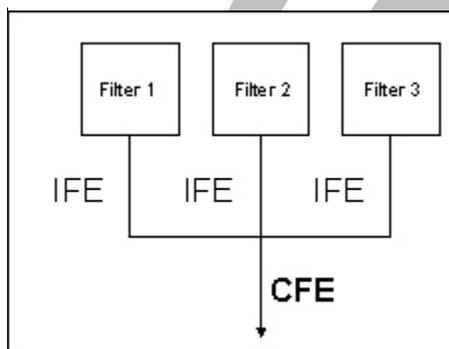
1.3.3.2 What are the requirements for *Cryptosporidium* control for unfiltered systems?

The LT1ESWTR also extends the existing watershed control requirements for unfiltered small systems to include the control of potential sources of *Cryptosporidium*. Such sources must be addressed in an unfiltered system's watershed control program. The State will review the adequacy of the watershed control program during annual on-site inspections. Failure of unfiltered systems to minimize the potential for *Cryptosporidium* contamination is a treatment technique (TT) violation and the system will be required to install filtration.

1.3.4 Combined Filter Effluent Turbidity Requirements

The LT1ESWTR includes a series of requirements related to turbidity. They apply to both combined filter effluent (CFE) and individual filter effluent (IFE) turbidity. Figure 1.5 illustrates the difference between CFE and IFE. Individual filter effluent turbidity monitoring requirements are described in Section 1.3.5. The sample location for IFE monitoring is at a point that represents an individual filter's effluent turbidity prior to mixing flow with the effluent from other filters. IFE does not include water produced during a filter-to-waste interval. The CFE sample location is representative of the combined effluent of all filters in use at any given time. CFE also would not include filter-to-waste intervals.

Figure 1.5: CFE and IFE Locations



The CFE requirements of the LT1ESWTR strengthen current SWTR requirements for systems that use conventional or direct filtration and may strengthen combined filter effluent for systems using alternative filtration. Systems that use slow sand or diatomaceous earth filtration must continue to meet the CFE turbidity requirements in 40 CFR §141.73 of the SWTR. Measurements must be taken on representative samples of the system's filtered water at least every 4 hours that the system serves water to the public, unless the State has determined that a reduced frequency is sufficient for systems using slow sand filtration or for systems serving 500 people or fewer using any type of filtration.

1.3.4.1 What are the CFE requirements for systems using conventional and direct filtration?

The turbidity level of a conventional or direct filtration system's combined filtered effluent at each plant must be less than or equal to 0.3 nephelometric turbidity units (NTUs) in at least 95 percent of the measurements taken each month. In addition, the turbidity level of a system's combined filtered water must at no time exceed 1 NTU (under the 1989 SWTR, these turbidity requirements were 0.5 NTU and 5 NTU, respectively).

1.3.4.2 What are the CFE requirements for systems using slow sand and diatomaceous earth filtration?

The CFE requirements indicated in the SWTR still apply. Systems using slow sand and diatomaceous earth filtration must have a CFE that is less than or equal to 1 NTU in at least 95 percent of the measurements taken each month. The CFE must at no time exceed 5 NTU.

1.3.4.3 What are the CFE requirements for systems using alternative filtration?

The CFE turbidity requirements for systems that use alternative filtration will be determined by the State based on demonstration data submitted by the system (but cannot exceed 1 NTU in at least 95 percent of the measurements taken each month or a 5 NTU maximum turbidity value).

In order for the State to designate appropriate turbidity limits, the system must demonstrate to the State, using pilot plant studies or other means, that the alternative filtration methodology, in combination with disinfection treatment, consistently achieves 2-log removal of *Cryptosporidium* in addition to 3-log removal and/or inactivation of *Giardia lamblia* cysts, and 4-log removal and/or inactivation of viruses.

1.3.4.4 What happens if more than 5 percent of the measurements taken each month exceeds the designated 95th percentile turbidity limit?

If more than 5 percent of monthly combined filter effluent samples exceed 0.3 NTU for conventional and direct filtration systems, 1 NTU for slow sand and diatomaceous earth systems, or the State-determined 95th percentile level for alternative filtration, then a treatment technique (TT) violation is incurred.

1.3.4.5 What happens if the maximum CFE limits are exceeded?

The exceedance of maximum combined filter effluent turbidity limits is a treatment technique (TT) violation. In addition, the system must notify the State within 24 hours in accordance with the Public Notification (PN) Rule. Figure 1.6 provides a summary of the CFE turbidity limits prescribed by the LT1ESWTR.

Figure 1.6: Summary of the LT1ESWTR Combined Filter Effluent Turbidity Limits

Filtration Type	CFE 95th percentile turbidity limit	CFE Maximum turbidity limit
Conventional & Direct Filtration	≤0.3 NTU	1 NTU
Slow Sand & Diatomaceous Earth	≤1 NTU (same as SWTR)	5 NTU (same as SWTR)
Alternative Technologies <ul style="list-style-type: none">• Membranes• Cartridges• Other	Established by State (not to exceed 1 NTU)	Established by State (not to exceed 5 NTU)

1.3.4.6 What are the combined filter effluent turbidity reporting requirements?

By the 10th of the following month, systems must report for the prior month:

- The total number of CFE turbidity measurements taken;
- The number and percentage of CFE turbidity measurements which are less than or equal to the system's required 95th percentile limit; and
- The date and value of any CFE turbidity measurements which exceed the maximum turbidity value allowed for the system.

1.3.4.7 What if combined filter effluent turbidity samples are not collected and/or reported?

Failure to collect and/or report required combined filter effluent turbidity samples is a monitoring and reporting (M/R) violation.

1.3.5 Individual Filter Effluent Turbidity Requirements

1.3.5.1 Who must conduct IFE turbidity monitoring under the LT1ESWTR?

The LT1ESWTR IFE turbidity monitoring requirements apply only to surface water and GWUDI systems using conventional or direct filtration serving less than 10,000 people.

1.3.5.2 Why is individual filter effluent turbidity monitored?

Poor performance of one filter can be masked by the optimal performance of the remaining filters even when the system is still in compliance with CFE turbidity limits. Therefore, to address poorly performing filters and provide system operators with information concerning individual filter performance problems, the LT1ESWTR requires that surface water and GWUDI systems serving less than 10,000 people using conventional or direct filtration conduct continuous turbidity monitoring on the effluent of each individual filter.

1.3.5.3 What are the individual filter monitoring requirements?

Individual filter effluent monitoring must be conducted continuously with results recorded at least every 15 minutes. Systems with two filters have the option to continuously monitor the combined filter effluent instead of monitoring each individual filter. Systems with one filter must conduct continuous monitoring of the one filter.

Continuous turbidity monitoring must be conducted using an approved method in 40 CFR §141.74(a). In addition, calibration of turbidimeters must be conducted using procedures specified by the manufacturer.

1.3.5.4 What happens if the turbidity monitoring equipment fails?

If, for some reason, the turbidity monitoring equipment fails, the system must conduct grab sampling every four hours until the turbidimeter is back on-line. If continuous monitoring is not resumed by 14 days after the failure, the system will receive a monitoring and reporting (M/R) violation.

1.3.5.5 What are the IFE turbidity monitoring and reporting requirements?

Systems must report to the State by the 10th of the following month that individual filter turbidity monitoring was conducted. Failure to report all individual filter monitoring has been conducted is a monitoring and reporting (M/R) violation.

Systems must also report instances of poor filter performance to the State and, based on performance triggers, must take prescribed actions to identify and correct the cause(s). The required follow-up and reporting actions are based on the frequency and level of consecutive individual filter effluent turbidity exceedances and are discussed below:

A. What if the same filter exceeds 1.0 NTU in two consecutive recordings 15 minutes apart?

- ❑ If the turbidity of an individual filter (or the turbidity of CFE for systems with 2 filters that monitor CFE in lieu of individual filters) exceeds 1.0 NTU in two consecutive recordings 15 minutes apart, the system must report to the State by the 10th of the following month:
 - The filter number(s);
 - Corresponding date(s);
 - Turbidity value(s) which exceeded 1.0 NTU; and
 - The cause (if known) for the exceedance(s)

B. What if the same filter exceeds 1.0 NTU in two consecutive recordings 15 minutes apart for three months in a row?

- ❑ If the system exceeds 1.0 NTU in two consecutive recordings 15 minutes apart at the same filter (or the turbidity of CFE for systems with 2 filters that monitor CFE in lieu of individual filters) for three months in a row, the system must conduct a **self-assessment** of the filter(s) within 14 days of the exceedance occurring in the third month. Systems with 2 filters that monitor CFE instead of individual filters must conduct a self-assessment on both filters. The self-assessment must consist of at least the following:
 - Assessment of filter performance;
 - Development of a filter profile;
 - Identification and prioritization of factors limiting filter performance;
 - Assessment of the applicability of corrections;
 - Preparation of a filter self-assessment report;
 - Date self-assessment was triggered; and
 - Date self-assessment was completed

- ❑ In addition, the system must report to the State by the 10th of the following month (or 14 days after the self-assessment was triggered only if the self-assessment was triggered during the last four days of the month):
 - The date the self-assessment was triggered; and
 - The date the self-assessment was completed

See the *LT1ESWTR Turbidity Guidance Manual (EPA)* for further information on performing a self-assessment.

C. What if the same filter exceeds 2.0 NTU in two consecutive recordings 15 minutes apart for two months in a row?

- ❑ If the system exceeds 2.0 NTU in two consecutive recordings 15 minutes apart at the same filter (or the turbidity of CFE for systems with 2 filters that monitor CFE in lieu of individual filters) for two months in a row, the system must arrange to have a **comprehensive performance evaluation (CPE)** conducted by the State or a third party approved by the State. The CPE is the evaluation phase of the Composite Correction Program (CCP) and is a thorough review and analysis of a facility's design capabilities and associated administrative, operational, and maintenance practices as they relate to achieving optimum performance from the facility. The CPE must be:
 - Conducted within 60 days following the day of the exceedance occurring in the second month.
 - Completed and submitted to the State no later than 120 days following the exceedance trigger occurring in the second month.
- ❑ In addition, the system must report to the State by the 10th of the following month:
 - That a CPE is required; and
 - The date that the CPE was triggered.

NOTE: A new CPE is not required if a CPE was previously completed by the State or a third party approved by the State within the past 12 months or if the system and State are jointly participating in an ongoing Comprehensive Technical Assistance (CTA) project at the system. The CTA is the second component of the CCP and is implemented with the goal of achieving and sustaining optimized performance goals from the existing facility.

For further information regarding CPEs and CTAs, see the handbook entitled *Optimizing Water Treatment Plant Performance Using the Composite Correction Program (EPA, 1998)*.

1.3.5.6 What if IFE follow-up activities are not conducted or reported?

Failure to conduct and report follow-up activities triggered by individual filter turbidity exceedances is a monitoring and reporting (M/R) violation.

1.3.5.7 How long must the results of individual filter monitoring be maintained?

Results of individual filter monitoring must be maintained for at least 3 years. Failure to do so is a recordkeeping violation.

1.3.6 Uncovered Finished Water Storage Facilities

Uncovered finished water storage facilities are open to the environment and outside influences and can be subject to the reintroduction of contaminants which the treatment plant was designed to remove. To be more protective of public health, factors which may compromise the quality of finished water should be minimized. Therefore, the LT1ESWTR prohibits small PWSs from building any uncovered finished water reservoirs (including holding tanks and storage reservoirs) on or after March 15, 2002 (60 days after publication). Construction of an uncovered finished water storage facility on or after this date is a treatment technique (TT) violation.

1.3.7 Public Water System Recordkeeping Requirements

In addition to the recordkeeping requirements under §141.75, affected systems must maintain records of individual filter turbidity monitoring measurements for at least 3 years. Results from disinfection profiling and benchmarking (including raw data and analysis) must be kept indefinitely.

1.3.8 Public Notification of Drinking Water Violations

A Tier 1 public notification of a treatment technique violation is required for a single exceedance of the maximum allowable turbidity limit where the primacy agency determines after consultation that a Tier 1 notice is required or where consultation does not take place within 24 hours after the system learns of the violation.

A Tier 2 public notification of a treatment technique violation is required for a single exceedance of the maximum allowable turbidity limit, unless the primacy agency determines a Tier 1 public notice is required and for all treatment technique violations other than those resulting from single exceedance of the maximum turbidity level including exceedance of the 95th percentile CFE turbidity limits.

A Tier 3 public notification of a monitoring and reporting violation is required for failure to monitor and test, including profiling and benchmarking monitoring requirements.

More information on public notification requirements can be found at <http://www.epa.gov/safewater/pn.html>.

1.3.9 Consumer Confidence Report Requirements

The LT1ESWTR does not specifically modify the Consumer Confidence Report (CCR) Rule requirements. However, consumer confidence reports must contain any violations of treatment technique

requirements or violations of National Primary Drinking Water Regulation (NPDWR) requirements. This includes any such violations of the LT1ESWTR.

More information on consumer confidence report requirements can be found at <http://www.epa.gov/safewater/ccr1.html>.

More information can be obtained from:

- A. The Long-Term 1 Enhanced Surface Water Treatment Rule
67 FR 1812 (January 14, 2002); and
<http://www.epa.gov/safewater/mdbp/lt1eswtr.html>
- B. The EPA Safe Drinking Water Hotline, Telephone: 1.800.426.4791

1.4 Requirements of the Rule: States or Other Primacy Agents

The following rule requirements are from the LT1ESWTR published in the Federal Register on January 14, 2002 [67 FR 1812]. For a copy of the actual rule language, see Appendix B, or visit EPA's website at <http://www.epa.gov/safewater/mdbp/lt1eswtr.html> for a copy of the Federal Register notice.

1.4.1 Special Primacy Requirements

In order to receive primacy for the LT1ESWTR, States must adopt regulations no less stringent than this rule. States must submit revisions to their programs, regulations, or authorities no later than January 14, 2004 (2 years after rule publication), although States can request an extension of up to 2 years (January 14, 2006).

In addition, States are required to show in their primacy application that they have the authority to implement the following key provisions of the rule by describing:

- How the State will consult with the system and approve modifications to disinfection practices;
- How the State will approve a more representative data set for optional monitoring and profiling;
- How existing rules, adoption of appropriate rules or other authority require systems to participate in a Comprehensive Technical Assistance (CTA) activity and the performance improvement phase of the Composite Correction Program (CCP), to assure that PWSs implement any follow-up recommendations that result from the CCP;
- How the State will approve a method to calculate the logs of inactivation for viruses for a system that uses either chloramines, chlorine dioxide, or ozone for primary disinfection; and

- How the State will determine that a PWS may use an alternative filtration technology based on demonstration data and a description of how the State will set turbidity performance requirements for the 95th percentile and maximum turbidity levels.

More information on how to address these special primacy conditions can be found in Section 4.4 of this document.

1.4.2 Records Kept by States

States must keep records of:

- PWS turbidity measurements for not less than one year;
- Disinfection residual measurements and other parameters necessary to document disinfection effectiveness for not less than one year;
- Decisions made on a system-by-system and case-by-case basis including decisions for PWSs calculating log inactivation for viruses, PWSs that choose the option to conduct TTHM and HAA5 monitoring, PWSs conducting profiling and approval of an alternative data set for monitoring or profiling;
- Records of systems consulting with the State concerning a significant modification to their disinfection practice (including the status of the consultation);
- Records of decisions that a system using alternative filtration can consistently achieve a 2-log removal of *Cryptosporidium* as well as required levels of removal/inactivation of *Giardia* and viruses, including State-set turbidity limits for each system. A copy of the decision must be kept until the decision is reversed or revised and the State must provide a copy of the decision to the system; and
- Records of those systems required to perform filter self-assessments, CPE or CCP.

1.4.3 State Reporting Requirements

There are no additional reporting requirements under the LT1ESWTR, but States are required to report violations, variances and exemptions, enforcement actions, and general operations of State public water supply programs related to this rule under section 142.15.