

TITLE 179 PUBLIC WATER SYSTEMS

CHAPTER 19 LONG TERM 1 (LT 1) ENHANCED SURFACE WATER TREATMENT (for Systems Serving Fewer Than 10,000 People)

19-001 SCOPE AND AUTHORITY: These regulations establish requirements for filtration and disinfection that are in addition to criteria under which filtration and disinfection are required under 179 NAC 13. This chapter (179 NAC 19) applies to public water systems that use surface water or ground water under the direct influence of surface water as a source and serve fewer than 10,000 persons. The requirements were effective for the purpose of compliance beginning January 14, 2005 (which date is listed for informational purposes only) except where otherwise noted. The statutory authority is found in Neb. Rev. Stat. §§71-5301 to 71-5313.

19-002 DEFINITIONS

Comprehensive performance evaluation (CPE) is a 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. For the purpose of compliance with 179 NAC 17 and 179 NAC 19, the comprehensive performance evaluation must consist of at least the following components: Assessment of plant performance; evaluation of major unit processes; identification and prioritization of performance limiting factors; assessment of the applicability of comprehensive technical assistance; and preparation of a CPE report.

Disinfection profile is a summary of *Giardia lamblia* inactivation through the treatment plant. The procedure for developing a disinfection profile is contained in 179 NAC 17-004 (Disinfection profiling and benchmarking) in 179 NAC 17 and 179 NAC 19-007.01 to 19-007.07 (Disinfection profile) in 179 NAC 19.

Ground water under the direct influence of surface water (GWUDI) means any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium*, or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions. Direct influence must be determined for individual sources in accordance with the criteria established by the Director.

The Director determination of direct influence may be based on site-specific measurements of water quality and/or documentation of well construction characteristics and geology with field evaluation.

19-003 GENERAL: These regulations establish or extend treatment technique requirements in lieu of maximum contaminant levels for the following contaminants: *Giardia lamblia*, viruses, heterotrophic plate count bacteria, *Legionella*, *Cryptosporidium* and turbidity. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

1. At least 99% (2 log) removal of *Cryptosporidium* between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer for filtered systems, or *Cryptosporidium* control under the watershed control plan for unfiltered systems; and
2. Compliance with the profiling and benchmark requirements in 179 NAC 19-007.01 through 19-008.05.

19-004 BASIC REQUIREMENTS: Systems must comply with all the following requirements that are applicable to their system:

1. Finished water reservoirs must be covered as described in 179 NAC 19-005.01 and 19-005.02.
2. Public water systems that are unfiltered must comply with the updated watershed control requirements described in 179 NAC 19-006.01 to 19-006.03;
3. Community and non-transient non-community water systems must develop a disinfection profile as described in 179 NAC 19-007.01 to 19-007.07;
4. Systems considering making a significant change to their disinfection practices must develop a disinfection benchmark and consult with the Director for approval of the change as described in 179 NAC 19-008.01 to 19-008.05;
5. Filtered systems must comply with the combined filter effluent requirements as described in 179 NAC 19-009.01 to 19-009.04;
6. Filtered systems that use conventional or direct filtration must comply with the individual filter turbidity requirements as described in 179 NAC 19-010.01 to 19-010.05; and
7. Systems must comply with applicable reporting and recordkeeping requirements as described in 179 NAC 19-011.01 and 19-011.02.

19-005 FINISHED WATER RESERVOIRS

19-005.01 All public water systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 persons are subject to the finished water reservoir requirements.

19-005.02 Requirements: Systems that begin construction on or after (the effective date of these regulations) must be covered.

19-006 ADDITIONAL WATERSHED CONTROL REQUIREMENTS FOR UNFILTERED SYSTEMS

19-006.01 Systems using surface water or ground water under the direct influence of surface water that serve fewer than 10,000 persons and do not provide filtration must continue to comply with all the filtration avoidance criteria in 179 NAC 13-004, as well as the additional watershed control requirements in 179 NAC 19-006.02.

19-006.02 Systems must take any additional steps necessary to minimize the potential for contamination by *Cryptosporidium* oocysts in the source water. Watershed control programs must, for *Cryptosporidium*:

1. Identify watershed characteristics and activities which may have an adverse effect on source water quality; and
2. Monitor the occurrence of activities which may have an adverse effect on source water quality.

19-006.03 During an onsite inspection conducted under the provisions of 179 NAC 13-004.03, the Director must determine whether your watershed control program is adequate to limit potential contamination by *Cryptosporidium* oocysts. The adequacy of the program must be based on the comprehensiveness of the watershed review; the effectiveness of the system's program to monitor and control detrimental activities occurring in the watershed; and the extent to which the system has maximized land ownership and/or controlled land use within the watershed.

19-007 DISINFECTION PROFILE

19-007.01 What It Is, Who Must Develop One: A disinfection profile is a graphical representation of a system's level of *Giardia lamblia* or virus inactivation measured during the course of a year. Community and non-transient non-community water systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 persons must develop a disinfection profile unless the Director determines the system's profile is unnecessary. The Director may approve the use of a more representative data set for disinfection profiling than the data set required under 179 NAC 19-007.03 to 19-007.07.

19-007.02 Criteria used by the Director to determine that a profile is unnecessary: The Director may only determine that a system's profile is unnecessary if a system's TTHM and HAA5 levels are below 0.064 mg/L and 0.048 mg/L, respectively. To determine these levels, TTHM and HAA5 samples must be collected after January 1, 1998, during the month with the warmest water temperature, and at the point of maximum residence time in the distribution system. The Department may approve a more representative TTHM and HAA5 data set to determine these levels.

19-007.03 Development of a disinfection profile, when to begin: A disinfection profile consists of three steps:

1. First, collect data for several parameters from the plant as discussed in 179 NAC 19-007.04 over the course of 12 months. Systems serving between 500 and 9,999 persons must begin collecting the data no later than July 1, 2003. Systems serving fewer than 500 persons must begin to collect data no later than January 1, 2004.
2. Second, use this data to calculate weekly log inactivation as discussed in 179 NAC 19-007.05 and 19-007.06; and
3. Third, use these weekly log inactivations to develop a disinfection profile as specified in 179 NAC 19-007.07.

19-007.04 Data Required to Calculate a Disinfection Profile: Systems must monitor the following parameters to determine the total log inactivation using the analytical methods in 179 NAC 13-007.01, once per week on the same calendar day, over 12 consecutive months.

1. The temperature of the disinfected water at each residual disinfectant concentration sampling point during peak hourly flow;
2. For systems that use chlorine, the pH of the disinfected water at each residual disinfectant concentration sampling point during peak hourly flow;
3. The disinfectant contact time(s) ["T"] during peak hourly flow; and
4. The residual disinfectant concentration(s) ["C"] of the water before or at the first customer and prior to each additional point of disinfection during peak hourly flow.

19-007.05 How To Use the Previous Information to Calculate an Inactivation Ratio: Use the tables in 179 NAC 13-007.02C5 to determine the appropriate CT_{99.9} value. Calculate the total inactivation ratio as follows, and multiply the value by 3.0 to determine log inactivation of *Giardia lamblia*:

If Your System	Your System Must Determine
a. Uses only one point of disinfectant application	1. One inactivation ratio (CT _{calc} /CT _{99.9}) before or at the first customer during peak hourly flow or 2. Successive CT _{calc} /CT _{99.9} values, representing sequential inactivation ratios, between the point of disinfectant application and a point before or at the first customer during peak hourly flow. Under this alternative, your system must calculate the total inactivation ratio by determining (CT _{calc} /CT _{99.9}) for each sequence and then adding the (CT _{calc} /CT _{99.9}) values together to determine (ΣCT _{calc} /CT _{99.9}).
b. Uses more than one point of disinfectant application before the first customer	The (CT _{calc} /CT _{99.9}) value of each disinfection segment immediately prior to the next point of disinfectant application, or for the final segment, before or at the first customer, during peak hourly flow using the procedure specified in a.2. above.

19-007.06 Systems That Use Chloramines, Ozone, or Chlorine Dioxide for Primary Disinfection: These systems must also calculate the logs of inactivation for viruses and

develop an additional disinfection profile for viruses using methods approved by the Director.

19-007.07 After Inactivation Ratio Has Been Developed: Each log inactivation serves as a data point in a system's disinfection profile. Once a system has obtained 52 measurements (one for every week of the year), the system and the Director will have the opportunity to evaluate how microbial inactivation varied over the course of the year by looking at all 52 measurements (the disinfection profile). Systems must retain the disinfection profile data in graphic form, such as a spreadsheet, which must be available for review by the Director as part of a sanitary survey. Systems must use this data to calculate a benchmark if they are considering changes to disinfection practices.

19-008 DISINFECTION BENCHMARK

19-008.01 Who Must Develop a Disinfection Benchmark: Systems that use surface water or ground water under the direct influence of surface water that are required to develop a disinfection profile under 179 NAC 19-007.01 through 19-007.07 must develop a disinfection benchmark if they decide to make a significant change to their disinfection practice. These systems must consult with the Director for approval before implementing a significant disinfection practice change.

19-008.02 Significant changes to disinfection practices include:

1. Changes to the point of disinfection;
2. Changes to the disinfectant(s) used in the treatment plant; or
3. Changes to the disinfection process.

19-008.03 If a system is considering a significant change to its disinfection practice, the system must calculate a disinfection benchmark(s) as described in 179 NAC 19-008.04 and 19-008.05 and provide the benchmark(s) to the Director. Systems may only make a significant disinfection practice change after consulting with the Director for approval. Systems must submit the following information to the Director as part of the consultation and approval process:

1. A description of the proposed change;
2. The disinfection profile for *Giardia lamblia* (and, if necessary, viruses) and disinfection benchmark; and
3. An analysis of how the proposed change will affect the current levels of disinfection.

19-008.04 Calculating the disinfection benchmark: Systems making a significant change to their disinfection practice must calculate a disinfection benchmark using the procedure specified in the following table.

To Calculate a Disinfection Benchmark Your System Must Perform the Following Steps

Step 1: Using the data your system collected to develop the disinfection profile, determine the average *Giardia lamblia* inactivation for each calendar month by dividing the sum of all *Giardia lamblia* inactivations for that month by the number of values calculated for that month.

Step 2: Determine the lowest monthly average value out of the twelve values. This value becomes the disinfection benchmark.

19-008.05 Systems That Use Chloramines, Ozone, or Chlorine Dioxide for Primary Disinfection: These systems must calculate the disinfection benchmark from the data the system collected for viruses to develop the disinfection profile in addition to the *Giardia lamblia* disinfection benchmark calculated under 179 NAC 19-008.04. This viral benchmark must be calculated in the same manner used to calculate the *Giardia lamblia* disinfection benchmark in 179 NAC 19-008.04.

19-009 COMBINED FILTER EFFLUENT REQUIREMENTS

19-009.01 All systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 persons, are required to filter, and utilize filtration other than slow sand filtration or diatomaceous earth filtration must meet the combined filter effluent turbidity requirements of 179 NAC 19-009.02 to 19-009.04. Systems that use slow sand or diatomaceous earth filtration are not required to meet the combined filter effluent turbidity limits of 179 NAC 19, but they must continue to meet the combined filter effluent turbidity limits in 179 NAC 13-006.

19-009.02 Strengthened Combined Filter Effluent Turbidity Limits: Systems must meet two strengthened combined filter effluent turbidity limits:

1. The first combined filter effluent turbidity limit is a “95th percentile” turbidity limit that systems must meet in at least 95% of the turbidity measurements taken each month. Measurements must continue to be taken as described in 179 NAC 13-007.01 and 13-007.03. Monthly reporting must be completed according to 179 NAC 19-011.01. The following table describes the required limits for specific filtration technologies.

If Your System Consists of	Your 95th Percentile Turbidity Value Is
1. Conventional Filtration or Direct Filtration	0.3 NTU.
2. All other “Alternative” Filtration	A value determined by the Director (not to exceed 1 NTU) based on the demonstration described in 179 NAC 19-009.03.

2. The second combined filter effluent turbidity limit is a “maximum” turbidity limit which your system may at no time exceed during the month. Measurements must continue to be taken as described in 179 NAC 13-007.01 and 13-007.03. Monthly reporting must be completed according to 179 NAC 19-011.01. The following table describes the required limits for specific filtration technologies.

If Your System Consists of	Your Maximum Turbidity Value Is
1. Conventional Filtration or Direct Filtration	1 NTU
2. All other "Alternative" Filtration	A value determined by the Director (not to exceed 5 NTU) based on the demonstration as described in 179 NAC 19-009.03.

19-009.03 Systems Using "Alternative Filtration:"

19-009.03A Systems using alternative filtration (filtration other than slow sand filtration, diatomaceous earth filtration, conventional filtration, or direct filtration) are required to conduct a demonstration (see tables in 179 NAC 19-009.02). Systems must demonstrate to the Director, using pilot plant studies or other means, that their system's filtration, in combination with disinfection treatment, consistently achieves:

1. 99% removal of *Cryptosporidium* oocysts;
2. 99.9% removal and/or inactivation of *Giardia lamblia* cysts; and
3. 99.99% removal and/or inactivation of viruses.

19-009.04 Systems using lime softening may acidify representative combined filter effluent turbidity samples prior to analysis using a protocol approved by the Director.

19-010 INDIVIDUAL FILTER TURBIDITY REQUIREMENTS

19-010.01 Systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 people and utilize conventional filtration or direct filtration must conduct continuous monitoring of turbidity for each individual filter. The following requirements apply to continuous turbidity monitoring:

1. Monitoring must be conducted using an approved method in 179 NAC 13-007.01;
2. Calibration of turbidimeters must be conducted using procedures specified by the manufacturer and by analytical test procedures contained in *Technical Notes on Drinking Water Methods*, EPA-600/R-94-173, October 1994 which is hereby incorporated by reference. (This document is available from the National Technical Information Service, NTIS PB95-104766, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800-553-6847.) The document may be inspected at the Department of Health and Human Services Regulation and Licensure, Public Health Assurance Division, 301 Centennial Mall South, Lincoln, NE 68509.
3. Results of turbidity monitoring must be recorded at least every 15 minutes;
4. Monthly reporting must be completed according to 179 NAC 19-011.01; and
5. Records must be maintained according to 179 NAC 19-011.02.

19-010.02 Turbidity Monitoring Equipment Failure: If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every four hours in lieu of continuous monitoring until the turbidimeter is back on-line. The system has 14 days to resume continuous monitoring before a violation is incurred.

19-010.03 One Or Two Filters: If a system consists of only one or two filters, the system may conduct continuous monitoring of combined filter effluent turbidity in lieu of individual filter effluent turbidity monitoring. Continuous monitoring must meet the same requirements set forth in 179 NAC 19-010.01 items 1 through 4 and 19-010.02.

19-010.04 Follow-up action is required according to the following tables:

If	Your System Must
a. The turbidity of an individual filter (or the turbidity of combined filter effluent (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	Report to the Department by the 10 th of the following month and include the filter number(s), corresponding date(s), turbidity value(s) which exceeded 1.0 NTU, and the cause (if known) for the exceedance(s).
If a System Was Required to Report to the Director	Your System Must
b. For three months in a row and turbidity exceeded 1.0 NTU in two consecutive recordings 15 minutes apart at the same filter (or CFE for systems with 2 filters that monitor CFE in lieu of individual filters)	Conduct a self-assessment of the filter(s) within 14 days of the day the filter exceeded 1.0 NTU in two consecutive measurements for the third straight month unless a CPE as specified in 17919-010.04 item c was required. Systems with two filters that monitor CFE in lieu of individual filters must conduct a self assessment on both filters. The self-assessment must consist of at least the following components: assessment of filter performance; development of a filter profile; identification and prioritization of factors limiting filter performance; assessment of the applicability of corrections; and preparation of a filter self-assessment report.
c. For two months in a row and turbidity exceeded 2.0 NTU in two consecutive recordings 15 minutes apart at the same filter (or CFE for systems with two filters that monitor CFE in lieu of individual filters)	Arrange to have a comprehensive performance evaluation (CPE) conducted by the Director or a third party approved by the Director not later than 60 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month. If a CPE has been completed by the Director or a third party approved by the Director within the 12 prior months or the system and the Director are jointly participating in an ongoing Comprehensive Technical Assistance (CTA) project at the system, a new CPE is not required. If conducted, a CPE must be completed and submitted to the Department no later than 120 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month.

19-010.05 Lime Softening: Systems that utilize lime softening may apply to the Director for alternative turbidity exceedance levels for the levels specified in the table in 179 NAC

19-010.04. The system must be able to demonstrate to the Director that higher turbidity levels are due to lime carryover only, and not due to degraded filter performance.

19-011 REPORTING AND RECORDKEEPING REQUIREMENTS

19-011.01 The following table lists the items that must be reported and the frequency of reporting. Systems subject to the specific requirement shown in the first column are required to report the information that follows.

Corresponding Requirement	Description of Information to Report	Frequency
a. Combined Filter Effluent Requirements (179 NAC 19-009.01 to 19-009.04)	1. The total number of filtered water turbidity measurements taken during the month. 2. The number and percentage of filtered water turbidity measurements taken during the month which are less than or equal to the system's required 95 th percentile limit. 3. The date and value of any turbidity measurements taken during the month which exceed the maximum turbidity value for your filtration system.	By the 10 th of the following month. By the 10 th of the following month. By the 10 th of the following month.
b. Individual Turbidity Requirements (179 NAC 19-010.01 to 19-010.05)	1. That the system conducted individual filter turbidity monitoring during the month. 2. The filter number(s), corresponding date(s), and the turbidity value(s) which exceeded 1.0 NTU during the month, and the cause (if known) for the exceedence(s), but only if two consecutive measurements exceeded 1.0 NTU. 3. If a self-assessment is required, the date that it was triggered and the date that it was completed. 4. If a CPE is required, that the CPE is required and the date that it was triggered 5. Copy of completed CPE report	By the 10 th of the following month. By the 10 th of the following month. By the 10 th 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). By the 10 th of the following month. Within 120 days after the CPE was triggered.

c. Disinfection Profiling (179 NAC 19-007.01 to 19-007.07)	1. Results of optional monitoring which show TTHM levels <0.064 mg/L and HAA5 levels <0.048 mg/L (Only if your system wishes to forgo profiling) or that your system has begun disinfection profiling.	(i) For systems serving 500 – 9,999 by July 1, 2003; (ii) For systems serving fewer than 500 by January 1, 2004.
d. Disinfection Benchmarking (179 NAC 19-008.01 to 19-008.05)	1. A description of the proposed change in disinfection, your system’s disinfection profile for <i>Giardia lamblia</i> (and, if necessary, viruses) and disinfection benchmark, and an analysis of how the proposed change will affect the current levels of disinfection.	Any time your system is considering a significant change to its disinfection practice.

19-011.02 Required Recordkeeping: Systems must keep several types of records based on the requirements of 179 NAC 19, in addition to recordkeeping requirements under 179 NAC 13-008. The following table describes the necessary records, the length of time these records must be kept, and the requirement for which the records pertain. Systems are required to maintain records described in this table, if the system is subject to the specific requirement shown in the first column.

Corresponding Requirement	Description of Necessary Records	Duration of Time Records Must Be Kept
a. Individual Filter Turbidity Requirements (179 NAC 19-010.01 to 19-010.05)	Results of individual filter monitoring	At least 3 years
b. Disinfection Profiling (179 NAC 19-007.01 to 19-007.07)	Results of profile (including raw data and analysis)	Indefinitely
c. Disinfection Benchmarking (179 NAC 19-008.01 to 19-008.05)	Benchmark (including raw data and analysis)	Indefinitely