Rules of
Department of Natural Resources
Division 60—Safe Drinking Water Commission
Chapter 4—Contaminant Levels and Monitoring

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 60—Safe Drinking Water Commission
Chapter 4—Contaminant Levels and Monitoring

10 CSR 60-4.010 Maximum Contaminant Levels and Monitoring Requirements

PURPOSE: This rule establishes sampling and monitoring requirements for public water systems and criteria for significant defiencies at surface water systems.

(1) The rules in this chapter contain maximum contaminant levels (MCLs) permissible in public water systems and describe associated monitoring requirements. A supplier of water must collect or have collected samples of the water and shall provide for analysis of these samples for designated contaminants. Nothing in this chapter shall preclude a duly designated representative of the department from taking samples or from using the results from the samples to determine compliance by a supplier of water with applicable provisions of these rules.

(2) Laboratory services required by this chapter to determine contaminant levels are available from the Department of Natural Resources (DNR) or the Department of Health according to the fee schedule set out in 10 CSR 60-16.030.

(A) Samples must be collected at no less than the required frequency and in accordance with schedules established by the department when samples are submitted to the DNR or the Department of Health laboratory for analysis.

(B) A supplier of water which submits samples to the DNR or the Department of Health laboratory must collect and submit samples using containers provided by the department in accordance with the instructions enclosed.

(C) A supplier of water not using the DNR or the Department of Health laboratory must have the analysis done by a laboratory certified by the department.

(3) Samples taken to determine compliance with the requirements of this chapter shall be taken at representative points of the public water system, as approved by the department. The supplier of water shall provide satisfactory sampling taps. Samples for microbiological analysis must be received in the laboratory for analysis within thirty (30) hours of collection.

(4) All analytical results must be accurate to at least the same number of significant figures as the applicable MCL.

(5) All analyses must be consistent with the methods and procedures described in 10 CSR 60-5.010 and 10 CSR 60-5.020. The results of all analyses must be used to determine compliance with the MCLs unless the analytical results are invalidated for technical reasons, such as obvious sampling errors.

(6) When a public water supply system supplies water to one (1) or more other public water supply systems, the department may modify the monitoring requirements imposed by these rules to the extent that the interconnection of the systems justifies treating them as a single system for monitoring purposes. Any modified monitoring must be conducted pursuant to a schedule specified by the department.

(7) Inspections and Sanitary Surveys of Surface Water Systems.

(A) Sanitary surveys of all surface water systems and systems using groundwater under the direct influence of surface water will be conducted at least every three (3) years for community systems and every five (5) years for noncommunity systems. Sanitary survey as used in this section (7) means an on-site review, under the supervision of an engineer, of the water source (identifying its sources of contamination using the results of source water assessments where available), facilities, equipment, operation, maintenance, and monitoring compliance, in order to evaluate the adequacy of the system, its sources and operations and the distribution of safe drinking water. It also includes a review of the disinfection profile for systems that are required to comply with disinfection profiling requirements.

(B) For community water systems determined by the department to have no significant deficiencies (for example, defects or inadequacies that increase risk from waterborne disease, such as deficiencies involving the removal, inactivation or reintroduction of pathogens or prevention or removal of chemical contamination) in two (2) consecutive sanitary surveys, the frequency of sanitary surveys may be decreased to once every five (5) years. Upon finding a significant deficiency, the department may return the community water system to the three (3)-year schedule.

(C) Public water systems must respond in writing to significant deficiencies outlined in sanitary survey reports no later than forty-five (45) days after receipt of the report. The response must indicate how and on what schedule the system will address significant deficiencies noted in the survey. Failure to respond within forty-five (45) days is a violation. Public water systems shall take necessary steps to address significant deficiencies identified in sanitary survey reports if such deficiencies are within the control of the public water system and its governing body.

(D) The department, at its discretion, may conduct routine inspections of any public water system or make other necessary inspections to determine compliance with these rules. If, after investigation, the department finds that any public water system is incompetently supervised, improperly operated, inadequate, of defective design or if the water fails to meet standards established in 10 CSR 60, the water supplier must implement changes that may be required by the department.

(8) The provisions of this rule are declared severable. If any fee fixed by this rule is held invalid by a court of competent jurisdiction or by the Administrative Hearing Commission, the remaining provisions of this rule shall remain in full force and effect, unless otherwise determined by a court of competent jurisdiction or by the Administrative Hearing Commission.

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**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.020 Maximum Microbiological Contaminant Levels and Monitoring Requirements

PURPOSE: This rule establishes maximum contaminant levels and monitoring requirements for microbiological contaminants.

(1) Routine Monitoring.

(A) Public water systems must collect total coliform samples according to a written sample siting plan at sites which are representative of water throughout the distribution system. This plan shall be made available to the inspector conducting a sanitary survey or on-site inspection, or to the department upon request and the department will either approve or recommend improvements.

1. All routine samples should be taken from the distribution system.

2. Distribution sampling points should be chosen where both upstream and downstream repeat samples can be taken within five (5) service connections of the principal sampling point. The same distribution points may be used each month, but there must be a separate point for each distribution sample collected each day.

3. Groundwater supplies collecting five (5) or fewer samples per month may collect all samples on the same day with departmental approval; provided, that the samples are all collected from different points. Other supplies shall collect samples at regular intervals throughout the month.

4. Groundwater supplies under the direct influence of surface water that do not practice filtration must identify a sample point near the first service connection which is one (1) of twenty percent (20%) of all service connections in the entire system that are nearest the water supply treatment facility as measured by water transport time within the distribution system.

5. Supplies should identify at least five (5) sampling taps since these are needed for five (5) routine samples in the month following an unsafe sample.

(B) The monitoring frequency for total coliforms for community water systems is based on the population served by the system as follows except that systems utilizing surface or ground water under the direct influence of surface water and systems practicing iron removal or lime softening must collect at least five (5) samples per month. In addition, the department may require a greater frequency if necessary:

Total Coliform Monitoring Frequency for Community Water Systems

Population Served	Minimum Samples Per Month
25—1000*	1
1001—2500	2
2501—3300	3
3301—4100	4
4101—4900	5
4901—5800	6
5801—6700	7
6701—7600	8
7601—8500	9
8501—12,900	10
12,901—17,200	15
17,201—21,500	20
21,501—25,000	25
25,001—33,000	30
33,001—41,000	40
41,001—50,000	50
50,001—59,000	60
59,001—70,000	70
70,001—83,000	80
83,001—96,000	90
96,001—130,000	100
130,001—220,000	120
220,001—320,000	150
320,001—450,000	180
450,001—600,000	210
600,001—780,000	240
780,001—970,000	270
970,001—1,230,000	300
1,230,001—1,520,000	330
1,520,001—1,850,000	360
1,850,001—2,270,000	390
2,270,001—3,020,000	420
3,020,001—3,960,000	450
3,960,001—more	480

*Includes public water systems which have at least fifteen (15) service connections but serve fewer than twenty-five (25) persons.

(C) The monitoring frequency for total coliforms for noncommunity water systems is as follows, except that the department may require a greater frequency:

1. A noncommunity water system using only groundwater (except groundwater under the direct influence of surface water) and serving one thousand (1,000) persons or fewer per day must monitor each calendar quarter that the system provides water to the public, except that the department may reduce this monitoring frequency, in writing, if a sanitary survey or on-site inspection shows that the system is free of sanitary defects. Beginning June 29, 1994, the department cannot reduce the monitoring frequency for a noncommunity water system using only groundwater (except groundwater under the direct influence of surface water) and serving one thousand (1,000) persons or fewer per day to less than once per year;

2. A noncommunity water system using only groundwater (except groundwater under the direct influence of surface water) and serving more than one thousand (1,000) persons per day during any month must monitor at the same frequency as a like-sized community water system, as specified in subsection (1)(B) of this rule, except that the department may reduce this monitoring frequency, in writing, for any month the system serves less than one thousand (< 1,000) persons per day. The department cannot reduce the monitoring frequency to less than once per year. For systems using groundwater under the direct influence of surface water, paragraph (1)(C)4. of this rule applies;

3. A noncommunity water system using surface water, in total or in part, must monitor at the same frequency as a like-sized community water system that uses surface water, as specified in subsection (1)(B) of this rule; and

4. A noncommunity water system using groundwater under the direct influence of surface water must monitor at the same frequency as a like-sized community water system that uses surface water, as specified in subsection (1)(B) of this rule. The system must begin monitoring at this frequency beginning six (6) months after the department determines that the groundwater is under the direct influence of surface water.

(D) The public water system must collect samples at regular time intervals throughout the monitoring period, except that a system which uses groundwater (except groundwater under the direct influence of surface water) and serves four thousand nine hundred (4,900) persons or fewer, may collect, with departmental approval, all samples on a single day if they are taken from different sites.

(E) A public water system that uses groundwater under the direct influence of surface water and does not practice filtration must collect at least one (1) sample near the first service connection each day the turbidity level of the source water, measured as specified in 10 CSR 60-5.010(1), exceeds one (1) nephelometric turbidity unit (NTU). This sample must be analyzed for the presence of total coliforms. When one (1) or more turbidity measurements in any day exceeds one (1) NTU, the system must collect this coliform sample within twenty-four (24) hours of the exceedance unless the department determines that the system, for logistical reasons outside its control, cannot have the sample analyzed within thirty (30) hours of collection. Sample results from this coliform monitoring must be included in determining compliance with the maximum contaminant levels (MCLs) for total coliforms in section (7) of this rule.

(F) Special purpose samples, such as those taken to determine whether disinfection practices are sufficient following pipe placement, replacement or repair, shall not be used to determine compliance with the MCL for total coliforms in section (7) of this rule. Repeat samples taken pursuant to section (2) of this rule are not considered special purpose samples and must be used to determine compliance with the MCL for total coliforms in section (7) of this rule.

(2) Repeat Monitoring.

(A) If a routine sample is total coliform-positive, the public water system must collect a set of repeat samples within twenty-four (24) hours of being notified of the positive result. The department may extend the twenty-four (24)-hour limit on a case-by-case basis if the system has a logistical problem in collecting repeat samples that is beyond its control. In the case of an extension, the department must specify how much time the system has to collect the repeat samples. A system which collects more than one (1) routine sample per month must collect no fewer than three (3) repeat samples for each total coliform-positive sample found. A system which collects one (1) routine sample per month or fewer must collect no fewer than four (4) repeat samples for each total coliform-positive sample found.

(B) The system must collect at least one (1) repeat sample from the sampling tap where the original total coliform-positive sample was taken and at least one (1) repeat sample at a tap within five (5) service connections upstream and at least one (1) repeat sample at a tap within five (5) service connections downstream of the original sampling site. If a total coliform-positive sample is at the end of the distribution system, or one (1) away from the end of the distribution system, the department may waive the requirement to collect at least one (1) repeat sample upstream or downstream of the original sampling site except that the total number of repeat samples shall not be reduced.

(C) The system must collect all repeat samples on the same day, except that the department may allow a system with a single service connection to collect the required set of repeat samples over a four (4)-day period or to collect a larger volume repeat sample(s) in one (1) or more sample containers of any size, as long as the total volume collected is at least four hundred milliliters (400 ml) (three hundred milliliters (300 ml) for systems which collect more than one (1) routine sample per month). Systems with more than one (1) service connection, but fewer service connections than the required number of repeat samples, shall collect repeat samples as directed by the department.

(D) If one (1) or more repeat samples in the set is total coliform-positive, the public water system must collect an additional set of repeat samples in the manner specified in subsections (2)(A)–(C) of this rule. The additional samples must be collected within twenty-four (24) hours of being notified of the positive result, unless the department extends the limit as provided in subsection (2)(A) of this rule. The system must repeat this process until either total coliforms are not detected in one (1) complete set of repeat samples or the system determines that the MCL for total coliforms in section (7) of this rule has been exceeded and notifies the department.

(E) If a system collecting fewer than five (5) routine samples per month has one (1) or more total coliform-positive samples and the department does not invalidate the sample(s) under section (3) of this rule, it must collect at least five (5) routine samples during the next month the system provides water to the public, except that the department may waive this requirement if the following conditions are met (the department cannot waive the requirement for a system to collect repeat samples in subsections (2)(A)–(D) of this rule):

1. The department may waive the requirement to collect five (5) routine samples the next month the system provides water to the public if the department, or an agent approved by the department, performs a site visit before the end of the next month the system provides water to the public. Although a sanitary survey need not be performed, the site visit must be sufficiently detailed to allow the department to determine whether additional monitoring, any corrective action, or both, is needed. The department cannot approve an employee of the system to perform this site visit, even if the employee is an agent approved by the department to perform sanitary surveys; and

2. The department may waive the requirement to collect five (5) routine samples the next month the system provides water to the public if the department has determined why the sample was total coliform-positive and establishes that the system has corrected the problem or will correct the problem before the end of the next month the system serves water to the public. In this case, the department must document this decision to waive the following month's additional monitoring requirement in writing, have it approved and signed by the supervisor of the department official who recommends the decision, and make this document available to the Environmental Protection Agency (EPA) and the public upon request. The written documentation must describe the specific cause of the total coliform-positive sample and what action the system has taken, or will take, to correct this problem. The department cannot waive the requirement to collect five (5) routine samples the next month the system provides water to the public solely on the grounds that all repeat samples are total coliform-negative. Under this paragraph, a system must still take at least one (1) routine sample before the end of the next month it serves water to the public and use it to determine compliance with the MCL for total coliforms in section (7) of this rule, unless the department has determined that the system has corrected the contamination problem before the system took the set of repeat samples required in subsections (2)(A)–(D) of this rule and all repeat samples were total coliform-negative.

(F) After a system collects a routine sample and before it learns the results of the analysis of that sample, if it collects another routine sample(s) from within five (5) adjacent service connections of the initial sample, and the initial sample, after analysis, is found to contain total coliforms, then the system may count the subsequent sample(s) as a repeat sample instead of as a routine sample.

(G) Results of all routine and repeat samples not invalidated by the department must be included in determining compliance with the MCL for total coliforms in section (7) of this rule.

(3) Invalidation of Total Coliform Samples. A total coliform-positive sample invalidated under this section does not count towards meeting the minimum monitoring requirements of this rule.

(A) The department may invalidate a total coliform-positive sample only if any one (1) of the following conditions is met:

1. The laboratory establishes that improper sample analysis caused the total coliform-positive result;

2. The department, on the basis of the results of repeat samples collected as required by subsections (2)(A)–(D) of this rule, determines that the total coliform-positive sample resulted from a domestic or other nondistribution system plumbing problem. The department cannot invalidate a sample on the basis of repeat sample results unless all repeat

samples collected at the same tap as the original total coliform-positive sample are also total coliform-positive, and all repeat samples collected within five (5) service connections of the original tap are total coliform-negative (that is, the department cannot invalidate a total coliform-positive sample on the basis of repeat samples if all the repeat samples are total coliform-negative or if the public water system has only one (1) service connection); or

3. The department has substantial grounds to believe that a total coliform-positive result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case, the system must still collect all repeat samples required in subsections (2)(A)–(D) of this rule and then use them to determine compliance with the MCL for total coliforms in section (7) of this rule. To invalidate a total coliform-positive sample under this section, the decision with the rationale for the decision must be documented in writing, and approved and signed by the supervisor of the department official who recommended the decision. The department must make this document available to the EPA and to the public upon request. The written documentation must state the specific cause of the total coliform-positive sample and what action the system has taken, or will take, to correct this problem. The department may not invalidate a total coliform-positive sample solely on the grounds that all repeat samples are total coliform-negative.

(B) A laboratory must invalidate a total coliform sample (unless total coliforms are detected) if the sample produces a turbid culture in the absence of gas production using an analytical method where gas formation is examined (that is, the multiple-tube fermentation (MTF) technique), produces a turbid culture in the absence of an acid reaction in the presence-absence (P-A) coliform test, or exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter (that is, membrane filter technique (MFT)). When a laboratory invalidates a sample because of this interference, the system must collect another sample from the same location as the original sample within twenty-four (24) hours of being notified of the invalidation and have it analyzed for the presence of total coliform. The system must continue to resample within twenty-four (24) hours and have the samples analyzed until it obtains a valid result. The department may extend the twenty-four (24)-hour limit on a case-by-case basis if the system has a logistical problem in collecting the sample that is beyond its control. In the case of an extension, the department must specify how much time the system has to collect the replacement samples.

(4) Sanitary Surveys.

(A) Public water systems which do not collect five (5) or more routine samples per month must undergo an initial sanitary survey or on-site inspection by June 29, 1994, for community public water systems and June 29, 1999, for noncommunity water systems. After that, systems must undergo another sanitary survey or on-site inspection every five (5) years, except that noncommunity water systems using only protected and disinfected groundwater, as defined by the department, must undergo subsequent sanitary surveys or on-site inspections at least every ten (10) years after the initial sanitary survey or on-site inspection. The department must review the results of each sanitary survey or on-site inspection to determine whether the existing monitoring frequency is adequate and what additional measure, if any, the system needs to undertake to improve drinking water quality.

(B) Sanitary surveys or on-site inspections must be performed by the department or an agent approved by the department. The system is responsible for ensuring that the sanitary survey or on-site inspection takes place. Agents that can be approved by the department to conduct sanitary surveys include engineers. Agents that can be approved by the department to conduct on-site inspections include, but are not limited to, sanitarians and environmental specialists from other state agencies acting in their official capacity. Reports of sanitary surveys and on-site inspections shall include completed forms approved by the department. Sanitary surveys and on-site inspections shall be done in accordance with criteria established by the department.

(5) Fecal Coliforms/*Escherichia coli (E. coli*) Testing.

(A) If any routine or repeat sample is total coliform-positive, the system must analyze that total coliform-positive culture medium to determine if fecal coliforms are present, except that the system may test for *E. coli* in lieu of fecal coliforms. If fecal coliforms or *E. coli* are present, the system must notify the department by the end of the day when the system is notified of the result, unless the system is notified of the result after the department office is closed, in which case the system must notify the department before the end of the next business day.

(B) The department has the discretion to allow a public water system, on a case-by-case basis, to forego fecal coliform or *E. coli* testing on a total coliform-positive sample if that system assumes that the total coliform-positive sample is fecal coliform-positive or *E. coli*-positive. The system must notify the department as specified in subsection (5)(A) of this rule, except as provided in subsection (5)(C) of this rule, and must provide Tier 1 notice to the public as specified in 10 CSR 60-8.010, including the mandatory health effects language for fecal coliform/*E.coli*.

(C) The department, after consideration of the circumstances surrounding a specific incident, may reduce or extend the public notice period for acute violations, as it deems appropriate.

(6) Response to Violation.

(A) A public water system which has exceeded the MCL for total coliforms in section (7) of this rule must report the violation to the department no later than the end of the next business day after it learns of the violation and notify the public in accordance with 10 CSR 60-8.010.

(B) A public water system which has failed to comply with a coliform monitoring requirement, including the sanitary survey requirement, must report the monitoring violation to the department within ten (10) days after the system discovers the violation and notify the public in accordance with the applicable requirement in 10 CSR 60-8.010.

(7) MCLs for Microbiological Contaminants.

(A) The MCL is based on the presence or absence of total coliforms in a sample, rather than coliform density. Public water systems need only determine the presence or absence of total coliforms; a determination of total coliform density is not required.

1. For a system which collects at least forty (40) samples per month, if no more than five percent (5.0%) of the samples collected during a month are total coliform-positive, the system is in compliance with the MCL for total coliforms.

2. For a system which collects fewer than forty (40) samples per month, if no more than one (1) sample collected during a month is total coliform-positive, the system is in compliance with the MCL for total coliforms.

(B) Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or *E. coli*-positive routine sample constitutes a violation

of the MCL for total coliforms. For purposes of the public notification requirements in 10 CSR 60-8.010, this is a violation that may pose an acute risk to health.

(C) A public water system must determine compliance with the MCL for total coliforms in subsections (7)(A) and (B) of this rule for each month in which it is required to monitor for total coliforms.

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**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.030 Maximum Inorganic Chemical Contaminant Levels, Action Levels and Monitoring Requirements

PURPOSE: This rule establishes maximum contaminant levels, action levels and monitoring requirements for inorganic contaminants.

(1) Maximum Contaminant Levels (MCL) or Action Levels.

(A) The maximum contaminant or action level listed as follows for inorganic chemicals 1.–17. apply to community water systems. The maximum contaminant or action level listed as follows for inorganic chemicals 1.–9. and 11.–17. apply to nontransient noncommunity water systems. The maximum contaminant or action level listed as follows for inorganic chemicals 13.–15. apply to transient noncommunity water systems:

Contaminant	Maximum Contaminant Level (MCL)
1. Antimony	0.006 mg/l
2. Arsenic	0.05 mg/l (until Jan. 23, 2006) 0.010 mg/l (effective Jan. 23, 2006)
3. Asbestos	7 million fibers/liter (longer than 10 μm in length)
4. Barium	2 mg/l
5. Beryllium	0.004 mg/l
6. Cadmium	0.005 mg/l
7. Chromium	0.1 mg/l
8. Copper	* (See 10 CSR 60-15.010(3)(B).)
9. Cyanide	0.2 mg/l
10. Fluoride	4.0 mg/l
11. Lead	* (See 10 CSR 60-15.010(3)(A).)
12. Mercury	0.002 mg/l
13. Nitrate	10 mg/l (as nitrogen)
14. Nitrite	1 mg/l (as nitrogen)
15. Total Nitrate and Nitrite	10 mg/l (as nitrogen)
16. Selenium	0.05 mg/l
17. Thallium	0.002 mg/l

*Indicates action levels rather than maximum contaminant levels.

(B) Nitrate levels not to exceed twenty (20) mg/l may be allowed in a noncommunity water system if the supplier of water demonstrates to the satisfaction of the department that all of the following factors apply to the situation:

1. Such water will not be available to children under six (6) months of age;

2. The noncommunity water system is meeting the public notification requirements under 10 CSR 60-8.010(9), including continuous posting of the fact that nitrate levels exceed ten (10) mg/l and the potential health effects of exposure;

3. Local and state public health authorities will be notified annually of nitrate levels that exceed ten (10) mg/l; and

4. No adverse health effects shall result.

(2) Monitoring Frequency.

(A) Asbestos. The frequency of monitoring to determine compliance with the maximum contaminant level (MCL) for asbestos specified in section (1) of this rule shall be conducted as follows:

1. Each community and nontransient noncommunity water system is required to monitor for asbestos during the first three (3)-year compliance period of each nine (9)-year compliance cycle;

2. If monitoring data collected after January 1, 1990, are generally consistent with the requirements of subsection (2)(A) of this rule, then the state may allow systems to use those data to satisfy the monitoring requirement for the initial three (3)-year compliance period;

3. Waivers.

A. The system may apply to the department for a use waiver as described in 10 CSR 60-6.060(2). If the department grants the waiver, the system is not required to monitor while the waiver is effective. A waiver remains in effect until the completion of the three (3)-year compliance period and must be renewed for subsequent compliance periods. Systems not receiving a waiver must monitor in accordance with the provisions of paragraph (2)(A)1. of this rule.

B. The department may grant a waiver based on the potential asbestos contamination of the water source and the use of asbestos-cement pipe for finished water distribution and the corrosive nature of the water;

4. Increased and decreased monitoring.

A. A system that is out of compliance with the MCL as determined in section (6) of this rule shall monitor quarterly beginning in the next quarter after the violation occurs.

B. The department may decrease the quarterly monitoring requirement to the frequency specified in paragraph (2)(A)1. of this rule provided the department has determined that the analytical results for the system are reliably and consistently less than the MCL. In no case can the department make this determination unless a groundwater system takes a minimum of two (2) quarterly samples and a surface (or combined surface/ground) water system takes a minimum of four (4) quarterly samples; and

5. Sample collection.

A. A system vulnerable to asbestos contamination due solely to corrosion of asbestos-cement pipe shall take at least one (1) sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

B. A system vulnerable to asbestos contamination due solely to source water shall monitor in accordance with the provision of section (4) of this rule.

C. A system vulnerable to asbestos contamination due both to its source water supply and corrosion of asbestos-cement pipe shall take at least one (1) sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

(B) Inorganic Chemicals. Community and nontransient noncommunity water systems shall monitor for antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium and thallium as set forth here.

1. Groundwater systems shall take one (1) sample at each sampling point during each three (3)-year compliance period beginning in the initial compliance period. Surface water systems (or combined surface/ground) shall take one (1) sample annually at each sampling point beginning in the initial compliance period.

2. Waivers.

A. The system may apply to the department for a susceptibility waiver as described in 10 CSR 60-6.060(3). If the department grants the waiver, the system is

required to take a minimum of one (1) sample while the waiver is effective. The term during which the waiver is effective shall not exceed one (1) nine (9)-year compliance cycle. Systems not receiving a waiver must monitor in accordance with the provisions of paragraph (2)(B)1. of this rule.

B. The department may grant a waiver provided surface water systems have monitored annually for at least three (3) years and groundwater systems have conducted a minimum of three (3) rounds of monitoring. At least one (1) sample shall have been taken since January 1, 1990. Both surface and ground water systems shall demonstrate that all previous analytical results were reliably and consistently less than the MCL. Systems that use a new water source are not eligible for a waiver until three (3) rounds of monitoring from the new source have been completed.

C. In determining the appropriate reduced monitoring frequency, the department shall consider the reported concentrations from all previous monitoring, the degree of variation in reported concentrations and other factors which may affect contaminant concentrations (such as changes in groundwater pumping rates, changes in the system's configuration, changes in the system's operating procedures, or changes in stream flows or characteristics).

D. A decision by the department to grant a waiver shall be made in writing and shall set forth the basis for the determination. The determination may be initiated by the department or upon an application by the public water system. The public water system shall specify the basis for its request. The department shall review and, where appropriate, revise its determination of the appropriate monitoring frequency when the system submits new monitoring data or when other data relevant to the system's appropriate monitoring frequency become available.

E. The department may grant a waiver for monitoring for cyanide, if the department determines that the system is not vulnerable due to lack of proximity to any industrial source of cyanide.

3. Increased and decreased monitoring.

A. Systems which exceed the MCLs as calculated in section (6) of this rule shall monitor quarterly beginning in the next quarter after the violation occurs.

B. Where the results of sampling for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, or thallium indicate an exceedance of the maximum contaminant level, the department may require that one (1) additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two (2) weeks) at the same sampling point.

C. The department may decrease the quarterly monitoring requirement to the frequencies specified in paragraph (2)(B)1. of this rule provided it has determined that the analytical results for the system are reliably and consistently below the MCL. In no case can the department make this determination unless a groundwater system takes a minimum of two (2) quarterly samples and a surface water system (or combined surface/ground) takes a minimum of four (4) quarterly samples.

D. All new systems or systems that use a new source of water that begin operation after January 22, 2004 must demonstrate compliance with the MCL within a period of time specified by the department. The system must also comply with the initial sampling frequencies specified by the department to ensure a system can demonstrate compliance with the MCL. Routine and increased monitoring frequencies shall be conducted in accordance with the requirements in this section (2).

E. For systems which are conducting monitoring at a frequency greater than annual, compliance with the maximum contaminant levels for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, or thallium is determined by a running annual average at any sampling point. If the average at any sampling point is greater than the MCL, then the system is out of compliance. If any one (1) sample would cause the annual average to be exceeded, then the system is out of compliance immediately. Any sample below the method detection limit shall be calculated at zero (0) for the purpose of determining the annual average. If a system fails to collect the required number of samples, compliance (average concentration) will be based on the total number of samples collected.

F. For systems which are monitoring annually, or less frequently, and whose sample exceeds one-half (1/2) the MCL for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, or thallium, the system must begin quarterly monitoring. The system will not be in violation of the MCL until is has completed one (1) year of quarterly monitoring. If any sample result will cause the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL. If a system fails to collect the required number of samples, compliance (average concentration) will be based on the total number of samples collected.

G. Arsenic sampling results will be reported to the nearest 0.001 mg/l.

(C) Nitrate. All public water systems (community; nontransient noncommunity; and transient noncommunity) shall monitor to determine compliance with the MCL for nitrate specified in section (1) of this rule. The frequency of monitoring shall be conducted as follows:

1. Groundwater systems.

A. All public water systems (community; nontransient noncommunity; and transient noncommunity) served by groundwater systems shall monitor annually beginning in the initial compliance period.

B. The repeat monitoring frequency for groundwater systems shall be quarterly for at least one (1) year following any one (1) sample in which the concentration is greater than or equal to fifty percent ($\geq 50\%$) of the MCL.

C. The department may allow a groundwater system to reduce the sampling frequency to an annual basis after four (4) consecutive quarterly samples are reliably and consistently less than fifty percent ($< 50\%$) of the MCL.

D. After a round of quarterly sampling is completed, a system which is monitoring annually shall take subsequent samples during the quarter(s) which previously resulted in the highest analytical result; and

2. Surface water systems.

A. All public water systems (community; nontransient noncommunity; and transient noncommunity) served by a surface water system shall monitor quarterly beginning in the initial compliance period.

B. The department may allow a surface water system to reduce the sampling frequency to annually if all analytical results from four (4) consecutive quarters are less than fifty percent ($< 50\%$) of the MCL.

C. A surface water system shall return to quarterly monitoring if any one (1) sample is greater than or equal to fifty percent ($\geq 50\%$) of the MCL.

D. After a round of quarterly sampling is completed, a system which is monitoring annually shall take subsequent samples during the quarter(s) which previously resulted in the highest analytical result.

(D) Nitrite. All public water systems (community; nontransient noncommunity; and transient noncommunity) shall monitor to determine compliance with the MCL for nitrite specified in section (1) of this rule. The frequency of monitoring shall be conducted as follows:

1. All public water systems shall take one (1) sample at each sampling point in the initial three (3)-year compliance period;

2. After the initial sample, systems where an analytical result for nitrite is less than fifty percent (<50%) of the MCL shall monitor at the frequency specified by the department; and

3. Repeat monitoring.

A. The repeat monitoring frequency for any water system shall be quarterly for at least one (1) year following any one (1) sample in which the concentration is greater than or equal to fifty percent (≥50%) of the MCL.

B. The department may allow a system to reduce the sampling frequency to annually after determining the analytical results for the system are reliably and consistently less than the MCL.

C. Systems which are monitoring annually shall take each subsequent sample during the quarter(s) which previously resulted in the highest analytical result.

(E) Lead and Copper. All community and nontransient noncommunity water systems are required to monitor for lead and copper (see 10 CSR 60-15.070 for monitoring frequency, requirements and protocol for lead and copper).

(3) Monitoring Requirements.

(A) Each public water system shall monitor at the time designated by the department during each three (3)-year compliance period.

(B) Systems may apply to the department to conduct more frequent monitoring than the minimum monitoring frequencies specified in this chapter.

(C) The department may require more frequent monitoring than specified in section (2) of this rule or may require confirmation samples for positive and negative results at its discretion.

(4) Monitoring Protocol. For the purpose of determining compliance with MCLs, samples must be collected for analyses as follows:

(A) All public water systems shall take a minimum of one (1) sample at every entry point to the distribution system after any application of treatment which is representative of each source after treatment (called a sampling point) beginning in the initial compliance period;

(B) The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant; and

(C) If a system draws water from more than one (1) source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (that is, when water is representative of all sources being used).

(5) Confirmation Samples.

(A) Where the results of sampling for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium or thallium indicate an exceedance of the MCL, the department may require that one (1) additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two (2) weeks) at the same sampling point.

(B) Nitrate and Nitrite.

1. Where nitrate or nitrite sampling results indicate an exceedance of the MCL, the system shall take a confirmation sample within twenty-four (24) hours of the system's receipt of notification of the analytical results of the first sample.

2. Systems unable to comply with the twenty-four (24)-hour sampling requirement must immediately notify persons served by the public water system in accordance with 10 CSR 60-8.010(2). Systems exercising this option must take and analyze a confirmation sample within two (2) weeks of notification of the analytical results of the first sample.

(C) If a department-required confirmation sample is taken for any contaminant, then the results of the initial and confirmation sample shall be averaged. The resulting average shall be used to determine the system's compliance in accordance with section (6) of this rule. The department has the discretion to delete results of obvious sampling errors.

(6) Compliance. Compliance with section (1) of this rule shall be determined based on the analytical result(s) obtained at each sampling point.

(A) For systems which are conducting monitoring at a frequency greater than annual, compliance with the MCLs for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium or thallium is determined by a running annual average at each sampling point. If the average at any sampling point is greater than the MCL, then the system is out of compliance. If any one (1) sample would cause the annual average to be exceeded, then the system is out of compliance immediately. Any sample below the method detection limit shall be calculated at zero (0) for the purpose of determining the annual average.

(B) For systems which are monitoring annually, or less frequently, the system is out of compliance with the MCLs for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium or thallium if the level of a contaminant at any sampling point is greater than the MCL. If a confirmation sample is required by the department, the determination of compliance will be based on the average of the two (2) samples.

(C) Compliance with the MCLs for nitrate and nitrite is determined based on one (1) sample if the levels of these contaminants is below the MCLs. If the levels exceed the MCLs in the initial sample, a confirmation sample is required in accordance with subsection (5)(B) of this rule and compliance shall be determined based on the average of the initial and confirmation samples.

(D) All community and nontransient noncommunity water systems are required to monitor for lead and copper (see 10 CSR 60-15.070 for compliance requirements if lead and copper action levels are exceeded).

(7) Public Notice. If the result of analyses indicates that the level of antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium or thallium exceeds the MCL, the supplier of water must report to the department within seven (7) days.

(A) When the system is out of compliance for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium or thallium, as determined by section (6) of this rule, the supplier of water must notify the department as required by 10 CSR 60-7.010 and give public notice as required by 10 CSR 60-8.010.

(B) When the system is out of compliance for nitrate, nitrite or total nitrate and nitrite, as determined by section (6) of this rule, the supplier of water must notify the department as required by 10 CSR 60-7.010 and give public notice as required by 10 CSR 60-8.010.

(C) When the system is out of compliance for lead or copper as determined by 10 CSR 60-15.070, 10 CSR 60-15.080 and 10 CSR 60-15.090, the supplier of water must notify the department as required by 10 CSR 60-7.020 and give public notice as required by 10 CSR 60-8.010.

AUTHORITY: section 640.100, RSMo Supp. 2002. Original rule filed May 4, 1979, effective Sept. 14, 1979. Amended: Filed April 14, 1981, effective Oct. 11, 1981. Amended: Filed Aug. 4, 1987, effective Jan. 1, 1988. Rescinded and readopted: Filed March 31, 1992, effective Dec. 3, 1992. Amended: Filed Aug. 4, 1992, effective May*

6, 1993. Amended: Filed May 4, 1993, effective Jan. 13, 1994. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996. Amended: Filed March 17, 2003, effective Nov. 30, 2003.

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.040 Maximum Synthetic Organic Chemical Contaminant Levels and Monitoring Requirements

PURPOSE: This rule establishes maximum contaminant levels and monitoring requirements for synthetic organic chemical contaminants.

(1) The following are the maximum contaminant levels (MCLs) for synthetic organic chemical contaminants.

Contaminant	Maximum Contaminant Level, Milligrams Per Liter
1. Alachlor	0.002
2. Atrazine	0.003
3. Benzo(a)pyrene	0.0002
4. Carbofuran	0.04
5. Chlordane	0.002
6. Dalapon	0.2
7. Di(2-ethylhexyl) adipate	0.4
8. Dibromochloro-propane (DBCP)	0.0002
9. Di(2-ethylhexyl) phthlate	0.006
10. Dinoseb	0.007
11. Diquat	0.02
12. Endothall	0.1
13. Endrin	0.002
14. 2,4-D	0.07
15. Ethylene dibromide (EDB)	0.00005
16. Glyphosate	0.7
17. Heptachlor	0.0004
18. Heptachlor epoxide	0.0002
19. Hexachlorobenzene	0.001
20. Hexachlorocyclo-pentadiene	0.05
21. Lindane	0.0002
22. Methoxychlor	0.04
23. Oxamyl (Vydate)	0.2
24. Picloram	0.5
25. Polychlorinated biphenyls (PCBs)	0.0005 (as determined by Method 508A only)
26. Pentachlorophenol	0.001
27. Simazine	0.004
28. Toxaphene	0.003
29. 2,3,7,8-TCDD (Dioxin)	0.00000003
30. 2,4,5-TP (Silvex)	0.05

(2) For the purpose of determining compliance with MCLs, a supplier of water must collect samples of the product water for analysis as follows:

(A) During the initial three (3)-year compliance period, all community and nontransient noncommunity water systems must collect an initial round of four (4) consecutive quarterly samples unless a waiver has been granted by the department. The department will designate the year in which each system samples within this compliance period;

(B) All public water systems shall sample at points in the distribution system representative of each water source or at each entry point to the distribution system. The sampling point will be after the application of treatment, if any. Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant;

(C) If the system draws water from more than one (1) source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions; and

(D) The department may require more frequent monitoring than specified in this section of the rule and may require confirmation samples for positive or negative results, at its discretion.

(3) If contaminants are not detected during the initial sampling as indicated in section (2) of this rule, systems may decrease their sampling frequency beginning in the next three (3)-year compliance period.

(A) Systems that serve greater than three thousand three hundred ($>3,300$) persons may reduce their sampling frequencies to two (2) quarterly samples at each sampling point in one (1) year in each compliance period.

(B) Systems that serve less than or equal to three thousand three hundred ($\leq 3,300$) persons may reduce their sampling frequencies to one (1) sample in each compliance period.

(4) The department may allow sampling data collected between January 1, 1990 and December 31, 1995, to satisfy the initial base sampling requirements, if the sampling was completed as required by subsections (2)(B) and (C) of this rule.

(5) If contaminants are detected in any sample, then systems must sample quarterly beginning in the next quarter at each sampling point which resulted in a detection.

(A) Groundwater systems must sample a minimum of two (2) quarters and surface water must sample a minimum of four (4) quarters to establish a baseline.

(B) If the MCL is exceeded as described in subsection (5)(E) or (F) of this rule, then systems must sample quarterly beginning in the next quarter. Systems must sample a minimum of four (4) quarters to establish a baseline.

(C) If the baseline indicates a system's analytical results are reliably and consistently below the MCL, the department may reduce the system's sampling frequency to annually. (Annual sampling must be conducted during the quarter which previously yielded the highest analytical result.)

(D) Systems which have three (3) consecutive annual samples with no detection of a contaminant may apply to the department for a waiver.

(E) If one (1) sampling point is in violation of an MCL, the system is in violation of the MCL.

1. For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point.

2. Systems monitoring annually or less frequently whose sample result exceeds the regulatory detection level as defined by 10 CSR 60-5.010(6)(B) must begin quarterly sampling. The system will not be considered in violation of the MCL until it has completed one (1) year of quarterly sampling.

3. If any sample result will cause the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL immediately.

4. If a system fails to collect the required number of samples, compliance will be based on the total number of samples collected.

5. If a sample result is less than the detection limit, zero will be used to calculate the annual average.

(F) If monitoring results in detection of one (1) or more of certain related contaminants (aldicarb, aldicarb sulfone, aldicarb sulfoxide and heptachlor, heptachlor epoxide), then subsequent monitoring shall analyze for all related contaminants.

(6) A public water system may apply to the department for a waiver from required sampling. Systems are eligible for reduced monitoring in the initial three (3)-year compliance period. The waiver is effective for one (1) compliance period. It must be renewed in subsequent compliance periods or the system must conduct sampling as required by subsection (2)(A) of this rule.

(A) A public water system may apply to the department for a use waiver for reduced monitoring from required sampling if previous use of the chemical can be ruled out as required by 10 CSR 60-6.060(2).

(B) A public water system may apply to the department for a susceptibility waiver for reduced monitoring contingent on the conduct of a thorough vulnerability assessment as required by 10 CSR 60-6.060(3).

(7) As determined by the department, a confirmation sample may be required for either positive or negative results. If a confirmation sample is used, the compliance determination is based on the average of the results of both the confirmation sample and the initial sample. The department has the discretion to delete results of obvious sampling errors from this calculation.

(8) Any public water system violating MCLs or monitoring and reporting requirements for any of the contaminants listed in section (1) of this rule must notify the department within seven (7) days and give public notice as required by 10 CSR 60-8.010.

(9) Treatment Techniques.

(A) All public water systems shall use treatment techniques in lieu of MCLs for specified contaminants.

(B) Each public water system must certify annually in writing to the department (using third-party or manufacturers' certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified as follows:

Acrylamide = 0.05% dosed at 1 part per million (ppm) (or equivalent)
Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent)

Certifications can rely on manufacturers or third parties, as approved by the department.

(10) All new systems or systems that use a new source of water that begin operation after January 22, 2004 must demonstrate compliance with the MCL or treatment technique within a period of time specified by the department. The system must also comply with the initial sampling frequencies specified by the department to ensure a system can demonstrate compliance with the MCL or treatment technique. Routine and increased monitoring frequencies shall be conducted in accordance with the requirements in section (5) of this rule.

AUTHORITY: section 640.100, RSMo Supp. 2002. Original rule filed May 4, 1979, effective Sept. 14, 1979. Amended: Filed April 14, 1981, effective Oct. 11, 1981. Rescinded and readopted: Filed March 31, 1992, effective Dec. 3, 1992. Amended: Filed May 4, 1993, effective Jan. 13, 1994. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996. Amended: Filed March 17, 2003, effective Nov. 30, 2003.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.050 Maximum Turbidity Levels and Monitoring Requirements and Filter Backwash Recycling

PURPOSE: This rule establishes maximum contaminant levels and monitoring requirements for turbidity.

(1) Applicability.

(A) This rule applies to all public water systems that use surface water or groundwater under the direct influence of surface water. Requirements and compliance dates vary depending on system size.

(B) Beginning on November 30, 2002, any water treatment plant proposed for construction or major modification must be designed to meet the filter backwash requirements in section (4) of this rule.

(2) Systems Serving Less Than Ten Thousand (10,000) People. (Note: This section remains in effect only until January 13, 2005. Beginning January 14, 2005, the turbidity levels and other requirements in section (3) of this rule replace the requirements of this section.)

(A) Maximum Turbidity Levels.

1. The turbidity level must be less than or equal to 0.5 turbidity units in at least ninety-five percent (95%) of the measurements taken each month.

2. The turbidity level must at no time exceed five (5) turbidity units in any one (1) confirmed measurement.

(B) The frequency of sampling shall be as set forth in 10 CSR 60-4.080(3).

(C) If the result of a single turbidity measurement exceeds the level established in subsection (2)(A), the measurement must be confirmed by resampling, preferably within one (1) hour. The resample result must replace the original sample result for determining compliance with subsection (2)(A) of this rule.

(D) If any confirmed sample result exceeds five (5) turbidity units, the supplier of water must notify the department by the end of the next business day and give notice as required by 10 CSR 60-8.010(2).

(E) The department, on a case-by-case basis, may allow a system to operate at a maximum turbidity level of 1.0 turbidity units in at least ninety-five percent (95%) of the measurements taken each month if the following criteria are met: the total percent removal and inactivation of *Giardia lamblia* is ninety-nine and nine-tenths percent (99.9%), required treatment is provided, the treatment facilities are properly operated, none of the treatment units are malfunctioning due to mechanical failure or incorrect construction, the system is in compliance with all of the disinfection requirements of 10 CSR 60-4.055(1)–(4), the treatment facilities are providing ninety-nine percent (99%) *Giardia* cyst removal and the system cannot meet the turbidity level of 0.5 turbidity units due to raw water quality, iron, manganese or similar compelling factors. The request to operate at the higher turbidity level must be made in writing and be accompanied by an engineering report which includes the results of full scale particle or *Giardia* cyst removal studies, operational test data, water analyses results, a report of the sanitary survey of the treatment facilities and any other information that the department may require to assure that the criteria of this rule are met. Approval of the engineering report is the approval to operate at the higher turbidity level.

(3) Enhanced Turbidity Requirements.

(A) Beginning January 1, 2002 for systems serving ten thousand (10,000) or more people and beginning January 14, 2005 for systems serving less than ten thousand (10,000) people maximum turbidity levels and other requirements are as set forth in this section.

(B) Maximum Turbidity Levels.

1. Turbidity must be equal to or less than 0.3 turbidity units in at least ninety-five percent (95%) of the measurements taken each month; and

2. There must be no more than one (1) turbidity unit in any one (1) measurement.

(C) The frequency of sampling shall be as set forth in 10 CSR 60-4.080(3).

(D) Reporting to the Department.

1. If at any time the turbidity exceeds one (1) nephelometric turbidity unit (NTU) in representative samples of filtered water in a system using conventional filtration treatment or direct filtration, the system must inform the department as soon as possible, but no later than the end of the next business day.

2. If any sample result exceeds five (5) turbidity units, the supplier of water must

consult with the department as soon as practical, but no later than twenty-four (24) hours after the exceedance is known, except that the department may allow additional time in the event of extenuating circumstances beyond the control of the owner or operator, such as a natural disaster.

3. If at any time the turbidity in representative samples of filtered water exceeds the maximum level set by the department under subsection (3)(G) of this rule for filtration technologies other than conventional filtration treatment, the system must inform the department as soon as possible, but no later than the end of the next business day.

(E) Filtration Sampling Requirements for Surface Water Systems

1. A public water system subject to the requirements of 10 CSR 60-4.055(6) that provides conventional filtration treatment must conduct continuous monitoring of turbidity for each individual filter using an approved method in 10 CSR 60-5.010 and must calibrate turbidimeters using the procedure specified by the manufacturer. Systems must record the results of individual filter monitoring every fifteen (15) minutes.

2. If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every four (4) hours in lieu of continuous monitoring, until the turbidimeter is repaired and back on-line. A system has a maximum of five (5) working days after failure in the continuous monitoring equipment to repair the equipment before the system is in violation. With department approval, systems serving less than ten thousand (10,000) people may be granted up to fourteen (14) days to repair the equipment before the system is in violation.

(F) Lime Softening.

1. A system that uses lime softening may acidify representative samples prior to analysis using a protocol approved by the department.

2. Systems that use lime softening may apply to the department for alternative exceedance levels for the levels specified in 10 CSR 60-7.010(7)(B) if they can demonstrate that higher turbidity levels in individual filters are due to lime carryover only and not due to degraded filter performance.

(G) Filtration Technologies Other Than Conventional Filtration Treatment.

1. A public water system may use a filtration technology other than conventional filtration if it demonstrates to the department, using pilot plant studies or other means, that the alternative filtration technology, including direct filtration, in combination with disinfection treatment that meets the requirements of 10 CSR 60-4.055, consistently achieves 99.9 percent removal and/or inactivation of *Giardia lamblia* cysts and 99.99 percent removal and/or inactivation of viruses, and ninety-nine percent (99%) removal of *Cryptosporidium* oocysts, and the department approves the use of the filtration technology.

2. For each approval, the department will set turbidity performance requirements that the system must meet at least ninety-five percent (95%) of the time and that the system may not exceed at any time at a level that consistently achieves 99.9 percent removal and/or inactivation of *Giardia lamblia* cysts, 99.99 percent removal or inactivation of viruses, or both, and 99 percent removal of *Cryptosporidium* oocysts.

(4) Filter Backwash Recycling.

(A) Applicability. All surface water and groundwater under the direct influence of surface water systems that use conventional filtration or direct filtration treatment and that recycle spent filter backwash water, thickener supernatant, or liquids from dewatering processes must meet the requirements of this section.

(B) Reporting. A system must notify the department in writing by December 8, 2003, if the system recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes. This notification must include, at a minimum, the following information:

1. A plant schematic showing the origin of all flows which are recycled (including, but not limited to, spent filter backwash water, thickener supernatant, and liquids from dewatering processes), the hydraulic conveyance used to transport them, and the location where they are reintroduced back into the treatment plant; and

2. Typical recycle flow in gallons per minute (gpm), the highest observed plant flow experienced in the previous year (gpm), design flow for the treatment plant (gpm), and department-approved operating capacity for the plant where the department has made such determinations.

(C) Treatment Technique Requirement. Any system that recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes must return these flows through the processes of a system's existing conventional or direct filtration system or at an alternate location approved by the department by June 8, 2004. If capital improvements are required to modify the recycle location to meet this requirement, all capital improvements must be completed not later than June 8, 2006.

(D) Record Keeping. The system must collect and retain on file recycle flow information for review and evaluation by the department beginning June 8, 2004. This information shall include, but may not be limited to:

1. A copy of the recycle notification and information submitted to the department under subsection (4)(B) of this rule;

2. A list of all recycle flows and the frequency with which they are returned;

3. Average and maximum backwash flow rate through the filters and the average and maximum duration of the filter backwash process in minutes;

4. Typical filter run length and a written summary of how filter run length is determined;

5. The type of treatment provided for the recycle flow; and

6. Data on the physical dimensions of the equalization and/or treatment units, typical and maximum hydraulic loading rates, type of treatment chemicals used and average dose and frequency of use, and frequency at which solids are removed, if applicable.

AUTHORITY: section 640.100, RSMo Supp. 2002. Original rule filed May 4, 1979, effective Sept. 14, 1979. Amended: Filed April 14, 1981, effective Oct. 11, 1981. Amended: Filed July 12, 1991, effective Feb. 6, 1992. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996. Amended: Filed Dec. 15, 1999, effective Sept. 1, 2000. Amended: Filed Jan. 16, 2002, effective Nov. 30, 2002. Amended: Filed March 17, 2003, effective Nov. 30, 2003.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.052 Source Water Monitoring and Enhanced Treatment Requirements

PURPOSE: This rule establishes source water monitoring requirements and enhanced treatment for Cryptosporidium for surface water systems and systems under the direct influence of surface water. These requirements are in addition to requirements for filtration and disinfection in 10 CSR 60-4.050 and 10 CSR 60-4.055. This rule adopts the requirements found in subpart W of 40 CFR part 141.

(1) Enhanced Treatment for *Cryptosporidium* General Requirements.

(A) The requirements of this rule are national primary drinking water regulations. The regulations in this rule establish or extend treatment technique requirements in lieu of maximum contaminant levels for *Cryptosporidium.* These requirements are in

addition to requirements for filtration and disinfection in 10 CSR 60-4.050 and 10 CSR 60-4.055.

(B) Applicability.

1. The requirements of this rule apply to all public water systems supplied by a surface water source and public water systems supplied by a ground water source under the direct influence of surface water.

2. Wholesale systems, as defined in 10 CSR 60-2.015, must comply with the requirements of this rule based on the population of the largest system in the combined distribution system.

(C) Requirements. Systems subject to this rule must comply with the following requirements:

1. Systems must conduct an initial and a second round of source water monitoring for each plant that treats a surface water or ground water under the direct influence of surface water (GWUDISW) source. This monitoring may include sampling for *Cryptosporidium, E. coli,* and turbidity as described in sections (2)–(6) of this rule, to determine what level, if any, of additional *Cryptosporidium* treatment they must provide;

2. Systems that plan to make a significant change to their disinfection practice must develop disinfection profiles and calculate disinfection benchmarks, as described in sections (8) and (9) of this rule;

3. Filtered systems must determine their *Cryptosporidium* treatment bin classification as described in section (10) of this rule and provide additional treatment for *Cryptosporidium,* if required, as described in section (11) of this rule. Filtered systems must implement *Cryptosporidium* treatment according to the schedule in section (12) of this rule;

4. Systems required to provide additional treatment for *Cryptosporidium* must implement microbial toolbox options that are designed and operated as described in sections (13)–(18) of this rule; and

5. Systems must comply with the applicable record-keeping and reporting requirements described in 10 CSR 60-7.010 and 10 CSR 60-9.010.

(2) Source Water Monitoring Requirements.

(A) Initial Round of Source Water Monitoring. Systems must conduct the following monitoring on the schedule in subsection (2)(C) of this rule unless they meet the monitoring exemption criteria in subsection (2)(D) of this rule.

1. Filtered systems serving at least ten thousand (10,000) people must sample their source water for *Cryptosporidium, E. coli,* and turbidity at least monthly for twenty-four (24) months.

2. Filtered systems serving fewer than ten thousand (10,000) people must sample their source water for *E. coli* at least once every two (2) weeks for twelve (12) months.

3. A filtered system serving fewer than ten thousand (10,000) people may avoid *E. coli* monitoring if the system notifies the department that it will monitor for *Cryptosporidium* as described in paragraph (2)(A)4. of this rule. The system must notify the department no later than three (3) months prior to the date the system is otherwise required to start *E. coli* monitoring under subsection (2)(C) of this rule.

4. Filtered systems serving fewer than ten thousand (10,000) people must sample their source water for *Cryptosporidium* at least twice per month for twelve (12) months or at least monthly for twenty-four (24) months if they meet one (1) of the following, based on monitoring conducted under paragraphs (2)(A)2. and 3. of this rule.

A. For systems using lake or reservoir sources, the annual mean *E. coli* concentration is greater than 10 *E. coli*/100 mL.

B. For systems using flowing stream sources, the annual mean *E. coli* concentration is greater than 50 *E. coli*/100 mL.

C. The system does not conduct *E. coli* monitoring as described in paragraphs (2)(A)2. and 3. of this rule.

D. Systems using ground water under the direct influence of surface water (GWUDISW) must comply with the requirements of paragraph (2)(A)4. of this rule based on the *E. coli* level that applies to the nearest surface water body. If no surface water body is nearby, the system must comply based on the requirements that apply to systems using lake/reservoir sources.

5. For filtered systems serving fewer than ten thousand (10,000) people, the department may approve monitoring for an indicator other than *E. coli* under paragraph (2)(A)2. of this rule. The department also may approve an alternative to the *E. coli* concentration in subparagraph (2)(A)4.A., B., or D. of this rule to trigger *Cryptosporidium* monitoring. This approval by the department must be provided to the system in writing and must include the basis for the department's determination that the alternative indicator and/or trigger level will provide a more accurate identification of whether a system will exceed the Bin 1 *Cryptosporidium* level in section (10) of this rule.

6. Systems may sample more frequently than required under this section if the sampling frequency is evenly spaced throughout the monitoring period.

(B) Second Round of Source Water Monitoring. Systems must conduct a second round of source water monitoring that meets the requirements for monitoring parameters, frequency, and duration described in subsection (2)(A) of this rule, unless they meet the monitoring exemption criteria in subsection (2)(D) of this rule. Systems must conduct this monitoring on the schedule in subsection (2)(C) of this rule.

(C) Monitoring Schedule. Systems must begin the monitoring required in subsection (2)(A) and subsection (2)(B) of this rule no later than the month beginning with the date listed in this table—

Source Water Monitoring Starting Dates Table

Systems that serve:	Must begin the first round of source water monitoring no later than the month beginning:	And must begin the second round of source water monitoring no later than the month beginning:
At least 100,000 people	October 1, 2006	April 1, 2015
From 50,000 to 99,999	April 1, 2007	October 1, 2015
From 10,000 to 49,999	April 1, 2008	October 1, 2016
Fewer than 10,000 and monitor for E. coli	October 1, 2008	October 1, 2017
Fewer than 10,000 and monitor for *Cryptosporidium* (Applies to filtered systems that meet the conditions of paragraph (2)(A)3. of this rule.)	April 1, 2010	April 1, 2019

(D) Monitoring Avoidance.

1. Filtered systems are not required to conduct source water monitoring under this rule if the system will provide a total of at least 5.5-log of treatment for *Cryptosporidium,* equivalent to meeting the treatment requirements of Bin 4 in section (11) of this rule.

2. If a system chooses to provide the level of treatment in paragraph (2)(D)1. of this rule as applicable, rather than start source water monitoring, the system must notify the department in writing no later than the date the system is otherwise required to submit a sampling schedule for monitoring under section (3) of this rule. Alternatively, a system may choose to stop sampling at any point after it has initiated monitoring if it notifies the department in writing that it will provide this level of treatment. Systems must install and operate technologies to provide this level of treatment by the applicable treatment compliance date in section (12) of this rule.

(E) Plants Operating Only Part of the Year. Systems with plants that operate for only part of the year must conduct source water monitoring in accordance with this rule, but with the following modifications:

1. Systems must sample their source water only during the months that the plant operates unless the department specifies another monitoring period based on plant operating practices.

2. Systems with plants that operate less than six (6) months per year and that monitor for *Cryptosporidium* must collect at least six (6) *Cryptosporidium* samples per year during each of two (2) years of monitoring. Samples must be evenly spaced throughout the period the plant operates.

(F) New Source Requirements.

1. A system that begins using a new source of surface water or GWUDISW after the system is required to begin monitoring under subsection (2)(C) of this rule must monitor the new source on a schedule the department approves. Source water monitoring must meet the requirements of this rule. The system must also meet the bin classification and *Cryptosporidium* treatment requirements of sections (10) and (11) of this rule, as applicable, for the new source on a schedule the department approves.

2. The requirements of subsection (2)(F) of this rule apply to surface water systems and ground water under the direct influence of surface water systems that begin operation after the monitoring start date applicable to the system's size under subsection (2)(C) of this rule.

3. The system must begin a second round of source water monitoring no later than six (6) years following initial bin classification under section (10) of this rule.

(G) Failure to collect any source water sample required under this section in accordance with the sampling schedule, sampling location, analytical method, approved laboratory, and reporting requirements of sections (3) through (6) of this rule is a monitoring violation.

(H) Grandfathering Monitoring Data. Systems may use (i.e., may "grandfather") monitoring data collected prior to the applicable monitoring start date in subsection (2)(C) to meet the initial source water monitoring requirements in subsection (2)(A) of this rule. Grandfathered data may substitute for an equivalent number of months at the end of the monitoring period. All data submitted under subsection (2)(H) must meet the requirements in section (7) of this rule.

(3) Sampling Schedules.

(A) Systems required to conduct source water monitoring under section (2) of this rule must submit a sampling schedule that specifies the calendar dates when the system will collect each required sample.

1. Systems must submit sampling schedules no later than three (3) months prior to the applicable date listed in subsection (2)(C) of this rule for each round of required monitoring.

2. Systems serving at least ten thousand (10,000) people must submit their sampling schedule for the initial round of source water monitoring under subsection (2)(A) of this rule to the Environmental Protection Agency (EPA) electronically at the web address specified by the EPA for this purpose. If a system is unable to submit the sampling schedule electronically, the system may use an alternative approach for submitting the sampling schedule that the EPA approves.

3. Systems serving fewer than ten thousand (10,000) people must submit their sampling schedules for the initial round of source water monitoring in subsection (2)(A) of this rule to the department.

4. Systems must submit sampling schedules for the second round of source water monitoring in subsection (2)(B) of this rule to the department.

5. If the EPA or the department does not respond to a system regarding its sampling schedule, the system must sample at the reported schedule.

(B) Systems must collect samples within two (2) days before or two (2) days after the dates indicated in their sampling schedule (that is, within a five (5)-day period around the schedule date) unless one (1) of the conditions of paragraph (3)(B)1. or 2. applies.

1. If an extreme condition or situation exists that may pose danger to the sample collector, or that cannot be avoided and causes the system to be unable to sample in the scheduled five (5)-day period, the system must sample as close to the scheduled date as is feasible unless the department approves an

alternative sampling date. The system must submit an explanation for the delayed sampling date to the department concurrent with the shipment of the sample to the laboratory.

2. If a system is unable to report a valid analytical result for a scheduled sampling date due to equipment failure, loss of or damage to the sample, failure to comply with the analytical method requirements, including the quality control requirements in 10 CSR 60-5.010, or the failure of an approved laboratory to analyze the sample, then the system must collect a replacement sample. The system must collect the replacement sample not later than twenty-one (21) days after receiving information that an analytical result cannot be reported for the scheduled date unless the system demonstrates that collecting a replacement sample within this time frame is not feasible or the department approves an alternative resampling date. The system must submit an explanation for the delayed sampling date to the department concurrent with the shipment of the sample to the laboratory.

(C) Systems that fail to meet the criteria of subsection (3)(B) of this rule for any source water sample required under section (2) of this rule must revise their sampling schedules to add dates for collecting all missed samples. Systems must submit the revised schedule to the department for approval prior to when the system begins collecting the missed samples.

(4) Sampling Locations.

(A) Systems required to conduct source water monitoring under section (2) of this rule must collect samples for each plant that treats a surface water or GWUDISW source. Where multiple plants draw water from the same influent, such as the same pipe or intake, the department may approve one (1) set of monitoring results to be used to satisfy the requirements of section (2) of this rule for all plants.

(B) Systems must collect source water samples prior to chemical treatment, such as coagulants, oxidants, and disinfectants, unless the system meets the condition of paragraph (4)(B)1. of this rule.

1. The department may approve a system to collect a source water sample after chemical treatment. To grant this approval, the department must determine that collecting a sample prior to chemical treatment is not feasible for the system and that the chemical treatment is unlikely to have a significant adverse effect on the analysis of the sample.

(C) Systems that recycle filter backwash water must collect source water samples prior to the point of filter backwash water addition.

(D) Bank Filtration Requirements.

1. Systems that receive *Cryptosporidium* treatment credit for bank filtration under 10 CSR 60-4.050(3)(G), as applicable, must collect source water samples in the surface water prior to bank filtration.

2. Systems that use bank filtration as pretreatment to a filtration plant must collect source water samples from the well (i.e., after bank filtration). Use of bank filtration during monitoring must be consistent with routine operational practice. Systems collecting samples after a bank filtration process may not receive treatment credit for the bank filtration under subsection (15)(C) of this rule.

(E) Multiple Sources. Systems with plants that use multiple water sources, including multiple surface water sources and blended surface water and ground water sources, must collect samples as specified in paragraph (4)(E)1. or 2. of this rule. The use of multiple sources during monitoring must be consistent with routine operational practice.

1. If a sampling tap is available where the sources are combined prior to treatment, systems must collect samples from the tap.

2. If a sampling tap where the sources are combined prior to treatment is not available, systems must collect samples at each source near the intake on the same day and must follow either subparagraph (4)(E)2.A. or B. of this rule for sample analysis.

A. Systems may take composite samples from each source into one (1) sample prior to analysis. The volume of sample from each source must be weighted according to the proportion of the source in the total plant flow at the time the sample is collected.

B. Systems may analyze samples from each source separately and calculate a weighted average of the analysis results for each sampling date. The weighted average must be calculated by multiplying the analysis result for each source by the fraction the source contributed to total plant flow at the time the sample was collected and then summing these values.

(F) Additional Requirements. Systems must submit a description of their sampling location(s) to the department at the same time as the sampling schedule required under section (3) of this rule. This description must address the position of the sampling location in relation to the system's water source(s) and treatment processes, including pretreatment, points of chemical treatment, and filter backwash recycle. If the department does not respond to a system regarding sampling location(s), the system must sample at the reported location(s).

(5) Approved Laboratories.

(A) *Cryptosporidium*. Systems must have *Cryptosporidium* samples analyzed by a laboratory that is approved under the EPA's Laboratory Quality Assurance Evaluation Program for Analysis of *Cryptosporidium* in Water or a laboratory that has been certified for *Cryptosporidium* analysis by an equivalent state laboratory certification program.

(B) *E. Coli*. Any laboratory certified by the EPA, the National Environmental Laboratory Accreditation Conference, or the department for total coliform or fecal coliform analysis under 10 CSR 60-5.010(3) is approved for *E. coli* analysis under this rule when the laboratory uses the same technique for *E. coli* that the laboratory uses for 10 CSR 60-5.010(3).

(C) Turbidity. Measurements of turbidity must be made by a party approved by the department.

(6) Reporting Source Water Monitoring Results.

(A) Systems must report results from the source water monitoring required under section (2) of this rule no later than ten (10) days after the end of the first month following the month when the sample is collected.

(B) All systems serving at least ten thousand (10,000) people must report the results from the initial source water monitoring required under subsection (2)(A) of this rule to the EPA electronically at the web address specified by the EPA for this purpose. If a system is unable to report monitoring results electronically, the system may use an alternative approach for reporting monitoring results that the EPA approves.

(C) Systems serving fewer than ten thousand (10,000) people must report results from the initial source water monitoring required under subsection (2)(A) of this rule to the department.

(D) All systems must report results from the second round of source water monitoring required under subsection (2)(B) of this rule to the department.

(E) Systems must report the following applicable information for the source water monitoring required under section (2) of this rule:

1. For each *Cryptosporidium* analysis—

A. Systems must report the following data elements:

(I) Public water system (PWS) ID;

(II) Facility ID;

(III) Sample collection date;

(IV) Sample type (field or matrix spike);

(V) Sample volume filtered (L), to nearest;

(VI) Was one hundred percent (100%) of filtered volume examined; and

(VII) Number of oocysts counted;

B. For matrix spike samples, systems must also report the sample volume spiked and estimated number of oocysts spiked. These data are not required for field samples;

C. For samples in which less than ten (10) L is filtered or less than one hundred percent (100%) of the sample volume is examined, systems must also report the number of filters used and the packed pellet volume; and

D. For samples in which less than one hundred percent (100%) of sample volume is examined, systems must also report the volume of resuspended concentrate and volume of this resuspension processed through immunomagnetic separation; and

2. For each *E. coli* analysis, systems must report the following data elements:

A. PWS ID;

B. Facility ID;

C. Sample collection date;

D. Analytical method number;

E. Method type;

F. Source type (flowing stream, lake/reservoir, GWUDISW);

G. *E. coli*/100 mL; and

H. Turbidity. (Systems serving fewer than ten thousand (10,000) people that are not required to monitor for turbidity under section (2) of this rule are not required to report turbidity with their *E. coli* results.)

(7) Grandfathering Previously Collected Data.

(A) Systems may use previously collected data to comply with the initial source water monitoring requirements of subsection (2)(A) by grandfathering sample results that were collected before the system is required to begin monitoring. To be grandfathered, the sample results and analysis must meet the criteria in this section and must be approved by the department. A filtered system may grandfather *Cryptosporidium* samples to meet the requirements of subsection (2)(A) when the system does not have corresponding *E. coli* and turbidity samples. A system that grandfathers *Cryptosporidium* samples without *E. coli* and turbidity samples is not required to collect *E. coli* and turbidity samples when the system completes the requirements for *Cryptosporidium* monitoring under subsection (2)(A).

(B) *E. Coli* Sample Analysis. The analysis of *E. coli* samples must meet the analytical method and approved laboratory requirements of 10 CSR 60-5.010(3) and section (5) of this rule.

(C) *Cryptosporidium* Sample Analysis. The analysis of *Cryptosporidium* samples must meet the criteria in this subsection.

1. Laboratories must have analyzed *Cryptosporidium* samples using one (1) of these analytical methods:

A. Method 1623: *Cryptosporidium and Giardia in Water by Filtration/IMS/FA,* 2005, United States Environmental Protection Agency, EPA–815–R–05–002;

B. Method 1622: *Cryptosporidium in Water by Filtration/IMS/FA,* 2005, United States Environmental Protection Agency, EPA–815–R–05–001;

C. Method 1623: *Cryptosporidium and Giardia in Water by Filtration/IMS/FA,* 2001, United States Environmental Protection Agency, EPA–821–R–01–025;

D. Method 1622: *Cryptosporidium in Water by Filtration/IMS/FA,* 2001, United States Environmental Protection Agency, EPA–821–R–01–026;

E. Method 1623: *Cryptosporidium and Giardia in Water by Filtration/IMS/FA,* 1999, United States Environmental Protection Agency, EPA–821–R–99–006; and

F. Method 1622: *Cryptosporidium in Water by Filtration/IMS/FA,* 1999, United States Environmental Protection Agency, EPA–821–R–99–001.

2. For each *Cryptosporidium* sample, the laboratory analyzed at least ten (10) L of sample or at least two (2) mL of packed pellet or as much volume as could be filtered by two (2) filters that EPA approved for the methods listed in paragraph (7)(C)1.

(D) Sampling Location. The sampling location must meet the conditions in section (4) of this rule.

(E) Sampling Frequency. *Cryptosporidium* samples were collected no less frequently than each calendar month on a regular schedule, beginning no earlier than January 1999. Sample collection intervals may vary for the conditions specified in paragraphs (3)(B)1. and 2. of this rule if the system provides documentation of the condition when reporting monitoring results.

1. The department may approve grandfathering of previously collected data where there are time gaps in the sampling frequency if the system conducts additional monitoring the department specifies to ensure that the data used to comply with the initial source water monitoring requirements of subsection (2)(A) of this rule are seasonally representative and unbiased.

2. Systems may grandfather previously collected data where the sampling frequency varied within each month. If the *Cryptosporidium* sampling frequency varied, systems must follow the monthly averaging procedure in paragraph (10)(B)5. of this rule, as applicable, when calculating the bin classification for filtered systems.

(F) Reporting Monitoring Results for Grandfathering. Systems that request to grandfather previously collected monitoring results must report the following information by the applicable dates listed in this subsection. Systems serving at least ten thousand (10,000) people must report this information to the EPA unless the department approves reporting to the department rather than the EPA. Systems serving fewer than ten thousand (10,000) people must report this information to the department.

1. Systems must report that they intend to submit previously collected monitoring results for grandfathering. This report must specify the number of previously collected results the system will submit, the dates of the first and last sample, and whether a system will conduct additional source water monitoring to meet the requirements of subsection (2)(A) of this rule. Systems must report this information no later than the date the sampling schedule under section (3) of this rule is required.

2. Systems must report previously collected monitoring results for grandfathering, along with the associated documentation listed in the following subparagraphs no later than two (2) months after the applicable date listed in subsection (2)(C) of this rule:

A. For each sample result, systems must report the applicable data elements in section (6) of this rule;

B. Systems must certify that the reported monitoring results include all results the system generated during the time period beginning with the first reported result and ending with the final reported result. This applies to samples that were collected from the sampling location specified for source water monitoring under this rule, not spiked, and analyzed using the laboratory's routine process for the analytical methods listed in this section;

C. Systems must certify that the samples were representative of a plant's source water(s) and the source water(s) have not changed. Systems must report a description of the sampling location(s), which must address the position of the sampling location in relation to the system's water source(s) and treatment processes, including points of chemical addition and filter backwash recycle; and

D. For *Cryptosporidium* samples, the laboratory or laboratories that analyzed the samples must provide a letter certifying that the quality control criteria specified in the methods listed in paragraph (7)(C)1. were met for each sample batch associated with the reported results. Alternatively, the laboratory may provide bench sheets and sample

examination report forms for each field, matrix spike, Initial Precision and Recovery (IPR), Ongoing Precision and Recovery (OPR), and method blank sample associated with the reported results.

(G) If the department determines that a previously collected data set submitted for grandfathering was generated during source water conditions that were not normal for the system, such as a drought, the department may disapprove the data. Alternatively, the department may approve the previously collected data if the system reports additional source water monitoring data, as determined by the department, to ensure that the data set used under section (10) of this rule represents average source water conditions for the system.

(H) If a system submits previously collected data that fully meet the number of samples required for initial source water monitoring under subsection (2)(A) of this rule and some of the data are rejected due to not meeting the requirements of this section, systems must conduct additional monitoring to replace rejected data on a schedule the department approves. Systems are not required to begin this additional monitoring until two (2) months after notification that data have been rejected and additional monitoring is necessary.

(8) Disinfection Profiling and Benchmarking Requirements.

(A) Following the completion of initial source water monitoring, a system that plans to make a significant change to its disinfection practice, as defined in this section, must develop disinfection profiles and calculate disinfection benchmarks for *Giardia lamblia* and viruses as described in section (9) of this rule. Prior to changing the disinfection practice, the system must notify the department and must include in this notice the following information:

1. A completed disinfection profile and disinfection benchmark for *Giardia lamblia* and viruses as described in section (9) of this rule;

2. A description of the proposed change in disinfection practice; and

3. An analysis of how the proposed change will affect the current level of disinfection.

(B) Significant changes to disinfection practice are defined as follows:

1. Changes to the point of disinfection;

2. Changes to the disinfectant(s) used in the treatment plant;

3. Changes to the disinfection process; or

4. Any other modification identified by the department as a significant change to disinfection practice.

(9) Developing the Disinfection Profile and Benchmark.

(A) Systems required to develop disinfection profiles under section (8) of this rule must follow the requirements of this section. Systems must monitor at least weekly for a period of twelve (12) consecutive months to determine the total log inactivation for *Giardia lamblia* and viruses. If systems monitor more frequently, the monitoring frequency must be evenly spaced. Systems that operate for fewer than twelve (12) months per year must monitor weekly during the period of operation. Systems must determine log inactivation for *Giardia lamblia* through the entire plant, based on $CT_{99.9}$ values in the *Guidance Manual for Surface Water System Treatment Requirements*, January 1992, as applicable. Systems must determine log inactivation for viruses through the entire treatment plant based on a protocol approved by the department.

(B) Systems with a single point of disinfectant application prior to the entrance to the distribution system must conduct the monitoring specified here. Systems with more than one (1) point of disinfectant application must conduct this monitoring for each disinfection segment. Systems must monitor the parameters necessary to determine the total inactivation ratio, using analytical methods in 10 CSR 60- 5.010.

1. For systems using a disinfectant other than ultraviolet light (UV), the temperature of the disinfected water must be measured at each residual disinfectant concentration sampling point during peak hourly flow or at an alternative location approved by the department.

2. For systems using chlorine, the pH of the disinfected water must be measured at each chlorine residual disinfectant concentration sampling point during peak hourly flow or at an alternative location approved by the department.

3. The disinfectant contact time(s), (t), must be determined during peak hourly flow.

4. The residual disinfectant concentration(s), (C), of the water before or at the first customer and prior to each additional point of disinfectant application must be measured during peak hourly flow.

(C) In lieu of conducting new monitoring under subsection (9)(B), systems may elect to meet the requirements of paragraph (9)(C)1. or 2.

1. Systems that have at least one (1) year of existing data that are substantially equivalent to data collected under the provisions of subsection (9)(B) may use these data to develop disinfection profiles as specified in this section if the system has neither made a significant change to its treatment practice nor changed sources since the data were collected. Systems may develop disinfection profiles using up to three (3) years of existing data.

2. Systems may use disinfection profile(s) developed under 10 CSR 60-4.055(6)(C) in lieu of developing a new profile if the system has neither made a significant change to its treatment practice nor changed sources since the profile was developed. Systems that have not developed a virus profile under 10 CSR 60-4.055(6)(C) must develop a virus profile using the same monitoring data on which the *Giardia lamblia* profile is based.

(D) Systems must calculate the total inactivation ratio for *Giardia lamblia* as specified here.

1. Systems using only one (1) point of disinfectant application may determine the total inactivation ratio for the disinfection segment based on either of the methods in subparagraph (9)(D)1.A. or B.

A. Determine one (1) inactivation ratio ($CT_{calc}/CT_{99.9}$) before or at the first customer during peak hourly flow.

B. Determine 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. The 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 ($\sum (CT_{calc}/CT_{99.9})$).

2. Systems using more than one (1) point of disinfectant application before the first customer must determine the CT 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. The ($CT_{calc}/CT_{99.9}$) value of each segment and ($\sum (CT_{calc}/CT_{99.9})$) must be calculated using the method in subparagraph (9)(D)1.A. of this section.

3. The system must determine the total logs of inactivation by multiplying the value calculated in paragraph (9)(D)1. or 2. by three (3).

4. Systems must calculate the log of inactivation for viruses using a protocol approved by the department.

(E) Systems must use the procedures specified in paragraphs (9)(E)1. and 2. to calculate a disinfection benchmark.

1. For each year of profiling data collected and calculated under subsections (9)(A)–(D) of this rule, systems must determine the lowest mean monthly level of both *Giardia lamblia* and virus inactivation. Systems must determine the mean *Giardia lamblia* and virus inactivation for each calendar month for each year of profiling data by dividing the sum of daily or weekly *Giardia lamblia* and virus log inactivation by the number of values calculated for that month.

2. The disinfection benchmark is the lowest monthly mean value (for systems with one (1) year of profiling data) or the mean of the lowest monthly mean values (for systems with more than one (1) year of profiling data) of *Giardia lamblia* and virus log inactivation in each year of profiling data.

(10) Bin Classification for Filtered Systems.

(A) Following completion of the initial round of source water monitoring required under subsection (2)(A) of this rule, filtered systems must calculate an initial *Cryptosporidium* bin concentration for each plant for which monitoring was required. Calculation of the bin concentration must use the *Cryptosporidium* results reported under subsection (2)(A) of this rule and must follow the procedures in subsection (10)(B) of this rule.

(B) Procedures for Bin Determination.

1. For systems that collect a total of at least forty-eight (48) samples, the bin concentration is equal to the arithmetic mean of all sample concentrations.

2. For systems that collect a total of at least twenty-four (24) samples, but not more than forty-seven (47) samples, the bin concentration is equal to the highest arithmetic mean of all sample concentrations in any twelve (12) consecutive months during which *Cryptosporidium* samples were collected.

3. For systems that serve fewer than ten thousand (10,000) people and monitor for *Cryptosporidium* for only one (1) year (that is, collect twenty-four (24) samples in twelve (12) months), the bin concentration is equal to the arithmetic mean of all sample concentrations.

4. For systems with plants operating only part of the year that monitor fewer than twelve (12) months per year under subsection (2)(E) of this rule, the bin concentration is equal to the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

5. If the monthly *Cryptosporidium* sampling frequency varies, systems must first calculate a monthly average for each month of monitoring. Systems must then use these monthly average concentrations, rather than individual sample concentrations, in the applicable calculation for bin classification in paragraphs (10)(B)1.–5. of this rule.

(C) Filtered systems must determine their initial bin classification from the following table and using the *Cryptosporidium* bin concentration calculated under subsections (10)(A) and (B).

Bin Classification Table for Filtered Systems

For systems that are:	With a *Cryptosporidium* bin concentration (based on calculations in subsection (10)(A) or (10)(B) as applicable) of:	The bin classification is:
Required to monitor for *Cryptosporidium* under section (2) of this rule.	*Cryptosporidium* < 0.075 oocyst/L	Bin 1
	0.075 oocysts/L ≤ *Cryptosporidium* < 1.0 oocysts/L	Bin 2
	1.0 oocysts/L ≤ *Cryptosporidium* < 3.0 oocysts/L	Bin 3
	Cryptosporidium ≥ 3.0 oocysts/L	Bin 4
Serving fewer than 10,000 people and NOT required to monitor for *Cryptosporidium* under paragraph (2)(A)3.	NA	Bin 1

(D) Following completion of the second round of source water monitoring required under subsection (2)(B), filtered systems must recalculate their *Cryptosporidium* bin concentration using the *Cryptosporidium* results reported under subsection (2)(B) and following the procedures in paragraphs (10)(B)1. through 4. Systems must then redetermine their bin classification using this bin concentration and the table in subsection (10)(C) of this rule.

(E) Reporting Bin Classification Requirements.

1. Filtered systems must report their initial bin classification under subsection (10)(C) to the department for approval no later than six (6) months after the system is required to complete initial source water monitoring based on the schedule in subsection (2)(C) of this rule.

2. Systems must report their bin classification under subsection (10)(D) to the department for approval no later than six (6) months after the system is required to complete the second round of source water monitoring based on the schedule in subsection (2)(C) of this rule.

3. The bin classification report to the department must include a summary of source water monitoring data and the calculation procedure used to determine bin classification.

(F) Failure to comply with the conditions of subsection (10)(E) of this rule is a violation of the treatment technique requirement.

(11) Additional *Cryptosporidium* Treatment Requirements.

(A) Filtered systems must provide the level of additional treatment for *Cryptosporidium* specified in this subsection based on their bin classification as determined under section (10) of this rule and according to the schedule in section (12) of this rule.

If the system bin classification is:	And the system uses the following filtration treatment in full compliance with 10 CSR 60-4.050, 10 CSR 60-4.055, and 10 CSR 60-7.010 (as applicable), then the additional *Cryptosporidium* treatment requirements are:			
	Conventional filtration treatment (including softening)	Direct Filtration	Slow sand or diatomaceous earth filtration	Alternative filtration technologies
Bin 1	No additional treatment	No additional treatment	No additional treatment	No additional treatment
Bin 2	1-log treatment	1.5-log treatment	1-log treatment	As determined by the department such that the total *Cryptosporidium* removal and inactivation is at least 4.0-log.
Bin 3	2-log treatment	2.5-log treatment	2-log treatment	As determined by the department such that the total *Cryptosporidium* removal and inactivation is at least 5.0-log.
Bin 4	2.5-log treatment	3-log treatment	2.5-log treatment	As determined by the department such that the total *Cryptosporidium* removal and inactivation is at least 5.5-log.

(B) Filtered systems must use one (1) or more of the treatment and management options listed in section (13) of this rule, termed the Microbial Toolbox, to comply with the additional *Cryptosporidium* treatment required in subsection (11)(A) of this rule.

1. Systems classified in Bin 3 and Bin 4 must achieve at least 1-log of the additional *Cryptosporidium* treatment required under subsection (11)(A) of this rule using either one (1) or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV, as described in sections (14) through (18) of this rule.

(C) Failure by a system in any month to achieve treatment credit by meeting criteria in sections (14) through (18) of this rule for microbial toolbox options that is at least equal to the level of treatment required in subsection (11)(A) of this rule is a violation of the treatment technique requirement.

(D) If the department determines during a sanitary survey or an equivalent source water assessment that, after a system completed the monitoring conducted under subsection (2)(A) or (2)(B) of this rule, significant changes occurred in the system's watershed that could lead to increased contamination of the source water by *Cryptosporidium,* the system must take actions specified by the department to address the contamination. These actions may include additional source water monitoring and/or implementing microbial toolbox options listed in section (13) of this rule.

(12) Schedule for Compliance With *Cryptosporidium* Treatment Requirements.

(A) Following initial bin classification under subsection (10)(C), filtered systems must provide the level of treatment for *Cryptosporidium* required under section (11) according to the following *Cryptosporidium* treatment compliance dates.

Cryptosporidium Treatment Compliance Dates Table	
Systems that serve:	Must comply with *Cryptosporidium* treatment requirements no later than the following dates, except that the department may allow up to an additional two (2) years for complying with the treatment requirement for systems making capital improvements:
1. At least 100,000 people	April 1, 2012
2. From 50,000 to 99,999 people	October 1, 2012
3. From 10,000 to 49,999 people	October 1, 2013
4. Fewer than 10,000 people	October 1, 2014

(B) If the bin classification for a filtered system changes following the second round of source water monitoring, as determined under subsection (10)(D) of this rule, the system must provide the level of treatment for *Cryptosporidium* required under section (11) of this rule on a schedule the department approves.

(13) Microbial Toolbox Options for Meeting *Cryptosporidium* Treatment Requirements.

(A) Systems receive the treatment credit listed in the table in subsection (13)(B) of this rule by meeting the conditions for microbial toolbox options described in sections (14) through (18) of this rule. Systems apply these treatment credits to meet the treatment requirements in section (11) of this rule, as applicable.

(B) The following table summarizes options in the microbial toolbox:

Microbial Toolbox Summary Table: Options, Treatment Credit, and Criteria

Toolbox Option	*Cryptosporidium* treatment credit with design and implementation criteria
Source Protection and Management Toolbox Options	
Watershed control program	0.5-log credit for department-approved program comprising required elements, annual program status report to the department, and regular watershed survey. Specific criteria are in subsection (14)(A).
Alternative source/intake management	No prescribed credit. Systems may conduct simultaneous monitoring for treatment bin classification at alternative intake locations or under alternative intake management strategies. Specific criteria are in subsection (14)(B).
Pre-Filtration Toolbox Options	
Presedimentation basin with coagulation	0.5-log credit during any month that presedimentation basins achieve a monthly mean reduction of 0.5-log or greater in turbidity or alternative department-approved performance criteria. To be eligible, basins must be operated continuously with coagulant addition and all plant flow must pass through basins. Specific criteria are in subsection (15)(A).
Two-stage lime softening	0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All plant flow must pass through both stages. Single-stage softening is credited as equivalent to conventional treatment. Specific criteria are in subsection (15)(B).
Bank filtration	0.5-log credit for 25-foot setback; 1.0-log credit for 50-foot setback; aquifer must be unconsolidated sand containing at least 10 percent fines; average turbidity in wells must be less than 1 NTU. Systems using wells followed by filtration when conducting source water monitoring must sample the well to determine bin classification and are not eligible for additional credit. Specific criteria are in subsection (15)(C).
Treatment Performance Toolbox Options	
Combined filter performance	0.5-log credit for combined filter effluent turbidity less than or equal to 0.15 NTU in at least 95 percent of measurements each month. Specific criteria are in subsection (16)(A).
Individual filter performance	0.5-log credit (in addition to 0.5-log combined filter performance credit) if individual filter effluent turbidity is less than or equal to 0.15 NTU in at least 95 percent of samples each month in each filter and is never greater than 0.3 NTU in two consecutive measurements in any filter. Specific criteria are in subsection (16)(B).
Demonstration of performance	Credit awarded to unit process or treatment train based on a demonstration to the department with a department-approved protocol. Specific criteria are in subsection (16)(C).
Bag or cartridge filters (individual filters)	Up to 2-log credit based on the removal efficiency demonstrated during challenge testing with a 1.0-log factor of safety. Specific criteria are in subsection (17)(A).
Bag or cartridge filters (in series)	Up to 2.5-log credit based on the removal efficiency demonstrated during challenge testing with a 0.5-log factor of safety. Specific criteria are in subsection (17)(A).
Membrane filtration	Log credit equivalent to removal efficiency demonstrated in challenge test for device if supported by direct integrity testing. Specific criteria are in subsection (17)(B).

Second stage filtration	0.5-log credit for second separate granular media filtration stage if treatment train includes coagulation prior to first filter. Specific criteria are in subsection (17)(C).
Slow sand filtration	2.5-log credit as a secondary filtration step; 3.0-log credit as a primary filtration process. No prior chlorination for either option. Specific criteria are in subsection (17)(D).
Inactivation Toolbox Options	
Chlorine dioxide	Log credit based on measured CT in relation to CT table. Specific criteria in subsection (18)(B).
Ozone	Log credit based on measured CT in relation to CT table. Specific criteria in subsection (18)(B).
Ultra-violet	Log credit based on validated UV dose in relation to UV dose table; reactor validation testing required to establish UV dose and associated operating conditions. Specific criteria in subsection (18)(D).

(14) Source Toolbox Components.

(A) Watershed Control Program. Systems receive 0.5-log *Cryptosporidium* treatment credit for implementing a watershed control program that meets the requirements of this section.

1. Systems that intend to apply for the watershed control program credit must notify the department of this intent no later than two (2) years prior to the treatment compliance date applicable to the system in section (12) of this rule.

2. Systems must submit to the department a proposed watershed control plan no later than one (1) year before the applicable treatment compliance date in section (12) of this rule. The department must approve the watershed control plan for the system to receive watershed control program treatment credit. The watershed control plan must include the elements in subparagraphs (14)(A)2.A.–D. of this rule.

A. Identification of an "area of influence" outside of which the likelihood of *Cryptosporidium* or fecal contamination affecting the treatment plant intake is not significant. This is the area to be evaluated in future watershed surveys under subparagraph (14)(A)5.B.

B. Identification of both potential and actual sources of *Cryptosporidium* contamination and an assessment of the relative impact of these sources on the system's source water quality.

C. An analysis of the effectiveness and feasibility of control measures that could reduce *Cryptosporidium* loading from sources of contamination to the system's source water.

D. A statement of goals and specific actions the system will undertake to reduce source water *Cryptosporidium* levels. The plan must explain how the 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 completing specific actions identified in the plan.

3. Systems with existing watershed control programs (that is, programs in place on January 5, 2006) are eligible to seek this credit. Their watershed control plans must meet the criteria in paragraph (14)(A)2. of this rule and must specify ongoing and future actions that will reduce source water *Cryptosporidium* levels.

4. If the department does not respond to a system regarding approval of a watershed control plan submitted under this section and the system meets the other requirements of this section, the watershed control program will be considered approved and 0.5-log *Cryptosporidium* treatment credit will be awarded unless and until the department subsequently withdraws such approval.

5. Systems must complete the actions in subparagraphs (14)(A)5.A.–C. of this rule to maintain the 0.5-log credit.

A. Submit an annual watershed control program status report to the department. The annual watershed control program status report must describe the system's implementation of the approved plan and assess the adequacy of the plan to meet its goals. It must explain how the system is addressing any shortcomings in plan implementation, including those previously identified by the department or as the result of the watershed survey conducted under subparagraph (14)(A)5.B. of this rule. It must also describe any significant changes that have occurred in the watershed since the last watershed sanitary survey. If a system determines during implementation that making a significant change to its approved watershed control program is necessary, the system must notify the department prior to making any such changes. If any change is likely to reduce the level of source water protection, the system must also list in its notification the actions the system will take to mitigate this effect.

B. Undergo a watershed sanitary survey every three (3) years for community water systems and every five (5) years for noncommunity water systems and submit the survey report to the department. The survey must be conducted according to department guidelines and by persons the department approves.

(I) The watershed sanitary survey must meet the following criteria: encompass the region identified in the department-approved watershed control plan as the area of influence; assess the implementation of actions to reduce source water *Cryptosporidium* levels; and identify any significant new sources of *Cryptosporidium*.

(II) If the department determines that significant changes may have occurred in the watershed since the previous watershed

sanitary survey, systems must undergo another watershed sanitary survey by a date the department requires, which may be earlier than the regular date in subparagraph (14)(A)5.B. of this rule.

C. The system must make the watershed control plan, annual status reports, and watershed sanitary survey reports available to the public upon request. These documents must be in a plain language style and include criteria by which to evaluate the success of the program in achieving plan goals. The department may approve systems to withhold from the public portions of the annual status report, watershed control plan, and watershed sanitary survey based on water supply security considerations.

6. If the department determines that a system is not carrying out the approved watershed control plan, the department may withdraw the watershed control program treatment credit.

(B) Alternative Source Requirements.

1. A system may conduct source water monitoring that reflects a different intake location (either in the same source or for an alternate source) or a different procedure for the timing or level of withdrawal from the source (alternative source monitoring). If the department approves, a system may determine its bin classification under section (10) of this rule based on the alternative source monitoring results.

2. If systems conduct alternative source monitoring under paragraph (14)(B)1. of this rule, systems must also monitor their current plant intake concurrently as described in section (2) of this rule.

3. Alternative source monitoring under paragraph (14)(B)1. of this rule must meet the requirements for source monitoring to determine bin classification, as described in sections (2)–(6) of this rule. Systems must report the alternative source monitoring results to the department, along with supporting information documenting the operating conditions under which the samples were collected.

4. If a system determines its bin classification under section (10) of this rule using alternative source 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 withdrawal procedure, as applicable, no later than the applicable treatment compliance date in section (12) of this rule.

(15) Pre-Filtration Treatment Toolbox Components.

(A) Presedimentation. Systems receive 0.5-log *Cryptosporidium* treatment credit for a presedimentation basin during any month the process meets the criteria in this subsection.

1. The presedimentation basin must be in continuous operation and must treat the entire plant flow taken from a surface water or GWUDISW source.

2. The system must continuously add a coagulant to the presedimentation basin.

3. The presedimentation basin must achieve the performance criteria in subparagraph (15)(A)3.A. or B. of this rule.

A. Demonstrates at least 0.5-log mean reduction of influent turbidity. This reduction must be determined using daily turbidity measurements in the presedimentation process influent and effluent and must be calculated as follows: $\log_{10}$(monthly mean of daily influent turbidity) − $\log_{10}$(monthly mean of daily effluent turbidity).

B. Complies with department-approved performance criteria that demonstrate at least 0.5-log mean removal of micron-sized particulate material through the presedimentation process.

(B) Two (2)-Stage Lime Softening. Systems receive an additional 0.5-log *Cryptosporidium* treatment credit for a two (2)-stage lime softening plant if chemical addition and hardness precipitation occur in two (2) separate and sequential softening stages prior to filtration. Both softening stages must treat the entire plant flow taken from a surface water or GWUDISW source.

(C) Bank Filtration. Systems receive *Cryptosporidium* treatment credit for bank filtration that serves as pretreatment to a filtration plant by meeting the criteria in this subsection. Systems using bank filtration when they begin source water monitoring under subsection (2)(A) of this rule must collect samples as described in subsection (4)(D) of this rule and are not eligible for this credit.

1. Wells with a ground water flow path of at least twenty-five feet (25') receive 0.5-log treatment credit; wells with a ground water flow path of at least fifty feet (50') receive 1.0-log treatment credit. The ground water flow path must be determined as specified in paragraph (15)(C)4. of this rule.

2. Only wells in granular aquifers are eligible for treatment credit. Granular aquifers are those comprised of sand, clay, silt, rock fragments, pebbles or larger particles, and minor cement. A system must characterize the aquifer at the well site to determine aquifer properties. Systems must extract a core from the aquifer and demonstrate that, in at least ninety percent (90%) of the core length, grains less than 1.0 mm in diameter constitute at least ten percent (10%) of the core material.

3. Only horizontal and vertical wells are eligible for treatment credit.

4. For vertical wells, the ground water flow path is the measured distance from the edge of the surface water body under high flow conditions (determined by the one hundred (100)-year floodplain elevation boundary or by the floodway, as defined in Federal Emergency Management Agency flood hazard maps) to the well screen. For horizontal wells, the ground water flow path is the measured distance from the bed of the river under normal flow conditions to the closest horizontal well lateral screen.

5. Systems must monitor each wellhead for turbidity at least once every four (4) hours while the bank filtration process is in operation. If monthly average turbidity levels, based on daily maximum values in the well, exceed one (1) nephelometric turbidity unit (NTU), the system must report this result to the department and conduct an assessment within thirty (30) days to determine the cause of the high turbidity levels in the well. If the department determines that microbial removal has been compromised, the department may revoke treatment credit until the system implements corrective actions approved by the department to remediate the problem.

6. Springs and infiltration galleries are not eligible for treatment credit under this section but are eligible for credit under subsection (16)(C) of this rule.

7. Bank filtration demonstration of performance. The department may approve *Cryptosporidium* treatment credit for bank filtration based on a demonstration of performance study that meets the criteria in this subsection. This treatment credit may be greater than 1.0-log and may be awarded to bank filtration that does not meet the criteria in paragraphs (15)(C)1.–5. of this rule.

A. The study must follow a department-approved protocol and must involve the collection of data on the removal of *Cryptosporidium* or a surrogate for *Cryptosporidium* and related hydrogeologic and water quality parameters during the full range of operating conditions.

B. The study must include sampling both from the production well(s) and from monitoring wells that are screened and located along the shortest flow path between the surface water source and the production well(s).

(16) Treatment Performance Toolbox Components.

(A) Combined Filter Performance. Systems using conventional filtration treatment or direct filtration treatment receive an additional 0.5-log *Cryptosporidium* treatment credit during any month the system meets the criteria in this subsection. Combined filter effluent (CFE) turbidity must be less than or equal to 0.15 NTU in at least ninety-five percent (95%) of the measurements. Turbidity must be measured as described in 10 CSR 60-4.050(3) and 10 CSR 60-4.080(3).

(B) Individual Filter Performance. Systems using conventional filtration treatment or direct filtration treatment receive 0.5-log *Cryptosporidium* treatment credit, which can be in addition to the 0.5-log credit under subsection (16)(A) during any month the system meets the criteria in this subsection. Compliance with these criteria must be based on individual filter turbidity monitoring as described in 10 CSR 60-4.050(3)(E) and 10 CSR 60-7.010(7).

1. The filtered water turbidity for each individual filter must be less than or equal to 0.15 NTU in at least ninety-five percent (95%) of the measurements recorded each month.

2. No individual filter may have a measured turbidity greater than 0.3 NTU in two (2) consecutive measurements taken fifteen (15) minutes apart.

3. Any system that has received treatment credit for individual filter performance and fails to meet the requirements of paragraph (16)(B)1. or 2. of this rule during any month does not receive a treatment technique violation under subsection (11)(C) of this rule if the department determines the following:

A. The failure was due to unusual and short-term circumstances that could not reasonably be prevented through optimizing treatment plant design, operation, and maintenance; and

B. The system has experienced no more than two (2) such failures in any calendar year.

(C) Demonstration of Performance. The department may approve *Cryptosporidium* treatment credit for drinking water treatment processes based on a demonstration of performance study that meets the criteria in this subsection. This treatment credit may be greater than or less than the prescribed treatment credits in section (11) or section (15) through section (18) of this rule and may be awarded to treatment processes that do not meet the criteria for the prescribed credits.

1. Systems cannot receive the prescribed treatment credit for any toolbox option in sections (15) through (18) if that toolbox option is included in a demonstration of performance study for which treatment credit is awarded under this paragraph.

2. The demonstration of performance study must follow a department-approved protocol and must demonstrate the level of *Cryptosporidium* reduction the treatment process will achieve under the full range of expected operating conditions for the system.

3. Approval by the department 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. The department may designate such criteria, where necessary, to verify that the conditions under which the demonstration of performance credit was approved are maintained during routine operation.

(17) Additional Filtration Toolbox Components.

(A) Bag and Cartridge Filters. Systems receive *Cryptosporidium* treatment credit of up to 2.0-log for individual bag or cartridge filters and up to 2.5-log for bag or cartridge filters operated in series by meeting the criteria in paragraphs (17)(A)1. through 10. of this section. To be eligible for this credit, systems must report the results of challenge testing that meets the requirements of paragraphs (17)(A)2. through 9. to the department. The filters must treat the entire plant flow taken from a surface water or ground water under the direct influence of surface water source.

1. The *Cryptosporidium* treatment credit awarded to bag or cartridge filters must be based on the removal efficiency demonstrated during challenge testing that is conducted according to the criteria in paragraphs (17)(A)2. through 9. A factor of safety equal to 1-log for individual bag or cartridge filters and 0.5-log for bag or cartridge filters in series must be applied to challenge testing results to determine removal credit. Systems may use results from challenge testing conducted prior to January 5, 2006, if the prior testing was consistent with the criteria specified in paragraphs (17)(A)2. through 9.

2. Challenge testing must be performed on full-scale bag or cartridge filters, and the associated filter housing or pressure vessel, that are identical in material and construction to the filters and housings the system will use for removal of *Cryptosporidium*. Bag or cartridge filters must be challenge tested in the same configuration that the system will use, either as individual filters or as a series configuration of filters.

3. Challenge testing must be conducted using *Cryptosporidium* or a surrogate that is removed no more efficiently than *Cryptosporidium*. The microorganism or surrogate used during challenge testing is referred to as the challenge particulate. The concentration of the challenge particulate must be determined using a method capable of discretely quantifying the specific microorganism or surrogate used in the test; gross measurements such as turbidity may not be used.

4. The maximum feed water concentration that can be used during a challenge test must be based on the detection limit of the challenge particulate in the filtrate (i.e., filtrate detection limit) and must be calculated using the following equation:

Maximum Feed Concentration = $1 \times 10^4 \times$ (Filtrate Detection Limit).

5. Challenge testing must be conducted at the maximum design flow rate for the filter as specified by the manufacturer.

6. Each filter evaluated must be tested for a duration sufficient to reach one hundred percent (100%) of the terminal pressure drop, which establishes the maximum pressure drop under which the filter may be used to comply with the requirements of this rule.

7. Removal efficiency of a filter must be determined from the results of the challenge test and expressed in terms of log removal values using the following equation:

$$LRV = LOG_{10}(C_f) - LOG_{10}(C_p)$$

Where:

LRV = log removal value demonstrated during challenge testing

C_f = the feed concentration measured during the challenge test

C_p = the filtrate concentration measured during the challenge test

In applying this equation, the same units must be used for the feed and filtrate concentrations. If the challenge particulate is not detected in the filtrate, then the term C_p must be set equal to the detection limit.

8. Each filter tested must be challenged with the challenge particulate during three (3) periods over the filtration cycle: within two (2) hours of start-up of a new filter; when the pressure drop is between forty-five percent and fifty-five percent (45%–55%) of the terminal pressure drop; and at the end of the cycle after the pressure drop has reached one hundred percent (100%) of the terminal pressure drop. An LRV must be calculated for each of these challenge periods for each filter tested. The LRV for the filter (LRV_{filter}) must be assigned the value of the minimum LRV

observed during the three (3) challenge periods for that filter.

9. If fewer than twenty (20) filters are tested, the overall removal efficiency for the filter product line must be set equal to the lowest LRV_{filter} among the filters tested. If twenty (20) or more filters are tested, the overall removal efficiency for the filter product line must be set equal to the 10th percentile of the set of LRV_{filter} values for the various filters tested. The percentile is defined by (i/(n+1)) where i is the rank of n individual data points ordered lowest to highest. If necessary, the 10th percentile may be calculated using linear interpolation.

10. If a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and submitted to the department.

(B) Membrane Filtration Requirements.

1. Systems receive *Cryptosporidium* treatment credit for membrane filtration that meets the criteria of this paragraph. Membrane cartridge filters that meet the definition of membrane filtration in 10 CSR 60-2.015 are eligible for this credit. The level of treatment credit a system receives is equal to the lower of the values determined under subparagraphs (17)(B)1.A. and B.

A. The removal efficiency demonstrated during challenge testing conducted under the conditions in paragraph (17)(B)2.

B. The maximum removal efficiency that can be verified through direct integrity testing used with the membrane filtration process under the conditions in paragraph (17)(B)3.

2. Challenge testing. The membrane used by the system must undergo challenge testing to evaluate removal efficiency, and the system must report the results of challenge testing to the department. Challenge testing must be conducted according to the criteria in subparagraphs (17)(B)2.A. through H. Systems may use data from challenge testing conducted prior to January 5, 2006, if the prior testing was consistent with the criteria in subparagraphs (17)(B)2.A. through G.

A. Challenge testing must be conducted on either a full-scale membrane module, identical in material and construction to the membrane modules used in the system's treatment facility, or a smaller-scale membrane module, identical in material and similar in construction to the full-scale module. A module is defined as the smallest component of a membrane unit in which a specific membrane surface area is housed in a device with a filtrate outlet structure.

B. Challenge testing must be conducted using *Cryptosporidium* oocysts or a surrogate that is removed no more efficiently than *Cryptosporidium* oocysts. The organism or surrogate used during challenge testing is referred to as the challenge particulate. The concentration of the challenge particulate, in both the feed and filtrate water, must be determined using a method capable of discretely quantifying the specific challenge particulate used in the test; gross measurements such as turbidity may not be used.

C. The maximum feed water concentration that can be used during a challenge test is based on the detection limit of the challenge particulate in the filtrate and must be determined according to the following equation:

$$\text{Maximum Feed Concentration} = 3.16 \times 10^6 \times \text{(Filtrate Detection Limit)}$$

D. Challenge testing must be conducted under representative hydraulic conditions at the maximum design flux and maximum design process recovery specified by the manufacturer for the membrane module. Flux is defined as the throughput of a pressure-driven membrane process expressed as flow per unit of membrane area. Recovery is defined as the volumetric percent of feed water that is converted to filtrate over the course of an operating cycle uninterrupted by events such as chemical cleaning or a solids removal process (i.e., backwashing).

E. Removal efficiency of a membrane module must be calculated from the challenge test results and expressed as a log removal value according to the following equation:

$$LRV = LOG_{10}(C_f) - LOG_{10}(C_p)$$

Where:

LRV = log removal value demonstrated during the challenge test

C_f = the feed concentration measured during the challenge test

C_p = the filtrate concentration measured during the challenge test

Equivalent units must be used for the feed and filtrate concentrations. If the challenge particulate is not detected in the filtrate, the term C_p is set equal to the detection limit for the purpose of calculating the LRV. An LRV must be calculated for each membrane module evaluated during the challenge test.

F. The removal efficiency of a membrane filtration process demonstrated during challenge testing must be expressed as a log removal value ($LRV_{C\text{-}Test}$). If fewer than twenty (20) modules are tested, then $LRV_{C\text{-}Test}$ is equal to the lowest of the representative LRVs among the modules tested. If twenty (20) or more modules are tested, then $LRV_{C\text{-}Test}$ is equal to the 10th percentile of the representative LRVs among the modules tested. The percentile is defined by (i/(n+1)) where i is the rank of n individual data points ordered lowest to highest. If necessary, the 10th percentile may be calculated using linear interpolation.

G. The challenge test must establish a quality control release value (QCRV) for a non-destructive performance test that demonstrates the *Cryptosporidium* removal capability of the membrane filtration module. This performance test must be applied to each production membrane module used by the system that was not directly challenge tested in order to verify *Cryptosporidium* removal capability. Production modules that do not meet the established QCRV are not eligible for the treatment credit demonstrated during the challenge test.

H. If a previously tested membrane is modified in a manner that could change the removal efficiency of the membrane or the applicability of the non-destructive performance test and associated QCRV, additional challenge testing to demonstrate the removal efficiency of, and determine a new QCRV for, the modified membrane must be conducted and submitted to the department.

3. Direct integrity testing. Systems must 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 and meets the requirements described in subparagraphs (17)(B)3.A.–G. of this rule. A direct integrity test is defined as a physical test applied to a membrane unit in order to identify and isolate integrity breaches (that is, one (1) or more leaks that could result in contamination of the filtrate).

A. The direct integrity test must be independently applied to each membrane unit in service. A membrane unit is defined as a group of membrane modules that share common valving that allows the unit to be isolated from the rest of the system for the purpose of integrity testing or other maintenance.

B. The direct integrity method must have a resolution of three (3) micrometers or less, where resolution is defined as the size of the smallest integrity breach that contributes to a response from the direct integrity test.

C. The direct integrity test must have a sensitivity sufficient to verify the log treatment credit awarded to the membrane filtration process by the department, where sensitivity is defined as the maximum log removal value that can be reliably verified by a direct integrity test. Sensitivity must be determined

using the approach in either part (17)(B)3.C.(I) or (II) of this section as applicable to the type of direct integrity test the system uses.

(I) For direct integrity tests that use an applied pressure or vacuum, the direct integrity test sensitivity must be calculated according to the following equation:

$$LRV_{DIT} = LOG_{10} (Q_p /(VCF \times Q_{breach}))$$

Where:

LRV_{DIT} = the sensitivity of the direct integrity test

Q_p = total design filtrate flow from the membrane unit

Q_{breach} = flow of water from an integrity breach associated with the smallest integrity test response that can be reliably measured

VCF = volumetric concentration factor

The volumetric concentration factor is the ratio of the suspended solids concentration on the high pressure side of the membrane relative to that in the feed water.

(II) For direct integrity tests that use a particulate or molecular marker, the direct integrity test sensitivity must be calculated according to the following equation:

$$LRV_{DIT} = LOG_{10}(C_f) - LOG_{10}(C_p)$$

Where:

LRV_{DIT} = the sensitivity of the direct integrity test

C_f = the typical feed concentration of the marker used in the test

C_p = the filtrate concentration of the marker from an integral membrane unit

D. Systems must establish a control limit within the sensitivity limits of the direct integrity test that is indicative of an integral membrane unit capable of meeting the removal credit awarded by the department.

E. If the result of a direct integrity test exceeds the control limit established under subparagraph (17)(B)3.D., the system must remove the membrane unit from service. Systems must conduct a direct integrity test to verify any repairs and may return the membrane unit to service only if the direct integrity test is within the established control limit.

F. Systems must conduct direct integrity testing on each membrane unit at a frequency of not less than once each day that the membrane unit is in operation. The department may approve less frequent testing, based on demonstrated process reliability, the use of multiple barriers effective for *Cryptosporidium*, or reliable process safeguards.

4. Indirect integrity monitoring. Systems must conduct continuous indirect integrity monitoring on each membrane unit according to the criteria in subparagraphs (17)(B)4.A. through E. Indirect integrity monitoring is defined as monitoring some aspect of filtrate water quality that is indicative of the removal of particulate matter. A system that implements continuous direct integrity testing of membrane units in accordance with the criteria in subparagraphs (17)(B)3.A. through E. of this section is not subject to the requirements for continuous indirect integrity monitoring. Systems must submit a monthly report to the department summarizing all continuous indirect integrity monitoring results triggering direct integrity testing and the corrective action that was taken in each case.

A. Unless the department approves an alternative parameter, continuous indirect integrity monitoring must include continuous filtrate turbidity monitoring.

B. Continuous monitoring must be conducted at a frequency of no less than once every fifteen (15) minutes.

C. Continuous monitoring must be separately conducted on each membrane unit.

D. If indirect integrity monitoring includes turbidity and if the filtrate turbidity readings are above 0.15 NTU for a period greater than fifteen (15) minutes (i.e., two (2) consecutive fifteen (15)-minute readings above 0.15 NTU), direct integrity testing must immediately be performed on the associated membrane unit as specified in subparagraphs (17)(B)3.A. through E.

E. If indirect integrity monitoring includes a department-approved alternative parameter and if the alternative parameter exceeds a department-approved control limit for a period greater than fifteen (15) minutes, direct integrity testing must immediately be performed on the associated membrane units as specified in subparagraphs (17)(B)3.A. through E.

(C) Second Stage Filtration. Systems receive 0.5-log *Cryptosporidium* treatment credit for a separate second stage of filtration that consists of sand, dual media, granular activated carbon (GAC), or other fine grain media following granular media filtration if the department approves. To be eligible for this credit, 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 surface water or GWUDISW source. A cap, such as GAC, on a single stage of filtration is not eligible for this credit. The department must approve the treatment credit based on an assessment of the design characteristics of the filtration process.

(D) Slow Sand Filtration (as Secondary Filter). Systems are eligible to receive 2.5-log *Cryptosporidium* treatment credit for a slow sand filtration process that follows a separate stage of filtration if both filtration stages treat entire plant flow taken from a surface water or GWUDISW source and no disinfectant residual is present in the influent water to the slow sand filtration process. The department must approve the treatment credit based on an assessment of the design characteristics of the filtration process. This subsection does not apply to treatment credit awarded to slow sand filtration used as a primary filtration process.

(18) Inactivation Toolbox Components.

(A) Calculation of CT Values.

1. CT is the product of the disinfectant contact time (T, in minutes) and disinfectant concentration (C, in milligrams per liter). Systems with treatment credit for chlorine dioxide or ozone under subsection (18)(B) or (C) must calculate CT at least once each day, with both C and T measured during peak hourly flow as specified in 10 CSR 60-5.010, 10 CSR 60-5.020, and the *Guidance Manual for Surface Water System Treatment Requirements*, January 1992.

2. Systems with several disinfection segments in sequence may calculate CT for each segment, where a disinfection segment is defined as a treatment unit process with a measurable disinfectant residual level and a liquid volume. Under this approach, systems must add the *Cryptosporidium* CT values in each segment to determine the total CT for the treatment plant.

(B) CT Values for Chlorine Dioxide and Ozone.

1. Systems receive the *Cryptosporidium* treatment credit listed in this table by meeting the corresponding chlorine dioxide CT value for the applicable water temperature, as described in subsection (18)(A). Systems may use this equation to determine log credit between the indicated values:

$$\text{Log credit} = (0.001506 \times (1.09116)^{\text{Temp}}) \times CT$$

CT Values (MG-MIN/L) for *Cryptosporidium* Inactivation By Chlorine Dioxide

Log credit	Water temperature, °C										
	≤ 0.5	1	2	3	5	7	10	15	20	25	30
0.25	159	153	140	128	107	90	69	45	29	19	12
0.5	319	305	279	256	214	180	138	89	58	38	24
1.0	637	610	558	511	429	360	277	179	116	75	49
1.5	956	915	838	767	643	539	415	268	174	113	73
2.0	1275	1220	1117	1023	858	719	553	357	232	150	98
2.5	1594	1525	1396	1278	1072	899	691	447	289	188	122
3.0	1912	1830	1675	1534	1286	1079	830	536	347	226	147

2. Systems receive the *Cryptosporidium* treatment credit listed in this table by meeting the corresponding ozone CT values for the applicable water temperature, as described in subsection (18)(A) of this rule.

CT Values (MG-MIN/L) for *Cryptosporidium* Inactivation by Ozone

Systems may use this equation to determine log credit between the indicated values: Log credit = $(0.0397 \times (1.09757)^{temp}) \times CT$

Log credit	Water Temperature, °C										
	≤ 0.5	1	2	3	5	7	10	15	20	25	30
0.25	6.0	5.8	5.2	4.8	4.0	3.3	2.5	1.6	1.0	0.6	0.39
0.5	12	12	10	9.5	7.9	6.5	4.9	3.1	2.0	1.2	0.78
1.0	24	23	21	19	16	13	9.9	6.2	3.9	2.5	1.6
1.5	36	35	31	29	24	20	15	9.3	5.9	3.7	2.4
2.0	48	46	42	38	32	26	20	12	7.8	4.9	3.1
2.5	60	58	52	48	40	33	25	16	9.8	6.2	3.9
3.0	72	69	63	57	47	39	30	19	12	7.4	4.7

(C) Site-Specific Study. The department may approve alternative chlorine dioxide or ozone CT values to those listed in subsection (18)(B) on a site-specific basis. The department must base this approval on a site-specific study a system conducts that follows a department-approved protocol.

(D) Ultraviolet Light. Systems receive C*ryptosporidium, Giardia lamblia,* and virus-treatment credits for ultraviolet (UV) light reactors by achieving the corresponding UV dose values shown in paragraph (18)(D)1. Systems must validate and monitor UV reactors as described in paragraphs (18)(D)2. and 3. to demonstrate that they are achieving a particular UV dose value for treatment credit.

1. UV dose table. The treatment credits listed in this table are for UV light at a wavelength of two hundred fifty-four nanometers (254 nm) as produced by a low pressure mercury vapor lamp. To receive treatment credit for other lamp types, systems must demonstrate an equivalent germicidal dose through reactor validation testing, as described in paragraph (18)(D)2. of this rule. The UV dose values in this table are applicable only to post-filter applications of UV in filtered systems.

UV Dose Table for *Cryptosporidium, Giardia lamblia*, and Virus Inactivation Credit			
Log credit	*Cryptosporidium* UV dose (mJ/cm^2)	*Giardia lamblia* UV dose (mJ/cm^2)	Virus UV dose (mJ/cm^2)
0.5	1.6	1.5	39
1.0	2.5	2.1	58
1.5	3.9	3.0	79
2.0	5.8	5.2	100
2.5	8.5	7.7	121
3.0	12	11	143
3.5	15	15	163
4.0	22	22	186

2. Reactor validation testing. Systems must use UV reactors that have undergone validation testing to determine the operating conditions under which the reactor delivers the UV dose required in paragraph (18)(D)1. (i.e., validated operating conditions). These operating conditions must include flow rate, UV intensity as measured by a UV sensor, and UV lamp status.

A. When determining validated operating conditions, systems must account for the following factors: UV absorbance of the water; lamp fouling and aging; measurement uncertainty of online sensors; UV dose distributions arising from the velocity profiles through the reactor; failure of UV lamps or other critical system components; and inlet and outlet piping or channel configurations of the UV reactor.

B. Validation testing must include the following: Full-scale testing of a reactor that conforms uniformly to the UV reactors used by the system and inactivation of a test microorganism whose dose response characteristics have been quantified with a low pressure mercury vapor lamp.

C. The department may approve an alternative approach to validation testing.

3. Reactor monitoring requirements.

A. Systems must monitor their UV reactors to determine if the reactors are operating within validated conditions, as determined under paragraph (18)(D)2. This monitoring must include UV intensity as measured by a UV sensor, flow rate, lamp status, and other parameters the department designates based on UV reactor operation. Systems must verify the calibration of UV sensors and must recalibrate sensors in accordance with a protocol the department approves.

B. To receive treatment credit for UV light, systems must treat at least ninety-five percent (95%) of the water delivered to the public during each month by UV reactors operating within validated conditions for the required UV dose, as described in paragraphs (18)(D)1. and 2. Systems must demonstrate compliance with this condition by the monitoring required under subparagraph (18)(D)3.A. of this rule.

(19) Reporting Requirements.

(A) Systems must report sampling schedules under section (3) of this rule and source water monitoring results under section (6) of this rule unless they notify the department that they will not conduct source water monitoring due to meeting the criteria of subsection (2)(D) of this rule.

(B) Filtered systems must report their *Cryptosporidium* bin classification as described in section (10) of this rule.

(C) Systems must report disinfection profiles and benchmarks to the department as described in sections (8) through (9) of this rule prior to making a significant change in disinfection practice.

(D) Systems must report to the department in accordance with the following table for any microbial toolbox options used to comply with treatment requirements under section (11) of this rule. Alternatively, the department may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

Microbial Toolbox Reporting Requirements		
Toolbox option	Systems must submit the following information	On the following schedule
Watershed control program (WCP)	(I) Notice of intention to develop a new or continue an existing watershed control program	No later than two years before the applicable treatment compliance date in section (12) of this rule
	(II) Watershed control plan	No later than one year before the applicable treatment compliance date in section (12) of this rule
	(III) Annual watershed control program status report	Every 12 months, beginning one year after the applicable treatment compliance date in section (12) of this rule
	(IV) Watershed sanitary survey report	For community water systems, every three years beginning three years after the applicable treatment compliance date in section (12) of this rule. For noncommunity water systems, every five years beginning five years after the applicable treatment compliance date in section (12) of this rule
Alternative source/intake management	Verification that system has relocated the intake or adopted the intake withdrawal procedure reflected in monitoring results	No later than the applicable treatment compliance date in section (12) of this rule
Presedimentation	Monthly verification of the following: (I) Continuous basin operation; (II) Treatment of 100% of the flow; (III) Continuous addition of a coagulate; and (IV) At least 0.5-log mean reduction of influent turbidity or compliance with alternative department-approved performance criteria	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
Two-stage lime softening	Monthly verification of the following: (I) Chemical addition and hardness precipitation occurred in two separate and sequential softening stages prior to filtration; and (II) Both stages treated 100% of the plant flow	Monthly reporting within 10 days following the month in which the monitoring was conducted beginning on the applicable treatment compliance date in section (12) of this rule
Bank filtration	(I) Initial demonstration of the following: (A) Unconsolidated, predominantly sandy aquifer; and (B) Setback distance of at least 25 ft. (0.5-log credit) or 50 ft. (1.0-log credit)	No later than the applicable treatment compliance date in section (12) of this rule
	(II) If monthly average of daily max turbidity is greater than 1 NTU, then the system must report result and submit an assessment of the cause	Report within 30 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule

Combined filter performance	Monthly verification of combined filter effluent (CFE) turbidity levels less than or equal to 0.15 NTU in at least 95% of the 4 hour CFE measurements taken each month	Monthly reporting within 10 days following the month in which the monitoring was conducted beginning on the applicable treatment compliance date in section (12) of this rule
Individual filter performance	Monthly verification of the following: (I) Individual filter effluent (IFE) turbidity levels less than or equal to 0.15 NTU in at least 95% of samples each month in each filter; and (II) No individual filter greater than 0.3 NTU in two consecutive readings 15 minutes apart	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
Demonstration of performance	(I) Results from testing following a department approved protocol	No later than the applicable treatment compliance date in section (12) of this rule
	(II) As required by the department, monthly verification of operation within conditions of department approval for demonstration of performance credit	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
Bag filters and cartridge filters	(I) Demonstration that the following criteria are met: (A) Process meets the definition of bag or cartridge filtration; and (B) Removal efficiency established through challenge testing that meets criteria in this rule	No later than the applicable treatment compliance date in section (12) of this rule
	(II) Monthly verification that 100% of plant flow was filtered	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
Membrane filtration	(I) Results of verification testing demonstrating the following: (A) Removal efficiency established through challenge testing that meets criteria in this rule; and (B) Integrity test method and parameters, including resolution, sensitivity, test frequency, control limits, and associated baseline	No later than the applicable treatment compliance date in section (12) of this rule
	(II) Monthly report summarizing the following: (A) All direct integrity tests above the control limit; and (B) If applicable, any turbidity or alternative department approved indirect integrity monitoring results triggering direct integrity testing and the corrective action that was taken	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule

Second stage filtration	Monthly verification that 100% of flow was filtered through both stages and that first stage was preceded by coagulation step	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
Slow sand filtration (as secondary filter)	Monthly verification that both a slow sand filter and a preceding separate stage of filtration treated 100% of flow from surface water and ground water under the direct influence of surface water sources	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
Chlorine dioxide	Summary of CT values for each day as described in section (18) of this rule	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
Ozone	Summary of CT values for each day as described in section (18) of this rule	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule
UV	Validation test results demonstrating operating conditions that achieve required UV dose	No later than the applicable treatment compliance date in section (12) of this rule
	Monthly report summarizing the percentage of water entering the distribution system that was not treated by UV reactors operating within validated conditions for the required dose specified in subsection (18)(D) of this rule	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in section (12) of this rule

AUTHORITY: section 640.100, RSMo Supp. 2008. Original rule filed Feb. 27, 2009, effective Oct. 30, 2009.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002, 2006.*

10 CSR 60-4.055 Disinfection Requirements

PURPOSE: This rule establishes minimum disinfectant levels and treatment requirements to assure the inactivation and removal of pathogenic organisms.

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. Therefore, the material which is so incorporated is on file with the agency who filed this rule, and with the Office of the Secretary of State. Any interested person may view this material at either agency's headquarters or the same will be made available at the Office of the Secretary of State at a cost not to exceed actual cost of copy reproduction. The entire text of the rule is printed here. This note refers only to the incorporated by reference material.

(1) The requirements of this rule apply to primary community and noncommunity public water systems that the department has required to disinfect and to secondary systems with a source of water from a primary water system that the department has required to disinfect, even if the water is obtained through another secondary system.

(A) Water systems using water obtained in whole or in part from a source determined by the department to be surface or ground water under the direct influence of surface water must install or construct facilities to provide conventional filtration treatment as a required treatment technique within eighteen (18) months of the determination.

(B) Any water system that the department determines to be a groundwater system under the direct influence of surface water may appeal the decision by notifying the department in writing. The appeal must be accompanied by a report prepared by an engineer that confirms that the water system's groundwater source is not directly influenced by surface water. The report must be supported by analytical data prepared by a laboratory that is acceptable to the department. Source sampling must be accomplished during the period the source is most susceptible to surface water influence. The department's approval of the report will result in the water system's source being redefined as groundwater not under the direct influence of surface water.

(C) If at any time in the department's opinion, the quality of a water source appears to have changed to be under the direct influence

of surface water, the water system must submit, at the department's written request, an engineer-prepared report that describes the current condition of the water source. If a report is not submitted, the source will be reclassified as groundwater supply under the direct influence of surface water.

(D) The department reserves the authority to make the final determination of whether or not a source is defined as groundwater under the direct influence of surface water.

(E) Primary systems which use water obtained from groundwater not under the direct influence of surface water and which the department requires to disinfect and secondary public water systems do not have to meet the requirements of section (2) of this rule but may be required to provide disinfection detention as deemed necessary by the department. These systems also do not have to submit reports to the department as required by 10 CSR 60-7.010(5) but must maintain the information on file at the system treatment plant or office.

(2) Contact Time and Removal Credit.

(A) Any water system providing required treatment, and existing water systems practicing conventional filtration treatment on February 6, 1992, will be credited with 99.68 percent (2.5 log) *Giardia lamblia* cyst removal and 99.0 percent (2.0 log) virus removal, excluding the disinfection process, provided that they meet the turbidity maximum contaminant levels in 10 CSR 60-4.050. A system may request additional credit for treatment process removal or inactivation of *Giardia lamblia* cysts and viruses by submitting a report prepared by an engineer to the department including studies of *Giardia* cyst and virus removal or inactivation. The department reserves the authority to make the final determination of removal credit.

(B) The residual disinfectant concentration (C) disinfectant contact time (T) values in the *Missouri Guidance Manual for Surface Water System Treatment Requirements,* 1992, must be used for determining the percentage of *Giardia lamblia* cyst and virus removal or inactivation by disinfection.

(C) The percentage of removal and inactivation of *Giardia lamblia* cysts and viruses will be determined as the sum of the percent removals and inactivations of the individual treatment and disinfection processes. The percent removal and inactivation of *Giardia lamblia* cysts must be at least 99.9 percent (3.0 log) and of viruses must be 99.99 percent (4.0 log).

(D) Disinfectant contact time must be determined for each system by evaluations performed as specified in the *Missouri Guidance Manual For Surface Water System Treatment Requirements,* 1992, which is incorporated by reference. Results of the evaluations, including the determined disinfectant contact times, must be submitted to the department for review. The evaluation must be submitted within one (1) year of the date that the system is covered by the requirements of this rule, except that new water treatment facilities will not be issued a Final Approval of Construction under 10 CSR 60-3.010 until disinfection contact times are determined and submitted to the department.

(3) For any water system adding a disinfectant, only free available chlorine or chloramines will be accepted as the disinfectant entering the distribution system. The residual disinfectant concentration in the water entering the distribution system cannot be less than 0.5 milligrams per liter (mg/l) free available chlorine or 1.0 mg/l chloramines for more than four (4) hours.

(A) Systems using chloramines as the disinfectant residual entering the distribution system must add and mix the chlorine prior to the addition of ammonia.

(B) At the department's discretion, any system may be required to provide breakpoint chlorination or to provide operational test data and other information that the department may require to demonstrate that the system daily meets all of the requirements of section (2) of this rule and all of the other requirements of this section.

(C) At least one (1) application point for chlorine or chloramines must be prior to filtration with a residual maintained through the filters.

(D) If at any time the disinfectant residual entering the distribution system falls below the levels established in this section, the system must notify the department as soon as possible but no later than by the end of the next business day. The system must notify the department by the end of the next business day whether or not the disinfectant residual was restored to the levels established in this section within four (4) hours. The department may require public notice for continuing or persistent violations of this requirement.

(E) A residual disinfectant concentration in the water entering the distribution system of less than 0.2 mg/l for at least four (4) hours is a treatment technique violation which requires public notice pursuant to 10 CSR 60-8.010.

(F) The frequency of sampling shall be as set forth in 10 CSR 60-4.080(3).

(4) The residual disinfectant concentration in the distribution system measured as total chlorine or combined chlorine cannot be less than 0.2 mg/l in more than five percent (5%) of the samples each month for any two (2) consecutive months that the system supplies water to the public.

(A) Heterotrophic plate count may be used in lieu of or as a supplement to residual disinfectant concentration analysis.

(B) Water in the distribution system with a heterotrophic bacteria concentration less than or equal to five hundred (500) colonies per milliliter is deemed to have 0.2 mg/l residual disinfectant concentration for the purpose of determining compliance with this rule.

(C) Water in the distribution system with a heterotrophic bacteria concentration of greater than five hundred (>500) colonies per milliliter is deemed to have less than 0.2 mg/l residual disinfectant concentration for the purpose of compliance with this rule.

(D) Failure to maintain the minimum residual disinfectant concentration required in this rule is a violation of a treatment technique which requires public notification as specified in 10 CSR 60-8.010.

(E) The residual disinfectant concentration must be measured at least at the same points in the distribution system and at the same time as total coliforms are sampled as specified in 10 CSR 60-4.020. Failure to comply with this subsection is a monitoring violation which requires public notification as specified in 10 CSR 60-8.010.

(5) Maximum Residual Disinfectant Levels.

(A) Maximum residual disinfectant levels (MRDL) are—

Disinfectant Residual	MRDL (mg/l)
Chlorine	4.0 (as Cl_2)
Chloramines	4.0 (as Cl_2)
Chlorine dioxide	0.8 (as ClO_2)

(B) Control of Disinfectant Residuals. For chlorine and chloramines, a public water system is in compliance with the MRDL when the running annual average of monthly averages of samples taken in the distribution system, computed quarterly, is less than or equal to the MRDL. For chlorine dioxide, a public water system (PWS) is in compliance with the MRDL when daily samples are taken at the entrance to the distribution system and no two (2) consecutive daily samples exceed the MRDL. MRDLs are enforceable in the same manner as maximum contaminant levels. Notwithstanding the MRDLs, systems may increase residual disinfectant levels in the distribution system of chlorine or chloramines (but not chlorine dioxide) to a level and for a time necessary to protect public health, to address specific microbiological contamination problems caused by circumstances such

as, but not limited to, distribution line breaks, storm run-off events, source water contamination events, or cross-connection events.

(C) Compliance Dates.

1. Community water systems and nontransient noncommunity water systems.

A. Systems serving ten thousand (10,000) or more persons and using surface water or groundwater under the direct influence of surface water must comply with the MRDLs beginning January 1, 2002.

B. Systems serving fewer than ten thousand (10,000) persons and using surface water or groundwater under the direct influence of surface water and systems using only groundwater not under the direct influence of surface water must comply with the MRDLs beginning January 1, 2004.

2. Transient noncommunity water systems.

A. Systems serving ten thousand (10,000) or more persons and using surface water or groundwater under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2002.

B. Systems serving less than ten thousand (10,000) persons, using surface water or groundwater under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant, and systems using only groundwater not under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant, must comply with the chlorine dioxide MRDL beginning January 1, 2004.

(6) Enhanced Disinfection Requirements. Enhanced disinfection requirements and compliance dates vary depending on system size.

(A) Compliance Dates. In addition to the requirements in sections (1)–(4) of this rule, surface water and groundwater under the direct influence of surface water systems serving at least ten thousand (10,000) people also must comply with the requirements in this section beginning January 1, 2002 unless otherwise specified. Those systems serving less than ten thousand (10,000) people must comply with the requirements in this section beginning January 14, 2005 unless otherwise specified.

(B) General Requirements.

1. This section (6) establishes or extends treatment technique requirements in lieu of maximum contaminant levels for the following contaminants: *Giardia lamblia,* viruses, heterotrophic plate count bacteria, *Legionella*, *Cryptosporidium*, and turbidity. Each surface water and groundwater under the direct influence of surface water system, including those serving less than ten thousand (10,000) people beginning January 14, 2005, must provide treatment of its source water that complies with these treatment technique requirements and are in addition to those identified in sections (1)–(4) of this rule. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

A. At least ninety-nine percent (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; and

B. Compliance with the profiling and benchmark requirements under the provisions of subsection (6)(C) of this rule.

2. A public water system subject to the requirements of this section (6) is in compliance with the requirements of paragraph (6)(B)1. of this rule if it meets the applicable filtration requirements in 10 CSR 60-4.050 and the disinfection requirements in sections (2)–(4) and subsection (6)(C) of this rule.

(C) Disinfection Profiling and Benchmarking.

1. Disinfection profile. A disinfection profile is a summary of *Giardia lamblia* inactivation through the treatment plant measured through the course of a year. A public water system subject to the requirements of this section (6) must determine its total trihalomethanes (TTHM) annual average and its HAA5 annual average. The annual average is the arithmetic average of the quarterly averages of four (4) consecutive quarters of monitoring. Surface water systems serving fewer than ten thousand (10,000) people must determine the arithmetic average based on samples collected after January 1, 1998. If the annual average exceeds the levels in subparagraph (6)(C)1.D. then the requirements in paragraph (6)(C)2. apply.

A. The TTHM annual average must be the annual average during the same period as is used for the HAA5 annual average.

(I) Those systems that use "grandfathered" HAA5 occurrence data that meet the provisions of part (5)(C)1.B.(I) of this rule must use TTHM data collected at the same time under the provisions of 10 CSR 60-4.090.

(II) Those systems that use HAA5 occurrence data that meet the provisions of subpart (6)(C)1.B.(II)(a) of this rule must use TTHM data collected at the same time under the provisions of 10 CSR 60-4.090.

B. The HAA5 annual average must be the annual average during the same period as is used for the TTHM annual average.

(I) Those systems that have collected four (4) quarters of HAA5 occurrence data that meets the routine monitoring sample number and location requirements for TTHM in 10 CSR 60-4.090 and handling and analytical method requirements of 40 CFR 141.142 may use those data to determine whether the requirements of this section apply.

(II) Those systems that did not collect four (4) quarters of HAA5 occurrence data that meets the provisions of part (6)(C)1.B.(I) of this rule by March 31, 2000 must either:

(a) Conduct monitoring for HAA5 that meets the routine monitoring sample number and location requirements for TTHM in 10 CSR 60-4.090(2) and handling and analytical method requirements of 40 CFR 141.142(b)(1) to determine the HAA5 annual average and whether the requirements of paragraph (6)(C)2. of this rule apply; or

(b) Comply with all other provisions of this section as if the HAA5 monitoring had been conducted and the results required compliance with paragraph (6)(C)2. of this rule.

C. The system must submit data to the department on the schedule required by the department.

D. Any system having either a TTHM annual average greater than or equal to 0.064 mg/l or an HAA5 annual average greater than or equal to 0.048 mg/l during the period identified in subparagraphs (6)(C)1.A. and B. of this rule must comply with paragraph (6)(C)2. of this rule.

2. Disinfection profiling requirements and compliance dates vary depending on system size. Surface water systems serving a population of less than ten thousand (10,000) must monitor profiling data according to subparagraph (6)(C)2.D. beginning July 1, 2003. Surface water and groundwater under the direct influence of surface water (GWUDISW) systems serving a population of less than five hundred (500) must monitor profiling data according to subparagraph (6)(C)2.D. beginning January 1, 2004.

A. Any system that meets the criteria in subparagraph (6)(C)1.D. of this rule must develop a disinfection profile of its disinfection practice for a period of up to three (3) years.

B. The system must monitor daily for a period of twelve (12) consecutive calendar months to determine the total logs of inactivation for each day of operation, based on the $CT_{99.9}$ values in Tables 1 through 8 of the Missouri "Guidance Manual for Surface Water System Treatment Requirements," as appropriate, through the entire treatment plant. This system must begin this monitoring when requested by the department. As a

minimum, the system with a single point of disinfectant application prior to entrance to the distribution system must conduct the monitoring set forth in this subparagraph (6)(C)2.B. A system with more than one (1) point of disinfectant application must conduct this monitoring for each disinfection segment. The system must monitor the parameters necessary to determine the total inactivation ratio, using analytical methods in 10 CSR 60-5.010, as follows:

(I) The temperature of the disinfected water must be measured once per day at each residual disinfectant concentration sampling point during peak hourly flow;

(II) If the system uses chlorine, the pH of the disinfected water must be measured once per day at each chlorine residual disinfectant concentration sampling point during peak hourly flow;

(III) The disinfectant contact time(s) must be determined for each day during peak hourly flow; and

(IV) The residual disinfectant concentration(s) of the water before or at the first customer and prior to each additional point of disinfection must be measured each day during peak hourly flow.

C. In lieu of the monitoring conducted under the provisions of subparagraph (6)(C)2.B. of this rule to develop the disinfection profile the system may elect to meet the requirements of part (6)(C)2.C.(I) of this rule. In addition to the monitoring conducted under the provisions of subparagraph (6)(C)2.B. of this rule to develop the disinfection profile, the system may elect to meet the requirements of part (6)(C)2.C.(II) of this rule.

(I) A PWS that has three (3) years of existing operational data may submit those data, a profile generated using those data, and a request that the department approve use of those data in lieu of monitoring under the provisions of paragraph (6)(C)2. of this rule. The department must determine whether these operational data are substantially equivalent to data collected under the provisions of subparagraph (6)(C)2.B. of this rule. These data must also be representative of *Giardia lamblia* inactivation through the entire treatment plant and not just of certain treatment segments. Until the department approves this request, the system is required to conduct monitoring under the provisions of subparagraph (6)(C)2.B. of this rule.

(II) In addition to the disinfection profile generated under subparagraph (6)(C)2.B. of this rule, a PWS that has existing operational data may use those data to develop a disinfection profile for additional years. Such systems may use these additional yearly disinfection profiles to develop a benchmark under the provisions of paragraph (6)(C)3. of this rule. The department will determine whether these operational data are substantially equivalent to data collected under the provisions of subparagraph (6)(C)2.B. of this rule. These data must also be representative of inactivation through the entire treatment plant and not just of certain treatment segments.

D. The system must monitor once per week on the same calendar day, for a period of twelve (12) consecutive calendar months, to determine the total logs of inactivation for each week of operation, based on the $CT_{99.9}$ values in Tables 1 through 8 of the Missouri "Guidance Manual for Surface Water System Treatment Requirements," as appropriate, through the entire treatment plant. As a minimum, the system with a single point of disinfectant application prior to entrance to the distribution system must conduct the monitoring set forth in this subparagraph. A system with more than one (1) point of disinfectant application must conduct this monitoring for each disinfection segment. The system must monitor the parameters necessary to determine the total inactivation ratio, using analytical methods in 10 CSR 60-5.010, as follows:

(I) The temperature of the disinfected water must be measured at each residual disinfectant concentration sampling point during peak hourly flow;

(II) If the system uses chlorine, the pH of the disinfected water must be measured at each chlorine residual disinfectant concentration sampling point during peak hourly flow;

(III) The disinfectant contact time(s) must be determined during peak hourly flow; and

(IV) The residual disinfectant concentration(s) of the water before or at the first customer and prior to each additional point of disinfection must be measured during peak hourly flow.

E. The system must calculate the total inactivation ratio as follows:

(I) The system may determine the total inactivation ratio for the disinfection segment based on either of the following methods:

(a) Determine one (1) inactivation ratio ($CTcalc/CT_{99.9}$) before or at the first customer during peak hourly flow; or

(b) Determine successive ($CTcalc/CT_{99.9}$) 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, the system must calculate the total inactivation ratio by determining ($CTcalc/CT_{99.9}$) for each sequence and then adding the ($CTcalc/CT_{99.9}$) values together to determine ($\sum(CTcalc/CT_{99.9})$); and

(II) The system must determine the total logs of inactivation by multiplying the value calculated in part (6)(C)2.D.(I) of this rule by three (3.0).

F. A system that uses either chloramines or ozone for primary disinfection must also calculate the logs of inactivation for viruses using a method identified in EPA's "Alternative Disinfectants and Oxidants Guidance Manual."

G. The system must retain disinfection profile data in graphic form, as a spreadsheet, or in some other format acceptable to the department for review as part of sanitary surveys conducted by the department.

3. Disinfection benchmarking.

A. Any system required to develop a disinfection profile under the provisions of paragraphs (6)(C)1. and 2. of this rule and that decides to make a significant change to its disinfection practice must consult with the department in writing prior to making such change. Significant changes to disinfection practice are:

(I) Changes to the point of disinfection;

(II) Changes to the disinfectant(s) used in the treatment plant;

(III) Changes to the disinfection process; and

(IV) Any other modification identified by the department.

B. Any system that is modifying its disinfection practice must calculate its disinfection benchmark using one of the following procedures:

(I) For each year of profiling data collected and calculated under paragraph (6)(C)2. of this rule, the system must determine the lowest average monthly *Giardia lamblia* inactivation in each year of profiling data. The system must determine the average *Giardia lamblia* inactivation for each calendar month for each year of profiling data by dividing the sum of *Giardia lamblia* inactivation by the number of values calculated for that month; or

(II) The disinfection benchmark is the lowest monthly average value (for systems with one (1) year of profiling data) or average of lowest monthly average values (for systems with more than one (1) year of profiling data) of the monthly logs of *Giardia lamblia* inactivation in each year of profiling data.

C. A system that uses either chloramines or ozone for primary disinfection must also calculate the disinfection benchmark for viruses using a method approved by

the department.

D. The system must submit the following information to the department as part of its consultation process:

(I) A description of the proposed change;

(II) The disinfection profile for *Giardia lamblia* (and, if necessary, viruses) under paragraph (6)(C)2. of this rule and benchmark as required by subparagraph (6)(C)3.B. of this rule; and

(III) An analysis of how the proposed change will affect the current levels of disinfection.

(D) Filtration Sampling Requirements. A public water system subject to the requirements of this section (6) that provides conventional filtration treatment must conduct continuous monitoring of turbidity for each individual filter as indicated in 10 CSR 60-4.050(3)(E).

AUTHORITY: section 640.100, RSMo Supp. 2002. Original rule filed July 12, 1991, effective Feb. 6, 1992. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996. Amended: Filed Dec. 15, 1999, effective Sept. 1, 2000. Amended: Filed March 17, 2003, effective Nov. 30, 2003.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.060 Maximum Radionuclide Contaminant Levels and Monitoring Requirements

PURPOSE: This rule establishes maximum contaminant levels and monitoring requirements for radionuclides.

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. Therefore, the material which is so incorporated is on file with the agency who filed this rule, and with the Office of the Secretary of State. Any interested person may view this material at either agency's headquarters or the same will be made available at the Office of the Secretary of State at a cost not to exceed actual cost of copy reproduction. The entire text of the rule is printed here. This note refers only to the incorporated by reference material.

(1) Maximum Contaminant Levels (MCL) and Compliance Dates.

(A) MCL for Combined Radium-226 and Radium-228. The maximum contaminant level for combined radium-226 and radium-228 is five picocuries per liter (5 pCi/l). The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.

(B) MCL for Gross Alpha Particle Activity (Excluding Radon and Uranium). The maximum contaminant level for gross alpha particle activity (including radium-226 but excluding radon and uranium) is fifteen picocuries per liter (15 pCi/l).

(C) MCL for Beta Particle and Photon Radioactivity.

1. The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than four (4) millirem/year (mrem/year).

2. Except for the radionuclides listed in Table A, the concentration of man-made radionuclides causing four (4) mrem total body or organ dose equivalents must be calculated on the basis of two (2) liter per day drinking water intake using the one hundred sixty-eight (168) hour data list in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure," NBS (National Bureau of Standards) Handbook 69 as amended August 1963, U.S. Department of Commerce, which is incorporated by reference. If two (2) or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed four (4) mrem/year.

Table A.—Average Annual Concentrations Assumed to Produce a Total Body or Organ Dose of Mrem/Year

Radionuclide	Critical Organ	pCi per Liter
Tritium	Total body	20,000
Strontium-90	Bone Marrow	8

(D) MCL for Uranium. The maximum contaminant level for uranium is thirty micrograms per liter (30 μg/l).

(E) Compliance Dates. Community water systems (CWSs) must comply with the MCLs listed in subsections (1)(A)–(D) of this rule beginning December 8, 2003. Compliance shall be determined in accordance with the requirements of 10 CSR 60-5.010 and section (2) of this rule. Compliance with Consumer Confidence Report and public notice requirements for radionuclides is required on December 8, 2003.

(2) Monitoring Frequency and Compliance Requirements for Radionuclides in Community Water Systems.

(A) Monitoring and Compliance Requirements for Gross Alpha Particle Activity, Radium-226, Radium-228, and Uranium.

1. Community water systems must conduct initial monitoring to determine compliance with subsections (1)(A), (B) and (D) of this rule by December 31, 2007. For the purposes of monitoring for gross alpha particle activity, radium-226, and radium-228, the detection limits are:

A. The detection limit for gross alpha particle activity is three (3) pCi/l;

B. The detection limit for radium-226 is one (1) pCi/l; and

C. The detection limit for radium-228 is one (1) pCi/l.

2. Applicability and sampling location for existing community water systems or sources. All existing CWSs using groundwater, surface water, or systems using both ground and surface water must sample at every entry point to the distribution system that is representative of all sources being used (hereafter called a sampling point) under normal operating conditions. The system must take each sample at the sample sampling point unless conditions make another sampling point more representative of each source or the department has designated a distribution system location, in accordance with part (2)(A)4.B.(III) of this rule.

3. Applicability and sampling location for new community water systems or sources. All new CWSs or CWSs that use a new source of water must begin to conduct initial monitoring for the new source within the first quarter after initiating use of the source. CWSs must conduct more frequent monitoring when ordered by the department in the event of possible contamination or when changes in the distribution system or treatment processes occur which may increase the concentration of radioactivity in finished water.

4. Initial monitoring for gross alpha particle activity, radium-226, radium-228, and uranium.

A. Systems without acceptable historical data, as defined below, shall collect four (4) consecutive quarterly samples at all sampling points before December 31, 2007.

B. Grandfathering of data. Systems may use historical monitoring data collected at a sampling point to satisfy the initial monitoring requirements for that sampling point, for the following situations.

(I) To satisfy initial monitoring requirements, a community water system having only one (1) entry point to the distribution system may use the monitoring data from the last compliance monitoring period that

began between June 1, 2000 and December 8, 2003.

(II) To satisfy initial monitoring requirements, a community water system with multiple entry points and having appropriate historical monitoring data for each entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 1, 2000 and December 8, 2003.

(III) To satisfy initial monitoring requirements, a community water system with appropriate historical data for a representative point in the distribution system may use the monitoring data from the last compliance monitoring period that began between June 1, 2000 and December 8, 2003, provided that the department finds that the historical data satisfactorily demonstrate that each entry point to the distribution system is expected to be in compliance based upon the historical data and reasonable assumptions about the variability of contaminant levels between entry points. The department must make a written finding indicating how the data conforms to the these requirements.

C. For gross alpha particle activity, uranium, radium-226, and radium-228 monitoring, the department will waive the final two (2) quarters of initial monitoring for a sampling point if the results of the samples from the previous two (2) quarters are below the detection limit.

D. If the average of the initial monitoring results for a sampling point is above the MCL, the system must collect and analyze quarterly samples at that sampling point until the system has results from four (4) consecutive quarters that are at or below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the department.

3. Reduced monitoring. Community water systems may reduce the future frequency of monitoring from once every three (3) years to once every six (6) or nine (9) years at each sampling point, based on the following criteria.

A. If the average of the initial monitoring results for each contaminant (that is, gross alpha particle activity, uranium, radium-226, or radium-228) is below the detection limit specified in paragraph (2)(A)1. of this rule, the system must collect and analyze for that contaminant using at least one (1) sample at that sampling point every nine (9) years.

B. For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is at or above the detection limit but at or below one-half (1/2) the MCL, the system must collect and analyze for that contaminant using at least one (1) sample at that sampling point every six (6) years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is at or above the detection limit but at or below one-half (1/2) the MCL, the system must collect and analyze for that contaminant using at least one (1) sample at that sampling point every six (6) years.

C. For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is above one-half (1/2) the MCL but at or below the MCL, the system must collect and analyze at least one (1) sample at that sampling point every three (3) years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is above one-half (1/2) the MCL but at or below the MCL, the system must collect and analyze at least one (1) sample at that sampling point every three (3) years.

D. Systems must use the samples collected during the reduced monitoring period to determine the monitoring frequency for subsequent monitoring periods (for example, if a system's sampling point is on a nine (9)-year monitoring period, and the sample result is above one-half (1/2) the MCL, then the next monitoring period for that sampling point is three (3) years).

E. If a system has a monitoring result that exceeds the MCL while on reduced monitoring, the system must collect and analyze quarterly samples at that sampling point until the system has results from four (4) consecutive quarters that are below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the department.

4. Compositing. To fulfill quarterly monitoring requirements for gross alpha particle activity, radium-226, radium-228, or uranium, a system may composite up to four (4) consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample. The department will treat analytical results from the composited as the average analytical result to determine compliance with the MCLs and the future monitoring frequency. If the analytical result from the composited sample is greater than one-half (1/2) the MCL, the department may direct the system to take additional quarterly samples before allowing the system to sample under a reduced monitoring schedule.

5. Gross alpha particle activity measurement.

A. A gross alpha particle activity measurement may be substituted for the required radium-226 measurement provided that the measured gross alpha particle activity does not exceed five (5) pCi/l. A gross alpha particle activity measurement may be substituted for the required uranium measurement provided that the measured gross alpha particle activity does not exceed fifteen (15) pCi/l.

B. The gross alpha measurement shall have a confidence interval of ninety-five percent (95%) (1.65σ, where σ is the standard deviation of the net counting rate of the sample) for radium-226 and uranium. When a system uses a gross alpha particle activity measurement in lieu of a radium-226 and/or uranium measurement, the gross alpha particle activity analytical result will be used to determine the future monitoring frequency for radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, one-half (1/2) the detection limit will be used to determine compliance and the future monitoring frequency.

(B) Monitoring and Compliance Requirements for Beta Particle and Photon Radioactivity. To determine compliance with the maximum contaminant levels in subsection (1)(C) of this rule for beta particle and photon radioactivity, a system must monitor at a frequency as follows:

1. Community water systems (both surface and ground water) designated by the department as vulnerable must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one (1) quarter after being notified by the department. Systems already designated by the department must continue to sample until the department reviews and either reaffirms or removes the designation.

A. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to fifty (50) pCi/L (screening level), the department may reduce the frequency of monitoring at that sampling point to once every three (3) years. Systems must collect all samples required in paragraph (2)(B)1. of this rule during the reduced monitoring period.

B. For systems in the vicinity of a nuclear facility, the department may allow the CWS to use environmental surveillance data

collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the department determines such data is applicable to the community water system. In the event that there is a release from a nuclear facility, systems, using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (2)(B)1. of this rule.

2. Community water systems (both surface and ground water) designated by the department as using waters contaminated by effluents from nuclear facilities must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one (1) quarter after being notified by the department. Systems already designated by the department as systems using waters contaminated by effluents from nuclear facilities shall continue to sample until the department reviews and either reaffirms or removes the designation.

A. Quarterly monitoring for gross particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three (3) monthly samples. The former is recommended.

B. For iodine-131, a composite of five (5) consecutive daily samples shall be analyzed once each quarter. As ordered by the department, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

C. Annual monitoring for strontium-90 and tritium shall be conducted by means of analysis of four (4) quarterly samples, or with department approval, a composite of samples collected in four (4) consecutive quarters.

D. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to fifteen (15) pCi/l, the department may reduce the frequency of monitoring at that sampling point to every three (3) years. Systems must collect all samples required in paragraph (2)(B)2. of this rule during the reduced monitoring period.

E. For systems in the vicinity of a nuclear facility, the department may allow the CWSs to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the department determines if such data is applicable to the water system. In the event that there is a release from a nuclear facility, systems using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (2)(B)2. of this rule.

3. Community water systems designated by the department to monitor for beta particle and photon radioactivity shall not apply to the department for a waiver from the monitoring frequencies specified in paragraph (2)(B)1. or (2)(B)2. of this rule.

4. Community water systems may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for the gross beta particle activity analysis. Systems are allowed to subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if the screening level is exceeded. The potassium-40 beta particle activity must be calculated by multiplying elemental potassium concentrations (in mg/l) by a factor of 0.82.

5. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity exceeds the screening level, an analysis of the sample must be performed to identify the major radioactive constituents present in the sample and the appropriate doses must be calculated and summed to determine compliance with paragraph (1)(C)1., using the formula in paragraph (1)(C)2. Doses must also be calculated and combined for measured levels of tritium and strontium to determine compliance.

6. Systems must monitor monthly at the sampling point(s) which exceed the maximum contaminant level in subsection (1)(C) beginning the month after the exceedance occurs. Systems must continue monthly monitoring until the system has established, by a rolling average of three (3) monthly samples, that the MCL is being met. Systems who establish that the MCL is being met must return to quarterly monitoring until they meet the requirements set forth in subparagraph (2)(B)1.B. or subparagraph (2)(B)2.A of this rule.

(C) General Monitoring and Compliance Requirements for Radionuclides.

1. The department may require more frequent monitoring than specified in subsections (2)(A) and (2)(B) of this rule, or may require confirmation samples at its discretion. The results of the initial and confirmation samples will be averaged for use in compliance determinations.

2. Each public water system shall monitor at the time designated by the department during each compliance period.

3. Compliance with subsections (1)(A)–(D) of this rule will be determined based on the analytical result(s) obtained at each sampling point. If one (1) sampling point is in violation of an MCL, the system is in violation of the MCL.

A. For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point. If the average of any sampling point is greater than the MCL, then the system is out of compliance with the MCL.

B. For systems monitoring more than once per year, if any sample result will cause the running average to exceed the MCL at any sample point, the system is out of compliance with the MCL immediately.

C. Systems must include all samples taken and analyzed under the provisions of this section in determining compliance, even if that number is greater than the minimum required.

D. If a system does not collect all required samples when compliance is based on a running annual average of quarterly samples, compliance will be based on the running average of the samples collected.

E. If a sample result is less than the detection limit, zero (0) will be used to calculate the annual average, unless a gross alpha particle activity is being used in lieu of radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, one-half (1/2) the detection limit will be used to calculate the annual average.

4. The department has the discretion to delete results of obvious sampling or analytic errors.

5. If the MCL for radioactivity set forth in subsection (1)(A)–(D) of this rule is exceeded, the operator of a community water system must give notice to the department pursuant to 10 CSR 60-7.010 and to the public as required by 10 CSR 60-8.010.

(3) Non-Community Water Systems. Noncommunity water systems must monitor for radionuclides as directed by the department.

AUTHORITY: section 640.100, RSMo 2000. Original rule filed May 4, 1979, effective Sept. 14, 1979. Amended: Filed April 14, 1981, effective Oct. 11, 1981. Rescinded and readopted: Filed Jan. 16, 2002, effective Nov. 30, 2002.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999.*

10 CSR 60-4.070 Secondary Contaminant Levels and Monitoring Requirements

PURPOSE: This rule establishes maximum contaminant levels and monitoring requirements for secondary contaminants.

(1) The following are the recommended secondary maximum contaminant levels for community and nontransient noncommunity water systems:

Contaminant	Level
Aluminum	0.05–0.2 mg/l
Chloride	250 mg/l
Color	15 color units
Copper	1.0 mg/l
Corrosivity	Noncorrosive
Fluoride	2.0 mg/l
Foaming agents	0.5 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
Odor	3 Threshold Odor number
pH	6.5–8.5
Silver	0.1 mg/l
Sulfate	250 mg/l
Total dissolved solids (TDS)	500 mg/l
Zinc	5 mg/l

(2) Groundwater systems shall take one (1) sample at each sampling point during each three (3)-year compliance period beginning in the compliance period starting January 1, 1993. Surface water systems (or combined surface/ground) shall take one (1) sample annually at each sampling point beginning January 1, 1993. Color, foaming agents and odor should be analyzed at the water system site, as needed.

(3) For community water systems, if the result of analyses indicates that the secondary contaminant level for fluoride is exceeded, the supplier of water must report to the department within seven (7) days and must collect three (3) additional samples from designated sampling points to be submitted for analysis within one (1) month at intervals determined by the department. When the average of the results of four (4) analyses as required by this section exceeds the secondary contaminant level, the supplier of water must notify the department as required by 10 CSR 60-7.010 and give notice as required by 10 CSR 60-8.010.

AUTHORITY: section 640.100, RSMo Supp. 2002. Original rule filed May 4, 1979, effective Sept. 14, 1979. Amended: Filed April 14, 1981, effective Oct. 11, 1981. Amended: Filed Aug. 4, 1987, effective Jan. 1, 1988. Rescinded and readopted: Filed March 31, 1992, effective Dec. 3, 1992. Amended: Filed March 17, 2003, effective Nov. 30, 2003.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.080 Operational Monitoring

PURPOSE: This rule establishes criteria for operation and operational monitoring.

Editor's Note: The following material is incorporated into this rule by reference:

*1) **Methods for Chemical Analysis of Water and Wastes, Revised March 1983** (Springfield VA: U.S. Department of Commerce, 1983);*

*2) **Standard Methods for the Examination of Water and Wastewater**, 18th Edition (Baltimore, MD, Victor Graphics, Inc., 1992).*

In accordance with section 536.013(4), RSMo, the full text of material incorporated by reference will be made available to any interested person at the Office of the Secretary of State and the headquarters of the adopting state agency.

(1) Public water systems utilizing any treatment process must perform sufficient analyses to maintain control of the treatment process, using methods as required by 10 CSR 60-5.010 and as acceptable to the department.

(2) Automatic instrumentation may be used if properly installed, maintained and periodically calibrated against known standards prepared in accordance with *Standard Methods for the Examination of Water and Wastewater 1992*, American Public Health Association, 18th edition, New York, NY or *Methods for Chemical Analysis of Water and Wastes*, Environmental Monitoring Support Laboratory, USEPA, Cincinnati, OH 45268, EPA-600/4-79-020.

(3) Sufficient analyses must be done to assure control of water quality, the following requirements notwithstanding. Continuous monitoring and recording may be used for any operational analysis instead of grab sampling provided that the requirements of section (2) are met. For those analyses where continuous monitoring is required, if there is a failure in the continuous monitoring equipment, grab sampling every two (2) hours of operation may be conducted in lieu of continuous monitoring but for no more than five (5) working days following the failure of the equipment. Applicable analyses and testing frequencies are as follows:

Operational Testing

Test	Frequency	Sample Location	Disinfection	Sequestration	Iron Removal	Zeolite Softening	Clarification	Lime Softening	Fluoride Adjustment
Alkalinity (phenolphthalein and total)	As necessary for control	Raw water					X	X	
	As necessary for control	Entry point to distribution					X	X	
Disinfectant Residual	Continuous[1]	Entry point to distribution			X[5]		X	X[5]	
	Daily	Entry point to distribution	X[6,7]	X[6]		X[6]			
	At time of bacti sampling	Sampling Points	X[6,7]	X[6]	X	X[6]	X	X	
	Start-up and every 2 hours of operation	Filter influent and effluent					X	X	
	Start-up and every 2 hours of operation	Entry point to distribution			X[5]		X	X	
	Start-up and every 4 hours of operation	Entry point to distribution			X[6]				
Fluoride (if fluoride compounds are added)	Daily	Entry point(s) to distribution							X
	Monthly	Representative point in distribution							X
Hardness	Daily	Entry point to distribution				X	X	X	
Iron	Start-up and every 4 hours of operation	Filter influent and and effluent			X	X[2]	X[2]	X[2]	
pH	As necessary for control	Entry point to distribution			X		X	X	
	As necessary for control	Raw Water					X		
	Start-up and every 4 hours of operation	Filter effluent			X				
	As necessary for control	Primary & secondary basins						X	

Test	Frequency	Sample Location	Disinfection	Sequestration	Iron Removal	Zeolite Softening	Clarification	Lime Softening	Fluoride Adjustment
Phosphate	As necessary for control	Downstream from point of application		X	X[3]	X[3]	X[3]	X[3]	
Sludge concentration[4]	As necessary for control	Center cone and sludge blowoff and sample taps					X	X	
Temperature[5]	As necessary for control	Entry point to distribution	X		X		X	X	
Turbidity[5]	Every 4 hours of plant operation	Entry point to distribution and filter influent			X[5]		X	X[5]	

X—Indicates test(s) needed
1—If system serves greater than 3300 population
2—If raw water contains > 0.3 mg/l iron
3—If phosphate compounds are added to the water
4—For facilities utilizing solids contact basins
5—Surface and ground water under the direct influence of surface water
6—Groundwater system not under the direct influence of surface water required to provide disinfection
7—Secondary system required to supplement disinfection or redisinfect

(4) The department, at its discretion, may conduct routine inspections of any public water system or make other necessary inspections to determine compliance with these rules.

(5) If, after investigation, the department finds that any public water system is incompetently supervised, improperly operated, inadequate, of defective design or if the water fails to meet standards established in these rules, the water supplier must implement changes that may be required by the department.

(6) Every supplier of water to a public water system must disinfect all newly constructed or repaired water distribution mains, finished water storage facilities or wells by methods acceptable to the department before being placed in or returned to service.

(7) All finished water reservoirs must be covered by a permanent, protective material, adequately vented with properly screened openings.

(8) Chemicals, materials and protective coatings used in public water systems must be acceptable to the department.

(9) Public water systems must maintain a minimum positive pressure of twenty pounds per square inch (20 psi) throughout the distribution system under all normal operating conditions.

(10) Within thirty (30) days, public water systems must inform the department of a change of the person in charge of the water system.

(11) A supplier of water that adds fluoride to the water system must submit two (2) samples per month for analyses to the Department of Health Laboratory or another approved laboratory.

AUTHORITY: section 640.100, RSMo 1994. Original rule filed May 4, 1979, effective Sept. 14, 1979. Amended: Filed April 14, 1981, effective Oct. 11, 1981. Amended: Filed July 12, 1991, effective Feb. 6, 1992. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995.*

10 CSR 60-4.090 Maximum Contaminant Levels and Monitoring Requirements for Disinfection By-Products

PURPOSE: This rule establishes the maximum contaminant levels and monitoring requirements for total trihalomethanes and other disinfection by-products.

(1) Applicability. This rule applies to community water systems and nontransient noncommunity water systems that add a chemical disinfectant to the water in any part of the drinking water treatment process or provide water that contains a chemical disinfectant and to water treatment plants proposed for construction or major modification as indicated in this section. The rule has different requirements and compliance dates, based on system size and type of source water.

(A) Community water systems serving ten thousand (10,000) or more people and using surface water or ground water under the direct influence of surface water (GWUDISW) must continue complying with the maximum contaminant level (MCL) of 0.10 for total trihalomethanes (TTHM) and section (3) of this rule until December 31, 2001. Beginning January 1, 2002, these systems and nontransient noncommunity water systems serving ten thousand (10,000) or more people and using surface water or GWUDISW must comply with sections (3)–(4) of this rule and the MCLs of 0.080 for TTHM, 0.060 for haloacetic acids (five) (HAA5), 0.010 for bromate, and 1.0 for chlorite.

(B) Community water systems and nontransient noncommunity water systems serving less than ten thousand (10,000) people and using surface water or GWUDISW. Beginning January 1, 2004, these systems must comply with sections (3)–(4) of this rule and the MCLs of 0.080 for TTHM, 0.060 for HAA5, 0.010 for bromate, and 1.0 for chlorite.

(C) Community water systems and nontransient noncommunity water systems using ground water. Beginning January 1, 2004, these systems must comply with sections (3)–(4) of this rule and the MCLs of 0.080 for TTHM, 0.060 for HAA5, 0.010 for bromate, and 1.0 for chlorite.

Table 1. Compliance with Disinfection By-Product Requirements

Who must comply	When	MCLs (mg/l)	Compliance Requirements
Community water systems serving 10,000 or more people and using surface water or groundwater under the direct influence of surface water (GWUDISW)	Oct. 11, 1981 to Dec. 31, 2001	TTHM 0.10	Section (2)
Community water systems and nontransient noncommunity water systems serving 10,000 or more people and using surface water or GWUDISW	Jan. 1, 2002	TTHM 0.080 HAA5 0.060 Bromate 0.010 Chlorite 1.0	Sections (3) and (4)
Community water systems and nontransient noncommunity water systems serving less than 10,000 people and using surface water or GWUDISW	Jan. 1, 2004	TTHM 0.080 HAA5 0.060 Bromate 0.010 Chlorite 1.0	Sections (3) and (4)
Community water systems and nontransient noncommunity water systems using groundwater	Jan. 1, 2004	TTHM 0.080 HAA5 0.060 Bromate 0.010 Chlorite 1.0	Sections (3) and (4)

(D) Stage 2 Disinfectants/Disinfection By-Products—Locational Running Annual Average (LRAA) Compliance. The MCLs of 0.080 mg/L for TTHM and 0.060 mg/L for HAA5 must be complied with as a locational running annual average at each monitoring location beginning with the date specified for Stage 2 compliance in 10 CSR 60-4.094(1)(C).

(E) Beginning September 1 2000, any water treatment plant proposed for construction or major modification must be designed to meet the disinfection by-product MCLs of 0.080 for TTHM, 0.060 for HAA5, 0.010 for bromate, and 1.0 for chlorite and the requirements of sections (3) and (4) of this rule.

(2) Compliance with the TTHM MCL of 0.10.

(A) A supplier of water must collect samples of the product water for analyses as follows:

1. Community water systems must perform sampling at quarterly intervals.

A. Analyses for TTHM shall be performed at quarterly intervals on at least four (4) water samples for each treatment plant used by the system.

B. The minimum number of samples required shall be based on the number of treatment plants used by the system except that multiple wells drawing raw water from a single aquifer, with the department's approval, may be considered one (1) treatment plant for determining the minimum number of samples.

C. Community water systems serving fewer than ten thousand (10,000) persons, at the discretion of the department, may be required to submit fewer samples; and

2. All samples taken within an established frequency shall be collected within a twenty-four (24)-hour period.

(B) At least twenty-five percent (25%) of the samples shall be taken at locations within the distribution system reflecting the maximum residence time of the water in the system. The remaining shall be taken at representative locations in the distribution system, taking into account the number of persons served, different sources of water, and different treatment methods employed.

(C) The results of all analyses per quarter shall be arithmetically averaged and all samples collected shall be used in the computation of the average.

(D) Upon a community water system's written request, the department may reduce the TTHM analysis monitoring frequency to a minimum of one (1) sample per quarter.

1. The sample shall be taken at a point in the distribution system that reflects the maximum residence time of the water in the system.

2. The department shall provide, in writing, a determination that local conditions and data from at least one (1) year of monitoring in accordance with subsection (2)(A) of this rule demonstrate that TTHM concentrations will be consistently below the MCL.

3. The supplier of water immediately shall begin monitoring in accordance with the requirements of subsection (2)(A) of this rule upon finding that—

A. At any time during the reduced monitoring, the results from any analysis for TTHM exceed 0.10 milligrams per liter (mg/l) and the results are confirmed by at least one (1) check sample taken promptly after the results are received; or

B. The system makes any significant change(s) to its source of water or treatment process; and

C. This monitoring shall continue at least one (1) year before the frequency may be reduced again.

(E) Upon the written request of a community water system that utilizes only groundwater sources, the department may allow the water system to substitute a minimum of one (1) sample per year for maximum TTHM potential in place of quarterly sampling for TTHM.

1. This monitoring frequency applies separately to each treatment plant used in the system.

2. The sample shall be taken at a point in the distribution system that reflects the maximum residence time of the water in the system.

3. The department shall provide, in writing, a determination that—

A. The system has a maximum TTHM potential of less than 0.10 mg/L based upon data submitted by the water supplier; and

B. Based upon an assessment of local conditions, the system is not likely to approach or exceed the MCL for TTHM.

4. A water supplier immediately shall begin monitoring in accordance with the requirements of subsection (2)(A) of this rule upon finding that—

A. The results from any analysis taken by the water supplier for maximum TTHM potential are equal to or greater than 0.10 mg/L; and

B. The results are confirmed by at least one (1) check sample which was taken promptly after the results were received; and

C. This monitoring shall continue for at least one (1) year before the frequency may be reduced again.

5. If the system makes any significant change(s) in the raw water or treatment program at any time during the period of reduced monitoring frequency, the water supplier immediately shall collect an additional sample to be analyzed for maximum TTHM potential. The sample shall be taken at a point in the distribution system that reflects the maximum residence time of the water in the system. The results of the analysis shall be used to determine whether the system must comply with the monitoring requirements of subsection (2)(A) of this rule.

(F) Compliance with the MCL of 0.10 for TTHM shall be determined based on a running annual average of quarterly samples collected by the supplier of water as prescribed in subsection (2)(A). If the average of samples covering any twelve (12)-month period exceeds the MCL, the supplier of water shall report to the department pursuant to 10 CSR 60-7.010 and notify the public pursuant to 10 CSR 60-8.010. Monitoring after public notification shall be at a frequency designated by the department and shall continue until a monitoring schedule as a condition to a variance, exemption, or enforcement action shall become effective.

(G) Samples for TTHM shall be dechlorinated upon collection to prevent further production of trihalomethanes. Samples for maximum TTHM potential shall not be dechlorinated and must be held for seven (7) days at twenty-five degrees Celsius (25 °C) prior to analysis.

(H) At the option of the department, monitoring frequencies may be increased above the minimum where this is necessary to detect variations of TTHM levels within the distribution system.

(I) Before a community water system makes any significant modifications to its existing treatment process for the purposes of achieving compliance with this rule, the system must obtain departmental approval of its proposed modifications and those safeguards that it will implement to ensure that the microbiological quality of the drinking water served by the system will not be adversely affected by the modifications. At a minimum, the department shall require the system modifying its disinfection practice to—

1. Evaluate the source water for microbiological quality;

2. Evaluate its existing treatment practices and consider improvements that will minimize disinfectant demand and optimize finished water quality throughout the distribution system; and

3. Conduct additional monitoring and studies as required by the department to assure continued maintenance of optimal biological quality in finished water.

(3) Monitoring Requirements and Plan.

(A) General Requirements.

1. Systems must take all samples during normal operating conditions.

2. With department approval, systems may consider multiple wells drawing water from a single aquifer as one treatment plant for determining the minimum number of TTHM and HAA5 samples required. The department may approve as one treatment plant—

A. Multiple wells located in the same unconsolidated formation; or

B. Multiple wells located in the same consolidated formation.

3. Each system required to monitor under this section (3) must develop and implement a monitoring plan. This includes systems purchasing water, unless the system is included in the seller's monitoring plan.

A. The monitoring plan must include at least the following elements:

(I) Specific locations and schedules for collecting samples;

(II) How the system will calculate compliance with MCLs, maximum residual disinfection levels (MRDLs), and treatment techniques; and

(III) If approved for monitoring as a consecutive system, or if providing water to a consecutive system, under the provisions of 10 CSR 60-4.010(6), the sampling plan must reflect the entire distribution system.

B. The system must maintain the monitoring plan and make it available for inspection by the department and the general public no later than thirty (30) days following the applicable compliance dates in section (1) of this rule.

C. All systems serving more than three thousand three hundred (>3,300) people and using surface water or ground water under the direct influence of surface water (GWUDISW) must submit a copy of the monitoring plan to the department no later than the date of the first report required under 10 CSR 60-7.010(6). The department may also require the plan to be submitted by any other system at the department's discretion. After review, the department may require changes in any plan elements.

D. Systems that purchase water must provide a monitoring plan and meet the monitoring requirements of this section unless the purchaser is included in the seller's monitoring plan.

4. Failure to monitor in accordance with the monitoring plan is a monitoring violation.

5. Failure to monitor will be treated as a violation for the entire period covered by the annual average where compliance is based on a running annual average of monthly or quarterly samples or averages and the system's failure to monitor makes it impossible to determine compliance with MCLs or MRDLs.

6. Systems may use only data collected under the provisions of this section (3) or EPA's Information Collection Rule (40 CFR Subpart M) to qualify for reduced monitoring.

(B) Monitoring Requirements for Disinfection By-Products.

1. TTHMs and HAA5.

A. Routine monitoring. Systems must monitor at the frequency indicated in Table 2.

Table 2. Routine Monitoring Frequency for TTHM and HAA5

Surface water or GWUDISW system serving at least 10,000 people.	Four (4) water samples per quarter per treatment plant.	At least 25 percent of all samples collected each quarter at locations representing maximum residence time. Remaining samples taken at locations representative of at least average residence time in the distribution system and representing the entire distribution system, taking into account number of persons served, different sources of water, and different treatment methods.[1]
Surface water or GWUDISW system serving from 500 to 9,999 people.	One (1) water sample per quarter per treatment plant.	Locations representing maximum residence time.[1]
Surface water or GWUDISW system serving fewer than 500 people.	One (1) sample per year per treatment plant during month of warmest water temperature.	Locations representing maximum residence time.[1] If the sample (or average of annual samples, if more than one sample is taken) exceeds MCL, system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until system meets reduced monitoring criteria in subsection (3)(C) of this rule.
System using only ground water not under the direct influence of surface water using chemical disinfectant and serving at least 10,000 people.	One (1) water sample per quarter per treatment plant.[2]	Locations representing maximum residence time.[1]
System using only ground water not under the direct influence of surface water using chemical disinfectant and serving fewer than 10,000 persons.	One (1) sample per year per treatment plant[2] during month of warmest water temperature.	Locations representing maximum residence time.[1] If the sample (or average of annual samples, if more than one sample is taken) exceeds MCL, the system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until system meets the criteria in subsection (3)(C) of this rule for reduced monitoring.

[1]If a system elects to sample more frequently than the minimum required, at least 25 percent of all samples collected each quarter (including those taken in excess of the required frequency) must be taken at locations that represent the maximum residence time of the water in the distribution system. The remaining samples must be taken at locations representative of at least average residence time in the distribution system.

[2]Multiple wells drawing water from a single aquifer may be considered one (1) treatment plant for determining the minimum number of samples required, with department approval.

B. Systems may reduce monitoring except as otherwise provided, in accordance with Table 3.

Table 3. Reduced Monitoring Frequency TTHM and HAA5

If you are a …	You may reduce monitoring if you have monitored at least once a year and your…	To this level
Surface water or GWUDISW system serving at least 10,000 persons which has a source water annual average total organic carbon (TOC) level, before any treatment, ≤4.0 mg/L.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L.	One (1) sample per treatment plant per quarter at distribution system location reflecting maximum residence time.
Surface water or GWUDISW system serving from 500 to 9,999 persons which has a source water annual average TOC level, before any treatment, ≤4.0 mg/L.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L.	One (1) sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature. NOTE: Any surface water or GWUDISW system serving fewer than 500 persons may not reduce its monitoring to less than one (1) sample per treatment plant per year.
System using only ground water not under direct influence of surface water using chemical disinfectant and serving at least 10,000 persons.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L.	One (1) sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature.
System using only ground water not under direct influence of surface water using chemical disinfectant and serving fewer than 10,000 persons.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L for two (2) consecutive years OR TTHM annual average ≤0.20 mg/L and HAA5 annual average ≤0.015 mg/L for one (1) year.	One (1) sample per treatment plant every three (3) years at distribution system location reflecting maximum residence time during month of warmest water temperature, with the three (3)-year cycle beginning on January 1 following quarter in which system qualifies for reduced monitoring.

C. Monitoring requirements for source water TOC. In order to qualify for reduced monitoring for TTHM and HAA5 under subparagraph (3)(B)1.B. of this rule, surface water and ground water under the direct influence of surface water (GWUDISW) systems not monitoring under the provisions of subsection (3)(D) of this rule must take monthly TOC samples every thirty (30) days at a location prior to any treatment, beginning April 1, 2008, or earlier, if specified by the department. In addition to meeting other criteria for reduced monitoring in subparagraph (3)(B)1.B. of this rule, the source water TOC running annual average must be less than or equal to 4.0 mg/L (based on the most recent four (4) quarters of monitoring) on a continuing basis at each treatment plant to reduce or remain on reduced monitoring for TTHM and HAA5. Once qualified for reduced monitoring for TTHM and HAA5 under subparagraph (3)(B)1.B. of this rule, a system may reduce source water TOC monitoring to quarterly TOC samples taken every ninety (90) days at a location prior to any treatment.

D. Systems on a reduced monitoring schedule may remain on that reduced schedule as long as the average of all samples taken in the year (for systems which must monitor quarterly) or the result of the sample (for systems which must monitor no more frequently than annually) is no more than 0.060 mg/L for TTHMs and 0.045 mg/L for HAA5. Systems that do not meet these levels must resume monitoring at the frequency identified in Table 2: Routine Monitoring in the quarter immediately following the quarter in which the system exceeds 0.060 mg/L for TTHMs and 0.045 mg/l for HAA5. For systems using only ground water not under the direct influence of surface water and serving fewer than ten thousand (10,000) persons, if either the TTHM annual average is greater than 0.080 mg/L or the HAA5 annual average is greater than 0.060 mg/L, the system must go to increased monitoring. Systems on increased monitoring may return to routine monitoring if after at least one (1) year of monitoring their TTHM annual average is less than or equal to 0.060 mg/L and HAA5 annual average is less than or equal to 0.045 mg/L, respectively.

E. The department may return a system to routine monitoring at the department's discretion.

2. Chlorite. Community and nontransient noncommunity water systems using chlorine dioxide, for disinfection or oxidation, must conduct monitoring for chlorite.

A. Routine monitoring.

(I) Daily monitoring. Systems must take daily samples at the entrance to the distribution system. For any daily sample that exceeds the chlorite MCL, the system must take additional samples in the distribution system the following day at the following locations: near the first customer; at a location representative of average residence time; and at a location reflecting maximum residence time in the distribution system, in addition to the sample required at the entrance to the distribution system.

(II) Monthly monitoring. Systems must take a three (3)-sample set each month

in the distribution system. The system must take one (1) sample at each of the following locations: near the first customer; at a location representative of average residence time; and at a location reflecting maximum residence time in the distribution system. Any additional routine sampling must be conducted in the same manner (as three (3)-sample sets, at the specified locations). The system may use the results of additional monitoring conducted under subparagraph (3)(B)2.B. to meet the requirement for monthly monitoring.

B. Additional monitoring. On each day following a routine sample monitoring result that exceeds the chlorite MCL at the entrance to the distribution system, the system is required to take three (3) chlorite distribution system samples at the following locations: as close to the first customer as possible, in a location representative of average residence time, and as close to the end of the distribution system as possible (reflecting maximum residence time in the distribution system).

C. Reduced monitoring.

(I) Chlorite monitoring at the entrance to the distribution system required by part (3)(B)2.A.(I) of this rule may not be reduced.

(II) Chlorite monitoring in the distribution system required by part (3)(B)2.A.(II) of this rule may be reduced to one (1) three (3)-sample set per quarter after one (1) year of monitoring where no individual chlorite sample taken in the distribution system under part (3)(B)2.A.(II) of this rule has exceeded the chlorite MCL and the system has not been required to conduct monitoring under subparagraph (3)(B)2.B. of this rule. The system may remain on the reduced monitoring schedule until either any of the three (3) individual chlorite samples taken quarterly in the distribution system under part (3)(B)2.A.(II) of this rule exceeds the chlorite MCL or the system is required to conduct monitoring under subparagraph (3)(B)2.B. of this rule, at which time the system must revert to routine monitoring.

3. Bromate.

A. Routine monitoring. Community and nontransient noncommunity systems using ozone for disinfection or oxidation must take one (1) sample per month for each treatment plant in the system using ozone. Systems must take samples monthly at the entrance to the distribution system while the ozonation system is operating under normal conditions.

B. Reduced monitoring.

(I) Through March 31, 2009, systems required to analyze for bromate may reduce monitoring from monthly to once per quarter, if the system's average source water bromide concentration is less than 0.05 mg/L based on representative monthly bromide measurements for one (1) year. The system may remain on reduced bromate monitoring until the running annual average source water bromide concentration, computed quarterly, is equal to or greater than 0.05 mg/L based on representative monthly measurements. If the running annual average source water bromide concentration is greater than or equal to 0.05 mg/L, the system must resume routine monitoring required by subparagraph (3)(B)3.A. of this rule in the following month.

(II) Beginning April 1, 2009, systems may no longer use the provisions of the preceding part (3)(B)3.B.(I) to qualify for reduced monitoring. A system required to analyze for bromate may reduce monitoring from monthly to quarterly, if the system's running annual average bromate concentration is less than or equal to 0.0025 mg/L based on monthly bromate measurements under subparagraph (3)(B)3.A. of this rule for the most recent four (4) quarters, with samples analyzed using Method 317.0 Revision 2.0, 326.0, or 321.8. If a system has qualified for reduced bromate monitoring under part (3)(B)3.B.(I), that system may remain on reduced monitoring as long as the running annual average of quarterly bromate samples is $\leq$0.0025 mg/L based on samples analyzed using Method 317.0 Revision 2.0, 326.0, or 321.8. If the running annual average bromate concentration is $>$0.0025 mg/L, the system must resume routine monitoring required by subparagraph (3)(B)3.A. of this rule.

(C) Monitoring Requirements for Disinfectant Residuals.

1. Chlorine and chloramines.

A. Routine monitoring. Community and nontransient noncommunity water systems must measure the residual disinfectant level at the same points in the distribution system and at the same time as total coliforms are sampled, as specified in 10 CSR 60-4.020. System using surface water or ground water under the direct influence of surface water may use the results of residual disinfectant concentration sampling conducted under 10 CSR 60-4.080(3) and 10 CSR 60-4.055(4), in lieu of taking separate samples.

B. Reduced monitoring. Monitoring may not be reduced.

2. Chlorine dioxide.

A. Routine monitoring. Community, nontransient noncommunity, and transient noncommunity water systems that use chlorine dioxide for disinfection or oxidation must take daily samples at the entrance to the distribution system. For any daily sample that detects chlorine dioxide, the system must take additional samples in the distribution system the following day, in addition to the sample required at the entrance to the distribution system.

B. Additional monitoring. On each day following a routine sample monitoring result that detects chlorine dioxide, the system is required to take three (3) chlorine dioxide distribution system samples as close to the first customer as possible, at intervals of at least six (6) hours. If chloramines are used to maintain a disinfectant residual in the distribution system, or if chlorine is used to maintain a disinfectant residual in the distribution system and there are no disinfection addition points after the entrance to the distribution system (that is, no booster chlorination), the system must take three (3) samples as close to the first customer as possible, at intervals of at least six (6) hours. If chlorine is used to maintain a disinfectant residual in the distribution system and there are one (1) or more disinfection addition points after the entrance to the distribution system (that is, booster chlorination), the system must take one (1) sample at each of the following locations: as close to the first customer as possible; in a location representative of average residence time; and as close to the end of the distribution system as possible (reflecting maximum residence time in the distribution system).

C. Reduced monitoring. Chlorine dioxide monitoring may not be reduced.

(D) Monitoring Requirements for Disinfection By-Product Precursors (DBPP).

1. Routine monitoring. Systems using surface water or ground water under the direct influence of surface water and using conventional filtration treatment must monitor each treatment plant for total organic carbon (TOC) no later than the point of combined filter effluent turbidity monitoring and representative of the treated water. These systems must also monitor for TOC in the source water prior to any treatment at the same time as monitoring for TOC in the treated water. These samples (source water and treated water) are referred to as paired samples. At the same time as the source water sample is taken, all systems must monitor for alkalinity in the source water prior to any treatment. Systems must take one (1) paired sample and one (1) source water alkalinity sample per month per plant at a time representative of normal operating conditions and influent water quality.

2. Reduced monitoring. Systems using surface water or ground water under the

direct influence of surface water with an average treated water TOC of less than 2.0 mg/L for two (2) consecutive years, or less than 1.0 mg/L for one (1) year, may reduce monitoring for both TOC and alkalinity to one (1) paired sample and one (1) source water alkalinity sample per plant per quarter. The system must revert to routine monitoring in the month following the quarter when the annual average treated water TOC greater than or equal to 2.0 mg/L.

(E) Bromide. Systems required to analyze for bromate may reduce bromate monitoring from monthly to once per quarter, if the system demonstrates that the average source water bromide concentration is less than 0.05 mg/L based upon representative monthly measurements for one (1) year. The system must continue bromide monitoring to remain on reduced bromate monitoring.

(4) Compliance Requirements.

(A) General Requirements.

1. Where compliance is based on a running annual average of monthly or quarterly samples or averages and the system fails to monitor for TTHM, HAA5, or bromate, this failure to monitor will be treated as a monitoring violation for the entire period covered by the annual average.

2. Where compliance is based on a running annual average of monthly or quarterly samples or averages and the system's failure to monitor makes it impossible to determine compliance with MRDLs for chlorine and chloramines, this failure to monitor will be treated as a monitoring violation for the entire period covered by the annual average.

3. All samples taken and analyzed under the provisions of this rule must be included in determining compliance, even if that number is greater than the minimum required.

4. If, during the first year of monitoring, any individual quarter's average will cause the running annual average of that system to exceed the MCL, the system is out of compliance at the end of that quarter.

(B) Disinfection By-Products.

1. TTHMs and HAA5.

A. For systems monitoring quarterly, compliance must be based on a running annual arithmetic average, computed quarterly, of quarterly arithmetic averages of all samples collected by the system as prescribed by paragraph (3)(B)1. of this rule.

B. For systems monitoring less frequently than quarterly, systems demonstrate compliance if the average of samples taken that year under the provisions of paragraph (3)(B)1. of this rule does not exceed the MCL. If the average of these samples exceeds the MCL, the system must increase monitoring to once per quarter per treatment plant. The system is not in violation until it has completed one (1) year of quarterly monitoring, unless the result of fewer than four (4) quarters of monitoring will cause the running annual average to exceed the MCL, in which case the system is in violation at the end of that quarter. Systems required to increase to quarterly monitoring must calculate compliance by including the sample that triggered the increased monitoring plus the following three (3) quarters of monitoring.

C. If the running annual arithmetic average of quarterly averages covering any consecutive four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 10 CSR 60-8.010 addition to reporting to the department pursuant to 10 CSR 60-7.010.

D. If a public water system fails to complete four (4) consecutive quarters of monitoring, compliance with the MCL for the last four-quarter compliance period must be based on an average of the available data.

2. Bromate. Compliance must be based on a running annual arithmetic average, computed quarterly, of monthly samples (or, for months in which the system takes more than one sample, the average of all samples taken during the month) collected by the system as prescribed by paragraph (3)(B)3. of this rule. If the average of samples covering any consecutive four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 10 CSR 60-8.010, in addition to reporting to the department pursuant to 10 CSR 60-7.010. If a PWS fails to complete twelve (12) consecutive months' monitoring, compliance with the MCL for the last four (4)-quarter compliance period must be based on an average of the available data.

3. Chlorite. Compliance must be based on an arithmetic average of each three (3) sample set taken in the distribution system as prescribed by item (3)(B)2.A.(II) and subparagraph (3)(B)2.B. of this rule. If the arithmetic average of any three (3) sample set exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 10 CSR 60-8.010, in addition to reporting to the department pursuant to 10 CSR 60-7.010.

(C) Disinfectant Residuals.

1. Chlorine and chloramines.

A. Compliance must be based on a running annual arithmetic average, computed quarterly, of monthly averages of all samples collected by the system under paragraph (3)(C)1. of this rule. If the average covering any consecutive four (4)-quarter period exceeds the MRDL, the system is in violation of the MRDL and must notify the public pursuant to 10 CSR 60-8.010, in addition to reporting to the department pursuant to 10 CSR 60-7.010.

B. In cases where systems switch between the use of chlorine and chloramines for residual disinfection during the year, compliance must be determined by including together all monitoring results of both chlorine and chloramines in calculating compliance. Reports submitted pursuant to 10 CSR 60-7.010(6) must clearly indicate which residual disinfectant was analyzed for each sample.

2. Chlorine dioxide.

A. Acute violations. Compliance must be based on consecutive daily samples collected by the system under paragraph (3)(C)2. of this rule. If any daily sample taken at the entrance to the distribution system exceeds the MRDL, and on the following day one (1) (or more) of the three (3) samples taken in the distribution system exceed the MRDL, the system is in violation of the MRDL and must take immediate corrective action to lower the level of chlorine dioxide below the MRDL and must notify the public pursuant to the procedures for acute health risks in 10 CSR 60-8.010(2), in addition to reporting to the department pursuant to 10 CSR 60-7.010. Failure to take samples in the distribution system the day following an exceedance of the chlorine dioxide MRDL at the entrance to the distribution system will also be considered an MRDL violation and the system must notify the public of the violation in accordance with the provisions for acute violations under 10 CSR 60-8.010(2), in addition to reporting to the department pursuant to 10 CSR 60-7.010.

B. Nonacute violations. Compliance must be based on consecutive daily samples collected by the system in compliance with this rule.

(I) If any two (2) consecutive daily samples taken at the entrance to the distribution system detect chlorine dioxide, the system must take corrective action to lower the chlorine dioxide level.

(II) If any two (2) consecutive daily samples taken at the entrance to the distribution system exceed the MRDL and all distribution system samples taken are below the MRDL, the system is in violation of the MRDL and must take corrective action to lower the level of chlorine dioxide below the MRDL at the point of sampling and notify the public pursuant to the procedures for nonacute health risks in 10 CSR 60-8.010(3), in addition to reporting to the department pursuant to 10 CSR 60-7.010. Failure to monitor at the entrance to the distribution system the day following an exceedance of the

chlorine dioxide MRDL at the entrance to the distribution system is also an MRDL violation and the system must notify the public of the violation in accordance with the provisions for nonacute violations in 10 CSR 60-8.010(3), in addition to reporting to the department pursuant to 10 CSR 60-7.010.

(D) Disinfection By-Product Precursors (DBPP).

1. Systems using surface water or ground water under the direct influence of surface water and using conventional filtration treatment must operate with enhanced coagulation or enhanced softening to achieve the TOC percent removal levels specified in this rule unless the system meets at least one (1) of the alternative compliance criteria listed here. These systems must still comply with monitoring requirements in sections (3)–(4) of this rule. The alternative compliance criteria for enhanced coagulation and enhanced softening are:

A. The system's source water TOC level, measured according to 10 CSR 60-5.010, is less than 2.0 mg/L, calculated quarterly as a running annual average;

B. The system's treated water TOC level, measured according to 10 CSR 60-5.010, is less than 2.0 mg/L, calculated quarterly as a running annual average;

C. The system's source water TOC level, measured according to 10 CSR 60-5.010, is less than 4.0 mg/L, calculated quarterly as a running annual average; the source water alkalinity, measured according to 10 CSR 60-5.010, is greater than sixty (60) mg/L (as $CaCO_3$), calculated quarterly as a running annual average; and either the TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively; or prior to the effective date for compliance with this rule, the system has made a clear and irrevocable financial commitment not later than the effective date for compliance with this rule to use technologies that will limit the levels of TTHMs and HAA5 to no more than 0.040 mg/L and 0.030 mg/L, respectively. Systems must submit evidence of a clear and irrevocable financial commitment, in addition to a schedule containing milestones and periodic progress reports for installation and operation of appropriate technologies, to the department for approval not later than the effective date for compliance with this rule. These technologies must be installed and operating not later than June 30, 2005. Failure to install and operate these technologies by the date in the approved schedule will constitute a violation;

D. The TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively, and the system uses only chlorine for primary disinfection and maintenance of a residual in the distribution system;

E. The system's source water SUVA, prior to any treatment and measured monthly according to 10 CSR 60-5.010, is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average. SUVA refers to Specific Ultraviolet Absorption at two hundred fifty-four nanometers (254 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); and

F. The system's finished water SUVA, measured monthly according to 10 CSR 60-5.010, is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average.

2. Additional alternative compliance criteria for softening systems. Systems practicing enhanced softening that cannot achieve the Step 1 TOC removals may use the alternative compliance criteria listed here in lieu of complying with paragraph (4)(D)3. of this rule. Systems must still comply with monitoring requirements in sections (3)–(4) of this rule.

A. Softening that results in lowering the treated water alkalinity to less than sixty (60) mg/L (as $CaCO_3$), measured monthly according to 10 CSR 60-5.010 and calculated quarterly as a running annual average.

B. Softening that results in removing at least ten (10) mg/L of magnesium hardness (as $CaCO_3$), measured monthly according to 10 CSR 60-5.010 and calculated quarterly as an annual running average.

3. Enhanced coagulation and enhanced softening performance requirements.

A. Systems must achieve the percent reduction of TOC specified in Table 4 between the source water and the combined filter effluent, unless the department approves a system's request for alternate minimum TOC removal (Step 2) requirements. Systems may begin monitoring to determine whether Step 1 TOC removals can be met twelve (12) months prior to the compliance date for the system. This monitoring is not required and failure to monitor during this period is not a violation. However, any system that does not monitor during this period, and then determines in the first twelve (12) months after the compliance date that it is not able to meet the Step 1 requirements and must therefore apply for alternate minimum TOC removal (Step 2) requirements, is not eligible for retroactive approval of alternate minimum TOC removal (Step 2) requirements and is in violation. Systems may apply for alternate minimum TOC removal (Step 2) requirements any time after the compliance date. For systems required to meet Step 1 TOC removals, if the value calculated under part (4)(D)4.A.(IV) of this rule is less than 1.00, the system is in violation of the treatment technique requirements and must notify the public pursuant to 10 CSR 60-8.010 in addition to reporting to the department pursuant to 10 CSR 60-7.010.

B. Required Step 1 TOC reductions, indicated in the following table, are based upon specified source water parameters measured in accordance with 10 CSR 60-5.010. Systems practicing softening are required to meet the Step 1 TOC reductions in the far right column (Source water alkalinity > 120 mg/L) for the specified source water TOC

Table 4: Required Step 1 TOC Reduction

Step 1 Required Removal of TOC by Enhanced Coagulation and Enhanced Softening for Surface Water and GWUDISW Systems Using Conventional Treatment[1,2]			
	Source water alkalinity, mg/L as $CaCO_3$		
Source water TOC, mg/L	0–60	>60–120	>120[3]
>2.0–4.0	35.0%	25.0%	15.0%
>4.0–8.0	45.0%	35.0%	25.0%
>8.0	50.0%	40.0%	30.0%

[1]Systems meeting at least one (1) of the conditions in paragraph (4)(D)1. of this rule are not required to operate with enhanced coagulation.

[2]Softening systems meeting one (1) of the alternative compliance criteria in paragraph (4)(D)1. of this rule are not required to operate with enhanced softening.

[3]Systems practicing softening must meet the TOC removal requirements in this column.

C. Conventional treatment systems using surface water or ground water under the direct influence of surface water that cannot achieve the Step 1 TOC removals due to water quality parameters or operational constraints must apply to the department, within three (3) months of failure to achieve the Step 1 TOC removals, for approval of alternative minimum TOC removal (Step 2) requirements submitted by the system. If the department approves the alternative minimum TOC removal (Step 2) requirements, the department may make those requirements retroactive for the purposes of determining compliance. Until the department approves the alternate minimum TOC removal (Step 2) requirements, the system must meet the Step 1 TOC

removals.

D. Alternate minimum TOC removal (Step 2) requirements. Applications made to the department by enhanced coagulation systems for approval of alternative minimum TOC removal (Step 2) requirements under subparagraph (4)(D)3.C. of this rule must include, as a minimum, results of bench- or pilot-scale testing conducted under this subparagraph (4)(D)3.D. and used to determine the alternate enhanced coagulation level.

(I) Alternate enhanced coagulation level is defined as coagulation at a coagulant dose and pH as determined by the method described here such that an incremental addition of ten (10) mg/L of alum (or equivalent amount of ferric salt) results in a TOC removal of less than or equal to 0.3 mg/L. The percent removal of TOC at this point on the "TOC removal versus coagulant dose" curve is then defined as the minimum TOC removal required for the system. Once approved by the department, this minimum requirement supersedes the minimum TOC removal required by Table 4 of this rule. This requirement will be effective until such time as the department approves a new value based on the results of a new bench- and pilot-scale test. Failure to achieve department-set alternative minimum TOC removal levels is a violation.

(II) Bench- or pilot-scale testing of enhanced coagulation must be conducted by using representative water samples and adding 10 mg/L increments of alum (or equivalent amounts of ferric salt) until the pH is reduced to a level less than or equal to the enhanced coagulation Step 2 target pH shown in Table 5.

Table 5: Enhanced Coagulation Step 2 Target pH

Alkalinity (mg/L as $CaCO_3$)	Target pH
0–60	5.5
>60–120	6.3
>120–240	7.0
>240	7.5

(III) For waters with alkalinities of less than sixty (60) mg/L for which addition of small amounts of alum or equivalent addition of iron coagulant drives the pH below 5.5 before significant TOC removal occurs, the system must add necessary chemicals to maintain the pH between 5.3 and 5.7 in samples until the TOC removal of 0.3 mg/L per 10 mg/L alum added (or equivalent addition of iron coagulant) is reached.

(IV) The system may operate at any coagulant dose or pH necessary (consistent with other regulatory requirements) to achieve the minimum TOC percent removal approved under subsection (3)(C) of this rule.

(V) If the TOC removal is consistently less than 0.3 mg/L of TOC per 10 mg/L of incremental alum dose at all dosages of alum (or equivalent addition of iron coagulant), the water is deemed to contain TOC not amenable to enhanced coagulation. The system may then apply to the department for a waiver of enhanced coagulation requirements.

4. Compliance calculations.

A. Systems using surface water or ground water under the direct influence of surface water, other than those identified in paragraphs (4)(D)1. or 2. of this rule, must comply with requirements contained in subparagraph (4)(D)3.B. of this rule. Systems must calculate compliance quarterly, beginning after the system has collected twelve (12) months of data, by determining an annual average using the following method:

(I) Determine actual monthly TOC percent removal, equal to: (1 – (treated water TOC/source water TOC)) × 100;

(II) Determine the required monthly TOC percent removal;

(III) Divide the value in part (4)(D)4.A.(I) by the value in part (4)(D)4.A(II); and

(IV) Add together the results of part (4)(D)4.A.(III) for the last twelve (12) months and divide by twelve (12). If the value calculated is less than 1.00, the system is not in compliance with the TOC percent removal requirements.

B. Systems may use the following provisions in lieu of the calculations in subparagraph (4)(D)4.A. of this rule to determine compliance with TOC percent removal requirements:

(I) In any month that the system's treated or source water TOC level, measured according to 10 CSR 60-5.010, is less than 2.0 mg/L, the system may assign a monthly value of 1.0 (in lieu of the value calculated in part (4)(D)4.A.(III) of this rule);

(II) In any month that a system practicing softening removes at least 10 mg/L of magnesium hardness (as $CaCO_3$), the system may assign a monthly value of 1.0 (in lieu of the value calculated in part (4)(D)4.A.(III) of this rule);

(III) In any month that the system's source water SUVA, prior to any treatment and measured according to 10 CSR 60-5.010, is less than or equal to 2.0 L/mg-m, the system may assign a monthly value of 1.0 (in lieu of the value calculated in part (4)(D)4.A.(III) of this rule);

(IV) In any month that the system's finished water SUVA, measured according to 10 CSR 60-5.010, is less than or equal to 2.0 L/mg-m, the system may assign a monthly value of 1.0 (in lieu of the value calculated in part (4)(D)4.A.(III) of this rule); and

(V) In any month that a system practicing enhanced softening lowers alkalinity below sixty (60) mg/L (as $CaCO_3$), the system may assign a monthly value of 1.0 (in lieu of the value calculated in part (4)(D)4.A.(III) of this rule).

C. Systems using conventional treatment and surface water or ground water under the direct influence of surface water may also comply with the requirements of this rule by meeting the criteria in paragraph (4)(D)1. or 2. of this rule.

AUTHORITY: section 640.100, RSMo Supp. 2008. Original rule filed April 14, 1981, effective Oct. 11, 1981. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996. Amended: Filed Dec. 15, 1999, effective Sept. 1, 2000. Amended: Filed March 17, 2003, effective Nov. 30, 2003. Amended: Filed Feb. 27, 2009, effective Oct. 30, 2009.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002, 2006.*

10 CSR 60-4.092 Initial Distribution System Evaluation

PURPOSE: This rule incorporates by reference the Stage 2 Disinfectants/Disinfection By-Products Rule initial distribution system evaluation requirements found in 40 CFR part 141 subpart U, July 1, 2007.

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference material. The entire text of the rule is printed here.

(1) The regulations set forth in 40 CFR part 141 subpart U, July 1, 2007, are incorporated by reference, subject to the clarification in section (2) of this rule. The *Code of Federal Regulations* is published by the U.S. Government and is available by calling toll-free (866) 512-1800 or going to http://bookstore.gpo.gov. The address is: U.S.

Government Printing Office, U.S. Superintendent of Documents, Washington, DC 20402-0001. This does not include later amendments or additions.

(2) Clarifications to the Incorporation by Reference.

(A) Missouri Department of Natural Resources shall be substituted for U.S. Environmental Protection Agency, EPA, the state, or primacy agency wherever those terms appear in the incorporated subpart.

(B) "Director" shall be substituted for administrator wherever that term appears in the incorporated subpart.

AUTHORITY: section 640.100, RSMo Supp. 2008. Original rule filed Feb. 27, 2009, effective Oct. 30, 2009.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002, 2006.*

10 CSR 60-4.094 Stage 2 Disinfectants/Disinfection By-Products

PURPOSE: This rule establishes monitoring and other requirements for achieving compliance with maximum contaminant levels based on locational running annual averages for certain disinfection by-products and for achieving compliance with maximum residual disinfectant levels for chlorine and chloramine for certain consecutive systems. This rule incorporates the requirements of subpart V of 40 CFR part 141, Stage 2 Disinfectants/Disinfection By-Products, published in the January 4, 2006, ***Federal Register****.*

(1) Stage 2 Disinfectants/Disinfection By-Products (D/DBP) Rule General Requirements.

(A) The requirements of this rule constitute national primary drinking water regulations. This rule establishes monitoring and other requirements for achieving compliance with maximum contaminant levels based on locational running annual averages (LRAA) for total trihalomethanes (TTHM) and haloacetic acids five (HAA5), and for achieving compliance with maximum residual disinfectant residuals for chlorine and chloramine for certain consecutive systems.

(B) Applicability. This rule applies to community water systems and nontransient noncommunity water systems that use a primary or residual disinfectant other than ultraviolet light or deliver water that has been treated with a primary or residual disinfectant other than ultraviolet light.

(C) Compliance Schedules.

1. Systems must comply with the requirements in this rule on the following schedule. The department may grant up to an additional twenty-four (24) months beyond the deadlines specified below for compliance with maximum contaminant levels (MCL) and operational evaluation levels if capital improvements are required to comply with an MCL.

A. Systems that are not part of a combined distribution system and systems that serve the largest population in the combined distribution system.

(I) Systems serving $\geq$ 100,000 population must comply with this rule by April 1, 2012.

(II) Systems serving 50,000–99,999 population must comply with this rule by October 1, 2012.

(III) Systems serving 10,000–49,999 population must comply with this rule by October 1, 2013.

(IV) Systems serving $<$ 10,000 population must comply with this rule by October 1, 2013, if no *Cryptosporidium* monitoring is required under 10 CSR 60-4.052(2)(A)4. or October 1, 2014, if *Cryptosporidium* monitoring is required under 10 CSR 60-4.052(2)(A)4.

B. Other systems that are part of a combined distribution system. Consecutive system or wholesale system must comply with this rule at the same time as the system with the earliest compliance date in the combined distribution system.

2. Monitoring frequency is specified in paragraph (2)(A)2. of this rule.

A. If you are required to conduct quarterly monitoring, you must begin monitoring in the first full calendar quarter that includes the applicable compliance date in paragraph (1)(C)1. of this rule.

B. If you are required to conduct monitoring at a frequency that is less than quarterly, you must begin monitoring in the calendar month recommended in the Initial Distribution System Evaluation (IDSE) report prepared under Standard Monitoring or the System Specific studies in 40 CFR part 141 subpart U, incorporated by reference in 10 CSR 60-4.092, or the calendar month identified in the monitoring plan developed under section (3) of this rule no later than twelve (12) months after the compliance date in this table.

3. If you are required to conduct quarterly monitoring, you must make compliance calculations at the end of the fourth calendar quarter that follows the compliance date and at the end of each subsequent quarter (or earlier if the LRAA calculated based on fewer than four (4) quarters of data would cause the MCL to be exceeded regardless of the monitoring results of subsequent quarters). If you are required to conduct monitoring at a frequency that is less than quarterly, you must make compliance calculations beginning with the first compliance sample taken after the compliance date.

4. For the purpose of the schedule in paragraph (1)(C)1. of this rule, the department may determine that the combined distribution system does not include certain consecutive systems based on factors such as receiving water from a wholesale system only on an emergency basis or receiving only a small percentage and small volume of water from a wholesale system. The department may also determine that the combined distribution system does not include certain wholesale systems based on factors such as delivering water to a consecutive system only on an emergency basis or delivering only a small percentage and small volume of water to a consecutive system.

(D) Monitoring and Compliance.

1. Systems required to monitor quarterly. To comply with MCLs in section 10 CSR 60-4.090(1)(D) you must calculate LRAAs for TTHM and HAA5 using monitoring results collected under this rule and determine that each LRAA does not exceed the MCL. If you fail to complete four (4) consecutive quarters of monitoring, you must calculate compliance with the MCL based on the average of the available data from the most recent four (4) quarters. If you take more than one (1) sample per quarter at a monitoring location, you must average all samples taken in the quarter at that location to determine a quarterly average to be used in the LRAA calculation.

2. Systems required to monitor yearly or less frequently. To determine compliance with the Stage 2 D/DBP MCLs in subsection 10 CSR 60-4.090(1)(D), you must determine that each sample taken is less than the MCL. If any sample exceeds the MCL, you must comply with the requirements of section (6) of this rule. If no sample exceeds the MCL, the sample result for each monitoring location is considered the LRAA for that monitoring location.

(E) Violation. You are in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA if you fail to monitor.

(2) Routine Monitoring.

(A) Monitoring.

1. If you submitted an IDSE report, you must begin monitoring at the locations and months you have recommended in your IDSE

report submitted under the monitoring location recommendations and chart in 40 CFR part 141 subpart U, which is incorporated by reference in 10 CSR 60-4.092, following the schedule in subsection (1)(C) of this rule, unless the department requires other locations or additional locations after its review. If you submitted a 40/30 certification or qualified for a very small system waiver under 40 CFR part 141 subpart U, which is incorporated by reference in 10 CSR 60-4.092, or you are a nontransient noncommunity water system serving less than ten thousand (10,000) population, you must monitor at the location(s) and dates identified in your monitoring plan under 10 CSR 60-4.090(3)(A)3., updated as required by section (3) of this rule.

2. You must monitor at no fewer than the number of locations identified in the following table.

Stage 2 D/DBP Routine Monitoring

Source water type	Population size category	Monitoring Frequency[1]	Distribution system monitoring location total per monitoring period [2]
Surface water system or ground water under the direct influence of surface water:	< 500	Per year	2
	500–3,300	Per quarter	2
	3,301–9,999	Per quarter	2
	10,000–49,999	Per quarter	4
	50,000–249,999	Per quarter	8
	250,000–999,999	Per quarter	12
	1,000,000–4,999,999	Per quarter	16
	≥ 5,000,000	Per quarter	20
Ground water:	< 500	Per year	2
	500–9,999	Per year	2
	10,000–99,999	Per quarter	4
	100,000–499,999	Per quarter	6
	≥ 500,000	Per quarter	8

[1] All systems must monitor during month of highest DBP concentrations.

[2] Systems on quarterly monitoring must take dual sample sets every 90 days at each monitoring location, except for surface water systems or ground water under the direct influence of surface water serving 500–3,300. Systems on annual monitoring and surface water systems or ground water under the direct influence of surface water serving 500–3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the location with the highest TTHM and HAA5 concentrations, respectively. Only one (1) location with a dual sample set per monitoring period is needed if the highest TTHM and HAA5 concentrations occur at the same location (and month, if monitored annually).

3. If you are an undisinfected system that begins using a disinfectant other than ultraviolet (UV) light after the dates in 40 CFR part 141 subpart U for complying with the Initial Distribution System Evaluation requirements, you must consult with the department to identify compliance monitoring locations for this rule. You must then develop a monitoring plan under section (3) of this rule that includes those monitoring locations.

(B) Analytical methods. You must use an approved method listed in 10 CSR 60-5.010 for TTHM and HAA5 analyses. Analyses must be conducted by laboratories that have received certification by Environmental Protection Agency (EPA) or the department as specified in 10 CSR 60-5.010.

(3) Stage 2 D/DBP Rule Monitoring Plan.

(A) Developing and implementing a monitoring plan.

1. You must develop and implement a monitoring plan to be kept on file for department and public review. The monitoring plan must contain the following elements and be complete no later than the date you conduct your initial monitoring under this rule:

A. Monitoring locations;

B. Monitoring dates;

C. Compliance calculation procedures; and

D. Monitoring plans for any other systems in the combined distribution system if the department has reduced monitoring requirements.

2. If you were not required to submit an IDSE report under either Standard Monitoring or System Specific Studies in 40 CFR part 141 subpart U, and you do not have sufficient Stage 1 D/DBP rule monitoring locations to identify the required number of Stage 2 D/DBP rule compliance monitoring locations indicated in the Monitoring Location Recommendations table in 40 CFR part 141 subpart U, you must identify additional locations by alternating selection of locations representing high TTHM levels and high HAA5 levels until the required number of compliance monitoring locations have been identified. You must also provide the rationale for identifying the locations as having high levels of TTHM or HAA5. If you have more Stage 1 D/DBP rule monitoring locations than required for Stage 2 D/DBP rule compliance monitoring, detailed in the Monitoring Location Recommendations table in 40 CFR part 141 subpart U, you must identify which locations you will use for Stage 2 D/DBP rule compliance monitoring by alternating selection of locations representing high TTHM levels and high HAA5 levels until the required number of Stage 2 D/DBP rule compliance monitoring locations have been identified.

(B) If you are a surface water system or ground water under the direct influence of surface water system serving greater than three thousand three hundred (>3,300) people, you must submit a copy of your monitoring plan to the department prior to the date you conduct your initial monitoring under this rule, unless your IDSE report submitted under 40 CFR part 141 subpart U contains all the information required by section (3) of this rule.

(C) You may revise your monitoring plan to reflect changes in treatment, distribution system operations and layout (including new service areas), or other factors that may affect TTHM or HAA5 formation, or for department-approved reasons, after consultation with the department regarding the need for changes and the appropriateness of changes. If you change monitoring locations, you must replace existing compliance monitoring locations with the lowest LRAA with new locations that reflect the current distribution system locations with expected high TTHM or HAA5 levels. The department may also require modifications in your monitoring plan. If you are a surface water system or ground water under the direct influence of surface water system serving greater than three thousand three hundred (>3,300) people, you must submit a copy of your modified monitoring plan to the department prior to the date you are required to comply with the revised monitoring plan.

(4) Reduced Monitoring.

(A) You may reduce monitoring to the level specified in this subsection (4)(A) any time the LRAA is ≤0.040 mg/L for TTHM and ≤0.030 mg/L for HAA5 at all monitoring locations. You may only use data collected under the provisions of this rule or the Stage 1 D/DBP rule to qualify for reduced monitoring. In addition, the source water annual average total organic carbon (TOC) level, before any treatment, must be ≤4.0 mg/L at each treatment plant treating surface water or ground water under the direct influence of surface water, based on monitoring conducted under either 10 CSR 60-4.090(3)(B)1.C. or 10 CSR 60-4.090(3)(D).

Stage 2 D/DBP Reduced Monitoring

Source water type	Population size category	Monitoring Frequency[1]	Distribution system monitoring location per monitoring period
Surface water system or ground water under the direct influence of surface water:	< 500	.....	Monitoring may not be reduced.
	500–3,300	Per year	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement; one at the location and during the quarter with the highest HAA5 single measurement; and 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	3,301–9,999	Per year	2 dual sample sets: one at the location and during the quarter with the highest TTHM single measurement; and one at the location and during the quarter with the highest HAA5 single measurement.
	10,000–49,999	Per quarter	2 dual sample sets at the locations with the highest TTHM and highest HAA5 LRAAs.
	50,000–249,999	Per quarter	4 dual sample sets—at the locations with the two highest TTHM and two highest HAA5 LRAAs.
	250,000–999,999	Per quarter	6 dual sample sets—at the locations with the three highest TTHM and three highest HAA5 LRAAs.
	1,000,000–4,999,999	Per quarter	8 dual sample sets—at the locations with the four highest TTHM and four highest HAA5 LRAAs.
	≥ 5,000,000	Per quarter	10 dual sample sets—at the locations with the five highest TTHM and five highest HAA5 LRAAs.
Ground water:	< 500	Every third year	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement; one at the location and during the quarter with the highest HAA5 single measurement; and 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	500-9,999	Per year	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement; one at the location and during the quarter with the highest HAA5 single measurement; and 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	10,000-99,999	Per year	2 dual sample sets: one at the location and during the quarter with the highest TTHM single measurement; and one at the location and during the quarter with the highest HAA5 single measurement.
	100,000-499,999	Per quarter	2 dual sample sets; at the locations with the highest TTHM and highest HAA5 LRAAs.
	≥ 500,000	Per quarter	4 dual sample sets at the locations with the two highest TTHM and two highest HAA5 LRAAs.

[1] Systems on quarterly monitoring must take dual sample sets every 90 days.

(B) You may remain on reduced monitoring as long as the TTHM LRAA $\leq$0.040 mg/L and the HAA5 LRAA $\leq$0.030 mg/L at each monitoring location (for systems with quarterly reduced monitoring) or each TTHM sample $\leq$0.060 mg/L and each HAA5 sample $\leq$0.045 mg/L (for systems with annual or less frequent monitoring). In addition, the source water annual average TOC level, before any treatment, must be $\leq$4.0 mg/L at each treatment plant treating surface water or ground water under the direct influence of surface water, based on monitoring conducted under either 10 CSR 60-4.090(3)(B)1.C. or 10 CSR 60-4.090(3)(D).

(C) If the LRAA based on quarterly monitoring at any monitoring location exceeds either 0.040 mg/L for TTHM or 0.030 mg/L for HAA5 or if the annual (or less frequent) sample at any location exceeds either 0.060 mg/L for TTHM or 0.045 mg/L for HAA5, or if the source water annual average TOC level, before any treatment, >4.0 mg/L at any treatment plant treating surface water or ground water under the direct influence of surface water, you must resume routine monitoring under section 10 CSR 60-4.094(2) or begin increased monitoring if section 10 CSR 60-4.094(6) applies.

(D) The department may return your system to routine monitoring at the department's discretion.

(5) Additional Requirements for Consecutive Systems. If you are a consecutive system that does not add a disinfectant but delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light, you must comply with analytical and monitoring requirements for chlorine and chloramines in 10 CSR 60-5.010 and 10 CSR 60-4.055(4)(E) and the compliance requirements in 10 CSR 60-4.090(4)(C)1. beginning April 1, 2009, unless required earlier by the department, and report monitoring results under 10 CSR 60-7.010(6)(C).

(6) Conditions Requiring Increased Monitoring.

(A) If you are required to monitor at a particular location annually or less frequently than annually under section (2) or (4) of this rule, you must increase monitoring to dual sample sets once per quarter (taken every ninety (90) days) at all locations if a TTHM sample is >0.080 mg/L or an HAA5 sample is >0.060 mg/L at any location.

(B) You are in violation of the MCL when the LRAA exceeds the Stage 2 D/DBP rule MCLs in subsection 10 CSR 60-4.090(1)(D), calculated based on four (4) consecutive quarters of monitoring (or the LRAA calculated based on fewer than four (4) quarters of data if the MCL would be exceeded regardless of the monitoring results of subsequent quarters). You are in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA if you fail to monitor.

(C) You may return to routine monitoring once you have conducted increased monitoring for at least four (4) consecutive quarters and the LRAA for every monitoring location is $\leq$0.060 mg/L for TTHM and $\leq$0.045 mg/L for HAA5.

(7) Operational Evaluation Levels.

(A) You have exceeded the operational evaluation level at any monitoring location where the sum of the two (2) previous quarters of TTHM results plus twice the current quarter's TTHM result, divided by four (4) to determine an average, exceeds 0.080 mg/L, or where the sum of the two (2) previous quarters of HAA5 results plus twice the current quarter's HAA5 result, divided by four (4) to determine an average, exceeds 0.060 mg/L.

(B) If Operational Evaluation Levels are Exceeded.

1. If you exceed the operational evaluation level, you must conduct an operational evaluation and submit a written report of the evaluation to the department no later than ninety (90) days after being notified of the analytical result that causes you to exceed the operational evaluation level. The written report must be made available to the public upon request.

2. Your operational evaluation must include an examination of system treatment and distribution operational practices, including storage tank operations, excess storage capacity, distribution system flushing, changes in sources or source water quality, and treatment changes or problems that may contribute to TTHM and HAA5 formation and what steps could be considered to minimize future exceedences.

A. You may request and the department may allow you to limit the scope of your evaluation if you are able to identify the cause of the operational evaluation level exceedance.

B. Your request to limit the scope of the evaluation does not extend the schedule in paragraph (7)(B)1. of this rule for submitting the written report. The department must approve this limited scope of evaluation in writing, and you must keep that approval with the completed report.

(8) Requirements for Remaining on Reduced TTHM and HAA5 Monitoring Based on Stage 1 D/DBP Rule Results. You may remain on reduced monitoring after the dates identified in subsection (1)(C) of this rule for compliance with this rule only if you qualify for a 40/30 certification under 40 CFR part 141 subpart U or have received a very small system waiver under 40 CFR part 141 subpart U, plus you meet the reduced monitoring criteria in subsection (4)(A) of this rule, and you do not change or add monitoring locations from those used for compliance monitoring under the Stage 1 D/DBP rule. If your monitoring locations under this rule differ from your monitoring locations under the Stage 1 D/DBP rule, you may not remain on reduced monitoring after the dates identified in subsection (1)(C) for compliance with this rule.

(9) Requirements for Remaining on Increased TTHM and HAA5 Monitoring Based on Stage 1 D/DBP Rule Results. If you were on increased monitoring under 10 CSR 60-4.090(3)(B)1., you must remain on increased monitoring until you qualify for a return to routine monitoring under subsection (6)(C) of this rule. You must conduct increased monitoring under section (6) of this rule at the monitoring locations in the monitoring plan developed under section (3) of this rule beginning at the date identified in subsection (1)(C) of this rule for compliance with this rule and remain on increased monitoring until you qualify for a return to routine monitoring under subsection (6)(C) of this rule.

(10) Stage 2 D/DBP Reporting and Record-Keeping Requirements.

(A) Reporting requirements are found in 10 CSR 60-7.010, Reporting Requirements.

(B) Record-keeping requirements are found in 10 CSR 60-9.010, Requirements for Maintaining Public Water System Records.

AUTHORITY: section 640.100, RSMo Supp. 2008. Original rule filed Feb. 27, 2009, effective Oct. 30, 2009.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002, 2006.*

10 CSR 60-4.100 Maximum Volatile Organic Chemical Contaminant Levels and Monitoring Requirements

PURPOSE: This rule establishes maximum contaminant levels and monitoring requirements for volatile organic chemicals.

(1) This rule applies to community and nontransient noncommunity public water systems.

(2) The following are the maximum contaminant levels (MCLs) for volatile organic chemicals (VOCs).

Contaminant	Maximum Contaminant Level, Milligrams Per Liter
(A) Eight (8) original VOCs	
1. Benzene	0.005
2. Carbon tetrachloride	0.005
3. 1,2-dichloroethane	0.005
4. 1,1-dichloroethylene	0.007
5. para-dichlorobenzene	0.075
6. 1,1,1-trichloroethane	0.2
7. Trichloroethylene	0.005
8. Vinyl chloride	0.002

Contaminant	Maximum Contaminant Level, Milligrams Per Liter
(B) Thirteen (13) VOCs	
1. cis-1,2-dichloroethylene	0.07
2. Dichloromethane	0.005
3. 1,2-dichloropropane	0.005
4. Ethylbenzene	0.7
5. Monochlorobenzene	0.1
6. o-dichlorobenzene	0.6
7. Styrene	0.1
8. Tetrachloroethylene	0.005
9. Toluene	1
10. 1,2,4-Trichlorobenzene	0.07
11. 1,1,2-Trichloroethane	0.005
12. trans-1,2-dichloroethylene	0.1
13. Xylenes (total)	10

(3) For the purpose of determining compliance with MCLs, a supplier of water must collect samples of the product water for analyses as follows:

(A) During the initial three (3)-year compliance, all community and nontransient noncommunity water systems must collect an initial round of four (4) consecutive quarterly samples for each of the contaminants listed in section (2) unless a waiver has been granted by the department. The department will designate the year in which each system samples within this compliance period;

(B) All public water systems shall sample at points in the distribution system representative of each water source or at each entry point to the distribution system. Each sample must be taken at the same sampling point, unless conditions make another sampling point more representative of each source or treatment plant. The sampling point will be after the application of treatment, if any;

(C) If the system draws water from more than one (1) source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions;

(D) The department may require more frequent monitoring than specified in subsection (3)(A) of this rule and may require confirmation samples for positive and negative results at its discretion; and

(E) If one (1) sampling point is in violation of an MCL, the system is in violation of the MCL.

1. For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point.

2. Systems monitoring annually or less frequently whose sample result exceeds the MCL must begin quarterly sampling. The system will not be considered in violation of the MCL until it has completed one (1) year of quarterly sampling.

3. If any sample result will cause the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL immediately.

4. If a system fails to collect the required number of samples, compliance will be based on the total number of samples collected.

5. If a sample result is less than the detection limit, zero will be used to calculate the annual average.

(4) The department may allow the use of monitoring data collected after January 1, 1988, to satisfy the initial base sampling requirements. If the initial monitoring for all contaminants has been completed by December 31, 1992, in accordance with the requirements of subsections (3)(B) and (C) of this rule, and the system did not detect any contaminants listed in section (2), then the system shall sample annually beginning in the initial compliance period.

(5) If contaminants are not detected during the first three (3)-year compliance period, systems may decrease their sampling frequency beginning in the next year.

(A) Groundwater systems must sample annually. After three (3) years of annual sampling and no previous detection, groundwater systems may reduce their sampling frequency to one (1) sample per compliance period.

(B) Surface water systems must sample annually after the initial sampling period if there are no contaminants detected in the initial sampling.

(6) If contaminants are detected in any sample, then systems must sample quarterly beginning in the next quarter at each sampling point which resulted in a detection.

(A) Groundwater systems must sample a minimum of two (2) quarters and surface water systems must sample a minimum of four (4) quarters to establish a baseline.

(B) If the MCL is exceeded, as described in subsection (6)(E) or (F) of this rule, then systems must sample quarterly beginning in the next quarter. Systems must sample a minimum of four (4) quarters to establish a baseline.

(C) If the baseline indicates a system's analytical results are reliably and consistently below the MCL, the department may reduce the system's sampling frequency to annually. (Annual sampling must be conducted during the quarter which previously yielded the highest analytical result.)

(D) Systems which have three (3) consecutive annual samples with no detection of a contaminant may apply to the department for a waiver.

(E) If a system conducts sampling more frequently than annually, the system will be in violation when the running annual average at any sampling point exceeds the MCL.

(F) If a system conducts sampling annually or on a less frequent basis, the system will be in violation when one (1) sample (or the average of the initial and confirmation samples) at any sampling point exceeds the MCL.

(7) A public water system may apply to the department for susceptibility waivers from required sampling. Systems are eligible for reduced monitoring in the initial three (3)-year compliance period. Waivers are effective for two (2) compliance periods. The waiver must be renewed in subsequent compliance periods, or the system must conduct sampling as required by section (3) of this rule. A public water system may apply to the department for susceptibility waivers for reduced monitoring contingent on the conduct of a thorough vulnerability assessment as required by 10 CSR 60-6.060(3).

(A) As a condition of the susceptibility waiver, a groundwater system must take one (1) sample at each sampling point during the time the waiver is effective (that is, one (1) sample during two (2) compliance periods or six (6) years) and update its vulnerability assessment by the end of the first compliance period. The department must confirm that the system is not vulnerable.

(B) Surface water systems must sample at a frequency determined by the department. A vulnerability assessment according to 10 CSR 60-6.060(3) must be required in subsequent

compliance periods in order for the system to return to its nonvulnerable status.

(C) For the purposes of this section, detection is defined as greater than 0.0005 mg/l.

(8) As determined by the department, confirmation samples may be required for either positive or negative results. If a confirmation sample is used, the compliance determination is based on the average of the results of both the confirmation sample and the initial sample.

(9) Any public water system violating MCLs or monitoring and reporting requirements for any of the contaminants listed in section (2) of this rule must notify the department within seven (7) days and give public notice as required by 10 CSR 60-8.010.

(10) All new systems or systems that use a new source of water that begin operation after January 22, 2004 must demonstrate compliance with the MCL or treatment technique within a period of time specified by the department. The system must also comply with the initial sampling frequencies specified by the department to ensure a system can demonstrate compliance with the MCL or treatment technique. Routine and increased monitoring frequencies shall be conducted in accordance with the requirements in this rule.

AUTHORITY: section 640.100, RSMo Supp. 2002. Original rule filed June 2, 1988, effective Aug. 31, 1988. Rescinded and readopted: Filed March 31, 1992, effective Dec. 3, 1992. Amended: Filed May 4, 1993, effective Jan. 13, 1994. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996. Amended: Filed March 17, 2003, effective Nov. 30, 2003.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995, 1996, 1998, 1999, 2002.*

10 CSR 60-4.110 Special Monitoring for Unregulated Chemicals

PURPOSE: This rule establishes monitoring requirements for organic chemicals, volatile organic chemicals, and an inorganic chemical, which are unregulated in that they do not have maximum contaminant levels.

(1) This rule applies to community and nontransient noncommunity public water systems.

(2) Unless a waiver has been granted by the department, all public water systems shall conduct a one (1)-time round of sampling. All public water systems shall monitor for the following contaminants:

(A) Organics—

1. Aldicarb;
2. Aldicarb sulfoxide;
3. Aldicarb sulfone;
4. Aldrin;
5. Butachlor;
6. Carbaryl;
7. Dicamba;
8. Dieldrin;
9. 3-Hydroxycarbofuran;
10. Methomyl;
11. Metolachlor;
12. Metribuzin; and
13. Propachlor;

(B) Inorganics—

1. Sulfate.

(3) All public water systems shall monitor at least once for the following contaminants:

(A) All public water systems shall monitor for the following contaminants:

1. Bromobenzene;
2. Bromodichloromethane;
3. Bromoform;
4. Bromomethane;
5. Chlorodibromomethane;
6. Chloroethane;
7. Chloroform;
8. Chloromethane;
9. o-Chlorotoluene;
10. p-Chlorotoluene;
11. Dibromomethane;
12. m-Dichlorobenzene;
13. 1,1-Dichloroethane;
14. 1,1-Dichloropropene;
15. 1,3-Dichloropropane;
16. 1,3-Dichloropropene;
17. 2,2-Dichloropropane;
18. 1,1,1,2-Tetrachloroethane;
19. 1,1,2,2-Tetrachloroethane; and
20. 1,2,3-Trichloropropane; and

(B) The department will determine which water systems shall monitor for the following chemicals:

1. Bromochloromethane;
2. n-Butylbenzene;
3. Dichlorodifluoromethane;
4. Fluorotrichloromethane;
5. Hexachlorobutadiene;
6. Isopropylbenzene;
7. p-Isopropyltoluene;
8. Naphthalene;
9. n-Propylbenzene;
10. sec-Butylbenzene;
11. tert-Butylbenzene;
12. 1,2,3-Trichlorobenzene;
13. 1,2,4-Trimethylbenzene; and
14. 1,3,5-Trimethylbenzene.

(4) All public water systems shall sample at points in the distribution system representative of each water source or at entry points to the distribution system. The sampling point will be after the application of treatment. The minimum number of samples is four consecutive quarterly samples per water source for the organic chemicals listed under subsection (2)(A) of this rule, and one (1) sample per water source for the inorganic chemical listed under subsection (2)(B) of this rule. Sampling must be completed no later than the end of the initial three (3)-year compliance period and results reported to the department. Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

(5) If the system draws water from more than one (1) source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions.

(6) A public water system may apply to the department for a waiver from the required sampling in section (3) for either organics or inorganics. All public water systems must conduct a one (1) time round of sampling.

(A) A public water system may apply to the department for a use waiver for reduced monitoring from required organics sampling as required by 10 CSR 60-6.060(2) if previous use of the chemical can be ruled out or a public water system may apply to the department for a susceptibility waiver for reduced monitoring from required organics sampling contingent on the conduct of a thorough vulnerability assessment as required by 10 CSR 60-6.060(3).

(B) A public water system may apply to the department for susceptibility waivers for reduced monitoring from required inorganic sampling contingent on the conduct of a thorough vulnerability assessment as required by 10 CSR 60-6.060(3). Only data collected after January 1, 1990, will be considered in making this assessment.

(C) A public water system serving fewer than one hundred fifty (150) service connections shall be treated as complying with the monitoring requirement if the owner or operator sends a letter to the department specifying that their system is available for sampling. This letter must be sent to the department no later than January 1, 1994.

(7) As determined by the department, confirmation samples may be required for either positive or negative results.

AUTHORITY: section 640.100, RSMo 1994. Original rule filed June 2, 1988, effective Aug. 31, 1988. Rescinded and readopted: Filed March 31, 1992, effective Dec. 3, 1992. Amended: Filed May 4, 1993, effective Jan. 13, 1994. Amended: Filed Feb. 1, 1996, effective Oct. 30, 1996.*

**Original authority: 640.100, RSMo 1939, amended 1978, 1981, 1982, 1988, 1989, 1992, 1993, 1995.*