ARC 8631C

ENVIRONMENTAL PROTECTION COMMISSION[567]

Notice of Intended Action

Proposing rulemaking related to water supplies and providing an opportunity for public comment

The Environmental Protection Commission (Commission) hereby proposes to rescind Chapter 41, "Water Supplies," Iowa Administrative Code, and to adopt a new chapter with the same title.

Legal Authority for Rulemaking

This rulemaking is proposed under the authority provided in Iowa Code sections 455B.103(2), 455B.105(3) and 455B.173.

State or Federal Law Implemented

This rulemaking implements, in whole or in part, Iowa Code sections 455B.171 through 455B.188 and 455B.190 through 455B.192 and the federal Safe Drinking Water Act (SDWA) as amended (42 U.S.C. §300f et seq.).

Purpose and Summary

Proposed Chapter 41 establishes certain SDWA requirements. Specifically, it establishes programs and processes for administration of these rules in Iowa. The SDWA regulations established include but are not limited to the establishment of coverage, regulated contaminant requirements (including but not limited to biological contaminants, inorganic contaminants, lead and copper, organic contaminants, disinfection byproducts, and radionuclides), and the federal groundwater rule. Establishing coverage is essential for obtaining and maintaining primacy to enforce the SDWA, and requires that the rules in 567—Chapters 40 through 44 and 83 apply to public water supply systems unless a set of conditions are met. This chapter has been reviewed and edited consistent with Executive Order 10.

Regulatory Analysis

A Regulatory Analysis for this rulemaking was published in the Iowa Administrative Bulletin on September 4, 2024. A public hearing was held on the following date(s):

- September 24, 2024

Fiscal Impact

This rulemaking has no fiscal impact to the State of Iowa.

Jobs Impact

After analysis and review of this rulemaking, no impact on jobs has been found.

Waivers

Any person who believes that the application of the discretionary provisions of this rulemaking would result in hardship or injustice to that person may petition the Commission for a waiver of the discretionary provisions, if any, pursuant to 567—Chapter 13.

Public Comment

Any interested person may submit comments concerning this proposed rulemaking, which must be received by the Department of Natural Resources (Department) no later than 4:30 p.m. on February 7, 2025. Comments should be directed to:

Carmily Stone
Iowa Department of Natural Resources
6200 Park Avenue, Suite 200
Des Moines, Iowa 50321
Email: carmily.stone@dnr.iowa.gov

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Public Hearing

Public hearings at which persons may present their views orally or in writing will be held as follows:

January 30, 2025 2 to 3 p.m.	Virtual meeting A meeting registration link will be provided prior to the hearing
January 31, 2025 9 to 10 a.m.	Virtual meeting A meeting registration link will be provided prior to the hearing

The public hearings will be held virtually. See www.iowadnr.gov/Environmental-Protection/Water-Quality/Water-Quality-Rulemaking for meeting information.

Persons who wish to make oral comments at a public hearing may be asked to state their names for the record and to confine their remarks to the subject of this proposed rulemaking.

Any persons who intend to attend a hearing and have special requirements, such as those related to hearing impairments, should contact the Department and advise of specific needs.

Free Language Assistance: if you need assistance in a language other than English, contact the Department at carmily.stone@dnr.iowa.gov or civilrights@dnr.iowa.gov or by telephone at 515.681.3548 at least seven days before the event.

Servicios gratuitos de asistencia lingüística: si necesita ayuda en un idioma que no sea inglés, comuníquese con el Departamento al carmily.stone@dnr.iowa.gov o civilrights@dnr.iowa.gov o por teléfono a 515.681.3548 al menos siete días antes del evento.

Review by Administrative Rules Review Committee

The Administrative Rules Review Committee, a bipartisan legislative committee which oversees rulemaking by executive branch agencies, may, on its own motion or on written request by any individual or group, review this rulemaking at its regular monthly meeting or at a special meeting. The Committee's meetings are open to the public, and interested persons may be heard as provided in Iowa Code section 17A.8(6).

The following rulemaking action is proposed:

ITEM 1. Rescind 567—Chapter 41 and adopt the following **new** chapter in lieu thereof:

CHAPTER 41
WATER SUPPLIES

567—41.1(455B) Primary drinking water regulations—coverage. 567—Chapters 40 through 44 and 83 shall apply to each public water supply system (PWS) unless the PWS meets all of the following conditions:

1. Consists only of distribution and storage facilities (and does not have any collection and treatment facilities);
2. Obtains all of its water from, but is not owned or operated by, a PWS to which such regulations apply;

3. Does not sell water to any person; and
4. Is not a carrier which conveys passengers in interstate commerce.

567—41.2(455B) Biological maximum contaminant level (MCL), treatment technique (TT), and monitoring requirements.

41.2(1) *Coliform bacteria and Escherichia coli (E. coli).* The provisions of this subrule include both MCL and TT requirements and apply to all PWSs. Failure to comply with the applicable requirements in this subrule is a violation of the national primary drinking water regulations.

a. *MCL.* A PWS must determine compliance with the *E. coli* MCL for each month in which the system is required to monitor for total coliforms. A system is in compliance with the *E. coli* MCL for samples taken under this subrule unless any of the following conditions occur. For purposes of the public notification (PN) requirements in rule 567—40.5(455B), MCL violation may pose an acute health risk. A system is not in compliance if it:

(1) Has an *E. coli*-positive repeat sample following a total coliform-positive routine sample;

(2) Has a total coliform-positive repeat sample following an *E. coli*-positive routine sample;

(3) Fails to take all required repeat samples following an *E. coli*-positive routine sample; or

(4) Fails to test for *E. coli* when any repeat sample tests positive for total coliform.

b. *Analytical methodology.*

(1) Sample volume. The standard sample volume required for analysis is 100 mL, regardless of the analytical method used.

(2) Presence/absence (P/A) required. Only the P/A of total coliforms and *E. coli* must be determined in any compliance sample; a determination of density is acceptable but is not required.

(3) Holding time and temperature. The time from sample collection to initiation of test medium incubation shall not exceed 30 hours. Systems are encouraged but not required to hold samples below 10 degrees Celsius during transit.

(4) Dechlorinating agent required for chlorinated water. If water having a residual chlorine (measured as free, combined, or total chlorine) will be analyzed, sufficient sodium thiosulfate (Na2S2O3) must be added to the sample bottle before sterilization to neutralize any residual chlorine in the water sample. Dechlorination procedures are addressed in Standard Methods (SM) Section 9060A.2, 20th and 21st editions.

(5) Systems must conduct total coliform and E. coli analyses in accordance with one of the analytical methods in the following table.

Bacteria Analytical Methods

Methodology Category	Method Name[1]	Method Citation[1]
Total Coliform Bacteria Methods:		
Lactose Fermentation	Standard Total Coliform Fermentation Technique	SM 9221 B.1, B.2 (20th, 21st, and 22nd ed.)[2, 3] SM Online 9221 B.1, B.2-99, B-06[2, 3]
	P/A Coliform Test	SM 9221 D.1, D.2 (20th and 21st ed.)[2, 7] SM Online 9221 D.1, D.2-99[2, 7]
Membrane Filtration	Standard Total Coliform Membrane Filter Procedure	SM 9222 B, C (20th and 21st ed.)[2, 4] SM Online 9222 B-97[2, 4], 9222 C-97[2, 4]
	Membrane Filtration using MI Medium	EPA Method 1604[2]
	m-ColiBlue24 Test[2, 4]	
	Chromocult[2, 4]	
Enzyme Substrate	Colilert	SM 9223 B (20th, 21st and 22nd ed.)[2, 5] SM Online 9223 B-97, B-04[2, 5]
	Colilert-18	SM 9223 B (21st and 22nd ed.)[2, 5] SM Online 9223 B-04[2, 5]
	Colisure	SM 9223 B (20th, 21st and 22nd ed.)[2, 5, 6] SM Online 9223 B-97, B-04[2, 5, 6]

Methodology Category	Method Name[1]	Method Citation[1]
	E*Colite Test[2]	
	Readycult Test[2]	
	modified Colitag Test[2]	
	Tecta EC/TC Test[2]	
***E. coli* Methods:**		
E. coli Procedures (following Lactose Fermentation Methods)	EC-MUG Medium	SM 9221 F.1 (20th, 21st and 22nd ed.)[2] SM Online 9221 F-06[2]
E. coli Partition	EC broth with MUG (EC-MUG)	SM 9222 G.1*c*(2) (20th and 21st ed.)[2, 8]
	NA-MUG Medium	SM 9222 G.1*c*(1) (20th and 21st ed.)[2]
Membrane Filtration	Membrane Filtration using MI Medium	EPA Method 1604[2]
	m-ColiBlue24 Test[2, 4]	
	Chromocult[2, 4]	
Enzyme Substrate	Colilert	SM 9223 B (20th, 21st and 22nd ed.)[2, 5] SM Online 9223 B-97, B-04[2, 5, 6]
	Colilert-18	SM 9223 B (21st and 22nd ed.)[2, 5] SM Online 9223 B-04[2, 5]
	Colisure	SM 9223 B (20th, 21st and 22nd ed.)[2, 5, 6] SM Online 9223 B-97, 04[2, 5, 6]
	E*Colite Test[2]	
	Readycult[2]	
	modified Colitag Test[2]	
	Tecta EC/TC Test[2]	

[1] Methods are listed in 41.2(1)*"b"*(6). For SM, either the 20th (1998) or 21st (2005) edition may be used. For SM Online, the year in which each method was approved is designated by the last two digits following the hyphen in the method number, and the methods listed are the only online versions that may be used. For vendor methods, the date in 41.2(1)*"b"*(6) is the date/version of the approved method, and the methods listed are the only versions that may be used. Laboratories should use only the approved versions of the methods, as product package inserts may not match the approved versions.

[2] Incorporated by reference. See 41.2(1)*"b"*(6).

[3] Lactose broth may be used in lieu of lauryl tryptose broth (LTB) if the system conducts at least 25 parallel tests between lactose broth and LTB using the water normally tested and if the findings from this comparison demonstrate that the false-positive rate and the false-negative rate for total coliforms, using lactose broth, is less than 10 percent.

[4] All filtration series must begin with membrane filtration equipment that has been sterilized by autoclaving. Exposure of filtration equipment to UV light is not adequate to ensure sterilization. Subsequent to the initial autoclaving, exposure of the filtration equipment to UV light may be used to sanitize the funnels between filtrations within a filtration series. Alternatively, membrane filtration equipment that is presterilized by the manufacturer may be used.

[5] Multiple-tube and multi-well enumerative formats for this method are approved for use in P/A determination under this subrule.

[6] Colisure results may be read after an incubation time of 24 hours.

[7] A multiple-tube enumerative format, as described in SM for the Examination of Water and Wastewater 9221, is approved for this method for use in P/A determination under this subrule.

[8] The following changes must be made to the EC broth with MUG (EC-MUG) formulation: Potassium dihydrogen phosphate, KH_2PO_4, must be 1.5 g, and 4-methylumbelliferyl-beta-D-glucuronide must be 0.05 g.

(6) Methods incorporated by reference. The methods in this subrule are incorporated by reference with the approval of the Director of the Federal Register under 5 U.S.C. 552(a) and 1 CFR Part 51. All approved material is available for inspection at www.regulations.gov, in hard copy at the EPA's Drinking Water Docket, (Docket ID EPA-HQ-OW-2008-0878), or from NARA.

1. APHA, SM 20th edition (1998):

- SM 9221, "Multiple-Tube Fermentation Technique for Members of the Coliform Group," B.1, B.2, "Standard Total Coliform Fermentation Technique;" D.1, D.2, "Presence-Absence (P/A) Coliform Test;" and F.1, "Escherichia coli Procedure: EC-MUG Medium."

- SM 9222, "Membrane Filter Technique for Members of the Coliform Group," B, "Standard Total Coliform Membrane Filter Procedure," C, "Delayed-Incubation Total Coliform Procedure," G.1c(1), "Escherichia coli Partition Method: NA-MUG Medium," and G.1c(2), "Escherichia coli Partition Method: EC Broth with MUG (EC-MUG)."
- SM 9223, "Enzyme Substrate Coliform Test," B, "Enzyme Substrate Test," Colilert and Colisure.

2. SM, 21st edition (2005):

- SM 9221, "Multiple-Tube Fermentation Technique for Members of the Coliform Group," B.1, B.2, "Standard Total Coliform Fermentation Technique;" D.1, D.2, "Presence-Absence (P/A) Coliform Test," and F.1, "Escherichia coli Procedure: EC-MUG Medium."
- SM 9222, "Membrane Filter Technique for Members of the Coliform Group," B, "Standard Total Coliform Membrane Filter Procedure;" C, "Delayed-Incubation Total Coliform Procedure;" G.1.c(1), "Escherichia coli Partition Method: NA-MUG Medium;" and G.1.c(2), "Escherichia coli Partition Method: EC Broth with MUG (EC-MUG)."
- SM 9223, "Enzyme Substrate Coliform Test," B, "Enzyme Substrate Test," Colilert and Colisure.

3. SM Online:

- SM 9221, "Multiple-Tube Fermentation Technique for Members of the Coliform Group" (1999), B.1, B.2-99, B-06, "Standard Total Coliform Fermentation Technique" and D.1, D.2-99, "Presence-Absence (P/A) Coliform Test."
- SM 9222, "Membrane Filter Technique for Members of the Coliform Group" (1997), B-97, "Standard Total Coliform Membrane Filter Procedure" and C-97, "Delayed-Incubation Total Coliform Procedure."
- SM 9223, "Enzyme Substrate Coliform Test" (1997), B-97, "Enzyme Substrate Test," Colilert and Colisure.

4. Charm Sciences, Inc., 659 Andover Street, Lawrence, MA 01843-1032: E*Colite—"Charm E*Colite Presence/Absence Test for Detection and Identification of Coliform Bacteria and Escherichia coli in Drinking Water," January 9, 1998.

5. CPI International, Inc., 5580 Skylane Blvd., Santa Rosa, CA 95403: modified Colitag, ATP D05-0035—"Modified Colitag Test Method for the Simultaneous Detection of *E. coli* and other Total Coliforms in Water," August 28, 2009.

6. EMD Millipore (a division of Merck KGaA, Darmstadt, Germany), 290 Concord Road, Billerica, MA 01821:

- Chromocult—"Chromocult Coliform Agar Presence/Absence Membrane Filter Test Method for Detection and Identification of Coliform Bacteria and Escherichia coli for Finished Waters," November 2000, Version 1.0.
- Readycult—"Readycult Coliforms 100 Presence/Absence Test for Detection and Identification of Coliform Bacteria and Escherichia coli in Finished Waters," January 2007, Version 1.1.

7. EPA's Water Resource Center (MC-4100T), EPA Method 1604, EPA 821-R-02-024—"EPA Method 1604: Total Coliforms and Escherichia coli in Water by Membrane Filtration Using a Simultaneous Detection Technique (MI Medium)," September 2002, www.nemi.gov.

8. Hach Company, www.hach.com: m-ColiBlue24—"Membrane Filtration Method m-ColiBlue24 Broth," Revision 2, August 17, 1999.

9. SM, 22nd edition (2012):

- SM 9221, "Multiple-Tube Fermentation Technique for Members of the Coliform Group," B.1, B.2, "Standard Total Coliform Fermentation Technique," and F.1, "Escherichia coli Procedure: EC-MUG Medium."
- SM 9223, "Enzyme Substrate Coliform Test," B, "Enzyme Substrate Test," Colilert and Colisure.

10. Veolia Water Solutions and Technologies, Suite 4697, Biosciences Complex, 116 Barrie Street, Kingston, Ontario, Canada K7L 3N6: Tecta EC/TC. "Presence/Absence Method for Simultaneous Detection of Total Coliforms and Escherichia coli in Drinking Water," April 2014.

(7) Laboratory certification. Systems must have all compliance samples required under this subrule analyzed by a laboratory certified in accordance with 567—Chapter 83. The laboratory used by the

system must be certified for each method and associated contaminant used for compliance monitoring analyses under this subrule.

c. Sampling plan.

(1) Written sampling plan required. Systems must collect total coliform samples according to their written sampling plan.

1. Systems must develop a written sampling plan that identifies sample locations and a sample collection schedule that are representative of water throughout the distribution system. Major elements of the plan shall include, but not be limited to, the following:

- Map of the distribution system served by the system;
- List of routine compliance sample locations for each sample period;
- List of repeat compliance sample locations for each routine compliance sample location;
- Any other sample locations necessary to meet the requirements of this subrule;
- Sample collection schedule;
- Proper sampling technique instructions;
- Log of samples taken; and
- For GW systems subject to 567—41.7(455B), triggered source water monitoring plan.

2. The system shall review the sampling plan every two years, update it as needed, and retain it on file at the facility. The plan must be made available to the department upon request and for review during sanitary surveys and must be revised at the department's direction.

3. Monitoring under this subrule may take place at a customer's premises, dedicated sampling station, or other designated compliance sampling location.

(2) Sampling schedule. Systems must collect routine samples at regular time intervals throughout the month. Systems that use only GW and serve 4,900 or fewer people, or regional water systems that use only GW and serve less than 121 miles of pipe, may collect all required routine samples on a single day, if the samples are taken from different sites.

(3) Minimum number of routine samples. Systems must take at least the minimum number of required routine samples even if the system has had an *E. coli* MCL violation or has exceeded the coliform TT triggers in 41.2(1)*"i."* Such samples must be designated as "routine" when submitted to the laboratory.

(4) Additional sampling. A system may conduct more compliance monitoring than is required to uncover or investigate potential problems in the distribution system. A system may take more than the minimum number of required routine samples, and must include the additional routine sample results when calculating whether the coliform TT trigger in 41.2(1)*"i"*(1)"1" and "2" has been exceeded, only if the samples are taken in accordance with the existing sampling plan and are representative of water throughout the distribution system. Such samples must be designated as "routine" when submitted to the laboratory.

(5) Repeat samples. Systems must identify repeat monitoring locations in the sampling plan. Repeat samples must be analyzed at the same laboratory as the corresponding original routine sample(s), unless written approval for use of a different laboratory is granted by the department. A system must collect at least one repeat sample at the following locations: from the sampling tap where the original routine total coliform-positive sample was taken, at a tap within five service connections upstream of the original sample location, and at a tap within five service connections downstream of the original sample location. Such samples must be designated as "repeat" when submitted to the laboratory.

1. If the sampling location of a total coliform-positive sample is at or within one service connection from the end of the distribution system, the system must still take all required repeat samples. However, the department may allow an alternative sampling location in lieu of one of the upstream or downstream sampling locations.

2. A GW system with two or more wells that is required to conduct triggered source water monitoring under 41.7(3) must collect GW source sample(s) in addition to the required repeat samples.

3. A GW system with a single well that is required to conduct triggered source water monitoring may, with written department approval, collect one of its required repeat samples at the triggered source water sample monitoring location. The system must demonstrate to the department's satisfaction that the

sampling plan remains representative of water quality in the distribution system. If approved, the sample result may be used to meet the requirements of 41.7(3) and this subrule. If a repeat sample taken at the triggered source water monitoring location is *E. coli*-positive, the system has violated the *E. coli* MCL, and must also comply with the requirements for additional source water samples under 41.7(3)*"a"*(3).

4. The department may review, revise, and approve, as appropriate, repeat sampling proposed by a system under 41.2(1)*"c"*(5). The system must demonstrate that the sampling plan remains representative of the water quality in the distribution system.

(6) Special purpose samples. Special purpose samples, such as those taken to determine whether disinfection practices are sufficient following pipe placement, replacement, or repair, must not be used to determine whether the coliform TT trigger has been exceeded. Such samples must be designated as "special" when submitted to the laboratory and cannot be used for compliance. Repeat samples are not considered special purpose samples and must be used to determine whether the coliform TT trigger has been exceeded.

(7) Residual disinfectant measurement. Any system adding a chemical disinfectant to the water must meet the requirements of 567—subparagraph 40.8(3)*"b"*(1). The minimum required residual disinfectant measurements are as follows, unless otherwise directed by the department in writing:

1. GW systems. A system that uses only GW and adds a chemical disinfectant, or provides water that contains a disinfectant, must measure and record total chlorine residual disinfectant concentration at least at the same points in the distribution system and at the same time as routine and repeat total coliform bacteria samples are collected, as specified in 41.2(1)*"e"* through *"g."* The system shall report the total residual disinfectant concentration to the laboratory with the bacteria sample and comply with the reporting requirements in 567—subrule 40.8(3).

2. Surface water (SW) and influenced groundwater (IGW) systems.

- Any SW or IGW PWS must meet the requirements for minimum residual disinfectant entering the distribution system pursuant to 567—paragraph 43.5(4)*"b"*(2)"1"; and
- A system that uses SW or IGW must comply with the requirements in 567—subparagraph 43.5(4)*"b"*(2)"2" for daily distribution system residual disinfectant monitoring. The system must measure and record the free and total chlorine residual disinfectant concentration at least at the same points in the distribution system and at the same time as routine and repeat total coliform bacteria samples are collected, as specified in 41.2(1)*"e"* through *"g."* The residual disinfectant measurements required in this subrule may be used to satisfy the requirement in 567—paragraph 43.5(4)*"b"*(2)"2" on the day(s) when a routine or repeat total coliform bacteria sample(s) is collected, in lieu of separate samples. The system shall report the residual disinfectant concentration to the laboratory with the bacteria sample and comply with the applicable reporting requirements of 567—subrule 40.8(3).

d. Invalidation of total coliform samples. A total coliform-positive sample invalidated under this paragraph does not count toward meeting the minimum monitoring requirements of this subrule.

(1) The department may invalidate a total coliform-positive sample only if the following conditions are 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 the required repeat samples, determines that the total coliform-positive sample resulted from a domestic or other non-distribution system plumbing problem. "Domestic or other non-distribution system plumbing problem" means a coliform contamination problem in a PWS with more than one service connection that is limited to the specific service connection from which the coliform-positive sample was taken. The department cannot invalidate a total coliform-positive sample on the basis of repeat samples 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 at a location other than the original tap are total coliform-negative. 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 system has only one service connection.

3. The department has substantial grounds to believe that the total coliform-positive result is due to a circumstance or condition that does not reflect water quality in the distribution system. The system

must still collect all repeat samples required under 41.2(1)*"g"* and use them to determine whether a coliform TT trigger in 41.2(1)*"i"* has been exceeded.

The decision and supporting rationale for invalidating a total coliform-positive sample under this subparagraph must be in writing and signed by the supervisor of the water supply operations section or water supply engineering section and the department official who recommended the decision. The department must make this document available to EPA and the public. The 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 or because of poor sampling technique.

(2) Laboratory invalidation. A laboratory must invalidate a total coliform sample (unless total coliforms are detected, in which case the sample is valid) if the sample produces a turbid culture in the absence of gas production using an analytical method where gas formation is examined, produces a turbid culture in the absence of an acid reaction in the P/A coliform test, or exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter. If a laboratory invalidates a sample because of such interference, the system must collect another sample from the same location as that of the original within 24 hours of being notified of the interference and must have the sample analyzed for the presence of total coliforms. The system must continue to resample within 24 hours and have the samples analyzed until a valid result is obtained. The department may waive the 24-hour time limit on a case-by-case basis.

e. Routine monitoring for specific groundwater (GW) NCWS serving 1,000 or fewer people. This paragraph applies to NCWS using only GW (not IGW) as a source and serving 1,000 or fewer people. GW NCWS that serve schools, preschools, and child care facilities, and all PWSs owned or managed by state agencies, must monitor at the same frequency as a like-sized CWS, in accordance with 41.2(1) *"f"*(1), 41.2(1)*"f"*(2), or 41.2(1)*"f"*(3).

(1) General. Following any total coliform-positive sample taken under this paragraph, systems must comply with the repeat monitoring and *E. coli* analytical requirements in 41.2(1)*"g."* Once all monitoring required by this paragraph and 41.2(1)*"g"* for a calendar month has been completed, systems must determine whether any coliform TT triggers in 41.2(1)*"i"* have been exceeded. If any trigger has been exceeded, systems must complete the assessments required by 41.2(1)*"i."*

(2) Monitoring frequency for total coliforms. Systems must monitor each calendar quarter that they provide water to the public, with the following exceptions:

1. A system on quarterly monitoring that experiences any of the following events must begin monthly monitoring in the month following the event. A system must continue on monthly monitoring until it meets the requirements for returning to quarterly monitoring. The events include:

- An *E. coli* MCL violation;
- The triggering of one Level 2 assessment under 41.2(1)*"i"* in a rolling 12-month period.
- The triggering of two Level 1 assessments under 41.2(1)*"i"* in a rolling 12-month period.
- One coliform TT violation.
- Two coliform monitoring violations in a rolling 12-month period.
- One monitoring coliform violation and one Level 1 assessment under 41.2(1)*"i"* in a rolling 12-month period.

2. A system on monthly monitoring for reasons other than those identified above in 41.2(1)*"e"*(2) "1" is not considered to be on increased monitoring for the purposes of 41.2(1).

3. Seasonal systems must sample each month in which they are in operation. All seasonal systems must demonstrate completion of a department-approved start-up procedure before serving water to the public, which includes a requirement for a coliform-negative start-up sample.

(3) Sampling frequency evaluation during a sanitary survey. During each sanitary survey, the department must evaluate the status of a system, including the distribution system, to determine whether the system is on an appropriate monitoring schedule. The department may modify a system's monitoring schedule, as necessary, or may allow a system to stay on its existing monitoring schedule, consistent with this paragraph.

(4) Returning from monthly to quarterly sampling for nonseasonal NCWSs. The department may reduce the monitoring frequency for a nonseasonal NCWS on monthly monitoring triggered under 41.2(1)*"e"*(2)"1" to quarterly monitoring if the system meets the following criteria. For the purposes of this subparagraph, "protected water source" means either the well meets separation distances from sources of microbial contamination pursuant to 567—subrule 43.3(7), Table A; or the system has department-approved 4-log virus inactivation treatment in continuous usage.

1. The system must have a completed sanitary survey or voluntary Level 2 assessment within the previous 12 months, be free of sanitary defects, and have a protected water source;

2. The system must have a clean compliance history for at least the previous 12 months; and

3. The department must review the approved sampling plan, which must designate the monitoring time period(s) based on site-specific considerations (e.g., during periods of highest demand or highest vulnerability to contamination). The system must collect compliance samples during these time periods.

(5) Additional routine monitoring for systems on quarterly sampling in the month following a total coliform-positive routine sample. Systems collecting samples on a quarterly frequency must conduct additional routine monitoring the month following one or more total coliform-positive samples (with or without a Level 1 TT trigger). Systems must collect at least three routine samples during the next month. Systems may either collect samples at regular time intervals throughout the month or may collect all required routine samples on a single day if samples are taken from different sites. Systems must use the results of additional routine samples in coliform TT trigger calculations under 41.2(1)*"i."*

f. Routine monitoring requirements for other systems.

(1) GW CWS serving 1,000 or fewer people. This subparagraph applies to CWS using only GW (not IGW) as a source and serving 1,000 or fewer people. The routine total coliforms monitoring frequency for such systems is one sample per month.

(2) SW/IGW PWS serving 1,000 or fewer people. This subparagraph applies to all PWSs serving 1,000 or fewer people that use SW/IGW sources, including consecutive systems.

1. The routine total coliforms monitoring frequency for such systems is one sample per month. Systems may not reduce monitoring frequency.

2. Seasonal systems must sample each month in which they are in operation, and the monitoring frequency cannot be reduced. All seasonal systems must demonstrate completion of a department-approved start-up procedure before serving water to the public, which includes a requirement for a coliform-negative start-up sample.

(3) PWSs serving more than 1,000 people. This subparagraph applies to all PWSs serving more than 1,000 people, except regional water systems. The regional water system requirements are in 41.2(1) *"f"*(4) below.

1. The routine total coliforms monitoring frequency for PWSs serving more than 1,000 people is based upon the population served by the system, as follows:

Population Served	**Minimum Number of Routine Samples per Month**	**Population Served**	**Minimum Number of Routine Samples per Month**
1,001 to 2,500	2	41,001 to 50,000	50
2,501 to 3,300	3	50,001 to 59,000	60
3,301 to 4,100	4	59,001 to 70,000	70
4,101 to 4,900	5	70,001 to 83,000	80
4,901 to 5,800	6	83,001 to 96,000	90
5,801 to 6,700	7	96,001 to 130,000	100
6,701 to 7,600	8	130,001 to 220,000	120
7,601 to 8,500	9	220,001 to 320,000	150
8,501 to 12,900	10	320,001 to 450,000	180
12,901 to 17,200	15	450,001 to 600,000	210
17,201 to 21,500	20	600,001 to 780,000	240
21,501 to 25,000	25	780,001 to 970,000	270
25,001 to 33,000	30	970,001 to 1,230,000	300
33,001 to 41,000	40		

2. Seasonal systems must sample each month in which they are in operation, and the monitoring frequency cannot be reduced. All seasonal systems must demonstrate completion of a department-approved start-up procedure before serving water to the public, which includes a requirement for a coliform-negative start-up sample.

3. CWSs may not reduce the number of required routine samples.

4. If the department, on the basis of a sanitary survey or monitoring results history, determines that some greater monitoring frequency is more appropriate, that frequency shall be the frequency required under these rules. The increased frequency shall be confirmed or changed on the basis of subsequent surveys.

(4) Regional PWSs. This subparagraph applies to all regional water systems. The supplier of water for a regional PWS shall sample for coliform bacteria at a frequency based upon the miles of pipe in its distribution system.

1. The routine total coliforms monitoring frequency for regional PWSs is based on the miles of pipe in a system’s distribution system, as indicated in the following table. The sampling frequency for a regional water system shall not be less than as set forth in this subparagraph, based upon the population equivalent served. The following table represents sampling frequency per miles of pipe in a distribution system and is determined by calculating one-half the square root of the miles of pipe.

Miles of Pipe	**Minimum Number of Routine Samples per Month**	**Miles of Pipe**	**Minimum Number of Routine Samples per Month**
0 – 9	1	1,850 – 2,025	22
10 – 25	2	2,026 – 2,209	23
26 – 49	3	2,210 – 2,401	24
50 – 81	4	2,402 – 2,601	25
82 – 121	5	2,602 – 2,809	26
122 – 169	6	2,810 – 3,025	27
170 – 225	7	3,026 – 3,249	28
226 – 289	8	3,250 – 3,481	29
290 – 361	9	3,482 – 3,721	30
362 – 441	10	3,722 – 3,969	31
442 – 529	11	3,970 – 4,225	32
530 – 625	12	4,226 – 4,489	33
626 – 729	13	4,490 – 4,671	34
730 – 841	14	4,672 – 5,041	35
842 – 961	15	5,042 – 5,329	36
962 – 1,089	16	5,330 – 5,625	37
1,090 – 1,225	17	5,626 – 5,929	38
1,226 – 1,364	18	5,930 – 6,241	39
1,365 – 1,521	19	6,242 – 6,561	40
1,522 – 1,681	20	6,562 and greater	41
1,682 – 1,849	21		

2. Regional PWSs may not reduce the number of required routine samples.

3. If the department, on the basis of a sanitary survey or monitoring results history, determines that some greater monitoring frequency for a regional PWS is more appropriate, that frequency shall be the frequency required under these rules. The increased frequency shall be confirmed or changed on the basis of subsequent surveys.

(5) Requirements for all systems subject to this paragraph. Following any total coliform-positive sample taken under this paragraph, systems must comply with the repeat monitoring requirements and *E. coli* analytical requirements in 41.2(1)*“g.”* Once all monitoring required by this paragraph and 41.2(1) *“g”* for a calendar month has been completed, systems must determine whether any coliform TT triggers in 41.2(1)*“i”* have been exceeded. If any trigger has been exceeded, systems must complete assessments pursuant to 41.2(1)*“i.”*

g. *Repeat monitoring.* If a routine sample taken under 41.2(1)*"e"* and *"f"* is total coliform-positive, a system must collect a set of repeat samples. The department cannot waive this requirement.

(1) A system must:

1. Collect no fewer than three repeat samples for each total coliform-positive routine sample.

2. Collect repeat samples within 24 hours of receipt of the positive result. The department may extend the 24-hour limit on a case-by-case basis if the system has a logistical problem collecting the repeat samples within 24 hours that is beyond its control. In the case of an extension, the department must specify how much time a system has to collect the repeat samples.

3. 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 three-day period. "System with a single service connection" means a system that supplies drinking water to consumers through a single service line.

4. Collect an additional set of repeat samples as specified above in 41.2(1)*"g"*(1) through 41.2(1)*"g"*(3) if one or more repeat samples in the current set of repeat samples is total coliform-positive. A system must collect the additional set of repeat samples within 24 hours of receipt of a positive result, unless the department extends the time limit in 41.2(1)*"g"*(2). A system must continue to collect additional sets of repeat samples until either total coliforms are not detected in one complete set of repeat samples or it determines that a coliform TT trigger in 41.2(1)*"i"* has been exceeded as a result of a total coliform-positive repeat sample and notifies the department. If a TT trigger is exceeded as a result of a total coliform-positive routine sample, systems only need to conduct one round of repeat monitoring for each total coliform-positive routine sample.

(2) Results of all routine and repeat samples taken under 41.2(1)*"e"* through *"g"* that are not invalidated by the department must be used to determine whether a coliform TT trigger in 41.2(1)*"i"* has been exceeded.

h. *E. coli testing requirements.*

(1) If any routine or repeat sample is total coliform-positive, a system must analyze that total coliform-positive culture medium to determine the presence of *E. coli*. If *E. coli* are present, the system must notify the department by the end of the same day the system receives notification of the test result. If the notification is outside of the department's routine office hours, the system shall call the department's Environmental Emergency Reporting Hotline at 515.725.8694.

(2) The department has the discretion to allow a system, on a case-by-case basis, to forgo E. coli testing on a total coliform-positive sample if that system assumes that the total coliform-positive sample is *E. coli*-positive. Accordingly, the system must notify the department as specified above in 41.2(1)*"h"*(1), and the provisions of 41.2(1)*"a"* apply.

i. *Coliform TT triggers.* Systems must conduct assessments in accordance with 41.2(1)*"j"* after exceeding any TT trigger.

(1) Level 1 TT triggers.

1. For systems taking 40 or more samples per month, the system exceeds 5.0 percent total coliform-positive samples for the month.

2. For systems taking fewer than 40 samples per month, the system has two or more total coliform-positive samples in the same month.

3. The system fails to take every required repeat sample after any single total coliform-positive sample.

(2) Level 2 TT triggers.

1. An *E. coli* MCL violation, as specified in 41.2(1)*"m"*(1).

2. A second Level 1 trigger as defined above in 41.2(1)*"i"*(1) within a rolling 12-month period, unless the department has determined a likely reason that the samples that caused the first Level 1 TT trigger were total coliform-positive and has established that the system has corrected the problem.

j. *Assessment requirements.* Systems must ensure that Level 1 and 2 assessments are conducted to identify the possible presence of sanitary defects and defects in distribution system coliform monitoring practices. Level 1 assessments may be conducted by a system owner or operator. Level 2 assessments must be conducted by the department with the assistance of the system owner or operator.

(1) General. Systems must conduct assessments consistent with any department directives and ensure that the assessor evaluates minimum elements, including:

1. A review and identification of inadequacies in sample sites;

2. Sampling protocol and processing;

3. Atypical events that could affect or indicate an impairment in distributed water quality;

4. Changes in distribution system operation or maintenance that could affect distributed water quality (including water storage);

5. Source and treatment considerations that bear on distributed water quality, where appropriate (e.g., small GW systems); and

6. Existing water quality monitoring data.

(2) Level 1 assessment. A system must conduct a Level 1 assessment if it exceeds one of the TT triggers in 41.2(1)*"i"*(1).

1. A system must complete a Level 1 assessment as soon as practical after any trigger in 41.2(1)*"i"*(1). The assessment form must describe the sanitary defects detected and corrective actions completed and include a proposed timetable for any other corrective action completion. It may also be noted on the assessment form that no sanitary defects were identified. A system must submit the completed Level 1 assessment form to the department within 30 days of learning that it has exceeded a trigger.

2. If the department reviews the completed Level 1 assessment and determines that it is not sufficient (including any proposed timetable for corrective action completion), the department must consult with the system. If the department requires revisions after consultation, the system must submit a revised assessment form to the department on an agreed-upon schedule, not to exceed 30 days.

3. Upon submission of an assessment form, the department must determine if the system has identified the likely cause for the Level 1 trigger and, if so, establish that the system has corrected the problem or has included an acceptable schedule to correct the problem.

(3) Level 2 assessment. A system must ensure that a Level 2 assessment is conducted if it exceeds one of the TT triggers in 41.2(1)*"i"*(2). A system must comply with any department-required expedited or additional actions in the case of an E. coli MCL violation.

1. A system must ensure that a Level 2 assessment is completed by the department as soon as practical after any trigger in 41.2(1)*"i"*(2). The assessment form must describe the sanitary defects detected and corrective actions completed and include a proposed timetable for any other corrective action completion. It may also be noted on the assessment form that no sanitary defects were identified. A system must submit a completed Level 2 assessment form to the department within 30 days of learning that the system has exceeded a trigger.

2. If the department reviews the completed Level 2 assessment and determines that it is not sufficient (including any proposed timetable for corrective action completion), the department must consult with the system. If the department requires revisions after consultation, the system must submit a revised assessment form to the department on an agreed-upon schedule, not to exceed 30 days.

3. Upon submission of an assessment form, the department must determine if a system has identified the likely cause for the Level 2 trigger and determine whether the system has corrected the problem or has included an acceptable schedule to correct the problem.

(4) Corrective actions. A system must correct sanitary defects found through either a Level 1 or 2 assessment. Corrective action(s) that are not completed by a system prior to the submission of the assessment form must be completed in compliance with a timetable approved by the department in consultation with the system. Systems must notify the department when each scheduled corrective action is completed.

(5) Consultation. At any time during the assessment or corrective actions phase, either the system or the department may request a consultation with the other party to determine appropriate actions. A system may consult with the department on all relevant information that may impact its ability to comply with this subrule.

k. *Reporting requirements.*

(1) *E. coli.*

1. A system must notify the department by the end of the same day when it learns of an *E. coli*-positive violation or routine sample.

2. If a notification is outside of the department's routine office hours, the system shall call the department's Environmental Emergency Reporting Hotline at 515.725.8694.

(2) A system that has violated the coliform TT in 41.2(1)*"i"* must report the violation to the department no later than the end of the next business day after learning of the violation and must provide PN in accordance with rule 567—40.5(455B).

(3) A system required to conduct an assessment under the provisions of 41.2(1)*"i"* must submit an assessment form within 30 days. Systems must notify the department in accordance with 41.2(1)*"j"*(4) when each scheduled corrective action is completed.

(4) A system that has failed to comply with a coliform monitoring requirement must report the monitoring violation to the department within ten days of discovering the violation and must provide PN in accordance with rule 567—40.5(455B).

(5) A seasonal system must certify, prior to serving water to the public, that it has complied with the department-approved start-up procedure.

l. Recordkeeping requirements. Additional recordkeeping requirements are listed in 567—subrule 40.9(10).

m. Violations. A system is in violation and must conduct PN in accordance with rule 567—40.5(455B) in any of the following instances.

(1) *E. coli* MCL violation. A system is in violation of the MCL for *E. coli* when any of the following occurs:

1. An *E. coli*-positive repeat sample following a total coliform-positive routine sample;
2. A total coliform-positive repeat sample following an *E. coli*-positive routine sample;
3. Failure to take all required repeat samples following an *E. coli*-positive routine sample; or
4. Failure to test for *E. coli* when any repeat sample tests positive for total coliform.

(2) TT violation. A system is in violation of a TT trigger when any of the following occurs:

1. Exceedance of a TT trigger specified in 41.2(1)*"i"* and failure to conduct the required assessment within the time frame specified in 41.2(1)*"j"*;
2. Exceedance of a TT trigger specified in 41.2(1)*"i"* and failure to conduct the required corrective actions within the time frame specified in 41.2(1)*"j"*(4); or
3. A seasonal system failing to complete a department-approved start-up procedure prior to serving water to the public, including collection of a finished water sample that tests total coliform-negative.

(3) Monitoring violation. A system is in violation of monitoring requirements if it fails to either:

1. Take every required routine or additional routine sample in a compliance period; or
2. To analyze for *E. coli* following a total coliform-positive routine sample.

(4) Reporting violation. A system is in violation of the reporting requirements if it fails to:

1. Submit a monitoring report in a timely manner after a system properly conducts monitoring;
2. Submit a completed assessment form in a timely manner after a system properly conducts an assessment;
3. Notify the department in a timely manner following an *E. coli*-positive sample, as required by 41.2(1)*"h"*(1); or
4. Submit the certification of completion of department-approved start-up procedure by a seasonal system.

n. Best available technology (BAT). The EPA identifies, and the department has adopted, the following as the best technology, TTs, or other means available for all systems in achieving compliance with the *E. coli* MCL in 41.2(1)*"a."* The following is also identified as affordable technology, TTs, or other means available to systems serving 10,000 or fewer people for achieving compliance with the *E. coli* MCL.

(1) Protection of wells from fecal contamination by appropriate placement and construction.

(2) Maintenance of a disinfectant residual throughout the distribution system.

(3) Proper distribution system maintenance, including appropriate pipe replacement and repair procedures, main flushing programs, proper operation and maintenance of storage tanks and reservoirs, cross-connection control, and continual maintenance of a minimum positive water pressure of 20 psi in all parts of the distribution system at all times.

(4) Filtration or disinfection of surface water (SW) or influenced groundwater (IGW) in accordance with rules 567—43.5(455B), 567—43.9(455B), and 567—43.10(455B) or disinfection of GW in accordance with rule 567—41.7(455B) using strong oxidants such as, but not limited to, chlorine, chlorine dioxide, or ozone.

(5) For GW systems, compliance with the requirements of the department's wellhead protection program.

41.2(2) *Heterotrophic plate count (HPC) bacteria.*

a. Applicability. All PWSs that use a SW source or source under the direct influence of SW must provide treatment consisting of disinfection, as specified in 567—subrule 43.5(2), and filtration treatment, as specified in 567—subrule 43.5(3). The HPC is an alternate method to demonstrate a detectable disinfectant residual in accordance with 567—paragraph 43.5(2)*"d."*

b. Analytical methodology. PWSs shall conduct HPC bacteria analysis in accordance with 567—subrule 43.5(2) and the following analytical method. When HPC bacteria are being measured in lieu of a detectable residual disinfectant pursuant to 567—paragraph 43.5(2)*"d,"* measurements must be conducted by a laboratory certified by the department to do such analysis. The time from sample collection to initiation of analysis may not exceed eight hours, and systems must hold the samples below 10 degrees Celsius during transit to the laboratory.

(1) Method. The HPC shall be performed in accordance with one of the following methods:

1. Method 9215B Pour Plate Method, SM, 18th (1992), 19th (1995), 20th (1998), 21st (2005), and 22nd (2012) editions. The cited method in any of these editions may be used. SM Online method 9215 B-04 may be used.

2. SimPlate Method, "IDEXX SimPlate TM HPC Test Method for Heterotrophs in Water," November 2000, IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, ME 04092.

(2) Reporting. A PWS shall report the results of HPC bacteria in accordance with 567—subparagraph 40.8(3)*"c"*(2).

41.2(3) *Macroscopic organisms and algae.*

a. Applicability. This subrule applies to CWSs, NTNCs, and TNCs using SW or IGW, as defined by 567—subrule 43.5(1).

b. MCLs for macroscopic organisms and algae. Finished water shall be free of any macroscopic organisms such as plankton, worms, or cysts. The finished water algal cell count shall not exceed 500 organisms per mL or 10 percent of the total cells found in the raw water, whichever is greater.

c. Analytical methodology. Algal cell measurement shall be in accordance with Method 10200F: Phytoplankton Counting Techniques, SM, 18th edition, pp. 10-13 to 10-16. Such measurement shall be required only when the department determines, on the basis of complaints or otherwise, that excessive algal cells may be present.

567—41.3(455B) MCLs and monitoring requirements for inorganic contaminants other than lead or copper.

41.3(1) *MCLs and other requirements for inorganic chemical (IOC) contaminants.*

a. Applicability. The MCLs, BATs, and analytical methods for IOC contaminants specified in this subrule apply to CWSs and NTNCs as specified herein. The fluoride MCL applies only to CWSs and NTNCs that primarily serve children (child care facilities and schools). The nitrate, nitrite, and total nitrate and nitrite MCLs apply to CWSs, NTNCs and TNCs. At the department's discretion, nitrate levels not to exceed 20.0 mg/L may be allowed in a NCWS if the supplier of water demonstrates to the department's satisfaction that:

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

(2) The system is meeting the PN requirements of rule 567—40.5(455B), including continuous posting of the fact that nitrate levels exceed 10 mg/L and the potential health effects of exposure;

(3) The following public health authorities will be notified annually of nitrate levels that exceed 10 mg/L, in addition to the reporting requirements of 567—Chapters 40 and 41: the local county health officials, including the health department, sanitarian, and public health administrator, and the Iowa department of health and human services; and

(4) No adverse health effects shall result.

b. IOC MCLs.

(1) The following table specifies the IOC MCLs:

IOC Contaminant	**EPA Contaminant Code**	**MCL (mg/L)**
Antimony	1074	0.006
Arsenic	1005	0.010
Asbestos	1094	7 million fibers/liter (longer than 10 micrometers in length)
Barium	1010	2
Beryllium	1075	0.004
Cadmium	1015	0.005
Chromium	1020	0.1
Cyanide (as free Cyanide)	1024	0.2
Fluoride*	1025	4.0
Mercury	1035	0.002
Nitrate	1040	10 (as nitrogen)
Nitrite	1041	1.0 (as nitrogen)
Total Nitrate and Nitrite	1038	10 (as nitrogen)
Selenium	1045	0.05
Thallium	1085	0.002

*The recommended fluoride level is 0.7 mg per liter as published by the U.S. Department of Health and Human Services, Public Health Service (July-August 2015). At this optimum level in drinking water, fluoride has been shown to have beneficial effects in reducing the occurrence of tooth decay.

(2) Compliance calculations. IOC MCL compliance shall be determined using the analytical result(s) obtained at each source/entry point (SEP). When the department requires a system to collect nitrate or nitrite samples in its distribution system, IOC MCL compliance shall also be determined using the analytical result(s) obtained at each discrete sampling point in the distribution system. Arsenic sampling results must be reported to the nearest 0.001 mg/L.

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

2. Sampling frequencies of annual or less. For PWSs 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, and 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, it must be collected as soon as possible from the same sampling location, but not to exceed two weeks, and the compliance determination will be based on the average of the two samples. If a system fails to collect the required number of samples, compliance (average concentration) will be based on the total number of samples collected.

3. Nitrate and nitrite. Compliance with the nitrate and nitrite MCLs is determined based on one sample if the level of these contaminants is below the MCLs. If the level of nitrate or nitrite exceeds the

MCLs in the initial sample, a confirmation sample may be required in accordance with 41.3(1)*"c"*(7)"2" and compliance shall be determined based on the average of the initial and confirmation samples.

(3) Additional requirements. The department may assign additional requirements deemed necessary to protect public health, including PN requirements or earlier compliance dates than indicated in rule. When a system is not in compliance with an MCL in this paragraph, the supplier of the water shall notify the department according to 567—subrule 40.8(1) and provide PN according to rule 567—40.5(455B).

c. IOC monitoring requirements.

(1) Routine IOC monitoring (excluding asbestos, nitrate, and nitrite). CWSs and NTNCs shall monitor to determine compliance with the IOC MCLs, in accordance with this subrule. TNCs shall monitor to determine compliance with the nitrate and nitrite MCLs as required by 41.3(1)*"c"*(5) and 41.3(1)*"c"*(6). All new systems or systems that use a new source of water must demonstrate compliance with the IOC MCLs within a time period specified by the department. A system must also comply with the specified initial sampling frequencies to ensure it can demonstrate MCL compliance. Routine and increased monitoring shall be conducted in accordance with this paragraph. A source of water that is determined by the department to be a new SEP is considered to be a new source for the purposes of this rule.

(2) Department designated sampling schedules. Each PWS shall monitor at the time designated by the department during each compliance period. The monitoring protocol is as follows:

1. GW sampling points. GW systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a source/entry point or SEP). Systems shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

2. SW sampling points. SW systems shall take a minimum of one sample at every SEP after any application of treatment or in the distribution system at a point that is representative of each SEP. For purposes of this paragraph, SW systems include systems with a combination of SW and GW sources. Systems shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

3. Multiple sources. If a PWS draws water from more than one source and the sources are combined before distribution, it must sample at an SEP during periods of normal operating conditions (i.e., when water is representative of all sources being used).

4. Composite sampling. The department may reduce the total number of samples that must be analyzed by compositing. In systems serving less than or equal to 3,300 persons, composite samples from a maximum of five samples are allowed, provided that the detection limit of the analysis method is less than one-fifth of the MCL. Sample compositing must be done in the laboratory. If the concentration in the composite sample is greater than or equal to one-fifth of the MCL of any IOC, a follow-up sample must be taken within 14 days at each sampling point included in the composite. The follow-up samples must be analyzed for the contaminants that exceeded one-fifth of the MCL in the composite sample. If duplicates of the original sample taken from each sampling point used in the composite are available, the system may use the duplicates instead of resampling, provided the holding time of the duplicates is not exceeded. Duplicates must be analyzed and the results reported to the department within 14 days after sample analysis. If the system serves a population greater than 3,300 persons, compositing may only be allowed at sampling points within a single system. For systems serving less than or equal to 3,300 persons, the department may allow compositing among different systems provided the five-sample limit is maintained. Detection limits for each IOC analytical method are in 41.3(1)*"e"*(1).

(3) Asbestos monitoring frequency. Monitoring to determine compliance with the asbestos MCL shall be conducted as follows:

1. Initial sampling frequency. Each CWS and NTNC is required to monitor for asbestos during the first three-year compliance period of each nine-year compliance cycle.

2. Asbestos waiver. If a PWS believes it is not vulnerable to asbestos contamination either in its source water or due to the presence of asbestos-cement pipe, or both, it may apply for a waiver of the asbestos monitoring requirement in this subparagraph. If the department grants the waiver, the system is not required to monitor. The department may grant a waiver based on a consideration of potential

asbestos contamination of the water source, the use of asbestos-cement pipe for finished water distribution, and the corrosive nature of the water. An asbestos waiver remains in effect until the completion of the three-year compliance period. Systems not receiving a waiver must monitor in accordance with the initial sampling frequency in this subparagraph.

3. Distribution system vulnerability. A PWS vulnerable to asbestos contamination due solely to the presence of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

4. Source water vulnerability. A PWS vulnerable to asbestos contamination due solely to source water shall monitor in accordance with the department designated sampling schedules in 41.3(1)*"c"*(2).

5. Combined vulnerability. A PWS vulnerable to asbestos contamination due both to its source water supply and the presence of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

6. Asbestos MCL exceedance. A PWS that exceeds the asbestos MCL shall monitor quarterly beginning in the next quarter after the violation occurred.

7. Asbestos below the MCL. The department may decrease the quarterly monitoring requirement to the initial sampling frequency in this subparagraph provided a system is reliably and consistently below the asbestos MCL. In no case can the department make this determination unless a GW system takes a minimum of two quarterly samples and a surface (or combined surface/ground) water system takes a minimum of four quarterly samples.

8. Grandfathered asbestos data. If monitoring data are generally consistent with the requirements of this subparagraph, the department may allow PWSs to use that data to satisfy the monitoring requirement for the initial compliance period beginning.

(4) Monitoring frequency for other IOCs. Monitoring to determine compliance with the MCLs for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium, and thallium shall be conducted as follows:

1. IOCs sampling frequency. GW systems shall take one sample at each sampling point once every three years. SW systems (or combined SW/GW systems) shall take one sample annually at each sampling point.

2. IOC sampling waiver. The PWS may apply for a waiver from the IOC sampling frequencies specified in this subparagraph. A PWS shall take a minimum of one sample while a waiver is effective. The term during which the waiver is effective shall not exceed one compliance cycle (i.e., nine years).

3. IOC waiver and grandfathered data. The department may grant a waiver provided SW systems have monitored annually for at least three years and GW systems have conducted a minimum of three rounds of monitoring. Both SW and GW systems shall demonstrate that all previous analytical results were less than the MCL. Systems that use a new water source are not eligible for a waiver until three rounds of monitoring from the new source have been completed. Systems may be granted a waiver for cyanide monitoring, provided the department determines that the system is not vulnerable due to a lack of any industrial source of cyanide.

4. IOC sampling frequency during a waiver. In determining the appropriate reduced monitoring frequency, the department will consider: 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 GW pumping rates, system configuration, system operating procedures, or stream flow characteristics.

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

6. Exceedance of an IOC MCL. PWSs that exceed the IOC MCLs shall monitor quarterly beginning in the next quarter after the violation occurred.

7. IOCs reliably and consistently below the MCL. The department may decrease the quarterly monitoring requirement to the IOC sampling frequencies specified in “1” and “3” of this subparagraph provided it has determined that a PWS is reliably and consistently below the MCL. The department shall not make this determination unless a GW system takes a minimum of two quarterly samples and a SW system takes a minimum of four quarterly samples.

(5) Nitrate monitoring frequency. All PWSs (CWSs, NTNCs, and TNCs) shall monitor to determine compliance with the nitrate MCL.

1. Initial nitrate sampling. All PWSs served by GW systems shall monitor annually.

2. GW repeat nitrate sampling frequency. For GW PWS, the repeat monitoring frequency is:

- Quarterly for at least one year following any one sample in which the concentration is greater than or equal to 5.0 mg/L as N. The department may allow a GW system to reduce its sampling frequency to annually after four consecutive quarterly samples are reliably and consistently less than 5.0 mg/L as N.
- Monthly for at least one year following any one sample in which the concentration is greater than or equal to 10.0 mg/L as N.

3. SW repeat nitrate sampling frequency. The department may allow a PWS SW system to reduce the sampling frequency to:

- Annually if all analytical results from four consecutive quarters are less than 5.0 mg/L as N.
- Quarterly for at least one year following any one sample in which the concentration is greater than or equal to 5.0 mg/L as N. The department may allow a SW system to reduce the sampling frequency to annually after four consecutive quarterly samples are reliably and consistently less than 5.0 mg/L as N.
- Monthly for at least one year following any nitrate MCL exceedance.

4. Scheduling annual nitrate repeat samples. After the initial round of quarterly sampling is completed, each CWS and NTNC monitoring annually shall take subsequent samples during the quarter(s) which previously resulted in the highest analytical result.

(6) Nitrite monitoring frequency. All PWSs shall monitor to determine compliance with the nitrite MCL.

1. Initial nitrite sampling. All PWSs shall take one sample at each sampling point.

2. Nitrite repeat monitoring. After the initial sample, systems where an analytical result for nitrite is less than 0.50 mg/L as N shall monitor at the department-specified frequency.

3. Nitrite increased monitoring. For all PWSs, the repeat monitoring frequency is:

- Quarterly for at least one year following any one sample in which the concentration is greater than or equal to 0.50 mg/L as N. The department may allow a system to reduce the sampling frequency to annually after determining a system is reliably and consistently less than 0.50 mg/L.
- Monthly for at least one year following any nitrite MCL exceedance.

4. Scheduling of annual nitrite repeat samples. Systems monitoring annually shall take each subsequent sample during the quarter(s) which previously resulted in the highest analytical result.

(7) IOC confirmation sampling.

1. IOC confirmation sample deadline (other than nitrate and nitrite). Where the results of an analysis for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, or thallium indicate an MCL exceedance, the department may require the collection of one additional sample as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point.

2. Nitrate and nitrite confirmation sample deadline. Where nitrate or nitrite sampling results indicate an MCL exceedance and the sampling frequency is quarterly or annual, a system shall take a confirmation sample within 24 hours of its receipt of the analytical results. PWSs unable to comply with the 24-hour confirmation sampling requirement must immediately notify the consumers served by the area served by the PWS in accordance with 567—40.5(455B) Tier 1 PN and complete an analysis of a confirmation sample within two weeks of receipt of the analytical results of the first sample. Where the sampling frequency is monthly, a confirmation sample will not be used to determine MCL compliance.

3. Compliance calculations and confirmation samples. If a required confirmation sample collected within the time specified in "1" of this subparagraph is taken for any contaminant, the results of the initial and confirmation sample shall be averaged. The resulting average shall be used to determine the system's compliance with the IOC MCLs. The department has the discretion to invalidate results of obvious sampling errors.

(8) Designation of increased sampling frequency. The department, at its discretion, may require more frequent monitoring than specified for asbestos, other IOCs, nitrate, and nitrite in 41.3(1)*"c"*(3) through 41.3(1)*"c"*(6), or confirmation samples for positive and negative results. PWSs may apply to conduct more frequent monitoring than the minimum monitoring specified in this subrule. Any increase or decrease in monitoring under this subparagraph will be designated in an operation permit or administrative order. To increase or decrease such frequency, the department shall consider:

1. Reported concentrations from previously required monitoring,
2. The degree of variation in reported concentrations,
3. Blending or treatment processes conducted to comply with an MCL, TT, or AL, and
4. Other factors, including changes in pumping rates in GW supplies, significant changes in a system's configuration, operating procedures, source of water, or streamflow changes.

(9) Grandfathered data. For the initial analysis required in this paragraph (41.3(1)*"c"*), data for surface waters acquired within one year prior to the effective date and data for GWs acquired within three years prior to [the effective date of this paragraph] may be substituted at the department's discretion.

d. Analytical and sampling methodology.

(1) IOC analytical methods. IOC contaminants shall be analyzed using the following methods, or their equivalent as determined by EPA. Criteria for analyzing arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, sodium, and thallium with digestion or directly without digestion, and other analytical test procedures are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994, NTIS PB95-104766.

IOC Contaminant Analytical Methods

Contaminant	**Methodology[15]**	**EPA**	**ASTM[3]**	**SM**	**SM Online[26]**	**Other**	**MDL in mg/L**
Antimony	Atomic absorption; furnace			3113B[4, 27, 33]	3113 B-04, B-10		0.003
	Atomic absorption; platform	200.9[2]					0.0008[12]
	ICP-MS[35]	200.8[2]					0.0004
	Atomic absorption; hydride		D3697-92, 02, 07, 12				0.001
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Arsenic[16]	ICP-MS	200.8[2]					0.0014
	Atomic absorption; platform	200.9[2]					0.0005[15]
	Atomic absorption; furnace		D2972-97C, 03C, 08C	3113B[4, 27, 33]	3113 B-04, B-10		0.001
	Atomic absorption; hydride		D2972-97B, 03B, 08B	3114B[4, 27, 33]	3114 B-09		0.001
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Asbestos	Transmission electron microscopy	100.1[9]					0.01 MFL
	Transmission electron microscopy	100.2[10]					
Barium	ICP	200.7[2]		3120B[18, 27, 33]	3120 B-99		0.002
	ICP-MS[35]	200.8[2]					
	Atomic absorption; direct			3111D[4, 27, 33]	3111 D-99		0.1
	Atomic absorption; furnace			3113B[4, 27, 33]	3113 B-04, B-10		0.002

Contaminant	Methodology[15]	EPA	ASTM[3]	SM	SM Online[26]	Other	MDL in mg/L
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Beryllium	ICP[35]	200.7[2]		3120B[18, 27, 33]	3120 B-99		0.0003
	ICP-MS[35]	200.8[2]					0.0003
	Atomic absorption; platform	200.9[2]					0.00002[12]
	Atomic absorption; furnace		D3645-97B, 03B, 08B	3113B[4, 27, 33]	3113 B-04, B-10		0.0002
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Cadmium	ICP[35]	200.7[2]					0.001
	ICP-MS[35]	200.8[2]					
	Atomic absorption; platform	200.9[2]					
	Atomic absorption; furnace			3113B[4, 27, 33]	3113 B-04, B-10		0.0001
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Chromium	ICP[35]	200.7[2]		3120B[18, 27, 33]	3120 B-99		0.007
	ICP-MS[35]	200.8[2]					
	Atomic absorption; platform	200.9[2]					
	Atomic absorption; furnace			3113B[4, 27, 33]	3113 B-04, B-10		0.001
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Cyanide	Manual distillation (followed by 1 of the 4 methods listed below:)		D2036-98A, D2036-06A	4500-CN-C[18, 27, 33]			
	Spectrophotometric; amenable[14]		D2036-98B, D2036-06B	4500-CN-G[18, 27, 33]	4500-CN-G-99		0.02
	Spectrophotometric; manual[13]		D2036-98A, D2036-06A	4500-CN-E[18, 27, 33]	4500-CN-E-99	I-3300-85[5]	0.02
	Spectrophotometric; semi-automated[13]	335.4[6]					0.005
	Selective electrode[13]			4500-CN-F[18, 27, 33]	4500-CN-F-99		0.05
	UV, distillation, spectrophotometric[22]					Kelada 01[20]	0.0005
	Micro distillation, flow injection, spectrophotometric[13]					QuikChem 10-204-00-1-X[21]	0.0006
	Ligand exchange with amperometry[14]		D6888-04			OIA-1677, DW[25]	0.0005
	GC/MS headspace					ME355.01[29]	
Fluoride	IC[36]	300.0[6], 300.1[23]	D4327-97, 03, 11	4110B[18, 27, 33]	4110 B-00		
	Manual distillation; colorimetric; SPADNS			4500F-B,D[18, 27, 33]	4500 F-B,D-97		
	Manual electrode		D1179-93B, 99B, D1179-04B, 10B	4500F-C[18, 27, 33]	4500 F-C-97		
	Automated electrode					380-75WE[11]	
	Automated alizarin			4500F-E[18, 27, 33]	4500 F-E-97	129-71W[11]	
	Capillary ion electrophoresis					D6508, Rev.2[24]	
	Arsenite-free colorimetric; SPADNS					Hach SPADNS 2 Method 10225[31]	
	Atomic absorption; direct		D511-93, 03B, 09B, 14B	3111B[4, 27, 33]	3111 B-99		

Contaminant	**Methodology**[15]	**EPA**	**ASTM**[3]	**SM**	**SM Online**[26]	**Other**	**MDL in mg/L**
Magnesium	ICP[35]	200.7[1]		3120B[18, 27, 33]	3120 B-99		
	Complexation Titrimetric Methods		D511-93, 03A, 09A, 14B	3500-Mg E[4] 3500-Mg B[19, 27, 33]	3500-Mg B-97		
	IC		D6919-03, 09				
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Mercury	Manual, cold vapor	245.1[2]	D3223-97, 02, 12	3112B[4, 27, 33]	3112 B-09		0.0002
	Automated, cold vapor	245.2[1]					0.0002
	ICP-MS[35]	200.8[2]					
Nickel	ICP[35]	200.7[2]		3120B[18, 27, 33]	3120 B-99		0.005
	ICP-MS[35]	200.8[2]					0.0005
	Atomic absorption; platform	200.9[2]					0.0006[12]
	Atomic absorption; direct			3111B[4, 27, 33]	3111 B-99		
	Atomic absorption; furnace			3113B[4, 27, 33]	3113 B-04, 10		0.001
	AVICP-AES[35]	200.5, Revision 4.2[28]					
Nitrate	IC[36]	300.0[6], 300.1[23]	D4327-97, 03, 11	4110B[18, 27, 33]	4110 B-00	B-1011[8]	0.01
	Automated cadmium reduction	353.2[6]	D3867-90A	4500-NO_3F[18, 27, 33]	4500-NO_3-F-00		0.05
	Ion selective electrode			4500-NO_3-D[18, 27, 33]	4500-NO_3-D-00	601[7]	1
	Manual cadmium reduction		D3867-90B	4500-NO_3-E[18, 27, 33]	4500-NO_3-E-00		0.01
	Capillary ion electrophoresis					D6508, Rev.2[24]	0.076
	Reduction/colorimetric					Systea Easy (1-Reagent)[30] NECi Nitrate-Reductase[34]	
	Colorimetric; direct					Hach TNTplus™ 835/836 Method 10206[32]	
Nitrite	IC[36]	300.0[6], 300.1[23]	D4327-97, 03, 11	4110B[18, 27, 33]	4110 B-00	B-1011[8]	0.004
	Automated cadmium reduction	353.2[6]	D3867-90A	4500-NO_3-F[18, 27, 33]	4500-NO_3-F-00		0.05
	Manual cadmium reduction		D3867-90B	4500-NO_3-E[18, 27, 33]	4500-NO_3-E-00		0.01
	Spectrophotometric			4500-NO_2-B[18, 27, 33]	4500-NO_2-B-00		0.01
	Capillary ion electrophoresis					D6508, Rev. 2[24]	0.103
	Reduction/colorimetric					Systea Easy (1-Reagent)[30] NECi Nitrate-Reductase[34]	
Selenium	Atomic absorption; hydride		D3859-98, 03A, 08A	3114B[4, 27, 33]	3114 B-09		0.002
	ICP-MS[35]	200.8[2]					
	Atomic absorption; platform	200.9[2]					
	Atomic absorption; furnace		D3859-98, 03B, 08B	3113B[4, 27, 33]	3113 B-04, 10		0.002

Contaminant	Methodology[15]	EPA	ASTM[3]	SM	SM Online[26]	Other	MDL in mg/L
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Sodium	ICP[35]	200.7[2]					
	Atomic absorption; direct			3111B[4, 27, 33]	3111 B-99		
	IC[36]		D6919-03, 09				
	AVICP-AES[17]	200.5, Revision 4.2[28]					
Thallium	ICP-MS[35]	200.8[2]					
	Atomic absorption; platform	200.9[2]					0.0007[12]

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be obtained from the sources listed below. Information regarding the documents can be obtained from the Safe Drinking Water Hotline at 800.426.4791. Documents may be inspected at EPA's Drinking Water Docket or at the Office of Federal Register.

[1] "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1983. NTIS, PB84-128677.

[2] "Methods for the Determination of Metals in Environmental Samples—Supplement I," EPA-600/R-94-111, May 1994. NTIS, PB95-125472.

[3] ASTM, 1994, 1996, 1999 or 2003, Vols. 11.01 and 11.02; the methods listed are the only versions that may be used.

[4] 18th and 19th editions, SM, 1992 and 1995, respectively.

[5] Techniques of Water Resources Investigation of the USGS, Book 5, Chapter A-1, 3rd edition, 1989, Method I-3300-85. Information Services, USGS, Federal Center, Box 25286, Denver, CO 80225-0425.

[6] "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA-600-R-93-100, August 1993. NTIS, PB94-120821.

[7] The procedure shall be done in accordance with the Technical Bulletin 601, "Standard Method of Test for Nitrate in Drinking Water," July 1994, PN221890-001, Analytical Technology, Inc. ATI Orion, 529 Main Street, Boston, MA 02129.

[8] Method B-1011, "Waters Test Method for Determination of Nitrite/Nitrate in Water Using Single Column Ion Chromatography," August 1987. Waters Corporation, Technical Services Division, 34 Maple Street, Milford, MA 01757.

[9] Method 100.1, "Analytical Method for Determination of Asbestos Fibers in Water," EPA-600/4-83-043, EPA, September 1983. NTIS, PB83-260471.

[10] Method 100.2, "Determination of Asbestos Structure Over 10 Microns in Length in Drinking Water," EPA-600/R-94-134, June 1994. NTIS, PB94-201902.

[11] Industrial Method No. 129-71W, "Fluoride in Water and Wastewater," December 1972, and Method No. 380-75WE, "Fluoride in Water and Wastewater," February 1976, Technicon Industrial Systems. Bran & Luebbe, 1025 Busch Parkway, Buffalo Grove, IL 60089.

[12] Lower MDLs are reported using stabilized temperature graphite furnace atomic absorption.

[13] Screening method for total cyanides.

[14] Measures "free" cyanides when distillation, digestion, or ligand exchange is omitted.

[15] Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. For direct analysis of cadmium by Method 200.7, sample preconcentration using pneumatic nebulization may be required to achieve lower detection limits. Preconcentration may also be required for direct analysis of antimony and thallium by Method 200.9, and antimony by Method 3113B, unless multiple in-furnace depositions are made.

[16] If ultrasonic nebulization is used in arsenic determination by Method 200.8, the arsenic must be in the pentavalent state to provide uniform signal response. For direct analysis of arsenic with Method 200.8 using ultrasonic nebulization, samples and standards must contain 1 mg/L of sodium hypochlorite.

[17] AVICP-AES means axially viewed inductively coupled plasma-atomic emission spectrometry.

[18] 18th, 19th, and 20th editions, SM, 1992, 1995, and 1998, respectively.

[19] 20th edition, SM, 1998.

[20] Kelada 01 Method, "Kelada Automated Test Methods for Total Cyanide, Acid Dissociable Cyanide, and Thiocyanate," Revision 1.2, August 2001, EPA #821-B-01-009 for cyanide, NTIS PB 2001-108275. Note: A 450W UV lamp may be used in this method instead of the 550W lamp specified if it provides performance within the quality control acceptance criteria of the method in a given instrument. Similarly, modified flow cell configurations and flow conditions may be used in the method, provided that the quality control acceptance criteria are met.

[21] QuikChem Method 10-204-00-1-X, "Digestion and distillation of total cyanide in drinking water and wastewaters using MICRO DIST and determination of cyanide by flow injection analysis," Revision 2.1, November 30, 2000, Lachat Instruments, 6645 W. Mill Road, Milwaukee, WI 53218.

[22] Measures total cyanides when UV-digestor is used, and "free" cyanides when UV-digestor is bypassed.

[23] "Methods for the Determination of Organic and Inorganic Compounds in Drinking Water," Volume 1, EPA 815-R-00-014, August 2000. NTIC, PB2000-106981.

[24] Method D6508, Rev. 2, "Test Method for Determination of Dissolved Inorganic Anions in Aqueous Matrices Using Capillary Ion Electrophoresis and Chromate Electrolyte," Waters Corp., 34 Maple Street, Milford, MA 01757.

[25] Method OIA-1677, DW "Available Cyanide by Flow Injection, Ligand Exchange, and Amperometry," January 2004. EPA-821-R-04-001. ALPKEM, a division of OI Analytical, P.O. Box 9010, College Station, TX 77542-9010.

[26] SM Online. The year that each method was approved is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[27] SM, 21st edition (2005).

[28] EPA Method 200.5, Revision 4.2: "Determination of Trace Elements in Drinking Water by Axially Viewed Inductively Coupled Plasma-Atomic Emission Spectrometry," 2003. EPA/600/R-06/115, www.nemi.gov.

[29] Method ME355.01, Revision 1.0, "Determination of Cyanide in Drinking Water by GC/MS Headspace," May 26, 2009. www.nemi.gov or H & E Testing Laboratory, 221 State Street, Augusta, ME 04333.

[30] Systea Easy (1-Reagent), "Systea Easy (1-Reagent) Nitrate Method," February 4, 2009. www.nemi.gov or Systea Scientific, LLC, 900 Jorie Blvd., Suite 35, Oak Brook, IL 60523.

[31] Hach Company Method, "Hach Company SPADNS 2 (Arsenic-free) Fluoride Method 10225 – Spectrophotometric Measurement of Fluoride in Water and Wastewater," January 2011, www.hach.com.

[32] Hach Company Method, "Hach Company TNTplusTM 835/836 Nitrate Method 10206 – Spectrophotometric Measurement of Nitrate in Water and Wastewater," January 2011, www.hach.com.

[33] SM, 22nd edition (2012).

[34] Nitrate Elimination Company, Inc. (NECi). "Method for Nitrate Reductase Nitrate-Nitrogen Analysis of Drinking Water," February 2016. Superior Enzymes, Inc., 334 Hecla Street, Lake Linden, MI 49945.

[35] IPC means inductively coupled plasma, and ICP-MS means inductively coupled plasma mass spectrometry.

[36] IC means ion chromatography.

(2) IOC sampling methods. Samples for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, nitrate, nitrite, selenium, and thallium under this subparagraph shall be collected using the sample preservation, container, and maximum holding time procedures specified in the table below:

IOC Sampling Methods

Contaminant	Preservative[1]	Container[2]	Time[3]
Antimony	HNO_3	P or G	6 months
Arsenic	HNO_3	P or G	6 months
Asbestos	4 degrees C	P or G	48 hours for filtration[5]
Barium	HNO_3	P or G	6 months
Beryllium	HNO_3	P or G	6 months
Cadmium	HNO_3	P or G	6 months
Chromium	HNO_3	P or G	6 months
Cyanide	4 degrees C, NaOH	P or G	14 days
Fluoride	None	P or G	1 month
Mercury	HNO_3	P or G	28 days
Nickel	HNO_3	P or G	6 months
Nitrate[4]	4 degrees C	P or G	48 hours
Nitrite[4]	4 degrees C	P or G	48 hours
Selenium	HNO_3	P or G	6 months
Thallium	HNO_3	P or G	6 months

[1] When indicated, samples must be acidified at the time of collection to $pH < 2$ with concentrated acid, or adjusted with sodium hydroxide to $pH > 12$. Samples collected for metals analysis may be preserved by acidification at the laboratory, using a 1:1 nitric acid solution (50 percent by volume), provided the shipping time and other instructions in Section 8.3 of EPA Methods 200.7, 200.8, and 200.9 are followed. When chilling is indicated, the sample must be shipped and stored at 4 degrees Celsius or less.

[2] P: plastic, hard or soft; G: glass, hard or soft.

[3] All samples should be analyzed as soon after collection as possible. Follow additional (if any) information on preservation, containers, or holding times that is specified in the method.

[4] Nitrate may only be measured separate from nitrite in samples that have not been acidified. Measurement of acidified samples provides a total nitrate (sum of nitrate plus nitrite) concentration.

[5] Instructions for containers, preservation procedures, and holding times as specified in Method 100.2 must be adhered to for all compliance analyses, including those conducted with Method 100.1.

41.3(2) Reserved.

567—41.4(455B) Lead, copper, and corrosivity.

41.4(1) *Lead, copper, and corrosivity regulation by the setting of a TT requirement.* The lead and copper rules establish a TT that includes requirements for corrosion control treatment (CCT), source water treatment, lead service line (LSL) replacement, and public education (PE). These requirements are triggered, in some cases, by lead and copper action levels (ALs) measured in samples collected at consumers' taps.

a. Applicability. Unless otherwise indicated, the provisions of this subrule apply to CWSs and NTNCs (hereinafter referred to as "PWSs" or "systems").

b. Action levels (ALs).

(1) The lead AL is exceeded if the lead concentration in more than 10 percent of tap water samples collected during any monitoring period, in accordance with 41.4(1)*"c,"* is greater than 0.015 mg/L (i.e., if the "90th percentile" lead level is greater than 0.015 mg/L).

(2) The copper AL is exceeded if the copper concentration in more than 10 percent of tap water samples collected during any monitoring period, in accordance with 41.4(1)*"c,"* is greater than 1.3 mg/L (i.e., if the "90th percentile" copper level is greater than 1.3 mg/L).

(3) 90th percentile calculation. The 90th percentile lead and copper levels shall be computed as follows:

1. The results of all lead or copper samples taken during a monitoring period shall be placed in ascending order from lowest concentration to highest concentration. Each sample shall be assigned a number, ascending by single integers beginning with the number 1 for the sample with the lowest concentration. The number assigned to the sample with the highest concentration shall be equal to the total number of samples taken.

2. The number of samples taken during the monitoring period shall be multiplied by 0.9.

3. The contaminant concentration in the numbered sample yielded by this calculation is the 90th percentile contaminant level.

4. For systems serving fewer than 100 people that collect five samples per monitoring period, the 90th percentile is computed by taking the average of the highest and second highest concentrations.

5. For a PWS allowed by the department to collect fewer than five samples, in accordance with 41.4(1)*"c"*(3), the sample result with the highest concentration is considered the 90th percentile value.

c. Lead and copper tap water monitoring requirements.

(1) Sample site selection.

1. General. PWSs shall complete a materials evaluation of their distribution systems by the date indicated in 41.4(1)*"c"*(4) in order to identify a pool of sampling sites that meets the requirements of this subrule, and which is sufficiently large to ensure that the system can collect the number of lead and copper tap samples required in 41.4(1)*"c"*(3). All sites from which first-draw samples are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have POU or POE treatment devices designed to remove inorganic contaminants.

2. Information sources. A PWS shall use the information on lead, copper, and galvanized steel collected under 41.4(1)*"f"* when conducting a materials evaluation. When an evaluation of the information is insufficient to locate the requisite number of lead and copper sampling sites meeting the targeting criteria in this subparagraph, the PWS shall review additional information to indicate locations that may be particularly susceptible to high lead or copper concentrations. The additional information includes all building department plumbing codes, permits, and records that indicate the plumbing materials installed within all structures connected to the distribution system; all distribution system inspections and records that indicate the material composition of the service connections that connect a structure to the distribution system; and all existing water quality information, including the results of all prior analyses of the system or individual structures connected to the system. System shall seek to collect such additional information where possible in the course of normal operations.

3. Tier 1 CWS sampling sites. The Tier 1 sampling sites selected for a CWS's sampling pool shall consist of single-family structures containing copper pipes with lead solder installed after 1982 or containing lead pipes; or served by an LSL. When multiple-family residences comprise at least 20

percent of the structures served by a water system, the system may include these types of structures in its sampling pool.

4. Tier 2 CWS sampling sites. Any CWS with insufficient Tier 1 sampling sites shall complete its sampling pool with Tier 2 sampling sites, consisting of buildings, including multiple-family residences containing copper pipes with lead solder installed after 1982 or containing lead pipes; or served by an LSL.

5. Tier 3 CWS sampling sites. Any CWS with insufficient Tier 1 and Tier 2 sampling sites shall complete its sampling pool with Tier 3 sampling sites, consisting of single-family structures containing copper pipes with lead solder installed before 1983. A CWS with insufficient Tier 1, Tier 2, and Tier 3 sampling sites shall complete its sampling pool with representative sites throughout the distribution system. A representative site is defined as a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

6. Tier 1 NTNC sampling sites. The Tier 1 sampling sites selected for a NTNC shall consist of buildings containing copper pipes with lead solder installed after 1982 or containing lead pipes; or served by an LSL.

7. Other NTNC sampling sites. An NTNC with insufficient Tier 1 NTNC sites shall complete its sampling pool with sites containing copper pipes with lead solder installed before 1983. If additional sites are needed to complete the sampling pool, the NTNC shall use representative sites throughout the distribution system. A representative site is defined as a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

8. LSL sampling sites. Any PWS whose distribution system contains LSLs shall draw 50 percent of the samples collected during each monitoring period from sites containing lead pipes or copper pipes with lead solder, and 50 percent of the samples from sites served by an LSL. A system that cannot identify a sufficient number of sampling sites served by an LSL shall collect first-draw samples from all of the sites identified as being served by such lines.

(2) Sample collection methods.

1. Tap samples for lead and copper collected in accordance with this subparagraph shall be first-draw samples, except for LSL samples collected under 567—subrule 43.7(4) and 41.4(1)*"c"*(2)"5."

2. First-draw tap samples for lead and copper shall be one liter in volume and have stood motionless in the plumbing system of each sampling site for at least six hours. First-draw samples from residential housing shall be collected from the cold-water kitchen tap or bathroom sink tap. First-draw samples from a nonresidential building shall be collected at an interior tap from which water is typically drawn for consumption. First-draw samples may be collected by the system, or it may allow residents to collect first-draw samples after instructing the residents of the sampling procedures specified in this paragraph. To avoid problems of residents handling nitric acid, acidification of first-draw samples may be done up to 14 days after the sample is collected. After acidification, the sample must stand in the original container for the time specified in the approved EPA method before the sample can be analyzed. If a system allows residents to perform sampling, the system may not challenge, based on alleged errors in sample collection, the accuracy of sampling results.

3. LSL samples collected to determine if the service line is directly contributing lead (as described in 567—subrule 43.7(4)) shall be one liter in volume, have stood motionless in the LSL for at least six hours, and be collected at the tap after flushing the volume of water between the tap and the LSL. The volume of water shall be calculated based on the interior diameter and length of the pipe between the tap and the LSL; tapping directly into the LSL; or if the sampling site is a building constructed as a single-family residence, allowing the water to run until there is a significant change in temperature, indicative of water that has been standing in the LSL.

4. A PWS shall collect each first-draw tap sample from the same sampling site from which it collected a previous sample. If, for any reason, a system cannot gain entry to a sampling site in order to collect a follow-up tap sample, it may collect the follow-up tap sample from another sampling site in its sampling pool as long as the new site meets the same targeting criteria, and is within reasonable proximity of the original site.

5. An NTNC system, or a CWS system meeting the criteria of 567—subparagraph 40.6(2)*"d"*(2) that does not have enough taps that can supply first-draw samples, may apply to the department in writing to substitute non-first-draw samples. Such systems must collect as many first-draw samples from appropriate taps as possible and identify sampling times and locations that would likely result in the longest standing time for the remaining sites. The department may waive the requirement for prior approval of non-first-draw sample sites selected by the system through written notification to the system. Non-first-draw samples collected in lieu of first-draw samples in accordance with this subparagraph shall be one liter in volume and shall be collected at an interior tap from which water is typically drawn for consumption.

(3) Number of samples. PWS shall collect at least one sample during each monitoring period specified in 41.4(1)*"c"*(4) from the number of sites specified below in the "standard monitoring" column. A system conducting reduced monitoring under 41.4(1)*"c"*(4) shall collect at least one sample from the number of sites specified below in the "reduced monitoring" column during each monitoring period. Reduced monitoring sites shall be representative of the sites required for standard monitoring. A PWS with fewer than five drinking water taps used for human consumption that meet the sample site criteria of 41.4(1)*"c"*(1) and that can be used to reach the required number of sample sites specified in this subparagraph must collect at least one sample from each tap and then must collect additional samples from those taps on different days during the monitoring period to meet the required number of sites. Alternatively, the department may allow these systems to collect a number of samples less than the number of sites specified in 41.4(1)*"c"*(1), provided that 100 percent of all taps that can be used for human consumption are sampled. This reduction of the minimum number of samples must be approved in writing by the department, based upon on-site verification or a request from the system. The department may specify sampling locations when a system is conducting reduced monitoring.

Required Number of Lead/Copper Samples

System Size (Number of People Served)	Standard Monitoring (Number of Sites)	Reduced Monitoring (Number of Sites)
greater than 100,000	100	50
10,001 to 100,000	60	30
3,301 to 10,000	40	20
501 to 3,300	20	10
101 to 500	10	5
less than or equal to 100	5	5

(4) Monitoring periods.

1. Initial tap sampling. The first six-month monitoring period for small, medium-size and large systems shall begin on the following dates:

System Size (Number of People Served)	First Six-month Monitoring Period Begins on:
greater than 50,000 (large system)	January 1, 1992
3,301 to 50,000 (medium system)	July 1, 1992
less than or equal to 3,300 (small system)	July 1, 1993

All large systems shall monitor during two consecutive six-month periods. All small and medium-size systems shall monitor during each six-month monitoring period until the system exceeds the lead or copper AL and is, therefore, required to implement the CCT requirements under 567—paragraph 43.7(1) *"a,"* in which case it shall continue monitoring in accordance with this subparagraph, or the system meets the lead and copper ALs during two consecutive six-month monitoring periods, in which case it may reduce monitoring in accordance with this subparagraph.

2. Monitoring after installation of CCT and source water treatment. Large systems that install optimal corrosion control treatment (OCCT) pursuant to 567—subparagraph 43.7(1)*"d"*(4) shall monitor during two consecutive six-month monitoring periods by the date specified in 567—subparagraph 43.7(1)*"d"*(5). Small or medium-size systems that install OCCT pursuant to 567—subparagraph 43.7(1)*"e"*(5) shall monitor during two consecutive six-month monitoring periods, as specified in 567—subparagraph 43.7(1)*"e"*(6). Systems that install source water treatment shall

monitor during two consecutive six-month monitoring periods by the date specified in 567—subparagraph 43.7(3)*"a"*(4).

3. Monitoring after the department specifies WQP values for optimal corrosion control (OCC). After the department specifies the values for WQP under 567—paragraph 43.7(2)*"f,"* the system shall monitor during each subsequent six-month monitoring period, with the first monitoring period to begin on the date the department specifies the OCC values under 567—paragraph 43.7(2)*"f."*

4. Reduced monitoring: a small or medium-size PWS that meets the lead and copper ALs during each of two consecutive six-month monitoring periods may reduce the number of lead and copper samples according to 41.4(1)*"c"*(3) and reduce the sampling frequency to once per year. A small or medium-size system collecting fewer than five samples as specified in 41.4(1)*"c"*(3) that meets the lead and copper ALs during each of two consecutive six-month monitoring periods may reduce the sampling frequency to once per year. This reduced sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period. A system shall not ever reduce the number of samples required below the minimum of one sample per available tap.

5. Reduced monitoring: any PWS that meets the lead AL and maintains the range of values for the WQPs reflecting OCCT specified in 567—paragraph 43.7(2)*"f"* during each of two consecutive six-month monitoring periods may reduce the monitoring frequency to once per year and reduce the number of lead and copper samples according to 41.4(1)*"c"*(3), upon written department approval. This monitoring shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period. The department shall review monitoring, treatment, and other relevant information submitted by the system in accordance with 567—subrule 40.8(2) and shall notify a system in writing when it determines that a system is eligible to commence reduced monitoring. The department will review and, where appropriate, revise its determination when a system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

6. Reduced monitoring: a small or medium-size PWS that meets the lead and copper ALs during three consecutive years of monitoring may reduce the monitoring frequency for lead and copper from annually to once every three years. Any system that meets the lead AL and maintains the range of values for the WQP reflecting OCCT specified in 567—paragraph 43.7(2)*"f"* during three consecutive years of monitoring may reduce the monitoring frequency from annually to once every three years if it receives written department approval. Samples collected once every three years shall be collected no later than every third calendar year. The department shall review monitoring, treatment, and other relevant information submitted by a system in accordance with 567—subrule 40.8(2) and shall notify a system in writing when it determines that a system is eligible to commence reduced monitoring. The department will review and, where appropriate, revise its determination when a system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

7. A PWS that reduces the number and frequency of sampling shall collect samples from sites included in the pool of targeted sampling sites identified in 41.4(1)*"c"*(1). Systems sampling annually or less frequently shall conduct lead and copper tap sampling during June through September unless the department, at its discretion, has approved a different sampling period. If approved, the sampling period shall be no longer than four consecutive months and must represent a time of normal operation where the highest levels of lead are most likely to occur. The department shall designate a sampling period representing normal operation for an NTNC system that does not operate during June through September, and for which the period of normal operation where the highest levels of lead are most likely to occur is not known. Sampling shall begin during the approved or designated sampling period in the calendar year immediately following the end of the second consecutive six-month monitoring period for systems initiating annual monitoring and during the three-year period following the end of the third consecutive calendar year of annual monitoring for systems initiating triennial monitoring.

8. Systems monitoring annually or triennially that have been collecting samples during June through September and that receive department approval to alter their sample collection period must collect their next round of samples during a time period that ends no later than 21 months (for annual

monitoring) or 45 months (for triennial monitoring) after the previous round of sampling. Subsequent rounds of sampling must be collected annually or triennially, as required by this paragraph.

9. Small systems that have been granted waivers pursuant to 41.4(1)*"c"*(7), that have been collecting samples during June through September, and that receive department approval to alter their sample collection period as previously stated must collect their next round of samples before the end of the nine-year period.

10. Any PWS that demonstrates for two consecutive six-month monitoring periods that the 90th percentile tap water level computed under 41.4(1)*"b"*(3) is less than or equal to 0.005 mg/L for lead and is less than or equal to 0.65 mg/L for copper may reduce the number of samples in accordance with 41.4(1)*"c"*(3) and reduce the sampling frequency to once every three calendar years, if approved by the department.

11. A small or medium-size PWS subject to reduced monitoring that exceeds the lead or copper AL shall resume sampling according to 41.4(1)*"c"*(4)"3" and collect the number of samples specified for standard monitoring in 41.4(1)*"c"*(3). Any such system shall also conduct WQP monitoring in accordance with 41.4(1)*"d"*(2), 41.4(1)*"d"*(3), or 41.4(1)*"d"*(4), as appropriate, during the monitoring period in which it exceeded the AL. Any such system may resume annual lead and copper tap monitoring at the reduced number of sites specified in 41.4(1)*"c"*(3) after completing two subsequent consecutive six-month rounds of monitoring meeting the criteria of 41.4(1)*"c"*(4)"4" and may resume triennial lead and copper monitoring at the reduced number of sites after demonstrating through subsequent rounds of monitoring that it meets the criteria of either 41.4(1)*"c"*(4)"6" or "10" and upon written department approval.

12. Any water system subject to reduced monitoring frequency that fails to meet the lead AL during any four-month monitoring period or that fails to operate at or above the minimum value or within the range of values for the OWQP specified in 567—paragraph 43.7(2)*"f"* for more than nine days in any six-month period specified in 41.4(1)*"d"*(4) shall resume tap water sampling according to 41.4(1)*"c"*(4) "3," collect the number of samples specified for standard monitoring in 41.4(1)*"c"*(3), and resume monitoring for WQP within the distribution system in accordance with 41.4(1)*"d"*(4). This standard tap water sampling shall begin no later than the six-month period beginning January 1 of the calendar year following the lead AL exceedance or WQP excursion. Systems may resume reduced monitoring for lead and copper at the tap and for WQPs within the distribution system under the following conditions:

- A system may resume annual lead and copper monitoring at the tap at the reduced number of sites specified in 41.4(1)*"c"*(3) after completing two subsequent six-month rounds of monitoring meeting the criteria of 41.4(1)*"c"*(4)"5" and upon written department approval. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period.
- A system may resume triennial lead and copper monitoring at the tap at the reduced number of sites after demonstrating, through subsequent rounds of monitoring, that it meets the criteria of either 41.4(1)*"c"*(4)"6" or"10" and upon written department approval.
- A system may reduce the number of WQP tap water samples required in 41.4(1)*"d"*(5)"1" and the sampling frequency required in 41.4(1)*"d"*(5)"2." Such a system may not resume triennial monitoring for WQPs at the tap until it demonstrates that it has requalified for triennial monitoring, pursuant to 41.4(1)*"d"*(5)"2."

13. Any PWS subject to a reduced monitoring frequency under 41.4(1)*"c"*(4)"4" through "12" must notify the department of any upcoming long-term change in treatment or addition of a new source in accordance with 567—subparagraph 40.8(2)*"a"*(3). The department must review and approve the addition of a new source or long-term change in water treatment before it is implemented. The department may require a system to resume sampling pursuant to 41.4(1)*"c"*(4)"3" and collect the number of samples specified for standard monitoring under 41.4(1)*"c"*(3), or take other appropriate steps such as increased WQP monitoring or reevaluation of CCT.

(5) Additional monitoring. The results of any monitoring conducted in addition to the minimum requirements of this paragraph shall be considered by a system and the department in making any determinations under this subrule.

(6) Invalidation of lead or copper tap water samples. A sample invalidated under this paragraph does not count toward determining the lead or copper 90th percentile levels under 41.4(1)*"b"*(3) or toward meeting the minimum monitoring requirements of 41.4(1)*"c"*(3).

1. The department may invalidate a lead or copper tap water sample if one or more of the following conditions are met:

- The laboratory establishes that improper sample analysis caused erroneous results;
- The department determines the sample was taken from a site that did not meet the site selection criteria of 567—41.4(455B);
- The sample container was damaged in transit to the laboratory;
- There is a substantial reason to believe that the sample was subject to tampering;
- The sample is not representative of water that would be consumed from the tap; or
- The department determined that a major disruption of the water flow occurred in the system or building plumbing prior to sample collection, which resulted in lead or copper levels that were not representative of the system.

2. A system must report the results of all samples to the department and all supporting documentation for samples it believes should be invalidated.

3. A sample invalidation decision under 41.4(1)*"c"*(6)"1" must be documented in writing and include the reason(s) for invalidation. The department may not invalidate a sample solely on the grounds that a follow-up sample result is higher or lower than that of the original sample.

4. Systems must collect replacement samples for any samples invalidated under this subparagraph if, after the sample invalidation(s), a system has too few samples to meet the minimum requirements of 41.4(1)*"c"*(3). Replacement samples must be taken as soon as possible, but no later than 20 days after the invalidation date, or by the end of the applicable monitoring period, whichever occurs later. Replacement samples taken after the end of the applicable monitoring period shall not also be used to meet the monitoring requirements of a subsequent monitoring period. Replacement samples shall be taken at the same locations as the invalidated samples or, if that is not possible, at locations other than those already used for sampling during the monitoring period.

(7) Monitoring waivers for small systems. Any small system meeting the criteria of this subparagraph may apply to the department to reduce the lead and copper monitoring frequency under this subrule to once every nine years if it meets all of the materials criteria and monitoring criteria specified in this subparagraph.

1. Materials criteria. A system must demonstrate that its distribution system, service lines, and all plumbing, including plumbing conveying drinking water within all residences and buildings connected to the system, are free of lead-containing materials and copper-containing materials, as defined below:

- Lead. A PWS must provide certification and supporting documentation to the department that it is free of all lead-containing materials. The system must not contain any plastic pipes that contain lead plasticizers or plastic service lines that contain lead plasticizers. The system must be free of LSLs, lead pipes, lead soldered pipe joints, and leaded brass or bronze alloy fittings and fixtures unless such fittings and fixtures meet the specifications of any standard established pursuant to 42 U.S.C. 300-g-6(e).
- Copper. A PWS must provide certification and supporting documentation to the department that the system contains no copper pipes or copper service lines.

2. Monitoring criteria. A system must have completed at least one six-month round of standard tap water monitoring for lead and copper at approved sites and from the number of sites required by 41.4(1)*"c"*(3) and demonstrate that the 90th percentile levels do not exceed 0.005 mg/L for lead and 0.65 mg/L for copper for any and all rounds of monitoring conducted since the system became free of all lead- and copper-containing materials.

3. Waiver determination. The department shall notify a system of its waiver determination in writing, including the basis of its decision and any condition of the waiver. The department may require as a waiver condition that a system conduct specific activities, such as limited monitoring or periodic customer outreach to remind them to avoid installation of materials that would void the waiver. A system must continue monitoring for lead and copper at the tap as required by 41.4(1)*"c"*(4)"1" through "4," as appropriate, until it receives written department approval for a waiver.

4. Monitoring frequency for systems with waivers.

- A system with a waiver must conduct tap water monitoring for lead and copper in accordance with 41.4(1)*"c"*(4)"4" at the reduced number of sampling sites identified in 41.4(1)*"c"*(3) at least once every nine years and provide the materials certification specified in 41.4(1)*"c"*(7)"1" for both lead and copper to the department along with the monitoring results. Samples collected every nine years shall be collected no later than every ninth calendar year.
- A system with a waiver must notify the department of any upcoming long-term change in treatment or addition of a new source, pursuant to 567—subparagraph 40.8(2)*"a"*(3). The department must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the system. The department has the authority to add or modify waiver conditions if it deems such modifications are necessary.
- If a system with a waiver becomes aware that it is no longer free of lead-containing or copper-containing materials, it shall notify the department in writing no later than 60 days after becoming aware of such a change.

5. Continued waiver eligibility. If a system continues to satisfy the requirements of 41.4(1)*"c"*(7) "4," the waiver will be renewed automatically unless either of the conditions below occur. A system whose waiver has been revoked may reapply for a waiver at such time as it again meets the appropriate materials and monitoring criteria in "1" and "2" of this subparagraph.

- A system no longer satisfies the materials criteria of 41.4(1)*"c"*(7)"1" or has a 90th percentile lead level greater than 0.005 mg/L or a 90th percentile copper level greater than 0.65 mg/L.
- The department notifies the system in writing that the waiver has been revoked, including the basis of its decision.

6. Requirements following waiver revocation. A system whose waiver has been revoked by the department is subject to the following CCT and lead and copper tap water monitoring requirements:

- If a system exceeds the lead or copper AL, it must implement CCT in accordance with the deadlines specified in 567—paragraph 43.7(1)*"e"* and any other applicable parts of 567—41.4(455B).
- If a system meets both the lead and copper ALs, it must monitor for lead and copper at the tap no less frequently than once every three years using the reduced number of sample sites specified in 41.4(1) *"c"*(3).

d. Water quality parameter (WQP) monitoring requirements. All large PWSs (and all small and medium-size PWSs that exceed the lead or copper AL) shall monitor WQPs in addition to lead and copper in accordance with this subrule. The requirements of this subrule are summarized in the table at the end of 41.4(1)*"d"*(6). The WQPs must be reported in accordance with the monthly operation report (MOR) requirements in 567—subrule 40.8(3).

(1) General.

1. Sample collection methods. Tap samples shall be representative of water quality throughout the distribution system and account for the number of persons served, the different sources of water, the different treatment methods employed by the system, and seasonal variability. Tap sampling under this subrule is not required to be conducted at taps targeted for lead and copper sampling under 41.4(1) *"c"*(1)"1." Systems may conduct tap sampling for WQPs at sites used for coliform sampling. Samples collected at the SEP(s) shall be from locations representative of each source after treatment. If a system draws water from more than one source and the sources are combined before distribution, it must sample at an SEP during periods of normal operating conditions.

2. Number of samples.

- Systems shall collect two tap samples for applicable WQPs during each monitoring period specified in 41.4(1)*"d"*(2) through 41.4(1)*"d"*(5) from the following number of sites.

Required Number of Samples: WQPs

System Size (Number of People Served)	Number of Sites for WQPs
greater than 100,000	25
10,001 to 100,000	10
3,301 to 10,000	3
501 to 3,300	2

101 to 500	1
less than or equal to 100	1

- Except as provided in 41.4(1)*"d"*(3)"3," systems shall collect two samples for each applicable WQP at each SEP during each six-month monitoring period specified in 41.4(1)*"d"*(2). During each monitoring period specified in 41.4(1)*"d"*(3) through 41.4(1)*"d"*(5), systems shall collect one sample for each applicable WQP at each SEP.

(2) Initial sampling.

1. During each six-month monitoring period specified in 41.4(1)*"c"*(4)"1":

- Large PWS shall measure the applicable WQP specified below at taps and at each SEP.
- Small and medium-size systems shall measure the applicable WQPs at taps and at each SEP, during which the system exceeds the lead or copper AL.

2. Tap water and SEP monitoring shall include: pH; alkalinity; orthophosphate, when an inhibitor containing a phosphate compound is used; silica, when an inhibitor containing a silicate compound is used; calcium; conductivity; and water temperature.

(3) Monitoring after installation of corrosion control. Large systems that install OCCT pursuant to 567—subparagraph 43.7(1)*"d"*(4) shall measure the WQPs at the locations and frequencies specified below during each six-month monitoring period specified in 41.4(1)*"c"*(4)"2." Small or medium-size systems that install OCCT shall conduct such monitoring during each six-month monitoring period specified in 41.4(1)*"c"*(4)"2" in which the system exceeds the lead or copper AL.

1. Tap water monitoring shall include two samples for: pH; alkalinity; orthophosphate, when an inhibitor containing a phosphate compound is used; silica, when an inhibitor containing a silicate compound is used; and calcium, when calcium carbonate stabilization is used as part of corrosion control.

2. Except as provided in 41.4(1)*"d"*(3)"3," monitoring at each SEP shall include one sample every two weeks (biweekly) for: pH; a reading of the dosage rate of the chemical used to adjust alkalinity, and the alkalinity concentration when alkalinity is adjusted as part of OCC; and a reading of the dosage rate of the inhibitor used, and the concentration of orthophosphate or silica (whichever is applicable) when a corrosion inhibitor is used as part of OCC.

3. Any GW system can limit SEP sampling to those entry points that are representative of water quality and treatment conditions throughout the system. If water from untreated GW sources mixes with water from treated GW sources, a system must monitor for WQPs both at representative SEPs receiving treatment and representative SEPs receiving no treatment. Prior to the start of any monitoring under this paragraph, the system shall provide the department with written information identifying the selected SEPs and documentation sufficient to demonstrate that the sites are representative of water quality and treatment conditions throughout the system, including information on seasonal variability.

(4) Monitoring after the department specifies WQPs for OCC. After the department specifies the values for applicable WQP reflecting OCCT under 567—paragraph 43.7(2)*"f,"* all large systems shall measure the applicable WQPs according to 41.4(1)*"d"*(3) and determine compliance with 567—paragraph 43.7(2)*"g"* every six months, with the first six-month period to begin on either January 1 or July 1, whichever comes first. Any small or medium-size system shall conduct such monitoring during each monitoring period specified in 41.4(1)*"c"*(4)"3" in which the system exceeds the lead or copper AL. For any such small and medium-size system subject to a reduced monitoring frequency pursuant to 41.4(1)*"c"*(4)"4" through "12" at the time of the AL exceedance, the start of the applicable six-month monitoring period under this paragraph shall coincide with the end of the applicable monitoring period under 41.4(1)*"c"*(4)"4" through "12." Compliance with department-designated optimal WQP values shall be determined as specified in 567—paragraph 43.7(2)*"g."*

(5) Reduced monitoring.

1. PWSs that maintain the range of values for the WQP reflecting OCCT during each of two consecutive six-month monitoring periods under 41.4(1)*"c"*(4) shall continue monitoring at the SEP(s) as specified in 567—paragraph 43.7(2)*"f."* Such systems may collect two tap samples for applicable WQPs from the following reduced number of sites during each six-month monitoring period.

Reduced WQP Monitoring

System Size (Number of People Served)	**Reduced Number of Sites for WQP**
greater than 100,000	10
10,001 to 100,000	7
3,301 to 10,000	3
501 to 3,300	2
101 to 500	1
less than or equal to 100	1

2. A PWS that maintains the range of values for the WQPs reflecting OCCT specified in 567—paragraph 43.7(2)*“f”* during three consecutive years of monitoring may reduce the sample collection frequency for the number of tap samples for the applicable WQPs specified in 41.4(1)*“d”*(5) from every six months to annually. This sampling shall begin during the calendar year immediately following the end of the monitoring period in which the third consecutive year of six-month monitoring occurs. Any system that maintains the range of values for the WQP reflecting OCCT specified in 567—paragraph 43.7(2)*“f”* during three consecutive years of annual monitoring may reduce the sample collection frequency for number of tap samples for applicable WQPs specified in 41.4(1)*“d”*(5) from annually to every three years. This sampling shall begin no later than the third calendar year following the end of the monitoring period in which the third consecutive year of monitoring occurs.

A system may reduce the sample collection frequency for tap samples for applicable WQPs specified in 41.4(1)*“d”*(5)“1” to every three years if it demonstrates during two consecutive monitoring periods that its tap water lead level at the 90th percentile is less than or equal to 0.005 mg/L, that its tap water copper level at the 90th percentile is less than or equal to 0.65 mg/L, and that it has maintained the range of values for the WQPs reflecting OCCT specified in 567—paragraph 43.7(2)*“f.”* Monitoring conducted every three years shall be done no later than every third calendar year.

3. A PWS that conducts sampling annually shall collect these samples evenly throughout the year so as to reflect seasonal variability.

4. Any PWS subject to the reduced monitoring frequency that fails to operate at or above the minimum value or within the range of values for the WQPs specified in 567—paragraph 43.7(2)*“f”* for more than nine days in any six-month period specified in 567—paragraph 43.7(2)*“g”* shall resume distribution system tap sampling in accordance with 41.4(1)*“d”*(3). Such a system may resume annual monitoring for WQPs at the tap at the reduced number of sites specified in 41.4(1)*“d”*(5)“1” after it has completed two subsequent consecutive six-month rounds of monitoring that meet the criteria of that paragraph or may resume triennial monitoring for WQPs at the tap at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria in 41.4(1)*“d”*(5)“2.”

(6) Additional monitoring. The results of any monitoring conducted in addition to the minimum requirements of this subrule shall be considered in making any determinations under this subrule or 567—subrule 43.7(2).

Summary of Monitoring Requirements for WQPs[1]

Monitoring Period	**Location**	**WQPs[2]**	**Frequency**
Initial Monitoring	Taps and SEP(s)	pH, alkalinity, orthophosphate or silica[3], calcium, conductivity, temperature	Every 6 months
After Installation of Corrosion Control	Taps	pH, alkalinity, orthophosphate or silica[3], calcium[4]	Every 6 months
	SEP(s)[6]	pH, alkalinity, if alkalinity is adjusted as part of corrosion control then include the chemical additive dosage rate and concentration, inhibitor dosage rate and inhibitor residual[5]	At least every 2 weeks
After Department Specifies WQP Values for OCC	Taps	pH, alkalinity, orthophosphate or silica[3], calcium[4]	Every 6 months
	SEP(s)[6]	pH, alkalinity, if alkalinity is adjusted as part of corrosion control then include the chemical additive dosage rate and concentration, inhibitor dosage rate and inhibitor residual[5]	At least every 2 weeks
Reduced Monitoring	Taps	pH, alkalinity, orthophosphate or silica[3], calcium[4]	Every 6 months, annually[7], or every 3 years[8], at a reduced number of sites
	SEP(s)[6]	pH, alkalinity, if alkalinity is adjusted as part of corrosion control then include the chemical additive dosage rate and concentration, inhibitor dosage rate and inhibitor residual[5]	At least every 2 weeks

[1] Table is for illustrative purposes; consult the text of this subrule for precise regulatory requirements.

[2] Small and medium-size systems must monitor for WQPs only during monitoring periods in which the system exceeds the lead or copper AL.

[3] Orthophosphate must be measured only when an inhibitor containing a phosphate compound is used. Silica must be measured only when an inhibitor containing a silicate compound is used.

[4] Calcium must be measured only when calcium carbonate stabilization is used as part of corrosion control.

[5] Inhibitor dosage rates and inhibitor residual concentrations (orthophosphate or silica) must be measured only when an inhibitor is used.

[6] GW systems may limit monitoring to representative locations throughout the systems.

[7] Systems may reduce monitoring frequency for WQPs at the tap from every six months to annually if they have maintained the range of values for WQPs reflecting OCC during three consecutive years of monitoring.

[8] Systems may further reduce the monitoring frequency for WQPs at the tap from annually to once every three years if they have maintained the range of values for WQPs reflecting OCC during three consecutive years of annual monitoring. Systems may accelerate to triennial monitoring for WQPs at the tap if they have maintained 90th percentile lead levels less than or equal to 0.005 mg/L, 90th percentile copper levels less than or equal to 0.65mg/L, and the range of WQPs designated by the department under 567—paragraph 43.7(2)*"f"* as representing OCC during two consecutive six-month monitoring periods.

e. Lead and copper source water monitoring requirements.

(1) Sample location, collection methods, and number of samples.

1. A PWS that fails to meet the lead or copper AL on the basis of tap samples collected in accordance with 41.4(1)*"c"* shall collect lead and copper source water samples in accordance with the following requirements:

- GW systems shall take a minimum of one sample at every entry point to the distribution system (hereafter called source/entry point or SEP) representative of each well after treatment. The system shall take one sample at the same SEP unless conditions make another sampling location more representative of each source or treatment plant.
- SW systems and any system with a combination of SW and GW shall take a minimum of one sample at SEP after any application of treatment or in the distribution system at a point representative of each source after treatment. 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.
- If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an SEP during periods of normal operating conditions, when water is representative of all sources being used.

2. Where the results of sampling indicate an exceedance of maximum permissible source water levels established under 567—subparagraph 43.7(3)*"b"*(4), the department may require that one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point. If a confirmation sample is taken for lead or copper, then the results of the initial and confirmation samples shall be averaged in determining compliance with the maximum permissible levels. Lead and copper analytical results below the detection limit shall be considered to be zero. Analytical results above the detection limit but below the practical quantification level (PQL) shall either be considered as the measured value or be considered one-half the PQL.

(2) Monitoring after system exceeds tap water AL. Any system that exceeds the lead or copper AL at the tap shall collect one source water sample from each SEP no later than six months after the end of the monitoring period during which the lead or copper AL was exceeded. For monitoring periods that are annual or less frequent, the end of the monitoring period is September 30 of the calendar year in which the sampling occurs or, if the department has established an alternate monitoring period, the last day of that period.

(3) Monitoring after installation of source water treatment. Any system that installs source water treatment pursuant to 567—subparagraph 43.7(3)*"a"*(3) shall collect an additional source water sample from each SEP during two consecutive six-month monitoring periods by the deadline specified.

(4) Monitoring frequency after the department specifies maximum permissible source water levels or determines that source water treatment is not needed.

1. A PWS shall monitor at the frequency specified below in cases where the department specifies maximum permissible source water levels under 567—subparagraph 43.7(3)*"b"*(4) or determines that the system is not required to install source water treatment under 567—subparagraph 43.7(3)*"b"*(2). A PWS using only GW shall collect samples once during the three-year compliance period in effect when

the department makes this determination. Such systems shall collect samples once during each subsequent compliance period. Triennial samples shall be collected every third calendar year. A PWS using SW (or a combination of SW and GW) shall collect samples once during each year, the first annual monitoring period to begin during the year in which the department determination is made under this subparagraph.

2. A PWS using only GW is not required to conduct lead or copper source water sampling if it meets the AL for the specific contaminant in tap water samples during the entire source water sampling.

(5) Reduced monitoring frequency.

1. A system using only GW may reduce the lead and copper monitoring frequency in source water to once during each nine-year compliance cycle provided that the samples are collected no later than every ninth calendar year and the system meets one of the following criteria:

- The system demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead or copper concentrations specified in 567—subparagraph 43.7(3)*"b"*(4) during at least three consecutive compliance periods under 41.4(1)*"e"*(4)"1"; or
- The department has determined that source water treatment is not needed and the system demonstrates that, during at least three consecutive compliance periods in which sampling was conducted under 41.4(1)*"e"*(4)"1," the concentrations in the source water were less than or equal to 0.005 mg/L for lead and less than or equal to 0.65 mg/L for copper.

2. A PWS using SW (or a combination of SW and GW) may reduce the monitoring frequency in 41.4(1)*"e"*(4)"1" to once during each nine-year compliance cycle provided that the samples are collected no later than every ninth calendar year and the system meets one of the following criteria:

- The system demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead and copper concentrations specified in 567—subparagraph 43.7(3)*"b"*(4) for at least three consecutive years; or
- The department has determined that source water treatment is not needed and the system demonstrates that, during at least three consecutive years, the concentrations in source water were less than or equal to 0.005 mg/L for lead and less than or equal to 0.65 mg/L for copper.

3. A PWS that uses a new source of water is not eligible for reduced monitoring for lead or copper until concentrations in samples collected from the new source during three consecutive monitoring periods are below the maximum permissible lead and copper concentrations specified.

f. Corrosivity monitoring protocol—special monitoring for corrosivity characteristics. Suppliers of water for CWSs shall collect samples from a representative SEP to determine the corrosivity characteristics of the water. This determination shall only include one round of sampling, except in cases where the department concludes additional monitoring is necessary due to variability of the raw water sources. Sampling requirements and approved analytical methods are as follows:

(1) SW systems. Systems utilizing a SW source either in whole or in part shall collect two samples per plant to determine the corrosivity characteristics. One of these samples shall be collected during the midwinter months and the other during midsummer.

(2) GW systems. Systems utilizing GW sources shall collect one sample per plant or source, except systems with multiple plants that do not alter the corrosivity characteristics identified in 41.4(1)*"f"*(3) or systems served by multiple wells drawing raw water from a single aquifer may, with departmental approval, be considered one treatment plant or source when determining the required number of samples.

(3) Corrosivity characteristics analytical parameters. Determination of corrosivity characteristics of water shall include measurements of pH, calcium hardness, alkalinity, temperature, total dissolved solids (TDS or total filterable residue), and calculation of the Langelier Index. In addition, sulfate and chloride monitoring may be required by the department. At the department's discretion, the Aggressiveness Index test may be substituted for the Langelier Index test.

(4) Corrosivity indices methodology. The following methods must be used to calculate the corrosivity indices:

1. Aggressiveness Index—"ANSI/AWWA C401-93: AWWA Standard for the Selection of Asbestos Cement Pressure Pipe, 4″–16″ for Water Distribution Systems."

2. Langelier Index—SM 14th edition, Method 203, pp. 61-63.

(5) Distribution system construction materials. CWS and NTNCs shall identify whether the any of following construction materials are present in their distribution system and report to the department:

1. Lead from piping, solder, caulking, interior lining of distribution mains, alloys, and home plumbing.
2. Copper from piping and alloys, service lines, and home plumbing.
3. Galvanized piping, service lines, and home plumbing.
4. Ferrous piping materials such as cast iron and steel.
5. Asbestos cement pipe.
6. Vinyl lined asbestos cement pipe.
7. Coal tar lined pipes and tanks.
8. Pipe with asbestos cement lining.

g. Lead, copper, and WQP analytical methods.

(1) Analytical methods. Analyses for alkalinity, calcium, conductivity, orthophosphate, pH, silica, and temperature may be performed by a Grade I, II, III, or IV certified operator meeting the requirements of 567—Chapter 81, any person under the supervision of such an operator, or a laboratory certified in accordance with 567—Chapter 83. Lead and copper analyses under this subrule shall only be conducted by certified laboratories, pursuant to 567—Chapter 83. The following methods must be used:

Lead, Copper, and WQP Analytical Methods

Contaminant	**Methodology[9]**	**Reference (Method Number)**				
		EPA	**ASTM[3]**	**SM**	**SM Online[16]**	**USGS[5] or Other**
Alkalinity	Titrimetric		D1067-92B, 02B, 06B, 11B	2320 B[11, 15, 18]	2320 B-97	
	Electrometric titration					I-1030-85
Calcium	EDTA titrimetric		D511-93A, 03A, 09A, 14A	3500-Ca D[4] 3500-Ca B[12, 15, 18]	3500-Ca B-97	
	Atomic absorption; direct aspiration		D511-93B, 03B, 09B, 14B	3111 B[4, 15, 18]	3111 B-99	
	ICP	200.7[2]		3120 B[11, 15, 18]	3120 B-99	
	Ion chromatography		D6919-03, 09			
	AVICP-AES	200.5, Rev. 4.2[17]				
Chloride	Ion chromatography	300.0[8], 300.1[13]	D4327-97, 03	4110 B[11, 15]	4550 B-00	
	Potentiometric titration			4500-Cl$^-$ D[11, 15]	4500-Cl$^-$ D-97	
	Argentometric titration		D512-89B (reapproved 1999), D512-04B	4500-Cl$^-$ B[11, 15]	4500-Cl$^-$ B-97	
	Capillary ion electrophoresis					D6508, Rev. 2[14]
Conductivity	Conductance		D1125-95A (reapproved 1999), 14A	2510 B[11, 15, 18]	2510 B-97	
Copper[6]	Atomic absorption; furnace technique		D1688-95C, 02C, 07C, 12C	3113 B[4, 15, 18]	3113 B-99, 04, 10	
	Atomic absorption; direct aspiration		D1688-95A, 02A, 07A, 12A	3111 B[4, 15, 18]	3111 B-99	
	ICP	200.7[2]		3120 B[11, 15, 18]	3120 B-99	
	ICP-MS	200.8[2]				
	AVICP-AES	200.5, Rev. 4.2[17]				
	Atomic absorption; platform furnace	200.9[2]				

Contaminant	Methodology[9]	Reference (Method Number)				
		EPA	ASTM[3]	SM	SM Online[16]	USGS[5] or Other
	Colorimetric					Hach Method 8026[19]; Hach Method 10272[20]
Lead[6]	Atomic absorption; furnace technique		D3559-96D, 03D, 08D	3113 B[4, 15, 18]	3113 B-99, 04, 10	
	ICP-MS	200.8[2]				
	AVICP-AES	200.5, Rev. 4.2[17]				
	Atomic absorption; platform furnace technique	200.9[2]				
	Differential pulse anodic stripping voltammetry					Method 1001[10]
pH	Electrometric	150.1[1], 150.2[1]	D1293-95, 99, 12	4500-H^+ B[11, 15, 18]	4500-H^+ B-00	
Orthophosphate (Unfiltered, no digestion or hydrolysis)	Colorimetric, automated, ascorbic acid	365.1[8]		4500-P F[11, 15, 18]	4500-P F-99	Thermo Fisher Discrete Analyzer[21]
	Colorimetric, ascorbic acid, single reagent		D515-88A	4500-P E[11, 15, 18]	4500-P E-99	
	Colorimetric, phosphomolybdate;					I-1602-85
	Automated-segmented flow					I-2601-90[8]
	Automated discrete					I-2598-85
	Ion chromatography	300.0[7], 300.1[13]	D4327-97, 03, 11	4110 B[11, 15, 18]	4110 B-00	
	Capillary ion electrophoresis					D6508, Rev. 2[14]
Silica	Colorimetric, molybdate blue					I-1700-85
	Automated-segmented flow					I-2700-85
	Colorimetric		D859-95, 00, 05, 10			
	Molybdosilicate			4500-Si D[4] 4500-SiO_2 C[12, 15, 18]	4500-SiO_2 C-97	
	Heteropoly blue			4500-Si E[15] 4500-SiO_2 D[12, 15, 18]	4500-SiO_2 D-97	
	Automated method for molybdate-reactive silica			4500-Si F 4500-SiO_2 E[12, 15, 18]	4500-SiO_2 E-97	
	ICP[6]	200.7[2]		3120 B[11, 15, 18]	3120 B-99	
	AVICP-AES	200.5, Rev. 4.2[17]				
	Ion chromatography	300.0[7], 300.1[13]	D4327-97, 03	4110[11, 15, 18]	4110 B-00	
	Automated methylthymol blue	375.2[7]		4500-SO_4 F[11, 15]	4500-SO_4^{-2} F-97	

Contaminant	Methodology[9]	Reference (Method Number)				
		EPA	ASTM[3]	SM	SM Online[16]	USGS[5] or Other
Sulfate	Gravimetric			4500-SO_4 C[11, 15] 4500-SO_4 D[11, 15]	4500-SO_4^{-2} C-97 4500-SO_4^{-2} D-97	
	Turbidimetric		D516-90, 02, 07	4500-SO_4 E[11, 15]	4500-SO_4^{-2} E-97	
	Capillary ion electrophoresis					D6508, Rev. 2[14]
Temperature	Thermometric			2550 B[11, 15, 18]	2550-00, 10	
Total Filterable Residue (TDS)	Gravimetric			2540 C[11, 15]	2540 C-97	

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be obtained from the sources listed below. Information regarding the documents can be obtained from the Safe Drinking Water Hotline at 800.426.4791. Documents may be inspected at EPA's Drinking Water Docket or at the Office of Federal Register.

[1] "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1983. NTIS as PB84-128677.

[2] "Methods for the Determination of Metals in Environmental Samples," EPA-600/4-91-010, June 1991. NTIS as PB91-231498.

[3] ASTM, 1994, 1996, 1999, or 2003, Vols. 11.01 and 11.02; the methods listed are the only versions that may be used. The previous versions of D1688-95A and D1688-95C (copper), D3559-95D (lead), D1293-95 (pH), D1125-91A (conductivity), and D859-94 (silica) are also approved. These previous versions, D1688-90A, C, D3559-90D, D1293-84, D1125-91A and D859-88, respectively, are located in ASTM, 1994.

[4] SM, 18th and 19th editions (1992 and 1995, respectively). Either edition may be used.

[5] Techniques of Water Resources Investigation of the USGS, Book 5, Chapter A-1, 3rd ed., 1989. Information Services, USGS, Federal Center, Box 25286, Denver, CO 80225-0425.

[6] Samples may not be filtered. Samples that contain less than 1 NTU and are properly preserved (concentrated nitric acid to pH < 2) may be analyzed directly (without digestion) for total metals; otherwise, digestion is required. When digestion is required, the total recoverable technique as defined in the method must be used.

[7] "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA/600/R-93/100, August 1993. NTIS as PB94-120821.

[8] "Methods of Analysis by the USGS National Water Quality Laboratory—Determination of Inorganic and Organic Constituents in Water and Fluvial Sediments, Open File Report 93-125." Information Services, USGS, Federal Center, Box 25286, Denver, CO 80225-0425.

[9] Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. Preconcentration may be required for direct analysis of lead by Methods 200.9, 3113B, and 3559-90D unless multiple in-furnace depositions are made.

[10] Method 1001; Palintest Water Analysis Technologies, www.palintest.com; or www.hach.com.

[11] SM, 18th, 19th, and 20th editions (1992, 1995, and 1998, respectively). Any edition may be used, except that the versions of 3111B and 3113B in the 20th edition may not be used.

[12] SM, 20th edition (1998).

[13] "Methods for the Determination of Organic and Inorganic Compounds in Drinking Water," Vol. 1, EPA 815-R-00-014, August 2000. NTIS, PB2000-106981.

[14] Method D6508, Rev. 2, "Test Method for Determination of Dissolved Inorganic Anions in Aqueous Matrices Using Capillary Ion Electrophoresis and Chromate Electrolyte," Waters Corp., 34 Maple Street, Milford, MA 01757.

[15] SM, 21st edition (2005).

[16] SM Online. The year in which each method was approved is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[17] EPA Method 200.5, Revision 4.2: "Determination of Trace Elements in Drinking Water by Axially Viewed Inductively Coupled Plasma-Atomic Emission Spectrometry," 2003. EPA/600/R-06/115. www.nemi.gov.

[18] SM, 22nd edition (2012).

[19] Hach Company. "Hach Method 8026 – Spectrophotometric Measurement of Copper in Finished Drinking Water," December 2015, Revision 1.2. www.hach.com.

[20] Hach Company. “Hach Method 10272 – Spectrophotometric Measurement of Copper in Finished Drinking Water,” December 2015, Revision 1.2. www.hach.com.

[21] Thermo Fisher. “Thermo Fisher Scientific Drinking Water Orthophosphate Method for Thermo Scientific Gallery Discrete Analyzer,” February 2016. Revision 5. Thermo Fisher Scientific, Ratastie 2 01620 Vantaa, Finland.

(2) Lead and copper analyses under this subrule shall only be conducted by certified laboratories in accordance with 567—Chapter 83.

(3) All lead and copper levels measured between the practical quantitation limit (PQL) and MDL must be either reported as measured or reported as one-half the PQL specified for lead and copper in 567—paragraph 83.6(7)*“a”*(5)“2.” All levels below the lead and copper MDLs must be reported as zero.

41.4(2) *Lead, copper, and corrosivity regulation by the setting of an MCL.*

567—41.5(455B) Organic chemicals.

41.5(1) *MCLs and other requirements for organic chemicals.* MCLs, analytical methods, and monitoring requirements for two classes of organic chemical contaminants apply to CWSs and NTNCs as specified herein. The two referenced organic chemical classes are volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). BAT for control of these organic contaminants is referenced in 567—paragraph 43.3(10)*“a.”*

a. *Compliance.* Compliance with the VOC and SOC MCL is calculated pursuant to 41.5(1)*“b”*(2).

b. *MCLs and analytical methodology for organic compounds.* The VOC and SOC MCLs are listed in the following table. VOC and SOC analyses shall be conducted using the methods in the following table and its footnotes or their equivalent as approved by EPA. For analysis of a compliance sample, a certified laboratory must be able to achieve at least the MDL for the specific VOC or SOC shown in the following table.

(1) Table.

Organic Chemical (VOC and SOC) Contaminants, Codes, MCLs,
Analytical Methods, and Detection Limits

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology[1]	Detection Limit (mg/L)
Volatile Organic Chemicals (VOCs):				
Benzene	2990	0.005	502.2, 524.2, 524.3, 524.4[7]	0.0005
Carbon tetrachloride	2982	0.005	502.2, 524.2, 524.3, 524.4[7], 551.1	0.0005
Chlorobenzene (mono)	2989	0.1	502.2, 524.2, 524.3, 524.4[7]	0.0005
1,2-Dichlorobenzene (ortho)	2968	0.6	502.2, 524.2, 524.3, 524.4[7]	0.0005
1,4-Dichlorobenzene (para)	2969	0.075	502.2, 524.2, 524.3, 524.4[7]	0.0005
1,2-Dichloroethane	2980	0.005	502.2, 524.2, 524.3, 524.4[7]	0.0005
1,1-Dichloroethylene	2977	0.007	502.2, 524.2, 524.3, 524.4[7]	0.0005
cis-1,2-Dichloroethylene	2380	0.07	502.2, 524.2, 524.3, 524.4[7]	0.0005
trans-1,2-Dichloroethylene	2979	0.1	502.2, 524.2, 524.3, 524.4[7]	0.0005
Dichloromethane	2964	0.005	502.2, 524.2, 524.3, 524.4[7]	0.0005
1,2-Dichloropropane	2983	0.005	502.2, 524.2, 524.3, 524.4[7]	0.0005
Ethylbenzene	2992	0.7	502.2, 524.2, 524.3, 524.4[7]	0.0005
Styrene	2996	0.1	502.2, 524.2, 524.3, 524.4[7]	0.0005
Tetrachloroethylene	2987	0.005	502.2, 524.2, 524.3, 524.4[7], 551.1	0.0005
Toluene	2991	1	502.2, 524.2, 524.3, 524.4[7]	0.0005
1,1,1-Trichloroethane	2981	0.2	502.2, 524.2, 524.3, 524.4[7], 551.1	0.0005
Trichloroethylene	2984	0.005	502.2, 524.2, 524.3, 524.4[7], 551.1	0.0005

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology[1]	Detection Limit (mg/L)
1,2,4-Trichlorobenzene	2378	0.07	502.2, 524.2, 524.3, 524.4[7]	0.0005
1,1,2-Trichloroethane	2985	0.005	502.2, 524.2, 524.3, 524.4[7], 551.1	0.0005
Vinyl chloride	2976	0.002	502.2, 524.2, 524.3, 524.4[7]	0.0005
Xylenes (total)	2955	10	502.2, 524.2, 524.3, 524.4[7]	0.0005
Synthetic Organic Chemicals (SOCs):				
Alachlor[3]	2051	0.002	505, 507, 508.1, 525.2, 525.3, 551.1	0.0002
Aldicarb	2047	0.003	531.1, 6610	0.0005
Aldicarb sulfone	2044	0.002	531.1, 6610	0.0008
Aldicarb sulfoxide	2043	0.004	531.1, 6610	0.0005
Atrazine[3]	2050	0.003	505, 507, 508.1, 523, 525.2, 525.3, 536, 551.1, Syngenta AG-625[5]	0.0001
Benzo(a)pyrene	2306	0.0002	525.2, 525.3, 550, 550.1	0.00002
Carbofuran	2046	0.04	531.1, 531.2, 6610, 6610B, 6610 B-04[2]	0.0009
Chlordane[3]	2959	0.002	505, 508, 508.1, 525.2, 525.3	0.0002
2,4-D[6] (as acids, salts, and esters)	2105	0.07	515.1, 515.2, 515.3, 515.4, 555, D5317-93, 98 (Reapproved 2003), 6610B, 6640-B, 6640 B-01, 6640 B-06	0.0001
Dalapon	2031	0.2	515.1, 515.3, 515.4, 552.1, 552.2, 552.3, 557, 6640, 6610B, 6640-B, 6640 B-01, 6640 B-06	0.001
1,2-Dibromo-3-chloropropane (DBCP)	2931	0.0002	504.1, 524.3, 551.1	0.00002
Di(2-ethylhexyl)adipate	2035	0.4	506, 525.2, 525.3	0.0006
Di(2-ethylhexyl)phthalate	2039	0.006	506, 525.2, 525.3	0.0006
Dinoseb[6]	2041	0.007	515.1, 515.2, 515.3, 515.4, 555, 6610B, 6640-B, 6640 B-01, 6640 B-06	0.0002
Diquat	2032	0.02	549.2	0.0004
Endothall	2033	0.1	548.1	0.009
Endrin[3]	2005	0.002	505, 508, 508.1, 525.2, 525.3, 551.1	0.00001
Ethylene dibromide (EDB)	2946	0.00005	504.1, 524.3, 551.1	0.00001
Glyphosate	2034	0.7	547, 6651, 6651B, 6651 B-00, 6640 B-05	0.006
Heptachlor[3]	2065	0.0004	505, 508, 508.1, 525.2, 525.3, 551.1	0.00004
Heptachlor epoxide[3]	2067	0.0002	505, 508, 508.1, 525.2, 525.3, 551.1	0.00002
Hexachlorobenzene[3]	2274	0.001	505, 508, 508.1, 525.2, 525.3, 551.1	0.0001
Hexachlorocyclopentadiene[3]	2042	0.05	505, 508, 508.1, 525.2, 525.3, 551.1	0.0001
Lindane (gamma BHC)[3]	2010	0.0002	505, 508, 508.1, 525.2, 525.3, 551.1	0.00002
Methoxychlor[3]	2015	0.04	505, 508, 508.1, 525.2, 525.3, 551.1	0.0001
Oxamyl	2036	0.2	531.1, 531.2, 6610, 6610B, 6610 B-04[2]	0.002
Pentachlorophenol	2326	0.001	515.1, 515.2, 515.3, 515.4, 525.2, 525.3, 555, D5317-93, 98	0.00004

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology[1]	Detection Limit (mg/L)
			(Reapproved 2003), 6610B, 6640-B, 6640 B-01, 6640 B-06	
Picloram[3, 6]	2040	0.5	515.1, 515.2, 515.3, 515.4, 555, D5317-93, 98 (Reapproved 2003), 6610B, 6640-B, 6640 B-01, 6640 B-06	0.0001
PCBs[4] (as decachlorobiphenyl) (as Arochlors)[3]	2383	0.0005	508A 505, 508, 508.1, 525.2, 525.3	0.0001
Simazine[3]	2037	0.004	505, 507, 508.1, 523, 525.2, 525.3, 536, 551.1	0.00007
2,3,7,8-TCDD (dioxin)	2063	$3x10^{-8}$	1613	$5x10^{-9}$
2,4,5-TP[6] (Silvex)	2110	0.05	515.1, 515.2, 515.3, 515.4, 555, D5317-93, 98 (Reapproved 2003), 6610B, 6640-B, 6640 B-01, 6640 B-06	0.0002
Toxaphene[3]	2020	0.003	505, 508, 508.1, 525.2, 525.3	0.001

[1] Analyses for the contaminants in this table shall be conducted using the following EPA methods or their equivalent as approved by EPA. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be inspected at EPA's Drinking Water Docket or at NARA.

NTIS methods:

Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised July 1991 (NTIS PB91-231480): Methods 508A and 515.1.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement I, EPA-600/4-90-020, July 1990 (NTIS PB91-146027): Methods 547, 550, 550.1.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement II, EPA-600/R-92-129, August 1992 (NTIS PB92-207703): Methods 548.1, 552.1, 555.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement III, EPA-600/R-95-131, August 1995 (NTIS PB95-261616): Methods 502.2, 504.1, 505, 506, 507, 508, 508.1, 515.2, 524.2, 525.2, 531.1, 551.1, 552.2.

EPA Method 523, "Determination of Triazine Pesticides and Their Degradates in Drinking Water by Gas Chromatography/Mass Spectrometry (GC/MS)," 2011. EPA-815-R-11-002. www.nepis.epa.gov.

EPA Method 524.3, Version 1.0. "Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry," June 2009. EPA 815-B-09-009. www.nemi.gov.

EPA Method 525.3, "Determination of Semivolatile Organic Chemicals in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatograph/Mass Spectrometry (GC/MS)," 2012. EPA/600/R-12-010. www.nepis.epa.gov.

EPA Method 536, "Determination of Triazine Pesticides and Their Degradates in Drinking Water by Liquid Chromatography Electrospray Ionization Tandem Mass Spectrometry (LC/ESI-MS/MS)," 2007. EPA/815-B-07-002. www.nepis.epa.gov.

EPA Method 557, "Determination of Haloacetic Acids, Bromate, and Dalapon in Drinking Water by Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)," September 2009. EPA 815-B-09-012. www.nemi.gov.

Method 1613 "Tetra-through Octa-Chlorinated Dioxins and Furans by Isotope-Dilution HRGC/HRMS," EPA-821-B-94-005, October 1994 (NTIS PB95-104774). APHA documents:

SM, supplement to the 18th edition, 1994, 19th edition, 1995, 20th edition, 1998, 21st edition, 2005, or 22nd edition, 2012 (any of these editions may be used), APHA: Method 6610 and (carbofuran and oxamyl only) 6610B and 6610 B-04; Method 6640B (21st and 22nd editions only) and SM online 6640 B-01 for 2,4-D, 2,4,5-TP Silvex, dalapon, dinoseb, pentachlorophenol, and picloram; Method 6651B (21st and 22nd editions only) and SM online 6670-B-00 for glyphosate.

SM, 18th edition, 1992, 19th edition, 1995, or 20th edition, 1998, (any of these editions may be used), APHA: Method 6651.

ASTM, 1999, Vol. 11.02 (or any edition published after 1993), ASTM: D5317-93, 98 (Reapproved 2003).

Methods 515.3 and 549.2, EPA NERL, 26 W. Martin Luther King Drive, Cincinnati, OH 45268.

Method 515.4, "Determination of Chlorinated Acids in Drinking Water by Liquid-Liquid Microextraction, Derivatization and Fast Gas Chromatography with Electron Capture Detection," Revision 1.0, April 2000, EPA 815/B-00/001 and EPA Method 552.3, "Determination of Haloacetic Acids and Dalapon in Drinking Water by Liquid-liquid Microextraction, Derivatization, and Gas Chromatography with Electron Capture Detection," Revision 1.0, July 2003, EPA 815-B-03-002, www.epa.gov/safewater/methods/sourcalt.html.

Method 531.2, "Measurement of n-Methylcarbamoyloximes and n-Methylcarbamates in Water by Direct Aqueous Injection HPLC with Postcolumn Derivatization," Revision 1.0, September 2001, EPA 815/B-01/002, www.epa.gov/safewater/methods/sourcalt.html.

Syngenta AG-625 Method, "Atrazine in Drinking Water by Immunoassay," February 2001, Syngenta Crop Protection, Inc., 410 Swing Road, P.O. Box 18300, Greensboro, NC 27419.

Other required analytical test procedures germane to the conduct of these analyses are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994 (NTIS PB95-104766).

[2] SM Online. The year that each method was approved is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[3] The detectors specified in Method 505, 507, 508, or 508.1 may be substituted for the purpose of achieving lower MDLs with either an electron capture or nitrogen-phosphorus detector, provided all regulatory requirements and quality control criteria are met.

[4] PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl. Users of Method 505 may have more difficulty in achieving the required detection limits than users of Method 508. 508.1, or 525.2.

[5] This method may not be used for atrazine analysis in any system where chlorine dioxide is used in the drinking water treatment. In samples from all other systems, any atrazine result generated by Method AG-625 that is greater than one-half the MCL must be confirmed using another approved atrazine method and should use additional volume of the original sample collected for compliance monitoring. In instances where a result from Method AG-625 triggers such confirmatory testing, the confirmatory result is to be used to determine compliance.

[6] Accurate determination of the chlorinated esters requires hydrolysis of the sample as described in EPA Methods 515.1, 515.2, 515.3, 515.4, and 555, and ASTM Method D5317-93, 98 (Reapproved 2003).

[7] EPA Method 524.4, Version 1.0. "Measurement of Purgeable Organic Compounds in Water by Gas Chromatography/Mass Spectrometry Using Nitrogen Purge Gas," May 2013, EPA 815-R-13-002.

(2) Organic chemical compliance calculations. Compliance with this paragraph shall be determined based on the analytical results obtained at each sampling point. If one sampling point is in violation of an MCL in this paragraph, the system is in violation of the MCL. If a system fails to collect the required number of samples, compliance will be based on the total number of samples collected. If a sample result is less than the detection limit, zero will be used when calculating the running annual average (RAA). If a system is in violation of an MCL, the water supplier is required to give notice to the department in accordance with 567—subrule 40.8(1) and to provide PN as required by 567—40.5(455B).

1. Monitoring more than once per year for VOC or SOC contaminants. For systems that monitor more than once per year, MCL compliance is determined by an RAA of all samples collected at each sampling point.

2. Monitoring annually or less frequently for VOC contaminants. Systems that monitor annually or less frequently and whose VOC 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 year of quarterly sampling. However, if any sample result will cause the RAA to exceed the MCL at any sampling point, a system is immediately out of compliance with the MCL.

3. Monitoring annually or less frequently for SOC contaminants. Systems that monitor annually or less frequently and whose SOC sample result exceeds the regulatory detection limit specified in 41.5(1)*"b"*(1) must begin quarterly sampling. The system will not be considered in violation of the MCL until it has completed one year of quarterly sampling. However, if any sample result will cause the RAA to exceed the MCL at any sampling point, a system is immediately out of compliance with the MCL.

(3) TTs for acrylamide and epichlorohydrin. Each PWS must certify annually in writing to the department (using third-party or manufacturer's 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 following levels:

Acrylamide = 0.05 percent dosed at 1 ppm (or equivalent)

Epichlorohydrin = 0.01 percent dosed at 20 ppm (or equivalent)

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

c. VOC and SOC monitoring requirements. Each PWS shall monitor at the time designated within each compliance period. All new systems or systems that use a new source of water must demonstrate compliance with the MCLs within the department-specified time period. The system must also comply with the specified initial sampling frequencies to ensure it can demonstrate MCL compliance. A water source that is determined by the department to be a new SEP is considered to be a new source for the purposes of this paragraph. Routine and increased monitoring shall be conducted in accordance with this in this paragraph.

(1) Routine VOC monitoring requirements. CWSs and NTNCs shall monitor the VOCs listed in 41.5(1)*"b"*(1) to determine MCL compliance.

(2) VOC monitoring protocol.

1. GW monitoring. GW systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a source/entry

point or SEP). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

2. SW monitoring. SW systems (and combined SW/GW systems) shall take a minimum of one sample at each SEP after treatment. Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

3. Multiple sources. If a system draws water from more than one source and the sources are combined before distribution, it must sample at an SEP during periods of normal operating conditions. If a representative sample of all water sources cannot be obtained, as determined by the department, separate SEPs with the appropriate monitoring requirements will be assigned by the department.

4. Initial VOC monitoring frequency. Each CWS and NTNC shall take four consecutive quarterly samples for each VOC during each compliance period, beginning in the initial compliance period. If the initial VOC monitoring has been completed by December 31, 1992, and a system did not detect any VOC, then each GW and SW system shall take one sample annually beginning with the initial compliance period.

5. Reduced VOC monitoring for GW systems. After a minimum of three years of annual sampling, the department may allow GW systems with no previous detection of any VOC to take one sample during each compliance period.

6. VOC monitoring waivers. Each CWS and NTNC GW system that does not detect a VOC may apply to the department for a waiver from 41.5(1)*"c"*(2)"4" and "5" after completing the initial monitoring. A waiver shall be effective for no more than six years (two compliance periods). The department may also issue waivers to small systems for the initial round of monitoring for 1,2,4-trichlorobenzene. Detection is defined as greater than or equal to 0.0005 mg/L.

7. Bases of a VOC monitoring waiver. The department may grant a waiver if it finds that there is no knowledge of previous use (including transport, storage, or disposal) of the contaminant within the watershed or the system's zone of influence. If previous use of the contaminant is unknown or it has been used previously, the following factors shall be used to determine whether a waiver is granted.

- Previous analytical results.
- The system's proximity to a potential point or nonpoint source of contamination. Point sources include spills and leaks of chemicals at or near: a water treatment facility or at manufacturing, distribution, or storage facilities, from hazardous and municipal waste landfills, or from other waste handling or treatment facilities.
- The environmental persistence and transport of the contaminants.
- The number of persons served by the PWS and the proximity of a smaller system to a larger system, and
- How well the water source is protected against contamination. GW systems must consider factors such as depth of the well, the type of soil, and wellhead protection. SW systems must consider watershed protection.

8. VOC waivers for GW systems. As a condition of the monitoring waiver, a GW system must take one sample at each sampling point during the time the waiver is effective and update its vulnerability assessment, considering the factors in 41.5(1)*"c"*(2)"7." Based on this vulnerability assessment, the department must reconfirm that the system is nonvulnerable. If the department does not reconfirm within three years of the initial vulnerability determination, the waiver is invalidated and the system is required to sample annually as specified in 41.5(1)*"c"*(2)"4."

9. VOC waivers for SW systems. Each CWS and NTNC that does not detect a VOC may apply to the department for a waiver from 41.5(1)*"c"*(2)"4" after completing the initial monitoring. Systems meeting this criterion must be determined by the department to be nonvulnerable based on a vulnerability assessment during each compliance period. Each system receiving a waiver shall sample at the department-specified frequency (if any).

10. Increased VOC monitoring—quarterly. If a VOC is detected at a level exceeding 0.0005 mg/L in any sample, the system must monitor quarterly at each sampling point which resulted in a detection. The department may decrease the quarterly monitoring specified in 41.5(1)*"c"*(2)"4" provided it has

determined that the system is reliably and consistently below the MCL. The department shall not make this determination unless a GW system takes a minimum of two quarterly samples and a SW system takes a minimum of four quarterly samples.

11. Increased VOC monitoring—annual. If the department determines that a system is reliably and consistently below the MCL, the system may be allowed to monitor annually. Systems that monitor annually must monitor during the quarter(s) that previously yielded the highest analytical result. Systems that have three consecutive annual samples with no detection of a contaminant may apply for a waiver as specified in 41.5(1)*"c"*(2)"6."

12. Increased VOC monitoring—vinyl chloride. GW systems that have detected one or more of the following two-carbon organic compounds: trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, or 1,1-dichloroethylene shall monitor quarterly for vinyl chloride. A vinyl chloride sample shall be taken at each sampling point at which one or more of the two-carbon organic compounds was detected. If the results of the first analysis do not detect vinyl chloride, the department may reduce the quarterly vinyl chloride monitoring frequency to one sample during each compliance period. SW systems are required to monitor for vinyl chloride as specified by the department.

13. VOCs reliably and consistently below the MCL. Systems that violate the MCL requirements of 41.5(1)*"b"*(1) must monitor quarterly. After a minimum of four consecutive quarterly samples that show the system is in compliance, and a department determination that the system is reliably and consistently below the MCL, the system may monitor at the frequency and times specified in 41.5(1)*"c"*(2)"10," third unnumbered paragraph (following department approval).

(3) Routine and repeat SOC monitoring requirements. Analysis of the SOCs contaminants listed in 41.5(1)*"b"*(1) to determine MCL compliance shall be conducted as follows:

1. SOC GW monitoring protocols. GW systems shall take a minimum of one sample at every SEP. Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

2. SOC SW monitoring protocols. SW systems shall take a minimum of one sample at each SEP after treatment. Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant. For purposes of this paragraph, SW systems include systems with a combination of surface and ground sources.

3. Multiple sources. If a system draws water from more than one source and the sources are combined before distribution, it must sample at an SEP during periods of normal operating conditions. If a representative sample of all water sources cannot be obtained, as determined by the department, separate SEPs with the appropriate monitoring requirements will be assigned by the department.

4. SOC monitoring frequency. CWSs and NTNCs shall take four consecutive quarterly samples for each SOC during each compliance period. Systems serving more than 3,300 persons that do not detect an SOC in the initial compliance period may reduce the sampling frequency to a minimum of two quarterly samples in one year during each repeat compliance period. Systems serving less than or equal to 3,300 persons that do not detect an SOC in the initial compliance period may reduce the sampling frequency to a minimum of one sample during each repeat compliance period.

5. SOC monitoring waivers. Each CWS and NTNC may apply to the department for a waiver from the requirements of 41.5(1)*"c"*(3)"4." A system must reapply for a waiver for each compliance period.

6. Bases of an SOC monitoring waiver. The department may grant a waiver if it finds that there is no knowledge of previous use (including transport, storage, or disposal) of the contaminant within the watershed or zone of influence of the system. If previous use of the contaminant is unknown or it has been used previously, the following factors shall be used to determine whether a waiver is granted.

- Previous analytical results.
- The system proximity to a potential point or nonpoint source of contamination. Point sources include spills and leaks of chemicals at or near a water treatment facility or at manufacturing, distribution, or storage facilities, from hazardous and municipal waste landfills, or from other waste handling or treatment facilities. Nonpoint sources include the use of pesticides to control insect and weed pests on agricultural areas, forest lands, homes, and gardens, and other land application uses.

- The environmental persistence and transport of a pesticide or PCBs.
- How well the water source is protected against contamination due to such factors as depth of the well, the type of soil, and the well casing integrity.
- Elevated nitrate levels at the water source, and
- Use of PCBs in equipment used in the production, storage, or distribution of water.

7. Increased SOC monitoring. If an SOC is detected in any sample, then:

- Each system must monitor quarterly at each sampling point which resulted in a detection.
- The department may decrease the quarterly SOC monitoring if the system is reliably and consistently below the MCL. The department shall not make this determination unless a GW system takes a minimum of two quarterly samples and a SW system takes a minimum of four quarterly samples.
- After the department determines the system is reliably and consistently below the MCL, the system may monitor annually. Systems that monitor annually must monitor during the quarter that previously yielded the highest analytical result.
- Systems that have three consecutive annual samples with no detection of a contaminant may apply for a waiver as specified in 41.5(1)*"c"*(3)"6."
- If monitoring results in detection of one or more of certain related contaminants (aldicarb, aldicarb sulfone, aldicarb sulfoxide, heptachlor, and heptachlor epoxide), subsequent monitoring shall analyze for all related contaminants.

8. MCL violation and reliably/consistently below the MCL. Systems that violate the requirements of 41.5(1)*"b"* must monitor quarterly. After a minimum of four quarterly samples show the system is in compliance and the department determines the system is reliably and consistently below the MCL, the system shall monitor at the frequency specified in 41.5(1)*"c"*(3)"7."

(4) SOC and VOC confirmation samples. The department may require a confirmation sample for positive or negative results. If a confirmation sample is required, the result must be averaged with the first sampling result and the average must be used for the compliance determination as specified by 41.5(1)*"b"*(2). The department has discretion to disregard results of obvious sampling errors from this calculation.

(5) Grandfathered VOC and SOC data. The department may allow the use of monitoring data collected after January 1, 1988, for VOCs and January 1, 1990, for SOCs required under SDWA Section 1445 for initial monitoring compliance. If the data are generally consistent with the other requirements in this subparagraph, the department may use such data to satisfy the initial monitoring requirement for the initial compliance period beginning January 1, 1993. Systems that use grandfathered samples for VOCs and did not detect any contaminants listed in 41.5(1)*"b"*(1) shall begin monitoring annually in accordance with 41.5(1)*"c"*(2) beginning January 1, 1993.

(6) Increased VOC and SOC monitoring. The department may increase the required monitoring frequency, where necessary, to detect system variations (e.g., fluctuations in concentration due to seasonal use, changes in water source, changes to treatment facilities, or normal operation thereof).

(7) VOC and SOC vulnerability assessment criteria. Vulnerability for each PWS shall be determined by the department based upon an assessment of the following factors.

1. Previous monitoring results. A system will be classified vulnerable if any sample was analyzed to contain one or more VOCs, SOCs, or acrylamide and epichlorohydrin, except for trihalomethanes or other demonstrated DBPs.
2. Proximity of SW supplies to commercial or industrial use, disposal, or storage of VOCs or SOCs. SW supplies that withdraw water directly from reservoirs are considered vulnerable if the drainage basin upgradient and within two miles of the shoreline at the maximum water level contains major transportation facilities or any of the contaminant sources in this subparagraph. SW supplies that withdraw water directly from flowing water courses are considered vulnerable if the drainage basin upgradient and within two miles of the water intake structure contains major transportation facilities or any of the contaminant sources in this subparagraph. Major transportation facilities include but are not limited to primary highways or railroads.

3. Proximity of wells to commercial or industrial use, disposal, or storage of VOCs or SOCs. Wells that are not separated from sources of contamination by at least the following distances will be considered vulnerable.

VOC and SOC Well Separation Distances

Sources of Contamination	Shallow Wells	Deep Wells
Sanitary and industrial point discharges	400 ft	400 ft
Mechanical waste treatment plants	400 ft	200 ft
Lagoons	1,000 ft	400 ft
Chemical and mineral storage (aboveground)	200 ft	100 ft
Chemical and mineral storage including underground storage tanks on or below ground	400 ft	200 ft
Solid waste disposal site	1,000 ft	1,000 ft

4. A system is deemed to be vulnerable for a period of three years after any positive measurement of one or more VOCs or SOCs, except for trihalomethanes or other demonstrated DBPs.

(8) PCB analytical methodology. PCBs analysis shall be conducted using the methods in 41.5(1)*"b"*(1) and as follows:

1. Each system that monitors for PCBs shall analyze each sample using Method 505, 508, 508.1, or 525.2. Users of Method 505 may have more difficulty in achieving the required Aroclor detection limits than users of Method 508, 508.1, or 525.2.

2. If PCBs (as one of seven Aroclors) are detected in any sample analyzed using Method 505 or 508, the system shall reanalyze the sample using Method 508A to quantitate PCBs as decachlorobiphenyl.

PCB Aroclor Detection Limits

Aroclor	Detection Limit (mg/L)
1016	0.00008
1221	0.02
1232	0.0005
1242	0.0003
1248	0.0001
1254	0.0001
1260	0.0002

3. Compliance with the PCB MCL shall be determined based upon the quantitative results of analyses using Method 508A.

41.5(2) *Organic chemicals occurring as (nontrihalomethane) DBPs.*

567—41.6(455B) Disinfection byproducts (DBPs) MCLs and monitoring requirements.

41.6(1) *Stage 1 DBP requirements.*

a. Applicability.

(1) This rule establishes criteria under which CWSs and NTNCs that add a chemical disinfectant to the water in any part of the drinking water treatment process or which provide water that contains a chemical disinfectant must modify their practices to meet the MCLs in this rule and the maximum residual disinfectant levels (MRDL) and TT requirements for DBP precursors in 567—43.6(455B).

(2) Compliance dates for this rule are based upon the source water type and the population served. Systems are required to comply with this rule as follows, unless otherwise noted. The department may assign an earlier monitoring period as part of the operation permit, but MCL compliance is not required until the dates stated below.

1. CWSs and NTNCs which use SW or IGW in whole or in part and which serve 10,000 or more persons must comply with this rule beginning January 1, 2002.

2. All other CWSs and NTNCs covered by 41.6(1)*"a"*(1) must comply with this rule by January 1, 2004.

(3) Consecutive systems that provide water containing a disinfectant or oxidant are required to comply with this rule.

(4) Systems with water sources that are used independently from each other, are not from the same source as determined by the department, or do not go through identical treatment processes are required to monitor for the applicable disinfectants or oxidants and DBP during operation of each source. Systems must comply with this rule during the use of each water source.

b. DBP MCLs.

(1) The MCLs for DBPs are as follows:

DBP	MCL (mg/L)
Bromate	0.010
Chlorite	1.0
Haloacetic acids (HAA5)	0.060
Total trihalomethanes (TTHM)	0.080

(2) Beginning on the date in the following table, a system must comply with the TTHM and HAA5 MCL as a locational RAA at each monitoring location.

System Size (number of people served)	Date system must comply with MCL at each sampling location*
Systems that are not part of a combined distribution system and systems that serve the largest population in the combined distribution system	
System serving at least 100,000 people	April 1, 2012
System serving 50,000-99,999 people	October 1, 2012
System serving 10,000-49,999 people	October 1, 2013
System serving fewer than 10,000 people	October 1, 2013 for all GW systems and for SW/IGW systems that did not collect *Cryptosporidium* source water samples October 1, 2014 for SW/IGW systems that collected *Cryptosporidium* source water samples
Other systems that are part of a combined distribution system	
Consecutive or wholesale system	At the same time as the system with the earliest compliance date in the combined distribution system

*The department may grant up to an additional 24 months for compliance with the MCLs and OELs if the system requires capital improvements to comply with an MCL.

c. DBP monitoring requirements.

(1) General.

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

2. 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, with department approval.

3. Failure to monitor in accordance with the monitoring plan required under 41.6(1)*"c"*(1)"6" is a monitoring violation.

4. Failure to monitor is a violation for the entire period covered by the annual average where compliance is based on an RAA of monthly or quarterly samples or averages, and the system's failure to monitor makes it impossible to determine MCL compliance.

5. Systems may use only data collected under the provisions of this rule or 567—43.6(455B) to qualify for reduced monitoring.

6. Each system required to monitor under the provisions of this rule or 567—43.6(455B) must develop and implement a monitoring plan. The system must maintain the plan and make it available for inspection by the department and the general public no later than 30 days following the applicable compliance dates in 41.6(1)*"a"*(3). All systems using SW or IGW and serving more than 3,300 people must submit a copy of the monitoring plan to the department by the applicable date in 41.6(1)*"a"*(3)"1." The department may also require the plan to be submitted by any other system. After review, the department may require changes in any plan elements. The plan must include the following elements:

- Specific locations and schedules for collecting samples for any parameters included in this rule.
- How the system will calculate compliance with MCLs, MRDLs, and TTs.

7. The department may require a monthly monitoring frequency for DBPs, which would be specified in the operation permit.

(2) Bromate. CWSs and NTNCS using ozone for disinfection or oxidation must monitor for bromate.

1. Routine monitoring. Systems must take at least one sample per month for each treatment plant in the system using ozone, collected at each SEP while the ozonation system is operating under normal conditions.

2. Reduced monitoring. A system may reduce monitoring from monthly to quarterly if its RAA bromate concentration is less than or equal to 0.0025 mg/L based on monthly bromate measurements for the most recent four quarters. If a system previously qualified for reduced bromate monitoring and is on quarterly sampling frequency, it may remain on reduced monitoring as long as the RAA of the bromate samples is less than or equal to 0.0025 mg/L. If the RAA of quarterly bromate samples exceeds 0.0025 mg/L, the system must resume routine bromate monitoring. Only three analytical methods may be used for bromate samples under reduced monitoring: EPA Method 317.0 Revision 2.0, Method 326.0, or Method 321.8.

(3) Chlorite. CWS and NTNC using chlorine dioxide, for disinfection or oxidation, must monitor for chlorite. If the system does not use chlorine dioxide on a daily basis, it must conduct the required daily monitoring each day chlorine dioxide is used, and any required monthly monitoring during those months in which chlorine dioxide is used during any portion of the month.

1. Routine daily monitoring. Systems must monitor daily at the SEP. For any daily sample that exceeds the chlorite MCL, the system must take additional samples in the distribution system the following day at the locations required by 41.6(1)*"c"*(3)"3," which are in addition to the sample required at the SEP. These daily SEP samples may be analyzed by system personnel, in accordance with 41.6(1)*"d."*

2. Routine monthly monitoring. Systems must take a three-sample set each month in the distribution system. The system must take one 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 (MRT) in the distribution system. Any additional routine sampling must be conducted in the same manner as the three-sample sets. The system may use the results of additional monitoring conducted in accordance with 41.6(1)*"c"*(3)"3" to meet the monitoring requirement in this subparagraph. These monthly samples must be analyzed by a certified laboratory using an approved ion chromatography method, in accordance with 41.6(1)*"d."*

3. Additional monitoring. On each day following a routine sample monitoring result that exceeds the chlorite MCL at the SEP the system is required to take three 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 MRT in the distribution system). These additional samples must be analyzed by a certified laboratory using an approved ion chromatography method, in accordance with 41.6(1)*"d."*

4. Reduced monitoring.

- Daily chlorite monitoring at the SEP required by 41.6(1)*"c"*(3)"1" may not be reduced.
- The department may allow the monitoring for systems with monthly chlorite monitoring in the distribution system to be reduce to 1 three-sample set per quarter after one year of monitoring where no individual chlorite sample taken in the distribution system under 41.6(1)*"c"*(3)"2" has exceeded the chlorite MCL and the system has not been required to conduct additional monitoring under 41.6(1)*"c"*(3)"3." The system may remain on the reduced monitoring schedule until either any of the three individual chlorite samples taken quarterly in the distribution system under 41.6(1)*"c"*(3)"2" exceeds the chlorite MCL, or the system is required to conduct additional monitoring under 41.6(1)*"c"*(3)"3," at which time it must revert to routine monitoring.

(4) Total trihalomethanes (TTHM) and haloacetic acids (HAA5).

1. Routine monitoring. Systems must monitor at the frequency indicated in the following table. Both the TTHM and HAA5 samples must be collected as paired samples during the same time period in order for each parameter to have the same annual average period for result comparison. A paired sample

is one that is collected at the same location and time and is analyzed for both TTHM and HAA5 parameters.

Routine Monitoring Frequency for TTHM and HAA5

Type of System (source water type and population served)	Minimum Monitoring Frequency	Sample Location in the Distribution System
SW/IGW[3] system serving ≥10,000 persons	4 water samples per quarter per treatment plant	At least 25 percent of all samples collected each quarter at locations representing MRT. Remaining samples taken at locations representative of at least average residence time in the distribution system and representing the entire distribution system, accounting for number of persons served, different sources of water, and different treatment methods.[1]
SW/IGW[3] system serving 500-9,999 persons	1 water sample per quarter per treatment plant	Locations representing MRT.[1]
SW/IGW[3] system serving <500 persons	1 sample per year per treatment plant during month of warmest water temperature	Locations representing MRT.[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 MRT in the distribution system, until system meets reduced monitoring criteria in 41.6(1)*“c”*(4)“2,” second bulleted paragraph.
System using only non-IGW GW using chemical disinfectant and serving ≥10,000 persons	1 water sample per quarter per treatment plant[2]	Locations representing MRT.[1]
System using only non-IGW GW using chemical disinfectant and serving <10,000 persons	1 sample per year per treatment plant during month of warmest water temperature	Locations representing MRT.[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 MRT time in the distribution system, until system meets reduced monitoring criteria in 41.6(1)*“c”*(4)“2,” second bulleted paragraph.

[1] If a system chooses 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 MRT 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 treatment plant for determining the minimum number of samples required, with department approval.

[3] SW/IGW indicates those systems that use either SW or IGW, in whole or in part.

2. Reduced monitoring. The department may allow systems a reduced monitoring frequency, except as otherwise provided, in accordance with the following table. Source water total organic carbon (TOC) levels must be determined in accordance with 567—subparagraph 43.6(2)*“c”*(1).

Reduced Monitoring Frequency for TTHM and HAA5

If you are a ...	And you have monitored at least one year and you have ...	You may reduce monitoring to this level
SW/IGW[1] system serving ≥10,000 persons with a source water annual average TOC level, before any treatment, of ≤4.0 mg/L.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L	1 sample per treatment plant per quarter at distribution system location reflecting MRT.
SW/IGW[1] system serving 500 - 9,999 persons with a source water annual average TOC level, before any treatment, of ≤4.0 mg/L.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L	1 sample per treatment plant per year at distribution system location reflecting MRT during month of warmest water temperature.
SW/IGW[1] system serving <500 persons	SW/IGW[1] systems serving <500 persons may not reduce monitoring to less than 1 sample per treatment plant per year.	
System using only non-IGW GW using chemical disinfectant and serving ≥10,000 persons	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L	1 sample per treatment plant per year at distribution system location reflecting MRT during month of warmest water temperature.
System using only non-IGW GW using chemical disinfectant and serving <10,000 persons	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L for two consecutive years; Or, TTHM annual average	1 sample per treatment plant per 3-year monitoring cycle at distribution system location reflecting MRT during month of warmest water temperature, with the 3-year cycle beginning on January 1 following quarter in which system qualifies for reduced monitoring.

If you are a ...	And you have monitored at least one year and you have ...	You may reduce monitoring to this level
	≤0.020 mg/L and HAA5 annual average ≤0.015 mg/L for one year.	

[1] SW/IGW indicates those systems that use either SW or IGW, in whole or in part.

- 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 monitoring quarterly) or the result of the sample (for systems monitoring no more frequently than annually) is less than or equal to 0.060 mg/L for TTHMs and less than or equal to 0.045 mg/L for HAA5. Systems that do not meet these levels must resume monitoring at the frequency identified in 41.6(1)*“c”*(4)“1” 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 GW not under the direct influence of SW and serving fewer than 10,000 persons, if either the TTHM annual average is >0.080 mg/L or the HAA5 annual average is >0.060 mg/L, the system must go to increased monitoring identified in 41.6(1)*“c”*(4)“1” in the quarter immediately following the monitoring period in which the system exceeds 0.080 mg/L for TTHMs or 0.060 mg/L for HAA5.
- The department may allow systems on increased monitoring to return to routine monitoring if, after one year of monitoring, 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.
- The department may return a system to routine monitoring at its discretion.

d. DBP Analytical requirements.

(1) Systems must use only the analytical method(s) specified in this paragraph, or equivalent methods as determined by EPA, to demonstrate compliance with this rule.

(2) Systems must measure DBPs using the methods in the following table, as modified by the footnotes:

Approved Methods for DBP Compliance Monitoring

Contaminant and Methodology	EPA Method[1]	SM[2]	ASTM Method[3]
TTHM			
P&T/GC/EICD & PID	502.2[4]		
P&T/GC/MS	524.2, 524.3, 524.4		
LLE/GC/ECD	551.1		
HAA5			
LLE (diazomethane)/GC/ECD		6251 B[5], 6251 B-07[12]	
SPE (acidic methanol)/GC/ECD	552.1[5]		
LLE (acidic methanol)/GC/ECD	552.2, 552.3		
IC electrospray ionization tandem MS (IC-ESI-MS/MS)	557[10]		
Bromate			
IC	300.1		D 6581-00
IC & postcolumn reaction[9]	317.0 Rev. 2.0[6], 326.0[6]		
IC/ICP-MS[9]	321.8[6, 7]		
Two-dimensional IC	302.0[11]		
IC electrospray ionization tandem MS (IC-ESI-MS/MS)	557[10]		
Chemically suppressed IC			D 6581-08 A
Electrolytically suppressed IC			D 6581-08 B
Chlorite[8]			
Amperometric titration		4500-ClO^{2} E[8]	
Amperometric sensor			ChlordioX Plus[8, 13]

Contaminant and Methodology	EPA Method[1]	SM[2]	ASTM Method[3]
Spectophotometry	327.0 Rev. 1.1[8]		
IC	300.0, 300.1, 317.0 Rev. 2, 326.0		
Chemically suppressed IC			D 6581-08 A
Electrolytically suppressed IC			D 6581-08 B

ECD = electron capture detector
EICD = electrolytic conductivity detector
GC = gas chromatography
IC = ion chromatography
LLE = liquid/liquid extraction
MS = mass spectrometer
P&T = purge and trap
PID = photoionization detector
SPE = solid phase extractor

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents was approved by the Director of the Federal Register on February 16, 1999, in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be obtained from the sources listed below. Information regarding the documents is available from the Safe Drinking Water Hotline at 800.426.4791. Documents may be inspected at EPA's Drinking Water Docket or at the Office of Federal Register.

[1] EPA: The following methods are available from the NTIS:

Methods 300.0 and 321.8: Methods for the Determination of Organic and Inorganic Compounds in Drinking Water, Volume 1, August 2000, EPA 815-R-00-014. NTIS, PB2000-106981.

Method 300.1: "Determination of Inorganic Anions in Drinking Water by Ion Chromatography, Revision 1.0," EPA-600/R-98/118, 1997. NTIS, PB98-169196.

Method 317.0: "Determination of Inorganic Oxyhalide Disinfection By-Products in Drinking Water Using Ion Chromatography with the Addition of a Postcolumn Reagent for Trace Bromate Analysis, Revision 2.0," July 2001, EPA 815-B-01-001.

Method 326.0: "Determination of Inorganic Oxyhalide Disinfection By-Products in Drinking Water Using Ion Chromatography Incorporating the Addition of a Suppressor Acidified Postcolumn Reagent for Trace Bromate Analysis, Revision 1.0," June 2002, EPA 815-R-03-007.

Method 327.0: "Determination of Chlorine Dioxide and Chlorite Ion in Drinking Water Using Lissamine Green B and Horseradish Peroxidase with Detection by Visible Spectrophotometry, Revision 1.1," May 2005, EPA 815-R-05-008.

Methods 502.2, 524.2, 551.1, and 552.2: Methods for the Determination of Organic Compounds in Drinking Water—Supplement III, EPA-600/R-95-131, August 1995. NTIS PB95-261616.

Method 524.3: "Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry, Version 1.0," June 2009. EPA 815-B-09-009. www.nemi.gov.

Method 524.4: "Measurement of Purgeable Organic Compounds in Water by Gas Chromatography/Mass Spectrometry Using Nitrogen Purge Gas, Version 1.0," May 2013. EPA 815-R-13-002. www.nepis.epa.gov.

Method 552.1: Methods for the Determination of Organic Compounds in Drinking Water—Supplement II, EPA-600/R-92-129, August 1992. NTIS PB92-207703.

Method 552.3: "Determination of Haloacetic Acids and Dalapon in Drinking Water by Liquid-liquid Microextraction, Derivatization, and Gas Chromatography with Electron Capture Detection, Revision 1.0," July 2003, EPA-815-B-03-002.

[2] 4500-ClO_2 E and 6251B: SM, 19th (1995), 20th (1998), 21st (2005), and 22nd (2012) editions.

[3] Method D 6581-00: ASTM Volume 11.01, 2001 (or any year containing the cited version).

[4] If TTHMs are the only analytes being measured in the sample, then a PID is not required.

[5] The samples must be extracted within 14 days of sample collection.

[6] IC and postcolumn reaction or IC/ICP-MS must be used for bromate analysis to demonstrate eligibility for reduced monitoring.

[7] Samples must be preserved at sample collection with 50 mg ethylenediamine (EDA)/L of sample and must be analyzed within 28 days.

[8] Amperometric titration or spectrophotometry may be used for routine daily chlorite monitoring at the SEP, as prescribed in 41.6(1)*"c"*(3)"1." IC must be used for routine monthly chlorite monitoring and additional chlorite monitoring in the distribution system, as prescribed in 41.6(1)*"c"*(3)"2" and "3."

[9] These are the only methods approved for reduced bromate monitoring under 41.6(1)*"c"*(2)"2."

[10] EPA Method 557, "Determination of Haloacetic Acids, Bromate, and Dalapon in Drinking Water by Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)," August 2009. EPA 815-B-09-012. www.nemi.gov.

[11] EPA Method 302.0, "Determination of Bromate in Drinking Water Using Two-Dimensional Ion Chromatography with Suppressed Conductivity Detection," September 2009. EPA 815-B-014. www.nemi.gov.

[12] SM Online. The year in which each method was approved is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[13] ChlordioX Plus. "Chlorine Dioxide and Chlorite in Drinking Water by Amperometry Using Disposable Sensors," November 2013. Palintest Water Analysis Technologies, www.palintest.com.

(3) DBP analyses under this rule shall only be conducted by laboratories certified in accordance with 567—Chapter 83, except as specified under 41.6(1)*"d"*(4). The performance evaluation sample acceptance limits and minimum reporting levels are in 40 CFR §141.131(b)(2)(iii).

(4) Daily chlorite samples at the SEP must be measured by a Grade II, III or IV operator meeting the requirements of 567—Chapter 81, any person under the supervision of such an operator, or a laboratory certified in accordance with 567—Chapter 83.

e. DBP compliance requirements.

(1) General.

1. When compliance is based on an RAA 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. Unless invalidated by the department, 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.

3. If, during the first year of monitoring under 41.6(1)*"c,"* any individual quarter's average will cause the RAA of that system to exceed the MCL, the system is out of compliance at the end of that quarter.

4. Any system that violates the bromate, chlorite, or TTHM and HAA5 MCLs specified in this paragraph must provide PN pursuant to rule 567—40.5(455B) and report to the department pursuant to 567—paragraph 40.8(3)*"d."*

(2) Bromate. Compliance must be based on an RAA, 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 41.6(1)*"c"*(2). If the average of samples covering any consecutive four-quarter period exceeds the MCL, a system is in violation of the MCL. If a PWS fails to complete 12 consecutive months' monitoring, MCL compliance for the last four-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-sample set taken in the distribution system as prescribed by 41.6(1)*"c"*(3)"1" and "2." If the arithmetic average of any three-sample set exceeds the MCL, a system is in violation of the MCL.

(4) TTHM and HAA5.

1. For systems monitoring quarterly, compliance with MCLs in 41.6(1)*"b"* must be based on an RAA, computed quarterly, of quarterly averages of all samples collected by the system as prescribed by 41.6(1)*"c"*(4).

2. For systems monitoring less frequently than quarterly, systems demonstrate MCL compliance if the average of samples taken that year under 41.6(1)*"c"*(4) does not exceed the MCLs in 41.6(1)*"b."* If the average of these samples exceeds the MCL, the system must increase monitoring to once per quarter per treatment plant and is not in violation of the MCL until it has completed one year of quarterly monitoring, unless the result of fewer than four quarters of monitoring will cause the RAA 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 quarters of monitoring.

3. If the RAA of quarterly averages covering any consecutive four-quarter period exceeds the MCL

4. If a PWS fails to complete four consecutive quarters of monitoring, MCL compliance for the last four-quarter compliance period must be based on an average of the available data.

f. DBP reporting requirements. Systems required to sample quarterly or more frequently must report to the department within ten days after the end of each quarter in which samples were collected, notwithstanding the PN provisions of rule 567—40.5(455B). Systems required to sample less frequently than quarterly must report to the department within ten days after the end of each monitoring period in which samples were collected. The specific reporting requirements for DBPs are in 567—subparagraph 40.8(3)*"d"*(2).

41.6(2) *Stage 2 initial distribution system evaluation.* The requirements for the Stage 2 initial distribution system evaluation (IDSE) in 40 CFR 141.600-60,5 as adopted on January 4, 2006, are adopted by reference. This regulation establishes monitoring and requirements for identifying compliance monitoring locations that are used to determine MCL compliance for TTHM and HAA5. All

CWS required to comply with 41.6(1) and all NTNC serving at least 10,000 people required to comply with 41.6(1) are required to comply with this subrule. The requirements in this subrule constitute national primary drinking water regulations. Only the analytical methods specified in 41.6(1)*"d"* may be used to demonstrate compliance with this subrule.

41.6(3) *Stage 2 DBP requirements.* The requirements of this subrule constitute national primary drinking water regulations. This subrule establishes monitoring and requirements for achieving MCL compliance based on locational running annual averages (LRAA) for TTHM and HAA5.

a. Applicability. All CWS and NTNC systems that use a primary or residual disinfectant other than UV light or deliver water that has been treated with a primary or residual disinfectant other than UV light must comply with this subrule.

(1) Schedule. Systems must comply with the dates in the appropriate schedule. For the purposes of this subrule, the combined distribution system (CDS) only includes active connections; emergency connections are excluded. Any CWS or NTNC that purchases or sells water on a routine basis through an active connection to another CWS or NTNC is part of a CDS. All systems included in a CDS must adhere to the schedule of the system that serves the largest population in that CDS. The system must comply with the requirements on the schedule for systems that are not a part of a CDS and for systems that serve the largest population in the CDS. The schedule for the other systems that are a part of a CDS, either wholesale or consecutive, is the same schedule as that of the system with the earliest compliance date in the CDS.

Schedule	System Population	Date by Which System Must Begin Stage 2 Compliance Monitoring
1	At least 100,000	April 1, 2012
2	50,000-99,999	October 1, 2012
3	10,000-49,999	October 1, 2013
4	Fewer than 10,000	October 1, 2013, for all GW systems and any SW/IGW systems that did not conduct *Cryptosporidium* sampling under 567—paragraph 43.11(3)*"b"*(2)"4" October 1, 2014, for SW/IGW systems that conducted *Cryptosporidium* sampling under 567—paragraph 43.11(3)*"b"*(2)"4"

(2) Initiation of compliance monitoring under Stage 2. Systems shall switch from Stage 1 compliance monitoring (41.6(1)) to Stage 2 monitoring as follows:

1. Systems required to monitor quarterly must start monitoring in the first full calendar quarter that includes the compliance date in the preceding table.

2. Systems that conducted IDSE monitoring and have an approved report and that are required to monitor at a frequency less than quarterly must start monitoring in the calendar month recommended in the approved IDSE report.

3. Systems that were not required to prepare an IDSE report under 41.6(2) must update their Stage 1 monitoring plan to meet the Stage 2 requirements and submit it for department approval six months prior to the compliance date in the preceding table.

(3) Timing of initial determination of compliance under Stage 2.

1. Systems required to monitor quarterly must make compliance calculations at the end of the fourth calendar quarter that follows the compliance date or earlier if the LRAA calculated based on fewer than four quarters of data would cause an MCL exceedance regardless of the results of subsequent sampling. Compliance determination must continue at the end of each subsequent quarter.

2. Systems required to monitor at a frequency that is less than quarterly must make compliance calculations beginning with the first compliance sample taken after the compliance date.

(4) Monitoring and compliance.

1. Systems required to monitor quarterly must calculate LRAAs for TTHM and HAA5 using the monitoring results collected under this subrule and determine that each LRAA does not exceed the MCL. If the system does not complete the four consecutive quarters of monitoring, it must calculate MCL compliance based on the average of the available data from the most recent four quarters. If the system collects more than one sample per quarter at a monitoring location, all samples taken in the quarter at that location must be averaged to determine a quarterly average to be used for the LRAA calculation. If a

system fails to monitor, it is in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA.

2. Systems required to monitor yearly or triennially must determine that each sample collected is less than the MCL. If any sample exceeds the MCL, the system must comply with 41.6(3)*"e."* If no sample exceeds the MCL, the sample result for each monitoring location is considered to be the LRAA for that monitoring location. If a system fails to monitor, it is in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA.

3. The department may grant up to an additional 24 months for compliance with MCLs and operational evaluation levels if the system is required to make capital improvements in order to comply with an MCL.

(5) Any CWS or NTNC that begins using water to which a disinfectant has been added, other than ultraviolet light, after the initial compliance dates for IDSE or Stage 2 compliance monitoring must comply with this subrule.

b. Monitoring plan. All systems must develop and implement a DBP monitoring plan that shall be kept on file at the system for review by the department and the public. The monitoring plan must contain the monitoring locations, monitoring dates, and compliance calculation procedures.

(1) If the system has an approved IDSE-standard monitoring plan (IDSE-SMP), that report contains all of the plan elements and meets this requirement.

(2) If the system does not have an approved IDSE-SMP and does not have sufficient monitoring locations from its initial DBP sampling plan, it 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. The system must provide the rationale for identifying locations as having high levels of TTHM or HAA5.

(3) If the system does not have an approved IDSE-SMP and has more monitoring locations from its initial Stage 1 DBP sampling plan than the number of locations required under the Stage 2 compliance monitoring, it must identify which locations it will use for compliance monitoring by alternating selection of locations representing high TTHM levels and high HAA5 levels until the required number of compliance monitoring locations have been identified.

(4) All plans must be reviewed by the system every three years and updated as system conditions change.

1. A system may revise its monitoring plan to reflect changes in treatment, distribution system operations, and layout (including new service areas), to reflect other factors that may affect TTHM or HAA5 formation, or for department-approved reasons.

2. A system must consult with the department regarding the need for plan changes and the appropriateness of changes. A system must replace existing compliance monitoring locations that have the lowest LRAA with new locations that reflect the current distribution system locations with expected high TTHM or HAA5 levels.

3. The department may require modifications in a system's monitoring plan.

(5) Systems are also required to maintain the disinfectant and MRDL elements of the Stage 1 monitoring plan pursuant to 41.6(1)*"c"*(1)"6" and 567—paragraph 43.6(1)*"c"*(1)"5."

(6) All systems are required to have a valid DBP monitoring plan prior to the start of compliance monitoring in 41.6(3)*"a"*(1).

c. Routine monitoring. Systems are required to start monitoring at the locations specified in the approved DBP monitoring plan and on the schedule specified in 41.6(3)*"a"*(1). Each system must monitor the DBPs at the minimum number of locations identified in the table below.

Routine Monitoring for DBPs

Source water type	**Population size category**	**Monitoring frequency**	**Total number of distribution system monitoring location sites per monitoring period**
SW/IGW	<500	per year	2
	500-3,300	per quarter	2
	3,301-9,999	per quarter	2

Source water type	Population size category	Monitoring frequency	Total number of distribution system monitoring location sites per monitoring period
	10,000-49,999	per quarter	4
	50,000-249,999	per quarter	8
	250,000-999,999	per quarter	12
GW	<500	per year	2
	500-9,999	per year	2
	10,000-99,999	per quarter	4
	100,000-499,999	per quarter	6

(1) All systems must monitor during the month of highest DBP concentrations.

(2) Systems on a quarterly monitoring frequency must collect samples for TTHM and HAA5 every 90 days at each monitoring location, except that SW/IGW systems serving 500 to 3,300 people may collect at one location as provided in 41.6(3)*"c"*(3). Each sample collected at each location must be analyzed for both TTHM and HAA5 components.

(3) Systems on an annual monitoring frequency and SW/IGW systems serving 500 to 3,300 people are required to collect TTHM and HAA5 samples at the locations with the highest TTHM and HAA5 concentrations, respectively. Each sample must be analyzed for both TTHM and HAA5 components. Sample collection is required from only one location if the highest TTHM concentration and the highest HAA5 concentration occur at the same location.

(4) Analytical methods. Systems must use an approved method in 41.6(1)*"d"*(2) for TTHM and HAA5 analyses pursuant to this subrule. DBP analyses must be conducted by laboratories certified in accordance with 567—Chapter 83.

d. Reduced monitoring. A system may reduce monitoring to the level specified in the Reduced Monitoring for DBPs table below anytime the LRAA is less than or equal to half the MCL for TTHM and HAA5 at all monitoring locations (i.e., less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5). Only data collected under this rule may be used to qualify for reduced monitoring.

Reduced Monitoring for DBPs

Source water type	Population size category	Monitoring frequency[1]	Distribution system monitoring location sites per monitoring period[2]
SW/IGW	<500	per year	Monitoring may not be reduced
	500-3,300	per year	1 sample per year at same location if the highest TTHM and HAA5 measurements occurred at the same location and in the same quarter, analyzed for both TTHM and HAA5
	3,301-9,999	per year	2 samples: 1 at location and during quarter with the highest TTHM single measurement; 1 at location and during quarter with the highest HAA5 single measurement
	10,000-49,999	per quarter	2 samples: 1 at highest TTHM LRAA location; 1 at highest HAA5 LRAA location
	50,000-249,999	per quarter	4 samples: 1 sample each at highest two TTHM LRAA locations; 1 sample each at highest two HAA5 LRAA locations
	250,000-999,999	per quarter	6 samples: 1 sample each at highest 3 TTHM LRAA locations; 1 sample each at highest 3 HAA5 LRAA locations
GW	<500	every third year	1 sample at same location if the highest TTHM and HAA5 measurements occurred at the same location and in the same quarter, analyzed for both TTHM and HAA5
	500-9,999	per year	1 sample per year at same location if the highest TTHM and HAA5 measurements occurred at the same location and in the same quarter, analyzed for both TTHM and HAA5
	10,000-99,999	per year	2 samples: 1 at location and during quarter with the highest TTHM single measurement; 1 at location and during quarter with the highest HAA5 single measurement
	100,000-499,999	per quarter	2 samples: 1 at the highest TTHM LRAA location; 1 at the highest HAA5 LRAA location

[1] Systems on a quarterly monitoring frequency must collect the sample(s) every 90 days.

[2] Each sample must be analyzed for all TTHM and HAA5 components.

(1) Additional source water TOC requirement for SW/IGW systems. For SW/IGW systems, the source water RAA TOC level, before any treatment, must be less than or equal to 4.0 mg/L at each treatment plant treating SW or IGW, based on the monitoring conducted under 567—paragraph 43.6(2) *"b,"* in order to qualify for reduced monitoring.

(2) Continued reduced monitoring frequency. Systems may remain on a reduced monitoring frequency as long as they meet the following criteria. For SW/IGW systems, the source water annual average TOC level requirement in 41.6(3)*"d"*(1) must continue to be met.

1. A system with a quarterly reduced monitoring frequency may remain on reduced monitoring as long as the TTHM LRAA is less than or equal to 0.040 mg/L and the HAA5 LRAA is less than or equal to 0.030 mg/L at each monitoring location.

2. A system with an annual or triennial monitoring frequency may remain on reduced monitoring as long as each TTHM sample is less than or equal to 0.060 mg/L and each HAA5 sample is less than or equal to 0.045 mg/L.

(3) Return to routine monitoring frequency. Systems that cannot meet the requirements for reduced monitoring must resume routine monitoring according to 41.6(3)*"c"* or begin increased monitoring according to 41.6(3)*"e."*

1. A system with a quarterly reduced monitoring frequency must resume routine monitoring if the LRAA from any location exceeds either 0.040 mg/L for TTHM or 0.030 mg/L for HAA5.

2. A system with an annual or triennial monitoring frequency must resume routine monitoring if the annual sample at any location exceeds either 0.060 mg/L for TTHM or 0.045 mg/L for HAA5.

3. Any SW/IGW system must resume routine monitoring if the RAA source water TOC level, prior to any treatment, is more than 4.0 mg/L.

4. In addition, the department may require any system to resume routine monitoring at the department's discretion.

(4) Remaining on reduced monitoring from Stage 1 to Stage 2 transition. A system may remain on reduced monitoring after the dates in 41.6(3)*"a"*(1) if all of the following three criteria are met. If the three criteria are not met, the system must return to routine monitoring.

1. Under the IDSE, the system qualified for a 40/30 certification or received a very small system waiver;

2. The system meets the reduced monitoring criteria of this paragraph; and

3. The system has not changed or added locations for DBP monitoring from those used under the Stage 1 requirements in 41.6(1).

e. Increased monitoring.

(1) Systems that are monitoring annually or triennially must increase their monitoring frequency to quarterly if the following conditions are met.

1. Single result exceeds the TTHM or HAA5 MCL. A system that is monitoring annually or triennially must increase monitoring to quarterly at all locations if a single TTHM sample is greater than 0.080 mg/L or a single HAA5 sample is greater than 0.060 mg/L. Quarterly samples must be analyzed for both TTHM and HAA5 components.

2. Systems with a TTHM or HAA5 MCL violation. A system that is monitoring annually or triennially that is in violation of the TTHM or HAA5 MCL, based upon the LRAA, must increase monitoring to quarterly at all locations. Quarterly samples must be analyzed for both TTHM and HAA5 components. Calculate the LRAA using either four consecutive quarters of monitoring or using fewer quarters of monitoring if the MCL would be exceeded regardless of the monitoring results of subsequent quarters.

(2) Systems on a quarterly monitoring frequency during Stage 1 to Stage 2 transition. A system that was on increased monitoring under Stage 1 must remain on increased monitoring until it qualifies for a return to routine monitoring under 41.6(3)*"e"*(3). The system must conduct the increased monitoring at the monitoring locations in the monitoring plan developed under 41.6(3)*"b,"* beginning on the date identified in 41.6(3)*"a"*(1).

(3) Return to routine monitoring frequency. A system may return to routine monitoring once it has conducted increased monitoring for at least four consecutive quarters and the LRAA for every monitoring location is less than or equal to 0.060 mg/L for TTHM and less than or equal to 0.045 mg/L for HAA5. A system may not have any monitoring violations during the most recent four consecutive quarters.

f. Operational evaluation level (OEL).

(1) TTHM OEL. The TTHM OEL is determined by the sum of the two previous quarters' TTHM results plus twice the current quarter's TTHM result, divided by four to determine an average. If that average exceeds 0.080 mg/L, a system has exceeded the TTHM OEL.

(2) HAA5 OEL. The HAA5 OEL is determined by the sum of the two previous quarters' HAA5 results plus twice the current quarter's HAA5 result, divided by four to determine an average. If that average exceeds 0.060 mg/L, a system has exceeded the HAA5 OEL.

(3) OEL compliance. A system must calculate the OEL at any monitoring location that has a single analytical result in excess of the TTHM or HAA5 MCL in the analytical data used to calculate the current 12-month LRAA. A system must determine compliance with the OEL every quarter.

(4) OEL exceedance requirements. A system must conduct an operational evaluation and submit a written evaluation report to the department within 90 days after the system is notified of the analytical result that caused it to exceed the OEL. The report must be made available to the public upon request. The report must include an evaluation of system treatment and distribution operational practices, including storage tank operations, excess storage capacity, distribution system flushing, changes in source water or source water quality, and treatment changes or problems that may contribute to DBP formation, and what steps could be considered to minimize future exceedances.

1. A system may request that the department limit the scope of the evaluation if it is able to identify the cause of the OEL exceedance. The 90-day report submission deadline cannot be extended.

2. A system must have written department approval to limit the scope of the evaluation. The approval must be kept with the completed report.

g. Reporting and recordkeeping. All systems required to comply with this rule must meet the reporting requirements of 567—paragraph 40.8(3)*"d,"* and retain monitoring plans and analytical results as required by 567—subrule 40.9(8).

567—41.7(455B) Groundwater (GW) rule: sanitary survey, microbial source water monitoring, TT.

41.7(1) *General requirements.*

a. Scope. The requirements of this rule constitute national primary drinking water regulations.

b. Applicability. This rule applies to all PWSs that use GW, except for PWSs that combine all of their GW with SW or with IGW prior to treatment under 567—43.5(455B). For the purposes of this rule, "GW system" is defined as any PWS meeting this applicability statement, including consecutive systems receiving finished GW. For the purposes of this rule, "4-log virus treatment" means treatment that includes inactivation, removal, or a department-approved combination of inactivation and removal before or at the first customer of 4-log (99.99 percent) of viruses.

c. General. Systems subject to this rule must comply with the following:

(1) Sanitary survey requirements for all GW systems are described in 41.7(2).

(2) Microbial source water monitoring requirements for GW systems that do not treat all of their GW to at least 99.99 percent (4-log) virus treatment, as described in 41.7(3).

(3) TT requirements that apply to GW systems either with fecally contaminated source waters, as determined by monitoring conducted under 41.7(3), or with significant department-identified deficiencies. A GW system with fecally contaminated source water or with significant deficiencies subject to the TT requirements of this rule must implement one or more of the following corrective action options:

1. Correct all significant deficiencies;
2. Provide an alternate source of water;
3. Eliminate the source of contamination; or

4. Provide treatment that reliably achieves at least 4-log virus treatment before or at the first customer.

(4) GW systems that provide at least 4-log virus treatment must conduct compliance monitoring to demonstrate treatment effectiveness, as described in 41.7(4).

(5) If requested, GW systems must provide information that will enable the department to perform a hydrogeologic sensitivity assessment. For the purposes of this rule, "hydrogeologic sensitivity assessment" is a determination of whether GW systems obtain water from hydrogeologically sensitive settings.

(6) Analyses under this rule shall only be conducted by laboratories certified in accordance with 567—Chapter 83.

41.7(2) *Sanitary surveys for GW systems.* For the purposes of this rule, a "sanitary survey" conducted in accordance with 567—subrule 43.1(7), includes, but is not limited to, an on-site review of the water sources (identifying sources of contamination using source water assessments or other relevant information), facilities, equipment, operation, maintenance, and monitoring compliance of a PWS.

41.7(3) *GW source microbial monitoring and analytical methods.* A GW system that has a department-approved 4-log virus treatment process and is fulfilling the requirements of 41.7(4)*"b"* is not required to conduct the triggered source water monitoring under 41.7(3)*"a."*

a. Triggered source water monitoring requirements.

(1) General. A GW system must conduct triggered source water monitoring if it:

1. Does not provide at least 4-log virus treatment for each GW source; and

2. Is notified that a sample collected under 41.2(1)*"e"* and *"f"* is total coliform-positive, and the sample is not invalidated under 41.2(1)*"d."*

(2) Sampling. A GW system must collect at least one GW source sample from each GW source in use at the time the total coliform-positive sample was collected under 41.2(1)*"e"* and *"f"* that could have reasonably contributed to the positive sample. The source sample must be collected within 24 hours of the system's receipt of the total coliform-positive sample.

1. The department may extend the 24-hour time limit on a case-by-case basis if the system cannot collect the GW source sample within 24 hours due to circumstances beyond its control. The department must specify how much time the system has to collect the sample.

2. A GW system serving 1,000 or fewer people may use a repeat sample collected from a GW source to meet both the requirements of 41.2(1)*"g"* and this paragraph if:

- The department approves the use of *E. coli* as the fecal indicator,
- The system only has one GW source required to be sampled,
- The system has no treatment, and
- Should the source water sample be *E. coli*-positive, the system would incur an acute coliform bacteria MCL violation, and would need to comply with Tier 1 PN requirements and the additional sample monitoring in 41.7(3)*"a"*(3).

(3) Additional sampling. Unless the department requires corrective action for a valid triggered source water sample that tested positive for the fecal indicator, the system must collect five additional source water samples from that same source within 24 hours of receipt of a fecal indicator-positive sample result.

(4) Consecutive and wholesale systems. In addition to the other requirements in this paragraph:

1. A consecutive GW system that has a total coliform-positive sample collected under 41.2(1)*"f"* must notify the wholesale system(s) within 24 hours of receipt of the total coliform-positive sample, and

2. A wholesale GW system that does not provide 4-log virus treatment must comply with the following:

- A wholesale GW system that receives notice from a consecutive system it serves that a sample collected under 41.2(1)*"f"* is total coliform-positive must, within 24 hours of receipt, collect triggered sample(s) from its GW source(s) under 41.7(3)*"a"*(2) and analyze the sample(s) for a fecal indicator.
- If the triggered source sample(s) is fecal indicator-positive, the wholesale GW system must, within 24 hours of receipt of the result, notify all consecutive systems served by that GW source of the

fecal indicator-positive result and collect the required additional five source water samples in accordance with 41.7(3)*“a.”*

(5) Exceptions. A GW system is not required to comply with the triggered source water monitoring requirements of this paragraph if either of the following conditions exists:

1. The department determines in writing that the total coliform-positive sample collected under 41.2(1)*“e”* and *“f”* was caused by a distribution system deficiency; or

2. The total coliform-positive sample collected under 41.2(1)*“e”* and *“g”* is collected at a location that meets department criteria for distribution system conditions that will cause total coliform-positive samples.

b. Assessment source water monitoring. If directed by the department, GW systems must conduct assessment source water monitoring that meets department-determined requirements. GW systems conducting assessment source water monitoring may use a triggered source water sample collected under 41.7(3)*“a”*(2) to meet the requirements of this paragraph. Department-determined assessment source water monitoring requirements may include:

(1) Collection of:

1. A total of 12 GW source samples representing each month the system provides GW to the public;

2. Samples from each well, unless the system obtains written department approval to conduct monitoring at one or more wells within the GW system that are representative of multiple wells used by that system and that draw water from the same hydrogeologic setting;

3. A standard sample volume of at least 100 mL for fecal indicator analysis, regardless of technical indicator or analytical method used;

4. GW source samples at a location before any treatment of the GW source, unless the department approves a sampling location after treatment; and

5. GW source samples at the well itself, unless the system’s configuration does not allow for sampling at the well itself and the department approves an alternate sampling location representative of the water quality of that well; or

(2) Analysis of all GW source samples using one of the analytical methods listed in 41.7(3)*“c”* for the presence of *E. coli*, enterococci, or coliphage.

c. Analytical methods.

(1) GW systems subject to the source water monitoring requirements of this rule must collect a standard sample volume of at least 100 mL for fecal indicator analysis regardless of the fecal indicator or analytical method used.

(2) GW systems must analyze all GW source samples collected under this rule using one of the analytical methods in the following table for the presence of *E. coli*, enterococci, or coliphage.

Analytical Methods for Source Water Monitoring

Fecal Indicator[1]	**Methodology**	**Method Citation**
E. coli	Colilert[3]	9223B[2, 12, 13], 9223 B-97, B-04[18]
	Colisure[3]	9223B[2, 12, 13], 9223 B-97, B-04[18]
	Membrane filter method with MI agar	EPA Method 1604[4]
	Colilert-18	9223B[2, 12, 13], 9223B-97, B-0418
	m-ColiBlue24 Test[5]	
	E*Colite Test[6]	
	EC-MUG[7]	9221F[2, 13], 9221 F-06[18]
	NA-MUG[7]	9222G[2]
	Readycult	Readycult[14]
	Colitag	Modified Colitag[15]
	Chromocult	Chromocult[16]
	Tecta EC/TC	Tecta EC/TC[19]
Enterococci	Multiple-tube technique	9230B[2], 9230 B-04[18]

Fecal Indicator[1]	Methodology	Method Citation
	Membrane filter technique	9230C[2], EPA Method 1600[8]
	Enterolert[9]	
Coliphage	Two-step enrichment presence-absence procedure	EPA Method 1601[10], FastPhage[17]
	Single agar layer procedure	EPA Method 1602[11]

Analyses must be conducted in accordance with the documents listed below. The Director of the Federal Register approves the incorporation by reference of the documents listed in footnotes 2 through 11 in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be obtained from the sources listed below or inspected at EPA's Drinking Water Docket or at NARA.

[1] The time from sample collection to initiation of analysis may not exceed 30 hours. GW systems are encouraged but not required to hold samples below 10 degrees Celsius during transit.

[2] Methods are described in SM, 20th edition (1998).

[3] Medium is available through IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, ME 04092.

[4] EPA Method 1604: Total Coliforms and Escherichia coli in Water by Membrane Filtration Using a Simultaneous Detection Technique (MI Medium); September 2002, EPA 821-R-02-024, www.nemi.gov.

[5] A description of the m-ColiBlue24 Test, "Total Coliforms and *E. coli* Membrane Filtration Method with m-ColiBlue24 Broth," Method No. 10029, Revision 2, August 17, 1999, Hach Company, 100 Dayton Avenue, Ames, IA 50010.

[6] A description of the E*Colite Test, "Charm E*Colite Presence/Absence Test for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Drinking Water," January 9, 1998, Charm Sciences, Inc., 659 Andover Street, Lawrence, MA 01843-1032.

[7] EC-MUG (Method 9221F) or NA-MUG (Method 9222G) can be used for *E. coli* testing step as described in 41.2(1)"f"(6) or (7) after use of SM 9221B, 9221D, 9222B, or 9222C.

[8] EPA Method 1600: Enterococci in Water by Membrane Filtration Using Membrane-Enterococcus Indoxyl-β-D-Glucoside Agar (MEI), EPA 821-R-02-022 (September 2002), is an approved variation of SM 9230C, www.nemi.gov. The holding time and temperature for GW samples is specified in footnote 1 above, rather than as specified in Section 8 of EPA Method 1600.

[9] Medium is available through IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, ME 04092. Preparation and use of the medium is set forth in the article "Evaluation of Enterolert for Enumeration of Enterococci in Recreational Waters" by Budnick, G.E., Howard, R.T., and Mayo, D.R., 1996, Applied and Environmental Microbiology, 62:3881-3884.

[10] EPA Method 1601: Male-Specific (F+) and Somatic Coliphage in Water by Two-Step Enrichment Procedure; April 2001, EPA 821-R-01-030, www.nemi.gov.

[11] EPA Method 1602: Male-Specific (F+) and Somatic Coliphage in Water by Single Agar Layer (SAL) Procedure; April 2001, EPA 821-R-01-029, www.nemi.gov.

[12] SM, 21st edition (2005).

[13] SM, 22nd edition (2012).

[14] Readycult Method, "Readycult Coliforms 100 Presence/Absence Test for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Finished Waters," January 2007, Version 1.1. EMD Millipore, 290 Concord Road, Billerica, MA 01821.

[15] Modified Colitag Method, "Modified Colitag Test Method for the Simultaneous Detection of *E. coli* and Other Total Coliforms in Water (ATP D05-0035)," August 28, 2009, www.nemi.gov or CPI International, 5580 Skylane Blvd., Santa Rosa, CA 95403.

[16] Chromocult Method, "Chromocult Coliform Agar Presence/Absence Membrane Filter Test Method for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Finished Waters," November 2000, Version 1.0. EMD Millipore, 290 Concord Road, Billerica, MA 01821.

[17] Charm Sciences, Inc., "FastPhage Test Procedure. Presence/Absence for Coliphage in Ground Water with Same Day Positive Prediction," Version 009, November 2012, www.charmsciences.com.

[18] SM Online. The year in which each method was approved is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[19] Tecta EC/TC. "Presence/Absence Method for Simultaneous Detection of Total Coliforms and *Escherichia coli* in Drinking Water," April 2014. Veolia Water Solutions and Technologies, Suite 4697, Biosciences Complex, 116 Barrie Street, Kingston, Ontario, Canada K7L 3N6.

d. Invalidation of a fecal indicator-positive GW source sample.

(1) GW systems may obtain invalidation from the department of a fecal indicator-positive GW source sample collected under 41.7(3)*"a"* only under these conditions:

1. The system provides the department with written notice from the laboratory that improper sample analysis occurred; or

2. The department determines in writing that there is substantial evidence that a fecal indicator-positive GW source sample is not related to source water quality.

(2) If the department invalidates a fecal indicator-positive GW source sample, the system must collect another source water sample under 41.7(3)*"a"* within 24 hours of department notification of the invalidation decision. The sample must be analyzed for the same fecal indicator using the analytical methods in 41.7(3)*"c."* The department may extend the 24-hour time limit on a case-by-case basis if the

system cannot collect the source water sample within 24 hours due to circumstances beyond its control. For an extension, the department must specify how much time the system has to collect the sample.

e. *Sampling location.*

(1) Any GW source sample required under 41.7(3)*"a"* must be collected at a location prior to any treatment of the GW source, unless the department approves a sampling location after treatment.

(2) If the system's configuration does not allow for sampling at the well itself, the system may collect a sample at a department-approved location to meet the requirements of 41.7(3)*"a"* if the sample is representative of the water quality of that well.

f. *New sources.* As directed by the department, a GW system that places a new GW source into service must conduct assessment source water monitoring, including the sampling and analysis in 41.7(3)*"b"*(3) to 41.7(3)*"b"*(6). If directed, the system must begin monitoring before the GW source is used to provide water to the public.

g. *PN.* A system with a GW source sample collected under 41.7(3)*"a"* or *"b"* that is fecal indicator-positive and that is not invalidated under 41.7(3)*"d,"* including consecutive systems served by the GW source, must conduct Tier 1 PN under 567—subrule 40.5(2).

h. *Monitoring violations.* Failure to meet the requirements of 41.7(3)*"a"* through *"f"* is a monitoring violation that requires the system to provide Tier 3 PN under 567—subrule 40.5(4).

41.7(4) *GW system TT requirements.*

a. *GW systems with significant deficiencies or source water fecal contamination.*

(1) The TT requirements of this subrule must be met by GW systems when a significant deficiency is identified or when a GW source sample collected under 41.7(3)*"a"*(3) is fecal indicator-positive.

(2) If directed by the department, a GW system with a GW source sample collected under 41.7(3)*"a"*(2), 41.7(3)*"a"*(4), or 41.7(3)*"b"* that is fecal indicator-positive must comply with the TT requirements of this subrule.

(3) When a significant deficiency is identified at a SW or IGW system that also uses a GW source not under the influence of SW, the system must comply with provisions of this paragraph, except in cases where the department determines that the significant deficiency is in a portion of the distribution system that is served solely by the SW or IGW source.

(4) Unless the department directs the GW system to implement a specific corrective action, the system must consult with the department regarding the appropriate corrective action within 30 days of either receiving a written department notice of a significant deficiency, written notice from a laboratory that a GW source sample collected under 41.7(3)*"a"*(3) is fecal indicator-positive, or direction from the department that a fecal indicator-positive sample collected under 41.7(3)*"a"*(2), 41.7(3)*"a"*(4), or 41.7(3)*"b"* requires corrective action. For the purposes of this subrule, significant deficiencies include, but are not limited to, defects in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the department determines to be causing, or have potential for causing, the introduction of contamination into the water delivered to consumers.

(5) Within 120 days, or earlier if directed by the department, of either receiving written department notification of a significant deficiency, written notice from a laboratory that a GW source sample collected under 41.7(3)*"a"*(3) is fecal indicator-positive, or direction from the department that a fecal indicator-positive sample collected under 41.7(3)*"a"*(2), 41.7(3)*"a"*(4), or 41.7(3)*"b"* requires corrective action, the GW system must either:

1. Have completed corrective action in accordance with applicable department plan review processes or other department guidance or direction, if any, including department-specified interim measures; or

2. Be in compliance with a department-approved corrective action plan and schedule, subject to the following conditions:

- Any subsequent modifications to a department-approved corrective action plan and schedule must also be approved by the department; and
- If the department specifies interim measures for public health protection, pending department approval of the corrective action plan and schedule, or pending completion of the corrective action plan, the system must comply with these interim measures in addition to any department-specified schedule.

(6) Corrective action alternatives. GW systems meeting the conditions of 41.7(4)*"a"*(1) or (2) must implement one or more of the following corrective action alternatives:

1. Correct all significant deficiencies;
2. Provide an alternate source of water;
3. Eliminate the source of contamination; or
4. Provide treatment that reliably achieves at least 4-log virus treatment for the GW source.

(7) Special PN of significant deficiencies or source water fecal contamination.

1. In addition to the Tier 1 PN requirements of 567—subrule 40.5(2), a community GW system that receives department notice of a significant deficiency or notification of a fecal indicator-positive GW source sample that is not invalidated under this rule must inform the public served by the water system of the fecal indicator-positive source sample or of any uncorrected significant deficiency, in accordance with 567—paragraph 40.7(9)*"e."* The system must continue to inform the public annually until the significant deficiency is corrected or until the department determines that the fecal contamination in the GW source is corrected, in accordance with 41.7(3)*"a"*(5).

2. In addition to the Tier 1 PN requirements of 567—subrule 40.5(2), a noncommunity GW system that receives department notice of a significant deficiency must inform the public served by the system, in a department-approved manner, of any significant deficiency that is not corrected within 12 months of department notification or earlier if directed by the department. The system must continue to inform the public annually until the significant deficiency is corrected. The information must include:

- The nature of the significant deficiency and the date it was identified by the department;
- The department-approved plan and schedule for correction of the significant deficiency, including interim measures, progress to date, and any interim measures completed; and
- For systems with a large proportion of non-English speaking consumers, as determined by the department, information in the applicable language(s) regarding the importance of the notice, or a telephone number or address where consumers may contact the system to obtain a translated copy of the notice or assistance in the appropriate language.

3. If directed by the department, an NCWS with significant deficiencies that have been corrected must inform its customers of the significant deficiencies, how the deficiencies were corrected, and the dates of correction under 41.7(4)*"a"*(7)"2."

b. Compliance monitoring.

(1) Existing GW sources. A GW system that provides at least 4-log virus treatment must submit a request to the department to avoid the source water monitoring requirements of 41.7(3). The request must include engineering, operational, or other information that the department may need to evaluate the submission. The department must approve the request in writing before the system can avoid the GW source monitoring requirements. The system's operation permit will include the mandatory operational requirements for the approved 4-log virus treatment. If the system subsequently discontinues 4-log virus treatment or no longer wishes to be exempt, the system must conduct GW source monitoring as required under 41.7(3).

(2) New GW sources. A GW system that places a GW source in service that is not required to meet the source water monitoring requirements of this subrule because it provides at least 4-log virus treatment for the GW source must comply with the following requirements:

1. The system must notify the department in writing that it provides at least 4-log virus treatment for the GW source. The department notification must include engineering, operational, or other information that the department requests to evaluate the submission. The contact time values for virus inactivation using free chlorine, chlorine dioxide, and ozone are in 567—Chapter 43, Appendix C. No CT table is provided for chloramines and total chlorine as the CT values would be prohibitively high for GW systems.

2. The system must conduct compliance monitoring under 41.7(4)*"b"*(3) within 30 days of placing the source in service.

3. The system must conduct GW source monitoring under 41.7(3) if it subsequently discontinues 4-log virus treatment for the GW source.

(3) Monitoring requirements. A GW system subject to 41.7(4)*"a,"*41.7(4)*"b"*(1), and 41.7(4)*"b"*(2) must monitor the effectiveness and reliability of treatment for that GW source before or at the first customer as follows:

1. Chemical disinfection. A GW system must monitor the residual disinfectant concentration, using analytical methods specified in 567—subparagraph 43.5(4)*"a"*(5), at a department-approved location and must record the lowest residual disinfectant concentration each day that water from the GW source is served to the public. A GW system must maintain the department-determined minimum residual disinfectant concentration every day the GW system serves water from the GW source to the public.

- A GW system serving more than 3,300 people must monitor continuously. If there is a failure in the continuous monitoring equipment, the system must conduct grab sampling every four hours until the continuous monitoring equipment is returned to service. The system must resume continuous residual disinfectant monitoring within 14 days.
- A GW system serving 3,300 or fewer people must take a daily grab sample during the hour of peak flow or at another department-specified time. If any daily grab sample measurement falls below the department-determined minimum residual disinfectant concentration, the system must take follow-up samples every four hours until the residual disinfectant concentration is restored to the department-determined minimum level. Alternatively, a GW system that serves 3,300 or fewer people may monitor continuously and meet the requirements of 41.7(4)*"b"*(3)"1," first bulleted paragraph.

2. Membrane filtration. A GW system using membrane filtration to meet the requirements of this paragraph to provide at least 4-log virus treatment must monitor and operate the membrane filtration process in accordance with all department-specified monitoring and compliance requirements. A GW system that uses membrane filtration is in compliance with the requirement to achieve at least 4-log virus removal when:

- The membrane has an absolute molecular weight cut-off (MWCO), or an alternate parameter that describes the exclusion characteristics of the membrane, that can reliably achieve at least 4-log virus removal;
- The membrane process is operated in accordance with department-specified compliance requirements; and
- The integrity of the membrane is intact.

3. Alternative treatment. A GW system using a department-approved alternative treatment to meet the requirements of 41.7(4)*"b"* by providing at least 4-log virus treatment must:

- Monitor the alternative treatment in accordance with all department-specified monitoring requirements; and
- Operate the alternative treatment in accordance with all compliance requirements that the department determines to be necessary to achieve at least 4-log virus treatment.

c. Discontinuing treatment. A GW system may discontinue 4-log virus treatment for a GW source if the department determines in writing that 4-log virus treatment is no longer necessary for that GW source. A system that discontinues 4-log virus treatment is subject to 41.7(3).

d. Monitoring violation. Failure to meet the monitoring requirements of 41.7(4)*"b"* is a monitoring violation and requires the GW system to provide Tier 3 PN under 567—subrule 40.5(4).

41.7(5) *GW system TT violations.* A GW system must give Tier 2 PN under 567—subrule 40.5(3) for the TT violations specified in this subrule.

a. Significant deficiency. A GW system with a significant deficiency is in violation of the TT requirement if, within 120 days (or earlier if directed by the department) of receiving written department notice of the significant deficiency, the system:

(1) Does not complete corrective action in accordance with any applicable department plan review processes or other department direction, including department-specified interim measures; or

(2) Is not in compliance with a department-approved corrective action plan and schedule.

b. Fecal indicator-positive source sample. Unless the department invalidates a fecal indicator-positive GW source sample under 41.7(3)*"d"*(1), a GW system is in violation of the TT requirement if, within 120 days (or earlier if directed by the department) of meeting the conditions of 41.7(4)*"a"*(1) or 41.7(4)*"a"*(2), the system:

(1) Does not complete corrective action in accordance with any applicable department plan review processes or other department direction, including department-specified interim measures; or

(2) Is not in compliance with a department-approved corrective action plan and schedule.

c. Failure to maintain 4-log treatment. A GW system subject to 41.7(4)*"b"*(3) that fails to maintain at least 4-log virus treatment for a GW source is in violation of the TT requirement if the failure is not corrected within four hours of the determination that the system is not maintaining at least 4-log virus treatment before or at the first customer.

41.7(6) *GW system reporting and recordkeeping.*

a. Reporting. In addition to meeting the requirements of 567—subrule 40.8(1), GW systems must provide the following information to the department:

(1) A GW system conducting compliance monitoring under 41.7(4)*"b"* must provide notification any time it fails to meet any of the requirements for 4-log virus treatment including, but not limited to, minimum residual disinfectant concentration, membrane operating criteria or membrane integrity, and alternative treatment operating criteria, if operation in accordance with the criteria or requirements is not restored within four hours. Notification must be provided as soon as possible but in no case later than the end of the next business day.

(2) Notification of action completion, within 30 days of completing any corrective action under 41.7(4)*"a."*

(3) If a GW system subject to 41.7(3)*"a"* does not conduct source water monitoring under 41.7(3)*"a"*(5)"2," the system must provide documentation within 30 days of the total coliform-positive sample that it met the department's criteria.

b. Recordkeeping. In addition to the requirements in 567—40.9(455B), GW systems must maintain the following information for the specified time period:

(1) Documentation of corrective actions must be kept for not less than ten years.

(2) Documentation of PN required under 41.7(4)*"a"*(7) must be kept for not less than three years.

(3) Records of decisions under 41.7(3)*"a"*(5)"2" and records of fecal indicator-positive GW source sample invalidation under 41.7(3)*"d"*(1) must be kept for not less than five years.

(4) For consecutive systems, documentation of notification to the wholesale system(s) of total coliform-positive samples that are not invalidated under 41.2(1)*"d"* must be kept for not less than five years.

(5) Systems, including wholesale systems, required to perform compliance monitoring under 41.7(4)*"b"*(1), must maintain the following records:

1. The department-specified minimum disinfectant residual must be kept for not less than ten years.

2. Both the lowest daily residual disinfectant concentration and the date and duration of any failure to maintain the department-prescribed minimum residual disinfectant concentration for more than four hours must be kept for not less than five years.

3. Department-specified compliance requirements for membrane filtration, department-specified parameters for department-approved alternative treatment, and the date and duration of any failure to meet the membrane operating, membrane integrity, or alternative treatment operating requirements for more than four hours must be kept for not less than five years.

567—41.8(455B) Radionuclides.

41.8(1) *Radionuclides.*

a. Applicability.

(1) This rule applies to all CWSs and specifies radionuclide MCLs, analytical methodology requirements, and monitoring requirements. Radionuclide reporting requirements are listed in 567—subrule 40.8(1), PN requirements are in 567—40.5(455B), and BAT is in 567—subparagraph 43.3(10)*"b"*(3). All CWSs must comply with the requirements and MCLs for gross alpha particle activity, radium-226, radium-228, uranium, beta particle activity, and photon emitter radioactivity. Only those CWSs designated by the department to be vulnerable to man-made

radioactivity contamination are required to monitor for beta particle activity and photon emitter radioactivity. To determine whether a system is vulnerable to man-made nuclear radioactivity, the department will evaluate proximity to a nuclear facility, source water, historical analytical data, ongoing surveillance data from the nuclear facility, and any other factor considered to be relevant.

(2) Compliance dates. CWS must comply with the MCLs in 41.8(1)*"b"*(1). Compliance shall be determined in accordance with 41.8(1)*"c"* through *"f."* Compliance with the radionuclides reporting requirements is required. All CWSs must conduct initial monitoring to determine compliance with 41.8(1)*"b"*(1) by December 31, 2007.

b. MCLs for radionuclides.

(1) Gross alpha particle activity, radium-226, radium-228, and uranium MCLs are specified in the following table:

Contaminant	MCL
Gross alpha particle activity, including Radium-226 but excluding radon and uranium	15 pCi/L
Combined Radium-226 and Radium-228	5 pCi/L[1]
Uranium	30 µg/L

[1] Determine the combined radium-226 and radium-228 by the adding the results of analysis for radium-226 and radium-228.

(2) Beta particle activity and photon radioactivity MCLs.

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 4 mrem/year.

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

Average Annual Concentrations Assumed to Produce a Total Body or Organ Dose of 4 mrem/year

Radionuclide	Critical Organ	Concentration
Strontium-90	Bone marrow	8 pCi/L
Tritium	Total body	20,000 pCi/L

c. Detection limits and compliance determinations. Compliance with the radionuclide MCLs will be determined based on the analytical results obtained at each sampling point. If one sampling point is in violation of an MCL, the system is in violation of the MCL. If a system is in violation of an MCL, the supplier of the water is required to give notice to the department in accordance with 567—subrule 40.8(1) and to provide PN as required by rule 567—40.5(455B).

(1) Detection limits. When monitoring gross alpha particle activity, radium-226, radium-228, uranium, and beta particle and photon radioactivity concentration in drinking water, the required sensitivity of the radioanalysis is defined in terms of a detection limit. The detection limit shall be that concentration which can be counted with a precision of plus or minus 100 percent at the confidence level (1.960 sigma, where sigma is the standard deviation of the net counting rate of the sample).

1. To determine compliance with the specified radionuclide MCLs, the detection limit shall not exceed the following concentrations:

Detection Limits for Gross Alpha Particle Activity, Radium-226, Radium-228, and Uranium

Contaminant	Detection Limit
Gross alpha particle activity	3 pCi/L
Radium-226	1 pCi/L

Contaminant	Detection Limit
Radium-228	1 pCi/L
Uranium	1 μg/L

2. To determine compliance with the specified radionuclide MCLs, the detection limits shall not exceed the following concentrations:

Detection Limits for Man-Made Beta Particle and Photon Emitters

Contaminant	Detection Limit
Gross beta	4 pCi/L
Cesium-134	10 pCi/L
Iodine-131	1 pCi/L
Strontium-89	10 pCi/L
Strontium-90	2 pCi/L
Tritium	1,000 pCi/L
Other radionuclides	1/10 of the applicable limit

(2) Compliance determination.

1. For systems monitoring more than once per year, MCL compliance is determined by a running annual average (RAA) at each sampling point. If the average of any sampling point is greater than the MCL, the system is immediately in violation of the MCL. If any sample result causes the RAA to exceed the MCL at any sample point, the system is immediately in violation of the MCL.

2. Systems monitoring annually or less frequently whose sample result exceeds the MCL must revert to quarterly sampling for that contaminant during the next quarter. Systems are required to conduct quarterly monitoring only at the SEP at which the sample was collected and for the specific contaminant that triggered the increased monitoring frequency. Systems triggered into increased monitoring will not be considered in violation of the MCL until they have completed one year of quarterly sampling. If any sample result causes the RAA to exceed the MCL at any sample point, the system is immediately in violation of the MCL.

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

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

5. If a sample result is less than the detection limit, use a value of zero to calculate the annual average.

6. The department may invalidate results of obvious sampling or analytical errors.

7. To judge compliance with the radionuclide MCLs, averages of data shall be used and shall be rounded to the same number of significant figures as the MCL for the contaminant in question.

(3) The department will determine compliance or initiate enforcement action based upon analytical results or other information compiled by department staff or the department's designee.

(4) The department may assign additional requirements deemed necessary to protect public health, including PN requirements.

d. Radionuclide analytical methodology. Analysis for radionuclides shall be conducted to determine compliance with the radionuclide MCLs in accordance with the methods in the following table, or equivalent methods determined in accordance with rule 567—41.10(455B).

(1) Radionuclide Analytical Methodology Table.

Radionuclide Analytical Methodology

Contaminant	Methodology	Reference (method or page number)								
		EPA[1]	EPA[2]	EPA[3]	EPA[4]	SM[5]	ASTM[6]	USGS[7]	DOE[8]	Other
Naturally occurring:										
Gross alpha[11] & beta	Evaporation	900.0	p. 1	00-01	p. 1	302, 7110B, 7110 B-00		R-1120-76		

Contaminant	Methodology	Reference (method or page number)								
		EPA[1]	EPA[2]	EPA[3]	EPA[4]	SM[5]	ASTM[6]	USGS[7]	DOE[8]	Other
Gross alpha[11]	Co-precipitation			00-02		7110C, 7110 C-00				
Radium-226	Radon emanation	903.1	p. 16	Ra-04	p. 19	305, 7500-Ra C, 7500Ra C-01	D 3454-97, 05	R-1141-76	Ra-04	NY[9]
	Radiochemical	903.0	p. 13	Ra-03		304, 7500-Ra B, 7500-Ra B-01	D 2460-97, 07	R-1140-76		GA[14]
Radium-228	Radiochemical	904.0	p. 24	Ra-05	p. 19	7500-Ra D, 7500-Ra D-01		R-1142-76		NY[9] NJ[10] GA[14]
Uranium[12]	Radiochemical	908.0				7500-U B, 7500-U B-00				
	Fluorometric	908.1				7500-U C (17th edition)	D 2907-97	R-1180-76 R-1181-76	U-04	
	ICP-MS	200.8[13]				3125	D 5673-03, 05, 10			
	Alpha spectrometry			00-07	p. 33	7500-U C, 7500-U C-00	D 3972-97, 02, 09	R-1182-76	U-02	
	Laser phosphorimetry						D 5174-97, 02, 07			
	Alpha liquid scintillation spectrometry						D 6239-09			
Man-made:										
Radioactive Cesium	Radiochemical	901.0	p. 4			7500-Cs B, 7500-Cs B-00	D 2459-72	R-1111-76		
	Gamma ray spectrometry	901.1			p. 92	7120, 7120-97	D 3649-91, 98a, 06	R-1110-76	4.5.2.3	
Radioactive Iodine	Radiochemical	902.0	p. 6 p. 9			7500-I B, 7500-I B-00 7500-I C, 7500-I C-00 7500-I D, 7500-I D-00	D 3649-91, 98a, 06			
	Gamma ray spectrometry	901.1			p. 92	7120, 7120-97	D 4785-93, 00a, 08		4.5.2.3	
Radioactive Strontium 89, 90	Radiochemical	905.0	p. 29	Sr-04	p. 65	303, 7500-Sr B, 7500-Sr B-01		R-1160-76	Sr-01 Sr-02	
Tritium	Liquid scintillation	906.0	p. 34	H-02	p. 87	306, 7500-^{3}H B, 7500-^{3}H B-00	D 4107-91, 98 (Reapproved 2002), 08	R-1171-76		
Gamma emitters	Gamma ray spectrometry	901.1 902.0 901.0			p. 92	7120 7500-Cs B, 7500-Cs B-00	D 3649-91, 98a, 06	R-1110-76	Ga-01-R	

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of documents 1 through 10 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be obtained from the sources listed below. Information regarding the documents can be obtained from the Safe Drinking Water Hotline at 800.426.4791. Documents may be inspected at EPA's Drinking Water Docket or at the Office of Federal Register.

[1] "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA 600/4-80-032, August 1980. NTIS, PB 80-224744.

[2] "Interim Radiochemical Methodology for Drinking Water," EPA 600/4-75-008(revised), March 1976. NTIS, ibid. PB 253258.

[3] "Radiochemistry Procedures Manual," EPA 520/5-84-006, December 1987. NTIS, ibid. PB 84-215581.

[4] "Radiochemical Analytical Procedures for Analysis of Environmental Samples," March 1979. NTIS, ibid. EMSL LV 053917.

[5] SM, 13th, 17th, 18th, 19th, 20th, 21st, and 22nd editions, 1971, 1989, 1992, 1995, 1998, 2005, and 2012. Methods 302, 303, 304, 305, and 306 are in the 13th edition. Methods 7110B, 7500-Ra B, 7500-Ra C, 7500-Ra D, 7500-U B, 7500-Cs B, 7500-I B, 7500-I C, 7500-I D, 7500-Sr B, 7500-3H B are in the 17th, 18th, 19th, 20th, 21st, and 22nd editions. Method 7110C and Method 7500-U C

Alpha spectrometry are in the 18th, 19th, 20th, 21st, and 22nd editions. Method 7500-U C Fluorimetric Uranium is in the 17th and 21st editions. Method 7120 is in the 19th, 20th, 21st, and 22nd editions. Method 3125 is in the 20th edition. Methods 7110 B-00, 7110 C-00, 7500-Ra B-01, 7500-Ra C-01, 7500-Ra D-01, 7500-U B-00, 7500-U C-00, 7500-I B-00, 7500-I C-00, 7500-I D-00, 7120-97, 7500-Sr B-01, and 7500-3H B-00. The year that each method was approved is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[6] ASTM, Volumes 11.01 and 11.02, 2002. Any year containing the cited version of the method may be used.

[7] "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," Chapter A5 in Book 5 of Techniques of Water-Resources Investigations of the USGS, 1977. USGS Information Services, Box 25286, Federal Center, Denver, CO 80225-0425.

[8] "EML Procedures Manual," 28th (1997) or 27th (1990) edition, Volumes 1 and 2; either edition may be used. In the 27th edition, Method Ra-04 is listed as Ra-05, and Method Ga-01-R is listed as Sect. 4.5.2.3. Environmental Measurements Laboratory, U.S. Department of Energy, 376 Hudson Street, New York, NY 10014-3621.

[9] "Determination of Ra-226 and Ra-228 (Ra-02)," January 1980, revised June 1982. Radiological Sciences Institute Center for Laboratories and Research, New York State Department of Health, Empire State Plaza, Albany, NY 12201.

[10] "Determination of Radium-228 in Drinking Water," August 1980. State of New Jersey, Department of Environmental Protection, Division of Environmental Quality, Bureau of Radiation and Inorganic Analytical Services, 9 Ewing Street, Trenton, NJ 08625.

[11] Natural uranium and thorium-230 are approved as gross alpha calibration standards for gross alpha with co-precipitation and evaporation methods; americium-241 is approved with co-precipitation methods.

[12] If uranium (U) is determined by mass, a 0.67 pCi/µg of uranium conversion factor must be used. This conversion factor is based on the 1:1 activity ratio of U-234 to U-238 that is characteristic of naturally occurring uranium.

[13] "Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry," Revision 5.4, published in "Methods for the Determination of Metals in Environmental Samples – Supplement 1," EPA 600-R-94-111, May 1994. NTIS, PB 95-125472.

[14] "The Determination of Radium-226 and Radium-228 in Drinking Water by Gamma-Ray Spectrometry Using HPGW or Ge(Li) Detectors," Revision 1.2, December 2004. Environmental Resources Center, Georgia Institute of Technology, 620 Cherry Street, Atlanta, GA 30332-0335.

(2) Method references for other radionuclides. When the identification and measurement of radionuclides other than those listed in 41.8(1)*"b"* are required, the following references shall be used, except in cases where alternative methods have been approved in accordance with 567—41.12(455B).

1. "Procedures for Radiochemical Analysis of Nuclear Reactor Aqueous Solutions," H. L. Krieger and S. Gold, EPA-R4-73-014, EPA, Cincinnati, Ohio 45268 (May 1973).

2. "HASL Procedure Manual," edited by John H. Harley. HASL 300, ERDA Health and Safety Laboratory, New York, NY (1973).

e. Monitoring requirements for gross alpha, radium-226, radium-228, and uranium.

(1) General.

1. Monitoring frequency and confirmation samples. The department may require more frequent monitoring than specified in this paragraph and may require confirmation samples at its discretion. The results of the initial and confirmation samples will be averaged for use in compliance determinations.

2. Monitoring period. Each PWS shall monitor during the time period specified in the operation permit.

(2) Applicability and sampling locations.

1. Existing systems and sources. All existing CWSs must sample at every SEP representative of all sources being used under normal operating conditions. Systems must take each sample at the same SEP sampling point, unless conditions make another alternate sampling point more representative of each source, or the department has designated a distribution system location, in accordance with this paragraph. The department must approve any alternate sampling point for radionuclides.

2. New systems and sources. All new CWSs or CWSs that use a new source of water must begin initial monitoring for the new system or source within the first calendar quarter after initiating use of the system or source. More frequent monitoring must be conducted by a CWS when required 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.

(3) Initial monitoring. Systems must conduct initial monitoring for gross alpha particle activity, radium-226, radium-228, and uranium as follows. If the average of the initial monitoring results for an SEP is above the MCL, a system must collect and analyze quarterly samples at that SEP until it has results from four consecutive quarters that are at or below the MCL unless it enters into another schedule as part of a formal compliance agreement with the department.

1. Systems without historical monitoring data. Systems without historical monitoring data must collect four consecutive quarterly samples at all SEP sampling points before December 31, 2007. The department may waive the final two quarters of initial monitoring from an SEP if the results of the samples from the previous two quarters are below the detection limit.

2. Systems with historical monitoring data and one SEP. Systems with only one SEP may use historical monitoring data collected between January 1, 2000, and December 31, 2003, from either the representative point in the distribution system or the SEP to satisfy the initial monitoring requirement.

3. Systems with historical SEP monitoring data and multiple SEPs. Systems with multiple SEPs that also have appropriate historical monitoring data for each SEP may use the monitoring data collected between January 1, 2000, and December 31, 2003, to satisfy the initial monitoring requirement.

4. Systems with historical distribution system monitoring data and multiple SEPs. Systems with appropriate historical data for a representative point in the distribution system and multiple SEPs may use the monitoring data collected between January 1, 2000, and December 31, 2003, provided that the department determines that the historical data satisfactorily demonstrates that each SEP is expected to be in compliance based upon the historical data and reasonable assumptions about the variability of contaminant levels between SEPs. The department must make a written finding indicating how the data conforms to these requirements in order for the data to satisfy the initial monitoring requirements.

(4) Reduced monitoring. The department may allow a CWS to reduce the future monitoring frequency from once every three years to once every six or nine years at each SEP, based on the following criteria. The samples collected during the reduced monitoring period must be used to determine the monitoring frequency for subsequent monitoring periods. If a system has a monitoring result that exceeds an MCL while on reduced monitoring, the system must collect and analyze quarterly samples at that SEP until it has results from four consecutive quarters that are below the MCL unless it enters into another schedule as part of a formal compliance agreement with the department.

1. Nine-year frequency. If the average of the initial monitoring results for each contaminant is below the radionuclide detection limits specified in this subrule, a system must collect and analyze for that contaminant using at least one sample at that SEP every nine years.

2. Six-year frequency. If the average of the initial monitoring results for gross alpha particle activity, uranium, and combined radium-226 and radium-228 is at or above the detection limit and at or below half the MCL for a contaminant, a system must collect and analyze for that contaminant using at least one sample at that SEP every six years. The analytical results for radium-226 and radium-228 must be added together to yield the combined result.

3. Three-year frequency. If the average of the initial monitoring results for gross alpha particle activity, uranium, and combined radium-226 and radium-228 is above half of the MCL and at or below the MCL for a contaminant, a system must collect and analyze for that contaminant using at least one sample at that SEP every three years. The analytical results for radium-226 and radium-228 must be added together to yield the combined result.

(5) Composite samples. To fulfill quarterly monitoring requirements for gross alpha particle activity, radium-226, radium-228, or uranium, a system may composite up to four consecutive quarterly samples from a single entry point if analysis is done within one year of the first sample. The analytical results from the composited samples will be considered by the department as the average analytical result to determine MCL compliance and to determine the future monitoring frequency. If the analytical result from the composited sample is greater than half of the MCL, the department may require additional quarterly samples from the system before the system will be allowed to sample under a reduced monitoring schedule.

(6) Data substitution using gross alpha particle activity results.

1. 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 15 pCi/L.

2. The gross alpha particle activity measurement shall have a confidence interval of 95 percent (1.65 sigma, where sigma is the standard deviation of the net counting rate of the sample) for uranium. When a system uses a gross alpha particle activity measurement in lieu of a uranium measurement, the gross alpha particle activity analytical result will be used to determine the future monitoring frequency

for uranium. If the gross alpha particle activity result is less than the detection limit, half the detection limit will be used to determine compliance and the future monitoring frequency.

f. Monitoring requirements for beta particle and photon emitters. To determine compliance with the radionuclide MCLs for beta particle and photon radioactivity, a system must monitor at a frequency specified in this paragraph.

(1) General.

1. Monitoring frequency and confirmation samples. The department may require more frequent monitoring than specified in this paragraph" and may require confirmation samples at its discretion. The results of the initial and confirmation samples will be averaged for use in compliance determinations.

2. Monitoring period. Each PWS shall monitor during the time period designated by the department in the operation permit.

(2) Systems designated by the department as vulnerable to man-made radioactivity.

1. Initial monitoring. Systems that have been determined by the department to be vulnerable to man-made radioactivity must collect quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each SEP, beginning within one quarter after being notified by the department of this requirement. Systems already required to conduct beta particle and photon radioactivity monitoring must continue to sample until the department removes the monitoring requirement.

2. Reduced monitoring. The department may reduce the monitoring frequency at that sampling point to once every three years, if the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at an SEP has an RAA (computed quarterly) of less than or equal to 50 pCi/L (screening level). Systems must collect all of the samples required in "1" of this subparagraph during the reduced monitoring period.

3. Data substitution. For a system in the vicinity of a nuclear facility, the department may allow the system to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at its SEP(s), where the department determines such data is applicable. In the event that there is a release from a nuclear facility, systems using surveillance data must begin monitoring at its SEP(s) in accordance with this subparagraph.

(3) Systems determined to utilize waters contaminated by effluents from nuclear facilities.

1. Initial monitoring. Systems designated by the department as utilizing water 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 SEP, beginning within one quarter after department notification. Systems already designated by the department as systems using waters contaminated by effluents from nuclear facilities must continue to sample until the department removes the sampling requirement.

- Gross beta particle activity. Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended.
- Iodine-131. A composite of five consecutive daily samples shall be analyzed once each quarter for iodine-131. The department may require more frequent monitoring when iodine-131 is identified in the finished water.
- Strontium-90 and tritium. Annual monitoring for strontium-90 and tritium shall be conducted either by analyzing a composite of four consecutive quarterly samples or by analyzing four quarterly samples. The latter is recommended.

2. Reduced monitoring. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at a sampling point has an RAA (computed quarterly) less than or equal to 15 pCi/L (screening level), the department may reduce the monitoring frequency at that sampling point to every three years. Systems must collect all samples required in this subparagraph during the reduced monitoring period.

3. Data substitution. For systems in the vicinity of a nuclear facility, the department may allow a CWS 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 such data is applicable. In the event that

there is a release from a nuclear facility, systems that are using surveillance data must begin monitoring at the CWS SEP in accordance with 41.8(1)*"f"*(2)"1."

(4) Monitoring frequency waiver. A CWS designated by the department to monitor for beta particle and photon radioactivity cannot apply to the department for a waiver from the monitoring frequencies in 41.8(1)*"f"*(2) or (3).

(5) CWSs may analyze for naturally occurring potassium-40 beta particle activity from the same or an 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.

(6) If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity exceeds the appropriate screening level, a sample analysis 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 41.8(1)*"b"*(2)"1," using the formula in 41.8(1)*"b"*(2)"2." Doses must also be calculated and summed for measured levels of tritium and strontium to determine compliance.

(7) Monitoring after an MCL violation. Systems must monitor monthly at the sampling point(s) that exceed the MCL in 41.8(1)*"b"*(2) beginning the month after the exceedance occurs. Systems must continue monthly monitoring until a system has established, by a rolling average of three monthly samples, that the MCL is being met. Systems that establish that the MCL is being met must return to quarterly monitoring until they meet the requirements of 41.8(1)*"f"*(2) or 41.8(1)*"f"*(3)"2."

41.8(2) Reserved.

567—41.9(455B) Special monitoring.

41.9(1) *Sodium special monitoring.* Suppliers of water for CWSs shall collect and have analyzed one sample per source or plant to determine the sodium concentration in the distribution system. Systems utilizing multiple wells that draw raw water from a single aquifer may, with departmental approval, be considered as one source for determining the minimum number of samples to be collected. Sampling frequency and approved analytical methods are as follows:

a. SW systems. Systems utilizing a SW source, in whole or in part, shall monitor for sodium at least once annually at the SEP.

b. GW systems. Systems utilizing GW sources shall monitor at least once every three years at the SEP.

c. Increased monitoring. Suppliers may be required to monitor more frequently where sodium levels are variable or if certain types of treatment are used, such as cation exchange softening.

d. Analytical methodology. Sodium analyses shall be performed in accordance with 41.3(1)*"e"*(1).

e. Reporting. The sodium level shall be reported to the public by at least one of the following methods:

(1) The CWS shall notify the appropriate local public health officials of the sodium levels by written notice by direct mail within three months of receipt of the analytical results. A copy of each notice required by this subrule shall be sent to the department within ten days of its issuance.

(2) In lieu of the reporting requirement in this paragraph, the CWS shall include the sodium level in its annual consumer confidence report, pursuant to 567—subparagraph 40.7(4)*"a"*(11).

f. CWSs using cation exchange treatment. CWS utilizing cation exchange treatment shall to collect one sodium sample of the finished water per year after all treatment. Analysis and reporting must be done in accordance with this subrule.

41.9(2) *Ammonia special monitoring.* Ammonia in GW is a precursor to the development of nitrite and nitrate in a drinking water system, which are both contaminants with acute health effects. This subrule lists the ammonia analytical methodology, sample preservation requirements, and holding times to be used for drinking water samples.

a. Analytical methodology. Analyses for ammonia shall be performed in accordance with the following methodology, with a detection limit of 0.1 mg/L ammonia as N:

Analytical Methodology for Ammonia

Methodology	EPA[1]	SM (20th edition)	ASTM	USGS[2]	Other
Manual distillation at pH 9.5[4], followed by:	350.2	4500-NH3 B			973.49[3]
Titration	350.2				
Manual electrode	350.3	4500-NH3 D or E	D1426-93(B)		
Automated phenate	350.1	4500-NH3 G		I-4523-85	
Automated electrode					See note 5

[1] "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, Revised March 1983 and 1979 where applicable.

[2] Fishman, M.J., et al., "Methods for Analysis of Inorganic Substances in Water and Fluvial Sediments," U.S. Department of the Interior, Techniques of Water—Resource Investigations of the USGS, Denver, CO, Revised 1989, unless otherwise stated.

[3] "Official Methods of Analysis of the Association of Official Analytical Chemists," 15th edition, 1990.

[4] Manual distillation is not required if the samples are very low in turbidity; however, manual distillation should be used whenever matrix interferences could be present in the sample, and will be required to resolve any controversies.

[5] Ammonia, Automated Electrode Method, Industrial Method Number 379-75 WE, February 19, 1976, Bran & Luebbe (Technicon) Auto Analyzer II, Bran & Luebbe Analyzing Technologies, Inc., Elmsford, NY 10523.

b. Sample preservation and holding time. Systems must collect a 500 mL grab sample into a plastic or glass bottle. The sample must be acidified at the time of collection to a pH of less than 2 by the addition of sulfuric acid (H_2SO_4) and refrigerated at 4 degrees Celsius. The sample must be analyzed within 28 days. If the sample is analyzed within 24 hours of collection, the sample acidification is not required.

567—41.10(455B) Department analytical results used to determine compliance. Analytical results or other information compiled by departmental staff may be used to determine compliance with the MCLs, TTs, or ALs in this chapter or 567—Chapter 43 or for initiating remedial action with respect to these violations.

567—41.11(455B) Other monitoring.

41.11(1) *Monitoring of interconnected PWS.* When a PWS system supplies water to one or more other PWSs, the department may modify the monitoring requirements imposed by this chapter to the extent that the interconnection of the systems justifies treating them as a single system for monitoring purposes. Any modified monitoring shall be conducted pursuant to a schedule specified by the department and concurred with by the EPA administrator.

41.11(2) *Monitoring of other contaminants.* If the department determines that other contaminants are present in a PWS, and the contaminants are known to pose, or scientific evidence strongly suggests that they pose, a threat to human health, a water supply may be required to monitor for such contaminants. The water supply will monitor at a frequency and in a manner which will adequately identify the magnitude and extent of the contamination. The monitoring frequency and sampling location will be determined by the department. All analytical results will be obtained using EPA-approved methods and submitted to the department for review and evaluation. Any monitoring required under this paragraph will be incorporated into an operation permit or an order.

These rules are intended to implement Iowa Code sections 455B.171 through 455B.188 and 455B.190 through 455B.192.