

CHAPTER 41  
WATER SUPPLIES

[These rules transferred from Health Department, 1971 IDR (Title II, Chs 1 and 2)]

[Prior to 7/1/83, DEQ Ch 22]

[Prior to 12/3/86, Water, Air and Waste Management[900]]

**567—41.1(455B) Primary drinking water regulations—coverage.** 567—Chapters 40 through 44 and 83 shall apply to each public water supply system, unless the public water supply system 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 public water supply system 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 levels (MCL) and monitoring requirements.**

**41.2(1) Coliforms, fecal coliforms and *E. coli*.**

*a. Applicability.* These rules apply to all public water supply systems.

*b. Maximum contaminant levels (MCL) for total coliforms, fecal coliforms, and *E. coli*.* The MCL is based on the presence or absence of total coliforms in a sample.

(1) Nonacute coliform bacteria MCL.

1. For a system which collects 40 samples or more per month, no more than 5.0 percent of the samples collected during a month may be total coliform-positive. A nonacute total coliform bacteria MCL violation occurs when more than 5.0 percent of routine and repeat samples collected during a month are total coliform-positive, but are not fecal coliform-positive or *E. coli*-positive.

2. For a system which collects less than 40 samples per month, no more than one sample collected during a month may be total coliform-positive. A nonacute total coliform bacteria MCL violation occurs when two or more routine and repeat samples collected during a month are total coliform-positive, but are not fecal coliform-positive or *E. coli*-positive.

(2) Acute coliform bacteria MCL. Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or *E. coli*-positive routine sample constitutes a violation of the MCL for total coliforms. For purposes of the public notification requirements in 567—42.1(455B), this is a violation that may pose an acute risk to health.

(3) MCL compliance period. Compliance of a system with the MCL for total coliforms in 41.2(1)“b”(1) and (2) is based on each month in which the system is required to monitor for total coliforms.

(4) Compliance determination. Results of all routine and repeat samples not invalidated by the department or laboratory must be included in determining compliance with the MCL for total coliforms. 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.

*c. Monitoring requirements.*

(1) Routine total coliform monitoring.

1. Public water supply systems must collect total coliform samples at sites which are representative of water throughout the distribution system according to a written sample siting plan. The plan shall be reviewed or updated by the public water supply system every two years and shall be retained on file at the facility. Major elements of the plan shall include, but are not limited to, a map of the distribution system, notation or a list of routine sample location(s) for each sample period, resample locations for each routine sample, and a log of samples taken. The plan must be made available to the department upon request and during sanitary surveys and must be revised by the system as directed by the department.

2. The public water supply system must collect samples at regular time intervals throughout the month, except that a system which uses only groundwater that is not under the direct influence of surface

water and which is required to collect five or fewer routine coliform bacteria samples per month may collect all required samples on a single day if they are taken from different sites. A system that uses only groundwater and adds a chemical disinfectant or provides water with a disinfectant must measure the residual disinfectant concentration at the same points in the distribution system and at the same time as total coliform bacteria samples are collected. A system that uses surface water or IGW must comply with the requirements specified in 567—paragraph 43.5(4) “b”(2)“2.” 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 42.4(3).

3. Community water systems and specific noncommunity systems. The monitoring frequency for total coliforms for community water systems and noncommunity water systems serving schools, to include preschools and child care facilities or serving public water systems owned or managed by state agencies, such as state parks and rest areas, is based on the population served by the system as listed below, until June 29, 1994. Public water systems which do not collect five or more routine samples each month must undergo an initial sanitary survey by June 29, 1994. After June 29, 1994, the monitoring frequency for systems serving less than 4,101 persons shall be a minimum of five routine samples per month unless the department determines, after completing sanitary surveys (at intervals not to exceed five years), that the monitoring frequency may continue as listed below. The monitoring frequency for regional water systems shall be as listed in 41.2(1) “c”(1)“4” but in no instance less than that required by the population equivalent served.

TOTAL COLIFORM MONITORING FREQUENCY FOR COMMUNITY  
WATER SYSTEMS AND NONCOMMUNITY (SCHOOL) WATER SYSTEMS

<u>Population Served</u>	<u>Minimum Number of Samples Per Month</u>
25 to 1,000*	1
1,001 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8
7,601 to 8,500	9
8,501 to 12,900	10
12,901 to 17,200	15
17,201 to 21,500	20
21,501 to 25,000	25
25,001 to 33,000	30
33,001 to 41,000	40
41,001 to 50,000	50
50,001 to 59,000	60
59,001 to 70,000	70
70,001 to 83,000	80
83,001 to 96,000	90
96,001 to 130,000	100

130,001 to 220,000	120
220,001 to 320,000	150
320,001 to 450,000	180
450,001 to 600,000	210
600,001 to 780,000	240
780,001 to 970,000	270

\*Includes public water supply systems which have at least 15 service connections, but serve fewer than 25 persons

4. Regional water systems. The supplier of water for a regional water system as defined in rule 567—40.2(455B) shall sample for coliform bacteria at a frequency indicated in the following chart until June 29, 1994, but in no case shall the sampling frequency for a regional water system be less than as set forth in 41.2(1)“c”(1)“3” based on the population equivalent served. Public water systems which do not collect five or more routine samples each month must undergo an initial sanitary survey by June 29, 1994. After June 29, 1994, the monitoring frequency of systems with less than 82 miles of pipe shall be a minimum of five routine samples per month unless the department determines, after completing sanitary surveys (at intervals not exceeding five years), that the monitoring frequency may continue as listed below. The following chart represents sampling frequency per miles of distribution system and is determined by calculating one-half the square root of the miles of pipe.

TOTAL COLIFORM MONITORING FREQUENCY FOR  
REGIONAL WATER SYSTEMS

<u>Miles of Pipe</u>	<u>Minimum Number of Samples Per Month</u>
0 - 9	1
10 - 25	2
26 - 49	3
50 - 81	4
82 - 121	5
122 - 169	6
170 - 225	7
226 - 289	8
290 - 361	9
362 - 441	10
442 - 529	11
530 - 625	12
626 - 729	13
730 - 841	14
842 - 961	15
962 - 1,089	16
1,090 - 1,225	17
1,226 - 1,364	18
1,365 - 1,521	19
1,522 - 1,681	20
1,682 - 1,849	21
1,850 - 2,025	22
2,026 - 2,209	23

2,210 - 2,401	24
2,402 - 2,601	25
2,602 - 3,249	28
3,250 - 3,721	30
3,722 - 4,489	33
greater than 4,489	35

5. Noncommunity water systems. The monitoring frequency for total coliforms for noncommunity water systems is as listed in the four unnumbered paragraphs below until June 29, 1999. Public water systems which do not collect five or more routine samples each month must undergo an initial sanitary survey by June 29, 1999. After June 29, 1999, the minimum number of samples shall be five routine samples per month unless the department determines, after completing sanitary surveys (at intervals not exceeding five years), that the monitoring frequency may continue as listed below. A noncommunity water system using only groundwater (except groundwater under the direct influence of surface water, as defined in 567—paragraph 43.5(1)“b”) and serving 1,000 persons or fewer must monitor each calendar quarter that the system provides water to the public. Systems serving more than 1,000 persons during any month must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)“c”(1)“3.”

A noncommunity water system using surface water, in total or in part, must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)“c”(1)“3,” regardless of the number of persons it serves.

A noncommunity water system using groundwater under the direct influence of surface water, as defined in 567—paragraph 43.5(1)“b,” must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)“c”(1)“3,” regardless of the number of persons it serves. The system must begin monitoring at this frequency beginning six months after the department determines that the groundwater is under the direct influence of surface water.

A noncommunity water system serving schools or daycares must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)“c”(1)“3.”

A noncommunity water system owned or managed by a state agency, such as a park or rest area, must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)“c”(1)“3.”

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

7. Special purpose samples, such as those taken to determine whether disinfection practices are sufficient following pipe placement, replacement, or repair, shall not be used to determine compliance with the MCL for total coliforms in 41.2(1)“b.” Repeat samples taken pursuant to 41.2(1)“c”(2) are not considered special purpose samples and must be used to determine compliance with the MCL for total coliforms in 41.2(1)“b.”

(2) Repeat total coliform monitoring.

1. Repeat sample time limit and numbers. If a routine sample is total coliform-positive, the public water supply system must collect a set of repeat samples within 24 hours of being notified of the positive result and in no case more than 24 hours after being notified by the department. A system which collects more than one routine sample per month must collect no fewer than three repeat samples for each total coliform-positive sample found. A system which collects one routine sample per month or fewer must collect no fewer than four repeat samples for each total coliform-positive sample found. The department may extend the 24-hour limit on a case-by-case basis if the system has a logistical problem in collecting the repeat samples within 24 hours that is beyond its control. In those cases, the public water supply system must report the circumstances to the department no later than the end of the next business day after receiving the notice to repeat sample and initiate the action directed by the department. In the case of an extension, the department will specify how much time the system has to collect the repeat samples.

2. Repeat sample location(s). The system must collect at least one repeat sample from the sampling tap where the original total coliform-positive sample was taken, at least one repeat sample at a tap within five service connections upstream and at least one repeat sample at a tap within five service connections downstream of the original sampling site. If a total coliform-positive sample is at the end of the distribution system, or at the first or last service connection, the system will be required to collect the repeat samples from the original sampling site and locations only upstream or downstream.

3. The system must collect all repeat samples on the same day, except that the department may allow a system with a single service connection to collect the required set of repeat samples over a four-day period. "System with a single service connection" means a system which supplies drinking water to consumers through a single service line.

4. Additional repeat sampling. If one or more repeat samples in the set is total coliform-positive, the public water supply system must collect an additional set of repeat samples in the manner specified in 41.2(1) "c"(2)"1" to 41.2(1) "c"(2)"3." The system must repeat this process until either total coliforms are not detected in one complete set of repeat samples or the system determines that the MCL for total coliforms in 41.2(1) "b" has been exceeded, notifies the department, and provides public notification to its users in accordance with 567—42.1(455B).

5. If a system collecting fewer than five routine samples per month has one or more total coliform-positive samples and the department does not invalidate the sample(s) under 41.2(1) "c"(3), it must collect at least five routine samples during the next month the system provides water to the public. For systems monitoring on a quarterly basis, the additional five routine samples may be required to be taken within the same quarter in which the original total coliform-positive sample occurred.

The department may waive the requirement to collect five routine samples the next month the system provides water to the public if the department has determined through an on-site visit the reason that the sample was total coliform-positive and establishes that the system has corrected the problem or will correct the problem before the end of the next month the system serves water to the public. In this case, the department must document this decision to waive the following month's additional monitoring requirement in writing, have it approved and signed by the supervisor of the water supply section and the department official who recommends such a decision, and make this document available to the EPA and public. The written documentation will generally be provided by the public water supply system in the form of a request and must describe the specific cause of the total coliform-positive sample and what action the system has taken to correct the problem. The department will not waive the requirement to collect five routine samples the next month the system provides water to the public solely on the grounds that all repeat samples are total coliform-negative. If the requirement to collect five routine samples is waived under this paragraph, a system must still take at least one routine sample before the end of the next month it serves water to the public and use it to determine compliance with the MCL for total coliforms in 41.2(1) "b."

(3) Invalidation of total coliform samples. A total coliform-positive sample invalidated under this subparagraph does not count towards meeting the minimum monitoring requirements of 41.2(1) "c." The department may invalidate a total coliform-positive sample only if one or more of the following conditions are met.

1. The laboratory establishes that improper sample analysis caused the total coliform-positive result. 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 (e.g., the multiple tube fermentation technique), produces a turbid culture in the absence of an acid reaction in the presence-absence (P-A) coliform test, or exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter (e.g., membrane filter technique). If a laboratory invalidates a sample because of such interference, the system must collect another sample from the same location as the original sample within 24 hours of being notified of the interference problem, and have it analyzed for the presence of total coliforms. The system must continue to resample within and have the samples analyzed until it obtains a valid result. The department may waive the 24-hour time limit on a case-by-case basis.

2. The department, on the basis of the results of repeat samples collected as required by 41.2(1) "c"(2)"1" to "4," determines that the total coliform-positive sample resulted from a domestic or other nondistribution system plumbing problem. "Domestic or other nondistribution system plumbing problem" means a coliform contamination problem in a public water supply system with more than one service connection that is limited to the specific service connection from which the coliform-positive sample was taken. The department will not invalidate a sample on the basis of repeat sample results unless all repeat samples collected at the same tap as the original total coliform-positive sample are also total coliform-positive, and all repeat samples collected within five service connections of the original tap are total coliform-negative (e.g., the department will not invalidate a total coliform-positive sample on the basis of repeat samples if all the repeat samples are total coliform-negative, or if the public water supply system has only one service connection).

3. The department has substantial grounds to believe that a total coliform-positive result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case, the system must still collect all repeat samples required under 41.2(1) "c"(2)"1" to "4," and use them to determine compliance with the MCL for total coliforms in 41.2(1) "b." To invalidate a total coliform-positive sample under this paragraph, the decision with the rationale for the decision must be documented in writing and approved and signed by the supervisor of the water supply section and the department official who recommended the decision. The department must make this document available to EPA and the public. The written documentation generally provided by the public water supply system in the form of a request must state the specific cause of the total coliform-positive sample, and what action the system has taken to correct this problem. The department will not invalidate a total coliform-positive sample solely on the grounds of poor sampling technique or that all repeat samples are total coliform-negative.

(4) Fecal coliforms/*Escherichia coli* (*E. coli*) testing.

1. If any routine or repeat sample is total coliform-positive, the system must analyze that total coliform-positive culture medium to determine if fecal coliforms are present, except that the system may test for *E. coli* in lieu of fecal coliforms.

2. The department may allow a public water supply system, on a case-by-case basis, to forego fecal coliform or *E. coli* on a total coliform-positive sample if that system assumes that the total coliform-positive sample is fecal coliform-positive or *E. coli*-positive. Accordingly, the system must notify the department as specified in 41.2(1) "c"(5)"1" and meet the provisions of 567—42.1(455B) pertaining to public notification.

(5) Public water supply system's response to violation.

1. A public water supply system which has exceeded the MCL for total coliforms in 41.2(1) "b" must report the violation to the water supply section of the department by telephone no later than the end of the next business day after it learns of the violation, and notify the public in accordance with 567—42.1(455B).

2. A public water supply system which has failed to comply with a coliform monitoring requirement must report the monitoring violation to the department within ten days after the system discovers the violation and notify the public in accordance with 567—42.1(455B).

3. If fecal coliforms or *E. coli* are detected in a routine or repeat sample, the system must notify the department by telephone by the end of the day when the system is notified of the test result, unless the system is notified of the result after the department office is closed, in which case the system must notify the department before the end of the next business day. If the detection of fecal coliform or *E. coli* in a sample causes a violation of the MCL, the system is required to notify the public in accordance with 567—42.1(455B).

d. *Best available technology (BAT)*. The U.S. EPA identifies, and the department has adopted, the following as the best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant level for total coliforms in 41.2(1) "b."

(1) Well protection. Protection of wells from contamination by coliforms by appropriate placement and construction;

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

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

(4) Filtration or disinfection. Filtration and disinfection of surface water or groundwater under the direct influence of surface water in accordance with 567—43.5(455B) or disinfection of groundwater using strong oxidants such as, but not limited to, chlorine, chlorine dioxide, or ozone.

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

*e. Analytical methodology.*

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

(2) Presence/absence determination. Public water supply systems shall determine the presence or absence of total coliforms. A determination of total coliform density is not required.

(3) Total coliform bacteria analytical methodology. Public water supply systems must conduct total coliform analyses in accordance with one of the analytical methods in the following table:

Organism	Methodology <sup>12</sup>	Citation <sup>1</sup>
Total Coliforms <sup>2</sup>	Total Coliform Fermentation Technique <sup>3,4,5</sup>	9221A, B
	Total Coliform Membrane Filter Technique <sup>6</sup>	9222A, B, C
	Presence-Absence (P-A) Coliform Test <sup>5,7</sup>	9221D
	ONPG-MUG Test <sup>8</sup>	9223
	Colisure Test <sup>9</sup>	
	E*Colite Test <sup>10</sup>	
	m-ColiBlue <sub>24</sub> Test <sup>11</sup>	
	ReadyCult Coliforms 100 Presence/Absence Test <sup>13</sup>	
	Membrane Filter Technique Using Chromocult Coliform Agar <sup>14</sup>	
Colitag Test <sup>15</sup>		

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents listed in footnotes 1, 6, 8, 9, 10, 11, 13, 14, and 15 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at (800)426-4791. Documents may be inspected at EPA's Drinking Water Docket, EPA West, 1301 Constitution Avenue NW, Room B102, Washington, DC 20460, telephone (202)566-2426; or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC 20408.

<sup>1</sup>Methods 9221A, B; 9222A, B, C; 9221D; and 9223 are contained in Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, 19th edition, 1995, or 20th edition, 1998, American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005. The cited methods published in any of these three editions may be used.

<sup>2</sup>The time from sample collection to initiation of the analysis may not exceed 30 hours. Systems are encouraged but not required to hold samples below 10 degrees Celsius during transit.

<sup>3</sup>Lactose broth, as commercially available, may be used in lieu of lauryl tryptose broth, if the system conducts at least 25 parallel tests between this medium and lauryl tryptose broth using the water normally tested, and this comparison demonstrates that the false-positive rate and false-negative rate for total coliforms, using lactose broth, is less than 10 percent.

<sup>4</sup>If inverted tubes are used to detect gas production, the media should cover these tubes at least one-half to two-thirds after the sample is added.

<sup>5</sup>No requirement exists to run the completed phase on 10 percent of all total coliform-positive confirmed tubes.

<sup>6</sup>MI agar also may be used. Preparation and use of MI agar is set forth in the article, "New medium for the simultaneous detection of total coliform and *Escherichia coli* in water," by Brenner, K.P., et al., 1993, Applied Environmental Microbiology 59:3534-3544. Also available from the Office of Water Resource Center (RC-4100), 401 M Street SW, Washington, DC 20460, EPA 600/J-99/225.

<sup>7</sup>Six-times formulation strength may be used if the medium is filter-sterilized rather than autoclaved.

<sup>8</sup>The ONPG-MUG Test is also known as the Autoanalysis Colilert System.

<sup>9</sup>The Colisure Test may be read after an incubation time of 24 hours. A description of the Colisure Test, February 28, 1994, may be obtained from IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, ME 04092.

<sup>10</sup>A description of the E\*Colite Test, "Presence/Absence for Coliforms and *E. Coli* in Water," December 21, 1997, is available from Charm Sciences, Inc., 25 Franklin Street, Malden, MA 02148-4120.

<sup>11</sup>A description of the m-ColiBlue24 Test, August 17, 1999, is available from the Hach Company, 100 Dayton Avenue, Ames, IA 50010.

<sup>12</sup>The department strongly recommends that laboratories evaluate the false-positive and false-negative rates for the method(s) they use for monitoring total coliforms. It also encourages laboratories to establish false-positive and false-negative rates within their own laboratory and sample matrix (drinking water or source water) with the intent that if the method chosen has an unacceptable false-positive or false-negative rate, another method may be used. The department suggests that laboratories perform these studies on a minimum of 5 percent of all total coliform-positive samples, except for those methods for which verification/confirmation is already required, e.g., the M-Endo and LES Endo Membrane Filter Tests, Standard Total Coliform Fermentation Technique, and Presence-Absence Coliform Test. Methods for establishing false-positive and false-negative rates may be based on lactose fermentation, the rapid test for beta-galactosidase and cytochrome oxidase, multitest identification systems, or equivalent confirmation tests. False-positive and false-negative information is often available in published studies or from the manufacturer(s).

<sup>13</sup>The ReadyCult Coliforms 100 Presence/Absence Test is described in the document, "ReadyCult Coliforms 100 Presence/Absence Test for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Finished Waters," November 2000, Version 1.0, available from EM Science, 480 S. Democrat Road, Gibbstown, NJ 08027-1297, telephone: (800)222-0342, E-mail address: [adellenbusch@emscience.com](mailto:adellenbusch@emscience.com).

<sup>14</sup>Membrane Filter Technique using Chromocult Coliform Agar is described in the document, "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, available from EM Science, 480 S. Democrat Road, Gibbstown, NJ 08027-1297, telephone: (800)222-0342, E-mail address: [adellenbusch@emscience.com](mailto:adellenbusch@emscience.com).

<sup>15</sup>Colitag product for the determination of the presence/absence of total coliforms and *E. coli* is described in "Colitag Product as a Test for Detection and Identification of Coliforms and *E. coli* Bacteria in Drinking Water and Source Water as Required in National Primary Drinking Water Regulations," August 2001, available from CPI International, Inc., 5580 Skylane Blvd., Santa Rosa, CA 95403, telephone: (800)878-7654, Internet address: [www.cpiinternational.com](http://www.cpiinternational.com).

(4) Rescinded IAB 8/11/99, effective 9/15/99.

(5) Fecal coliform analytical methodology. Public water systems must conduct fecal coliform analysis in accordance with the following procedure. When the MTF Technique or presence-absence (P-A) coliform test is used to test for total coliforms, shake the lactose-positive presumptive tube or P-A bottle vigorously and transfer the growth with a sterile 3-mm loop or sterile applicator stick into brilliant green lactose bile broth and EC medium to determine the presence of total and fecal coliforms, respectively. For EPA-approved analytical methods which use a membrane filter, transfer the total coliform-positive culture by one of the following methods: remove the membrane containing the total coliform colonies from the substrate with sterile forceps and carefully curl and insert the membrane into a tube of EC medium (the laboratory may first remove a small portion of selected colonies for verification); swab the entire membrane filter surface with a sterile cotton swab and transfer the inoculum to EC medium (do not leave the cotton swab in the EC medium); or inoculate individual total coliform-positive colonies into EC medium. Gently shake the inoculated EC tubes to ensure adequate mixing and incubate in a waterbath at 44.5 ( + or - ) 0.2 degrees C for 24 ( + or - ) 2 hours. Gas production of any amount in the inner fermentation tube of the EC medium indicates a positive fecal coliform test. The preparation of EC medium is described in Method 9221E (paragraph 1a) in Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, 19th edition, 1995, and 20th edition, 1998; the cited method in any one of these three editions may be used. Public water supply systems need only determine the presence or absence of fecal coliforms; a determination of fecal coliform density is not required.

(6) *E. coli* analytical methodology. Public water systems must conduct analysis of *Escherichia coli* (*E. coli*) in accordance with one of the following analytical methods:



1. EC medium supplemented with 50 micrograms per milliliter of 4-methylumbelliferyl-beta-D-glucuronide (MUG) (final concentration), as described in Method 9222G in Standard Methods for the Examination of Water and Wastewater, 19th edition (1995) and 20th edition (1998). Either edition may be used. Alternatively, the 18th edition (1992) may be used if at least 10 mL of EC medium, as previously described in subparagraph 41.2(1)“e”(5), is supplemented with 50 micrograms/mL of MUG before autoclaving. The inner inverted fermentation tube may be omitted. If the 18th edition is used, apply the procedure in subparagraph 41.2(1)“e”(5) for transferring a total coliform-positive culture to EC medium supplemented with MUG, incubate the tube at 44.5 plus or minus 0.2 degrees Celsius for 24 plus or minus 2 hours, and then observe fluorescence with an ultraviolet light (366 nm) in the dark. If fluorescence is visible, *E. coli* are present.

2. Nutrient agar supplemented with 100 micrograms per mL 4-methylumbelliferyl-beta-D-glucuronide (MUG) (final concentration). Nutrient agar is described in Method 9222G in Standard Methods for the Examination of Water and Wastewater, 19th edition (1995) and 20th edition (1998). Either edition may be used for determining if a total coliform-positive sample, as determined by a membrane filter technique, contains *E. coli*. Alternatively, the 18th edition (1992) may be used if the membrane filter containing a total coliform-positive colony(ies) is transferred to nutrient agar, as described in Method 9221B (paragraph 3) of Standard Methods (18th edition), supplemented with 100 micrograms/mL of MUG. If the 18th edition is used, incubate the agar plate at 35 degrees Celsius for 4 hours and then observe the colony(ies) under ultraviolet light (366 nm) in the dark for fluorescence. If fluorescence is visible, *E. coli* is present.

3. Minimal Medium ONPG-MUG (MMO-MUG) Test, as set forth in the article “National Field Evaluation of a Defined Substrate Method for the Simultaneous Detection of Total Coliforms and *Escherichia coli* from Drinking Water: Comparisons with Presence-Absence Techniques” (Edberg et al.), Applied and Environmental Microbiology, Volume 55, pp. 1003-1008, April 1989. (Note: The Autoanalysis Colilert System is an MMO-MUG test.) If the MMO-MUG Test is total coliform-positive after a 24-hour incubation, test the medium for fluorescence with a 366-nm ultraviolet light (preferably with a 6-watt lamp) in the dark. If fluorescence is observed, the sample is *E. coli*-positive. If fluorescence is questionable (cannot be definitively read) after 24 hours incubation, incubate the culture for an additional 4 hours (but not to exceed 28 hours total), and again test the medium for fluorescence. The MMO-MUG Test with hepes buffer is the only approved formulation for the detection of *E. coli*.

4. The membrane filter method with MI agar, as described in footnote 6 of the Total Coliform Methodology Table in 41.2(1)“e”(3).

5. E\*Colite Test, as described in footnote 10 of the Total Coliform Methodology Table in 41.2(1)“e”(3).

6. m-ColiBlue 24 Test, as described in footnote 11 of the Total Coliform Methodology Table in 41.2(1)“e”(3).

7. Colisure Test, as described in footnote 9 of the Total Coliform Methodology Table in 41.2(1)“e”(3).

8. ReadyCult Coliforms 100 Presence/Absence Test, as described in footnote 13 of the Total Coliform Methodology Table in 41.2(1)“e”(3).

9. Membrane Filter Technique using Chromocult Coliform Agar, as described in footnote 14 of the Total Coliform Methodology Table in 41.2(1)“e”(3).

10. Colitag, as described in footnote 15 of the Total Coliform Methodology Table in 41.2(1)“e”(3).

(7) Optional *E. coli* analytical methodology. As an option to 41.2(1)“e”(6) a system with a total coliform-positive, MUG-negative, MMO-MUG Test may further analyze the culture for the presence of *E. coli* by transferring a 0.1 mL, 28-hour MMO-MUG culture to EC Medium + MUG with a pipette. The formulation and incubation conditions of EC Medium + MUG and observation of the results are described in 41.2(1)“e”(6).

**41.2(2) *Giardia*.** Reserved.

**41.2(3) *Heterotrophic plate count bacteria (HPC)*.**

*a. Applicability.* All public water systems that use a surface water source or source under the direct influence of surface water must provide treatment consisting of disinfection, as specified

in 567—subrule 43.5(2), and filtration treatment which complies with 567—subrule 43.5(3). The heterotrophic plate count is an alternate method to demonstrate a detectable disinfectant residual in accordance with 567—paragraph 43.5(2)“d.”

b. *Maximum contaminant levels.* Reserved.

c. *Monitoring requirements.* Reserved.

d. *BAT.* Reserved.

e. *Analytical methodology.* Public water systems shall conduct heterotrophic plate count bacteria analysis in accordance with 567—subrule 43.5(2) and the following analytical method. Measurements for heterotrophic plate count bacteria must be conducted by a laboratory certified by the department to do such analysis, when heterotrophic plate count bacteria are being measured in lieu of a detectable residual disinfectant pursuant to 567—paragraph 43.5(2)“d.” In addition, the time from sample collection to initiation of analysis may not exceed eight hours, and the systems must hold the samples below 10 degrees Celsius during transit to the laboratory.

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

1. Method 9215B Pour Plate Method, Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, 19th edition, 1995, or 20th edition, 1998. The cited method in any of the three editions 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, telephone (800)321-0207.

(2) Reporting. The public water system shall report the results of heterotrophic plate count in accordance with 567—subparagraph 42.4(3)“c”(2).

**41.2(4) Macroscopic organisms and algae.**

a. *Applicability.* These rules apply to both community and noncommunity public water supply systems using surface water or groundwater under direct influence of surface water as defined by 567—subrule 43.5(1).

b. *Maximum contaminant levels (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 milliliter or 10 percent of the total cells found in the raw water, whichever is greater.

c. *Monitoring requirements.* Reserved.

d. *BAT.* Reserved.

e. *Analytical methodology.* Measurement of the algal cells shall be in accordance with Method 10200F: Phytoplankton Counting Techniques, Standard Methods for the Examination of Water and Wastewater, 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. [ARC 9915B, IAB 12/14/11, effective 1/18/12]

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

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

a. *Applicability.* Maximum contaminant levels for inorganic contaminants (IOCs) specified in 41.3(1)“b” apply to community water systems and nontransient noncommunity water systems as specified herein. The maximum contaminant level specified for fluoride applies only to community water systems and nontransient noncommunity systems which primarily serve children (child care facilities and schools). The maximum contaminant levels specified for nitrate, nitrite, and total nitrate and nitrite apply to community, nontransient noncommunity, and transient noncommunity water systems. At the discretion of the department, nitrate levels not to exceed 20.0 mg/L may be allowed in a noncommunity water system if the supplier of water demonstrates to the satisfaction of the department that:

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

(2) The system is meeting the public notification requirements of rule 567—42.1(455B), including continuous posting of the fact that nitrate levels exceed 10 mg/L and the potential health effects of exposure; and

(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 41 and 42: county board of health, county health department, county sanitarian, county public health administrator, and Iowa department of public health; and

(4) No adverse health effects shall result.

The requirements also contain monitoring requirements, best available technology (BAT) identification, and analytical method requirements pursuant to 41.3(1)“c,” and 567—paragraphs 41.3(1)“e” and 43.3(10)“b,” respectively.

*b. Maximum contaminant levels for inorganic chemicals (IOCs).*

(1) IOC MCLs. The following table specifies the MCLs for IOCs:

Contaminant	EPA Contaminant Code	Maximum Contaminant Level (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 arsenic MCL changed from 0.05 mg/L to 0.010 mg/L on January 23, 2006.

\*\*The recommended fluoride level is 1.1 milligrams per liter or the level as calculated from “Water Fluoridation, a Manual for Engineers and Technicians” Table 2-4 published by the U.S. Department of Health and Human Services, Public Health Service (September 1986). 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. Compliance with 41.3(1)“b”(1) shall be determined based on the analytical result(s) obtained at each source/entry point. When the department requires a system to collect nitrate or nitrite samples in its distribution system, compliance with 41.3(1)“b”(1) shall also be determined based on 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 (e.g., monthly or quarterly). For public water supply systems which are conducting monitoring at a frequency greater than annual, compliance with the maximum contaminant levels for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium, and thallium is determined by a running annual average at any sampling point. If the average at any sampling point is greater than the MCL, then the system is out of compliance. If any one sample would cause the annual average to be exceeded, then the system is out of compliance immediately. Any sample below the method detection limit shall be calculated at zero

for the purpose of determining the annual average. If a system fails to collect the required number of samples, compliance (average concentration) will be based on the total number of samples collected.

2. Sampling frequencies of annual or less. For public water supply systems which are monitoring annually, or less frequently, the system is out of compliance with the maximum contaminant levels 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 determination of compliance 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. Compliance calculations for nitrate and nitrite. Compliance with the maximum contaminant levels for nitrate and nitrite 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 as deemed necessary to protect the public health, including public notification requirements and earlier compliance dates than indicated in rule. When a system is not in compliance with an MCL as determined in subparagraph 41.3(1) "b"(2), the supplier of the water shall notify the department according to 567—subrule 42.4(1) and give notice to the public according to 567—42.1(455B).

*c. Inorganic chemicals—monitoring requirements.*

(1) Routine IOC monitoring (excluding asbestos, nitrate, and nitrite). Community public water supply systems and nontransient noncommunity water systems shall conduct monitoring to determine compliance with the MCLs specified in 41.3(1) "b" in accordance with this subrule. Transient noncommunity water systems shall conduct monitoring to determine compliance with the nitrate and nitrite maximum contaminant levels in 41.3(1) "b" as required by 41.3(1) "c"(5) and (6). All new systems or systems that use a new source of water must demonstrate compliance with the MCLs specified in 41.3(1) "b" within a period of time specified by the department. The system must also comply with the initial sampling frequencies specified by the department to ensure the system can demonstrate compliance with the MCLs. Routine and increased monitoring frequencies shall be conducted in accordance with the requirements in paragraph 41.3(1) "c." A source of water that is determined by the department to be a new source/entry point is considered to be a new source for the purposes of this rule.

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

1. Groundwater sampling points. Groundwater 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) beginning in the compliance period starting January 1, 1993. 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.

2. Surface water sampling points. Surface water systems shall take a minimum of one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point which is representative of each source after treatment (hereafter called a source/entry point) beginning in the compliance period starting January 1, 1993. (For purposes of this paragraph, surface water systems include systems with a combination of surface and ground sources.) 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.

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

4. Composite sampling. The department may reduce the total number of samples which must be analyzed by the use of 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 method used for analysis is less than one-fifth of the MCL. Compositing of samples 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 inorganic chemical, then a follow-up sample must be taken within 14 days at each sampling point included in the composite. These samples must be analyzed for the contaminants which 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 these duplicates instead of resampling, provided the holding time of the duplicate samples is not exceeded. The duplicate must be analyzed and the results reported to the department within 14 days after completing analysis of the composite sample. If the population served by the system is greater than 3,300 persons, then compositing may only be permitted by the department as sampling points within a single system. In systems serving less than or equal to 3,300 persons, the department may permit compositing among different systems provided the five-sample limit is maintained. Detection limits for each inorganic contaminant analytical method are contained in 41.3(1)"e"(1).

(3) Asbestos routine and repeat monitoring frequency. The frequency of monitoring conducted to determine compliance with the maximum contaminant level for asbestos specified in 41.3(1)"b" shall be conducted as follows:

1. Initial sampling frequency. Each community and nontransient noncommunity water system is required to monitor for asbestos during the first three-year compliance period of each nine-year compliance cycle beginning in the compliance period starting January 1, 1993.

2. Sampling during waiver. If the public water supply system believes it is not vulnerable to either asbestos contamination in its source water or due to corrosion of asbestos-cement pipe, or both, it may apply for a waiver of the monitoring requirement in 41.3(1)"c"(3)"1." If the department grants the waiver, the system is not required to monitor.

3. Bases of an asbestos waiver. 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.

4. Effect of an asbestos waiver. A waiver remains in effect until the completion of the three-year compliance period. Systems not receiving a waiver must monitor in accordance with 41.3(1)"c"(3)"1."

5. Distribution system vulnerability for asbestos. A public water supply system vulnerable to asbestos contamination due solely to corrosion 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. Source water vulnerability for asbestos. A public water supply system vulnerable to asbestos contamination due solely to source water shall monitor in accordance with the provision of 41.3(1)"c"(2).

7. Combined asbestos vulnerability. A public water supply system vulnerable to asbestos contamination due both to its source water supply and corrosion 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.

8. Exceedance of the asbestos MCL. A public water supply system which exceeds the maximum contaminant levels as determined in 41.3(1)"b" shall monitor quarterly beginning in the next quarter after the violation occurred.

9. Asbestos reliably and consistently below the MCL. The department may decrease the quarterly monitoring requirement to the frequency specified in 41.3(1)"c"(3)"1" provided the system is reliably and consistently below the maximum contaminant level. In no case can the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface (or combined surface/ground) water system takes a minimum of four quarterly samples.

10. Grandfathered asbestos data. If monitoring data collected after January 1, 1990, are generally consistent with the requirements of 41.3(1)"c"(3), then the department may allow public water supply

systems to use that data to satisfy the monitoring requirement for the initial compliance period beginning January 1, 1993.

(4) Monitoring frequency for other IOCs. The frequency of monitoring conducted to determine compliance with the maximum contaminant levels in 41.3(1) "b" for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, selenium, and thallium shall be as follows:

1. IOCs sampling frequency. Groundwater systems shall take one sample at each sampling point once every three years. Surface water systems (or combined surface/groundwater systems) shall take one sample annually at each sampling point.

2. IOC sampling waiver. The public water supply system may apply for a waiver from the monitoring frequencies specified in 41.3(1) "c"(4) "1."

3. IOC sampling during a waiver. A condition of the waiver shall require that a public water supply system shall take a minimum of one sample while the waiver is effective. The term during which the waiver is effective shall not exceed one compliance cycle (i.e., nine years).

4. Bases of an IOC waiver and grandfathered data. The department may grant a waiver provided surface water systems have monitored annually for at least three years and groundwater systems have conducted a minimum of three rounds of monitoring. (At least one sample shall have been taken since January 1, 1990.) Both surface and groundwater systems shall demonstrate that all previous analytical results were less than the maximum contaminant level. 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 monitoring of cyanide, provided that the department determines that the system is not vulnerable due to lack of any industrial source of cyanide.

5. Bases of the 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 groundwater pumping rates, changes in the system's configuration, changes in the system's operating procedures, or changes in stream flows or characteristics.

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

7. Exceedance of an IOC MCL. Public water supply systems which exceed the maximum contaminant levels as calculated in 41.3(1) "b" shall monitor quarterly beginning in the next quarter after the violation occurred.

8. IOCs reliably and consistently below the MCL. The department may decrease the quarterly monitoring requirement to the frequencies specified in 41.3(1) "c"(4) "1" and "3" provided it has determined that the public water supply system is reliably and consistently below the maximum contaminant level. In no case can the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

(5) Routine and repeat monitoring frequency for nitrates. All public water supply systems (community; nontransient noncommunity; and transient noncommunity systems) shall monitor to determine compliance with the maximum contaminant level for nitrate in 41.3(1) "b."

1. Initial nitrate sampling. Community and nontransient noncommunity water systems served by groundwater systems shall monitor annually beginning January 1, 1993; systems served by surface water shall monitor quarterly beginning January 1, 1993. Transient noncommunity water systems shall monitor annually beginning January 1, 1993.

2. Groundwater repeat nitrate sampling frequency. For community and noncommunity water systems, the repeat monitoring frequency for groundwater systems shall be:

- 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 groundwater 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 one sample in which the concentration is greater than or equal to 10.0 mg/L as N.

3. Surface water repeat nitrate sampling frequency. For community and noncommunity water systems, the department may allow a surface water 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 surface water 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 community and nontransient noncommunity system which is monitoring annually shall take subsequent samples during the quarter(s) which previously resulted in the highest analytical result.

(6) Routine and repeat monitoring frequency for nitrite. All public water supply systems (community; nontransient noncommunity; and transient noncommunity systems) shall monitor to determine compliance with the maximum contaminant level for nitrite in 41.3(1)“b.”

1. Initial nitrite sampling. All public water systems shall take one sample at each sampling point in the compliance period beginning January 1, 1993, and ending December 31, 1995.

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 frequency specified by the department.

3. Nitrite increased monitoring. For community, nontransient noncommunity, and transient noncommunity water systems, the repeat monitoring frequency for any water system shall be:

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

(7) Confirmation sampling.

1. Deadline for IOCs confirmation samples. Where the results of an analysis for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, or thallium indicate an exceedance of the maximum contaminant level, the department may require that one 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.

2. Deadline for nitrate and nitrite confirmation samples. Where nitrate or nitrite sampling results indicate an exceedance of the maximum contaminant level and the sampling frequency is quarterly or annual, the system shall take a confirmation sample within 24 hours of the system's receipt of notification of the analytical results of the first sample. Public water supply systems unable to comply with the 24-hour sampling requirement must immediately notify the consumers served by the area served by the public water system in accordance with 567—42.1(455B) Tier 1 public notice and complete an analysis of a confirmation sample within two weeks of notification of the analytical results of the first sample. Where the sampling frequency is monthly, a confirmation sample will not be used to determine compliance with the MCL.

3. Rescinded IAB 1/7/04, effective 2/11/04.

4. Compliance calculations and confirmation samples. If a required confirmation sample as collected within the time specified in 41.3(1)“c”(7)“1” is taken for any contaminant, then the results of the initial and confirmation sample shall be averaged. The resulting average shall be used to determine

the system's compliance in accordance with 41.3(1) "b." The department has the discretion to invalidate results of obvious sampling errors.

(8) Designation of increased sampling frequency. The department may require more frequent monitoring than specified in 41.3(1) "c"(3) through (6) or may require confirmation samples for positive and negative results at its discretion. Public water supply systems may apply to conduct more frequent monitoring than the minimum monitoring frequencies 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 the following factors:

1. Reported concentrations from previously required monitoring,
2. The degree of variation in reported concentrations,
3. Blending or treatment processes conducted for the purpose of complying with a maximum contaminant level, treatment technique, or action level, and
4. Other factors include changes in pumping rates in groundwater supplies or significant changes in the system's configuration, operating procedures, source of water and changes in streamflows.

(9) Grandfathered data. For the initial analysis required by 41.3(1) "c," data for surface waters acquired within one year prior to the effective date and data for groundwaters acquired within three years prior to the effective date of 41.3(1) "c" may be substituted at the discretion of the department.

*d. Best available treatment technologies (BATs) for IOCs.* Rescinded IAB 8/11/99, effective 9/15/99.

*e. Analytical methodology.*

(1) Analytical methods for IOCs. Analysis for the listed inorganic contaminants shall be conducted 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. This document is available from the National Technical Information Service, NTIS PB95-104766, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. The toll-free number is (800)553-6847.

#### INORGANIC CONTAMINANTS ANALYTICAL METHODS

Contaminant	Methodology <sup>15</sup>	EPA	ASTM <sup>3</sup>	SM	Other	Detection Limit, mg/L
Antimony	Atomic absorption; furnace			3113B <sup>4</sup>		0.003
	Atomic absorption; platform	200.9 <sup>2</sup>				0.0008 <sup>12</sup>
	ICP-Mass spectrometry	200.8 <sup>2</sup>				0.0004
Arsenic <sup>16</sup>	Atomic absorption; hydride		D3697-92			0.001
	ICP-Mass spectrometry	200.8 <sup>2</sup>				0.0014 <sup>17</sup>
	Atomic absorption; platform	200.9 <sup>2</sup>				0.0005 <sup>15</sup>
Asbestos	Atomic absorption; furnace		D2972-97C	3113B <sup>4</sup>		0.001
	Atomic absorption; hydride		D2972-97B	3114B <sup>4</sup>		0.001
	Transmission electron microscopy	100.1 <sup>9</sup>				0.01 MFL
Barium	Transmission electron microscopy	100.2 <sup>10</sup>				
	Inductively coupled plasma	200.7 <sup>2</sup>		3120B <sup>18</sup>		0.002
Beryllium	ICP-Mass spectrometry	200.8 <sup>2</sup>				0.0003
	Atomic absorption; direct			3111D <sup>4</sup>		0.1
	Atomic absorption; furnace			3113B <sup>4</sup>		0.002
Cadmium	Inductively coupled plasma	200.7 <sup>2</sup>		3120B <sup>18</sup>		0.0003
	ICP-Mass spectrometry	200.8 <sup>2</sup>				0.0003
	Atomic absorption; platform	200.9 <sup>2</sup>				0.00002 <sup>12</sup>
Cadmium	Atomic absorption; furnace		D3645-97B	3113B <sup>4</sup>		0.0002
	Inductively coupled plasma	200.7 <sup>2</sup>				0.001
	ICP-Mass spectrometry	200.8 <sup>2</sup>				



Contaminant	Methodology <sup>15</sup>	EPA	ASTM <sup>3</sup>	SM	Other	Detection Limit, mg/L
Chromium	Atomic absorption; platform	200.9 <sup>2</sup>				
	Atomic absorption; furnace			3113B <sup>4</sup>		0.0001
	Inductively coupled plasma	200.7 <sup>2</sup>		3120B <sup>18</sup>		0.007
	ICP-Mass spectrometry	200.8 <sup>2</sup>				
Cyanide	Atomic absorption; platform	200.9 <sup>2</sup>				
	Atomic absorption; furnace			3113B <sup>4</sup>		0.001
	Manual distillation (followed by one of the following four analytical methods:)		D2036-98A	4500-CN-C <sup>18</sup>		
	Spectrophotometric; amenable <sup>14</sup>		D2036-98B	4500-CN-G <sup>18</sup>		0.02
	Spectrophotometric; manual <sup>13</sup>		D2036-98A	4500-CN-E <sup>18</sup>	I-3300-85 <sup>5</sup>	0.02
	Spectrophotometric; semi-automated <sup>13</sup>	335.4 <sup>6</sup>				0.005
	Selective electrode <sup>13</sup>			4500-CN-F <sup>18</sup>		0.05
Fluoride	UV/Distillation/Spectrophotometric				Kelada 01 <sup>20</sup>	0.0005
	Distillation/Spectrophotometric				QuikChem 10-204-00-1-X <sup>21</sup>	0.0006
Magnesium	Ion chromatography	300.0 <sup>6</sup>	D4327-97	4110B <sup>18</sup>		
	Manual distillation; colorimetric; SPADNS			4500F-B,D <sup>18</sup>		
	Manual electrode		D1179-93B	4500F-C <sup>18</sup>		
	Automated electrode				380-75WE <sup>11</sup>	
Mercury	Automated alizarin			4500F-E <sup>18</sup>	129-71W <sup>11</sup>	
	Atomic absorption; direct		D511-93B	3111B <sup>4</sup>		
	ICP	200.7 <sup>1</sup>		3120B <sup>18</sup>		
Nickel	Complexation Titrimetric Methods		D511-93A	3500-Mg E <sup>4</sup>		
	Manual, cold vapor	245.1 <sup>2</sup>	D3223-97	3112B <sup>4</sup>		0.0002
	Automated, cold vapor	245.2 <sup>1</sup>				0.0002
Nitrate	ICP-Mass spectrometry	200.8 <sup>2</sup>				
	Inductively coupled plasma	200.7 <sup>2</sup>		3120B <sup>18</sup>		0.005
	ICP-Mass spectrometry	200.8 <sup>2</sup>				0.0005
Nitrite	Atomic absorption; platform	200.9 <sup>2</sup>				0.0006 <sup>12</sup>
	Atomic absorption; direct			3111B <sup>4</sup>		
	Atomic absorption; furnace			3113B <sup>4</sup>		0.001
	Ion chromatography	300.0 <sup>6</sup>	D4327-97	4110B <sup>18</sup>	B-1011 <sup>8</sup>	0.01
Selenium	Automated cadmium reduction	353.2 <sup>6</sup>	D3867-90A	4500-NO <sub>3</sub> -F <sup>18</sup>		0.05
	Ion selective electrode			4500-NO <sub>3</sub> -D <sup>18</sup>	6017	1
	Manual cadmium reduction		D3867-90B	4500-NO <sub>3</sub> -E <sup>18</sup>		0.01
	Ion chromatography	300.0 <sup>6</sup>	D4327-97	4110B <sup>18</sup>	B-1011 <sup>8</sup>	0.004
Sodium	Automated cadmium reduction	353.2 <sup>6</sup>	D3867-90A	4500-NO <sub>3</sub> -F <sup>18</sup>		0.05
	Manual cadmium reduction		D3867-90B	4500-NO <sub>3</sub> -E <sup>18</sup>		0.01
	Spectrophotometric			4500-NO <sub>2</sub> -B <sup>18</sup>		0.01
Thallium	Atomic absorption; hydride		D3859-98A	3114B <sup>4</sup>		0.002
	ICP-Mass spectrometry	200.8 <sup>2</sup>				
Thallium	Atomic absorption; platform	200.9 <sup>2</sup>				
	Atomic absorption; furnace	200.9 <sup>2</sup>	D3859-98B	3113B <sup>4</sup>		0.002
Thallium	Inductively coupled plasma	200.7 <sup>2</sup>				
	Atomic absorption; direct			3111B <sup>4</sup>		
Thallium	ICP-Mass spectrometry	200.8 <sup>2</sup>				
	Atomic absorption; platform	200.9 <sup>2</sup>				0.0007 <sup>12</sup>

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 of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at (800)426-4791. Documents may be inspected at EPA's Drinking Water Docket, EPA West, 1301 Constitution Avenue, NW Room B102, Washington, DC 20460 (telephone: (202)566-2426); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

<sup>1</sup>“Methods for Chemical Analysis of Water and Wastes,” EPA-600/4-79-020, March 1983. Available at NTIS, PB84-128677.

<sup>2</sup>“Methods for the Determination of Metals in Environmental Samples—Supplement I,” EPA-600/R-94-111, May 1994. Available at NTIS, PB95-125472.

<sup>3</sup>Annual Book of ASTM Standards, 1994, 1996, or 1999, Vols. 11.01 and 11.02, American Society for Testing and Materials (ASTM) International; any year containing the cited version of the method may be used. Copies may be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

<sup>4</sup>18th and 19th editions of Standard Methods for the Examination of Water and Wastewater, 1992 and 1995, respectively, American Public Health Association; either edition may be used. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

<sup>5</sup>Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd edition, 1989, Method I-3300-85. Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

<sup>6</sup>“Methods for the Determination of Inorganic Substances in Environmental Samples,” EPA-600-R-93-100, August 1993. Available at NTIS, PB94-120821.

<sup>7</sup>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. Copies may be obtained from ATI Orion, 529 Main Street, Boston, MA 02129.

<sup>8</sup>Method B-1011, “Waters Test Method for Determination of Nitrite/Nitrate in Water Using Single Column Ion Chromatography,” August 1987. Copies may be obtained from Waters Corporation, Technical Services Division, 34 Maple Street, Milford, MA 01757.

<sup>9</sup>Method 100.1, “Analytical Method for Determination of Asbestos Fibers in Water,” EPA-600/4-83-043, EPA, September 1983. Available at NTIS, PB83-260471.

<sup>10</sup>Method 100.2, “Determination of Asbestos Structure Over 10 Microns in Length in Drinking Water,” EPA-600/R-94-134, June 1994. Available at NTIS, PB94-201902.

<sup>11</sup>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. Copies may be obtained from Bran & Luebbe, 1025 Busch Parkway, Buffalo Grove, IL 60089.

<sup>12</sup>Lower MDLs are reported using stabilized temperature graphite furnace atomic absorption.

<sup>13</sup>Screening method for total cyanides.

<sup>14</sup>Measures “free” cyanides.

<sup>15</sup>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. Method 200.9 is capable of obtaining an arsenic MDL of 0.0001 mg/L using multiple depositions. 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.

<sup>16</sup>If ultrasonic nebulization is used in the determination of arsenic 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.

<sup>17</sup>Using selective ion monitoring, EPA Method 200.8 (ICP-MS) is capable of obtaining an MDL of 0.0001 mg/L.

<sup>18</sup>The 18th, 19th, and 20th editions of Standard Methods for the Examination of Water and Wastewater, 1992, 1995, and 1998, respectively, American Public Health Association; any edition may be used. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

<sup>19</sup>The 20th edition of Standard Methods for the Examination of Water and Wastewater, 1998, American Public Health Association. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

<sup>20</sup>The description for the 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 is available from NTIS PB 2001-108275.

<sup>21</sup>The description for the 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, for cyanide is available from Lachat Instruments, 6645 W. Mill Road, Milwaukee, WI 53218, telephone (414)358-4200.

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

SAMPLING METHODS FOR IOCs

Contaminant	Preservative <sup>1</sup>	Container <sup>2</sup>	Time <sup>3</sup>
Antimony	HNO <sub>3</sub>	P or G	6 months
Arsenic	HNO <sub>3</sub>	P or G	6 months
Asbestos	4 degrees C	P or G	48 hours for filtration <sup>5</sup>
Barium	HNO <sub>3</sub>	P or G	6 months
Beryllium	HNO <sub>3</sub>	P or G	6 months
Cadmium	HNO <sub>3</sub>	P or G	6 months
Chromium	HNO <sub>3</sub>	P or G	6 months
Cyanide	4 degrees C, NaOH	P or G	14 days
Fluoride	None	P or G	1 month
Mercury	HNO <sub>3</sub>	P or G	28 days
Nickel	HNO <sub>3</sub>	P or G	6 months
Nitrate <sup>4</sup>	4 degrees C	P or G	48 hours
Nitrate-Nitrite <sup>4</sup>	H <sub>2</sub> SO <sub>4</sub>	P or G	28 days
Nitrite <sup>4</sup>	4 degrees C	P or G	48 hours
Selenium	HNO <sub>3</sub>	P or G	6 months
Thallium	HNO <sub>3</sub>	P or G	6 months

<sup>1</sup>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 C or less.

<sup>2</sup>P: plastic, hard or soft; G: glass, hard or soft.

<sup>3</sup>In all cases, 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.

<sup>4</sup>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. Acidification of total nitrate (nitrate plus nitrite) samples must be done in the field at the time of sample collection.

<sup>5</sup>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.

*f. Unregulated inorganic chemicals.* Rescinded IAB 1/7/04, effective 2/11/04.

**41.3(2) Other inorganic chemical contaminants.** Reserved.  
[ARC 9915B, IAB 12/14/11, effective 1/18/12]

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

**41.4(1) Lead, copper, and corrosivity regulation by the setting of a treatment technique requirement.** The lead and copper rules do not set an MCL, although this could be changed in the future. The rules set two enforceable action levels, which trigger tap monitoring, corrosion control, source water treatment, lead service line replacement, and public education if exceeded.

*a. Applicability.* Unless otherwise indicated, each of the provisions of this subrule applies to community water systems and nontransient noncommunity water systems (hereinafter referred to as “water systems” or “systems”).

*b. Action levels.*

(1) Lead action level. The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period conducted 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) Copper action level. The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples collected during any monitoring period conducted 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) Calculation of 90th percentile. The 90th percentile lead and copper levels shall be computed as follows:

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

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

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

For water 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.

*c. Lead and copper tap water monitoring requirements.*

(1) Sample site selection.

1. General. Public water supply systems 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 water 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 point-of-use or point-of-entry treatment devices designed to remove inorganic contaminants.

2. Information sources. A public water supply system shall use the information on lead, copper and galvanized steel that it is required to collect under 41.4(1) “f” as part of its responsibility for the special monitoring for corrosivity characteristics when conducting a materials evaluation. When an evaluation of the information collected is insufficient to locate the requisite number of lead and copper sampling sites that meet the targeting criteria in 41.4(1) “c”(1), the water system shall review all plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system; all inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and all existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations. In addition, the system shall seek to collect such information where possible in the course of its normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities).

3. Tier 1 community sampling sites. The sampling sites selected for a community water system’s sampling pool (“tier 1 sampling sites”) shall consist of single-family structures that contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line. 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 community sampling sites. Any community water system with insufficient tier 1 sampling sites shall complete its sampling pool with “tier 2 sampling sites,” consisting of buildings, including multiple-family residences that contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line.

5. Tier 3 community sampling sites. Any community water system with insufficient Tier 1 and Tier 2 sampling sites shall complete its sampling pool with “Tier 3 sampling sites,” consisting of single-family structures that contain copper pipes with lead solder installed before 1983. A community water system 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 sampling sites selected for a nontransient noncommunity water system (“tier 1 sampling sites”) shall consist of buildings that: contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line.

7. Other NTNC sampling sites. A nontransient noncommunity water system with insufficient Tier 1 sites that meet the targeting criteria in 41.4(1) “c”(1)“6” shall complete its sampling pool with sampling sites that contain copper pipes with lead solder installed before 1983. If additional sites are needed to complete the sampling pool, the NTNC system 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 public water supply system whose distribution system contains lead service lines shall draw 50 percent of the samples it collects during each monitoring period from sites that contain lead pipes, or copper pipes with lead solder, and 50 percent of those samples from sites served by a lead service line. A water system that cannot identify a sufficient number of sampling sites served by a lead service line 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, with the exception of lead service line samples collected under 567—subrule 43.7(4) and 41.4(1) “c”(2)“5,” shall be first-draw samples.

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. Non-first-draw samples collected in lieu of first-draw samples pursuant to 41.4(1) “c”(2)“5” shall be one liter in volume and 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 the system 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 to resolubilize the metals, 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. Service line 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 and have stood motionless in the lead service line for at least six hours and be collected at the tap after flushing the volume of water between the tap and the lead service line. The volume of water shall be calculated based on the interior diameter and length of the pipe between the tap and the lead service line; tapping directly into the lead service line; 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 which would be indicative of water that has been standing in the lead service line.

4. A public water supply system shall collect each first-draw tap sample from the same sampling site from which it collected a previous sample. If, for any reason, the water system cannot gain entry to a sampling site in order to collect a follow-up tap sample, the system 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 that meets the criteria of 567—paragraphs 42.2(4) “h”(1) “1” and “2,” that does not have enough taps that can supply first-draw samples, as defined in 567—40.2(455B), 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 department approval of non-first-draw sample sites selected by the system, through written notification to the system.

(3) Number of samples. Water systems shall collect at least one sample during each monitoring period specified in 41.4(1) “c”(4) from the number of sites as listed in the column below titled “standard monitoring.” A system conducting reduced monitoring under 41.4(1) “c”(4) shall collect at least one sample from the number of sites specified in the column titled “reduced monitoring” during each monitoring period specified in 41.4(1) “c”(4). Such reduced monitoring sites shall be representative of the sites required for standard monitoring. 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) Timing of monitoring.

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 action level and is, therefore, required to implement the corrosion control treatment requirements under 567—paragraph 43.7(1) “a,” in which case the system shall continue monitoring in accordance with 41.4(1) “c”(4), or the system meets the lead and copper action levels during two consecutive six-month monitoring periods, in which case the system may reduce monitoring in accordance with 41.4(1) “c”(4).

2. Monitoring after installation of corrosion control and source water treatment. Large systems which install optimal corrosion control treatment 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 which install optimal corrosion control treatment 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 which 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 water quality parameter values for optimal corrosion control. After the department specifies the values for water quality control parameters 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 optimal values under 567—paragraph 43.7(2)“f.”

4. Reduced monitoring.

- A small or medium-size water system that meets the lead and copper action levels 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 frequency of sampling to once per year.

- Any public water supply system that maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the department under 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 approval by the department. The department shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with 567—subrule 42.4(2), and shall notify the system in writing when it determines that the system is eligible to commence reduced monitoring. Where appropriate, the department will revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

- A small or medium-size water system that meets the lead and copper action levels during three consecutive years of monitoring may reduce the frequency of monitoring for lead and copper from annually to once every three years. Any water system that maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)“f” during three consecutive years of monitoring may reduce the frequency of monitoring from annually to once every three years if it receives written approval by the department. The department shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with 567—subrule 42.4(2), and shall notify the system in writing when it determines that the system is eligible to reduce the monitoring frequency to once every three years. Where appropriate, the department will revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

- A water system that reduces the number and frequency of sampling shall collect these 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 the lead and copper tap sampling during the months of June through September, unless the department has approved a different sampling period. If approved by the department, the 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 period that represents a time of normal operation for an NTNC system that does not operate during the months of 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.

Systems monitoring annually that have been collecting samples during the months of 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 after the previous round of sampling.

Systems monitoring triennially that have been collecting samples during the months of June through September and that receive department approval to alter the sampling collection period must collect their

next round of samples during a time period that ends no later than 45 months after the previous round of sampling.

Subsequent rounds of sampling must be collected annually or triennially, as required by 41.4(1)“c.”

Small systems that have been granted waivers pursuant to 41.4(1)“c”(7), that have been collecting samples during the months of 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.

- Any water system 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 frequency of sampling to once every three calendar years, if approved by the department.

- A small or medium-size water system subject to reduced monitoring that exceeds the lead or copper action level 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 water quality parameter monitoring in accordance with 41.4(1)“d”(2), (3), or (4), as appropriate, during the monitoring period in which it exceeded the action level. Any such system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in 41.4(1)“c”(3) after it has completed two subsequent consecutive six-month rounds of monitoring that meet the criteria of 41.4(1)“c”(4)“4,” first bulleted paragraph, and may resume triennial monitoring for lead and copper at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria of either 41.4(1)“c”(4)“4,” third bulleted paragraph or fifth bulleted paragraph, and has received department approval.

Any water system subject to reduced monitoring frequency that fails to operate within the range of values for the water quality control parameters specified by the department under 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 water quality parameters within the distribution system in accordance with 41.4(1)“d”(4). The system may resume reduced monitoring for lead and copper at the tap and for water quality parameters within the distribution system under the following conditions:

The system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in 41.4(1)“c”(3) after it has completed two subsequent six-month rounds of monitoring that meet the criteria of 41.4(1)“c”(4)“4,” second bulleted paragraph, and upon written approval from the department to resume reduced annual monitoring.

The system may resume triennial monitoring for lead and copper at the tap at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria of either 41.4(1)“c”(4)“4,” third bulleted paragraph or fifth bulleted paragraph, and upon written approval from the department to resume triennial monitoring.

The system may reduce the number of water quality parameter 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 water quality parameters at the tap until it demonstrates that it has qualified for triennial monitoring, pursuant to 41.4(1)“d”(5)“2.”

- Any water system subject to a reduced monitoring frequency under 41.4(1)“c”(4)“4” that either adds a new source of water or changes any water treatment shall inform the department in writing in accordance with 567—subparagraph 42.4(2)“a”(3). The department may require the 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 water quality parameter monitoring or reevaluation of its corrosion control treatment given the potentially different water quality considerations.



(5) Additional monitoring by systems. The results of any monitoring conducted in addition to the minimum requirements of 41.4(1)“c” shall be considered by the system and the department in making any determinations (i.e., calculating the 90th percentile lead or copper level) 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 at least one of the following conditions is met:

- The laboratory establishes that improper sample analysis caused erroneous results.
- The department determines that 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.
- 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. The system must report the results of all samples to the department and all supporting documentation for samples the system believes should be invalidated.

3. To invalidate a sample under 41.4(1)“c”(6)“1,” the decision and the rationale for the decision must be documented in writing. 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. The system must collect replacement samples for any samples invalidated under subparagraph 41.4(1)“c”(6) if, after the invalidation of one or more samples, the system has too few samples to meet the minimum requirements of 41.4(1)“c”(3). Any such replacement samples must be taken as soon as possible, but no later than 20 days after the date the department invalidates the sample, 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. The 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 that meets the criteria of this subparagraph may apply to the department to reduce the frequency of monitoring for lead and copper under subrule 41.4(1) to once every nine years if it meets all of the materials criteria specified in 41.4(1)“c”(7)“1” and the monitoring criteria specified in 41.4(1)“c”(7)“2.”

1. Materials criteria. The system must demonstrate that its distribution system and service lines and all drinking water supply 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. The water system must provide certification and supporting documentation to the department that the system is free of all lead-containing materials. The system does not contain any plastic pipes which contain lead plasticizers, or plastic service lines which contain lead plasticizers. The system must be free of lead service lines, 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. The water system must provide certification and supporting documentation to the department that the system contains no copper pipes or copper service lines.

2. Monitoring criteria. The system must have completed at least one six-month round of standard tap water monitoring for lead and copper at sites approved by the department and from the number of sites required by 41.4(1)“c”(3), and demonstrate that the 90th percentile levels for any and all rounds of monitoring conducted since the system became free of all lead-containing and copper-containing materials meet the following criteria:

- Lead levels. The system must demonstrate that the 90th percentile lead level does not exceed 0.005 mg/L.

- Copper levels. The system must demonstrate that the 90th percentile copper level does not exceed 0.65 mg/L.

3. Department approval of waiver application. The department shall notify the 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 the system conduct specific activities, such as limited monitoring and periodic outreach to customers to remind them to avoid installation of materials that would void the waiver. The 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 the system receives written approval for the waiver from the department.

4. Monitoring frequency of systems with waivers.

- A system 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 subparagraph 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.

- If a system with a waiver adds a new source of water or changes any water treatment, the system must notify the department in writing pursuant to 567—subparagraph 42.4(2) "a"(3). The department has the authority to require the system to add or modify waiver conditions, such as to require recertification that the system is free of lead-containing and copper-containing materials or to require additional monitoring, if the department deems such modifications are necessary to address treatment or source water changes at the system.

- If a system with a waiver becomes aware that it is no longer free of lead-containing or copper-containing materials, such as from new construction or repairs, the system shall notify the department in writing no later than 60 days after becoming aware of such a change.

5. Continued eligibility. If the system continues to satisfy the requirements of 41.4(1) "c"(7)"4," the waiver will be renewed automatically, unless any of the conditions listed 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 of 41.4(1) "c"(7)"1" and 41.4(1) "c"(7)"2."

- 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 corrosion control treatment and lead and copper tap water monitoring requirements as follows:

- If the system exceeds the lead or copper action level, the system must implement corrosion control treatment in accordance with the deadlines specified in 567—paragraph 43.7(1) "e," and any other applicable parts of 567—41.4(455B).

- If the system meets both the lead and copper action levels, the system 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 subparagraph 41.4(1) "c"(3).

*d. Water quality parameter monitoring requirements.* All large public water supply systems (and all small and medium-size public water supply systems that exceed the lead or copper action level) shall monitor water quality parameters 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 water quality parameters must be reported in accordance with the monthly operation report requirements listed in 567—subrule 42.4(3).

(1) General requirements.

1. Sample collection methods. Tap samples shall be representative of water quality throughout the distribution system taking into account 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 water quality parameters at sites used for coliform sampling. Samples collected at the entry point(s) to the distribution system 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, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

2. Number of samples.

- Systems shall collect two tap samples for applicable water quality parameters during each monitoring period specified in 41.4(1)“d”(2) through (5) from the following number of sites.

REQUIRED NUMBER OF SAMPLES: WATER QUALITY PARAMETERS

System Size (Number of People Served)	Number of Sites for Water Quality Parameters
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 water quality parameter at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)“d”(2). During each monitoring period specified in 41.4(1)“d”(2). During each monitoring period specified in 41.4(1)“d”(3) through (5), systems shall collect one sample for each applicable water quality parameter at each entry point to the distribution system.

(2) Initial sampling. Large water systems shall measure the applicable water quality parameters as specified below at taps and at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)“c”(4)“1.” Small and medium-size systems shall measure the applicable water quality parameters at taps and at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)“c”(4)“1” during which the system exceeds the lead or copper action level. Tap water and entry point 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 which install optimal corrosion control treatment pursuant to 567—subparagraph 43.7(1)“d”(4) shall measure the water quality parameters 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 which install optimal corrosion control treatment 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 action level.

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; calcium, when calcium carbonate stabilization is used as part of corrosion control.

2. Except as provided for in 41.4(1)“d”(3)“3,” monitoring at each entry point to the distribution system 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 optimal corrosion control; 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 optimal corrosion control.

3. Any groundwater system can limit entry point sampling described in 41.4(1)“d”(3)“3” to those entry points that are representative of water quality and treatment conditions throughout the system. If water from untreated groundwater sources mixes with water from treated groundwater sources, the

system must monitor for water quality parameters both at representative entry points receiving treatment and representative entry points receiving no treatment. Prior to the start of any monitoring under this paragraph, the system shall provide to the department written information identifying the selected entry points 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 water quality parameter values for optimal corrosion control. After the department specifies the values for applicable water quality control parameters reflecting optimal corrosion control treatment, all large systems shall measure the applicable water quality parameters according to 41.4(1)“d”(3) and determine compliance with the requirements of 567—paragraph 43.7(2)“g” every six months, with the first six-month period to begin on the date the department specifies the optimal values under 567—paragraph 43.7(2)“f.” 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 action level. For any such small and medium-size system that is subject to a reduced monitoring frequency pursuant to 41.4(1)“c”(4)“4” at the time of the action level exceedance, the end of the applicable six-month period under this paragraph shall coincide with the end of the applicable monitoring period under 41.4(1)“c”(4)“4.” Compliance with department-designated optimal water quality parameter values shall be determined as specified in 567—paragraph 43.7(2)“g.”

(5) Reduced monitoring.

1. Public water supply systems that maintain the range of values for the water quality parameters reflecting optimal corrosion control treatment during each of two consecutive six-month monitoring periods under 41.4(1)“c”(4) shall continue monitoring at the entry point(s) to the distribution system as specified in 567—paragraph 43.7(2)“f.” Such system may collect two tap samples for applicable water quality parameters from the following reduced number of sites during each six-month monitoring period.

#### REDUCED WATER QUALITY PARAMETER MONITORING

System Size (Number of People Served)	Reduced Number of Sites for Water Quality Parameters
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 public water system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)“f” during three consecutive years of monitoring may reduce the frequency with which the system collects the number of tap samples for applicable water quality parameters specified in 41.4(1)“d”(5) from every six months to annually. Any system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)“f” during three consecutive years of annual monitoring may reduce the frequency with which it collects the number of tap samples for applicable water quality parameters specified in 41.4(1)“d”(5) from annually to every three years.

A water system may reduce the frequency with which it collects tap samples for applicable water quality parameters 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 also has maintained the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)“f.”

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

4. Any water system subject to the reduced monitoring frequency that fails to operate at or above the minimum value or within the range of values for the water quality parameters specified by the department under 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 water sampling in accordance with the number and frequency requirements in 41.4(1) “d”(3). Such a system may resume annual monitoring for water quality parameters 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 water quality parameters 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 by systems. The results of any monitoring conducted in addition to the minimum requirements of this subrule shall be considered in making any determinations (i.e., determining concentrations of water quality parameters) under this subrule or 567—subrule 43.7(2).

#### SUMMARY OF MONITORING REQUIREMENTS FOR WATER QUALITY PARAMETERS<sup>1</sup>

Monitoring Period	Location	Parameters <sup>2</sup>	Frequency
Initial Monitoring	Taps and at entry point(s) to distribution systems	pH, alkalinity, orthophosphate or silica <sup>3</sup> , calcium, conductivity, temperature	Every 6 months
After Installation of Corrosion Control	Taps	pH, alkalinity, orthophosphate or silica <sup>3</sup> , calcium <sup>4</sup>	Every 6 months
	Entry point(s) to distribution system <sup>6</sup>	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 <sup>5</sup>	At least every two weeks
After Department Specifies Parameter Values for Optimal Corrosion Control	Taps	pH, alkalinity, orthophosphate or silica <sup>3</sup> , calcium <sup>4</sup>	Every 6 months
	Entry point(s) to distribution system <sup>6</sup>	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 <sup>5</sup>	At least every two weeks
Reduced Monitoring	Taps	pH, alkalinity, orthophosphate or silica <sup>3</sup> , calcium <sup>4</sup>	Every 6 months, annually <sup>7</sup> , or every 3 years <sup>8</sup> , at a reduced number of sites
	Entry point(s) to distribution system <sup>6</sup>	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 <sup>5</sup>	At least every two weeks

<sup>1</sup>Table is for illustrative purposes; consult the text of this subrule for precise regulatory requirements.

<sup>2</sup>Small and medium-size systems have to monitor for water quality parameters only during monitoring periods in which the system exceeds the lead or copper action level.

<sup>3</sup>Orthophosphate must be measured only when an inhibitor containing a phosphate compound is used. Silica must be measured only when an inhibitor containing silicate compound is used.

<sup>4</sup>Calcium must be measured only when calcium carbonate stabilization is used as part of corrosion control.

<sup>5</sup>Inhibitor dosage rates and inhibitor residual concentrations (orthophosphate or silica) must be measured only when an inhibitor is used.

<sup>6</sup>Groundwater systems may limit monitoring to representative locations throughout the systems.

<sup>7</sup>Water systems may reduce frequency of monitoring for water quality parameters at the tap from every six months to annually if they have maintained the range of values for water quality parameters reflecting optimal corrosion control during three consecutive years of monitoring.

<sup>8</sup>Water systems may further reduce the frequency of monitoring for water quality parameters at the tap from annually to once every three years if they have maintained the range of values for water quality parameters reflecting optimal corrosion control during three consecutive years of annual monitoring. Water systems may accelerate to triennial monitoring for water quality parameters 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 water quality parameters designated by the department under 567—paragraph 43.7(2)“f” as representing optimal corrosion control 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 water system that fails to meet the lead or copper action level 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 regarding sample location, number of samples, and collection methods:

- Groundwater systems shall take a minimum of one sample at every entry point to the distribution system (source entry point) which is representative of each well after treatment. The system shall take one sample at the same source entry point unless conditions make another sampling location more representative of each source or treatment plant.

- Surface water systems and any system with a combination of surface water and groundwater shall take a minimum of one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point which is 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 entry point to the distribution system 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 action level. Any system which exceeds the lead or copper action level at the tap shall collect one source water sample from each entry point to the distribution system within six months after the exceedance.

(3) Monitoring after installation of source water treatment. Any system which installs source water treatment pursuant to 567—subparagraph 43.7(3)“a”(3) shall collect an additional source water sample from each entry point to the distribution system 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 system 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 water system using only groundwater 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. A public water system using surface water (or a combination of surface and groundwater) shall collect samples once during each year, the first annual monitoring period to begin on the date on which the department makes this determination.

2. A system using only groundwater is not required to conduct source water sampling for lead or copper if the system meets the action level for the specific contaminant in tap water samples during the entire source water sampling.

(5) Reduced monitoring frequency.

1. A water system using only groundwater may reduce the monitoring frequency for lead and copper in source water to once during each nine-year compliance cycle if 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 by the department 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 concentration of lead in source water was less than or equal to 0.005 mg/L and the concentration of copper in source water was less than or equal to 0.65 mg/L.

2. A water system using surface water (or a combination of surface water and groundwater) may reduce the monitoring frequency in 41.4(1) “e”(4) “1” to once during each nine-year compliance cycle if that 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 by the department 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 concentration of lead in source water was less than or equal to 0.005 mg/L and the concentration of copper in source water was less than or equal to 0.65 mg/L.

3. A water system 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 community public water systems shall collect samples from a representative entry point to the water distribution system for the purpose of analysis to determine the corrosivity characteristics of the water. The determination of corrosivity characteristics of water 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) Surface water systems. Systems utilizing a surface water source either in whole or in part shall collect two samples per plant for the purpose of determining the corrosivity characteristics. One of these samples is to be collected during the midwinter months and the other during midsummer.

(2) Groundwater systems. Systems utilizing groundwater 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 number of samples required.

(3) Corrosivity characteristics analytical parameters. Determination of corrosivity characteristics of water shall include measurements of pH, calcium hardness, alkalinity, temperature, total dissolved solids (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,” American Water Works Association, Denver, CO.

2. Langelier Index—“Standard Methods for the Examination of Water and Wastewater,” 14th edition, American Public Health Association, 1015 15th Street NW, Washington, DC 20005 (1975), Method 203, pp. 61-63.

(5) Distribution system construction materials. Community and nontransient noncommunity water supply systems shall identify whether the 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 water quality parameter 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 a Grade I, II, III, or IV certified operator meeting the requirements of 567—Chapter 81, or a laboratory certified by the department to perform analysis under 567—Chapter 83. Analyses under this subrule for lead and copper shall only be conducted by laboratories that have been certified by the department, pursuant to 567—Chapter 83. The following methods must be used:

#### LEAD, COPPER AND WATER QUALITY PARAMETER ANALYTICAL METHODS

Contaminant	EPA Contaminant Code	Methodology <sup>9</sup>	Reference (Method Number)			
			EPA	ASTM <sup>3</sup>	SM	USGS <sup>5</sup>
Alkalinity	1927	Titrimetric Electrometric titration		D1067-92B	2320 B <sup>11</sup>	I-1030-85
Calcium	1919	EDTA titrimetric  Atomic absorption; direct aspiration Inductively coupled plasma	200.7 <sup>2</sup>	D511-93A D511-93B	3500-Ca D <sup>4</sup> 3500-Ca B <sup>12</sup> 3111 B <sup>4</sup> 3120 B <sup>11</sup>	
Chloride	1017	Ion chromatography Potentiometric titration Argentometric titration	300.0 <sup>8</sup>	D4327-97 D512-89B	4110 B <sup>11</sup> 4500-Cl- D <sup>11</sup> 4500-Cl- B <sup>11</sup>	
Conductivity	1064	Conductance		D1125-95A	2510 B <sup>11</sup>	
Copper <sup>6</sup>	1022	Atomic absorption; furnace technique Atomic absorption; direct aspiration Inductively coupled plasma Inductively coupled plasma; mass spectrometry Atomic absorption; platform furnace	200.7 <sup>2</sup> 200.8 <sup>2</sup> 200.9 <sup>2</sup>	D1688-95C D1688-95A	3113 B <sup>4</sup> 3111 B <sup>4</sup> 3120 B <sup>11</sup>	
Lead <sup>6</sup>	1030	Atomic absorption; furnace technique Inductively coupled plasma; mass spectrometry Atomic absorption; platform furnace technique Differential pulse anodic stripping voltammetry	200.8 <sup>2</sup> 200.9 <sup>2</sup>	D3559-96D	3113 B <sup>4</sup>	Method 1001 <sup>10</sup>
pH	1925	Electrometric	150.1 <sup>1</sup> 150.2 <sup>1</sup>	D1293-95	4500-H+ B <sup>11</sup>	



Contaminant	EPA Contaminant Code	Methodology <sup>9</sup>	Reference (Method Number)			
			EPA	ASTM <sup>3</sup>	SM	USGS <sup>5</sup>
Orthophosphate (Unfiltered, no digestion or hydrolysis)	1044	Colorimetric, automated, ascorbic acid	365.1 <sup>8</sup>		4500-P F <sup>11</sup>	
		Colorimetric, ascorbic acid, single reagent		D515-88A	4500-P E <sup>11</sup>	
		Colorimetric, phosphomolybdate;				I-1602-85
		Automated-segmented flow				I-2601-90 <sup>8</sup>
		Automated discrete				I-2598-85
		Ion chromatography	300.0 <sup>7</sup>	D4327-97	4110 B <sup>11</sup>	
Silica	1049	Colorimetric, molybdate blue				I-1700-85
		Automated-segmented flow				I-2700-85
		Colorimetric		D859-95		
		Molybdosilicate			4500-Si D <sup>4</sup>	
					4500-SiO <sub>2</sub> C <sup>12</sup>	
		Heteropoly blue			4500-Si E	
		Automated method for molybdate-reactive silica			4500-SiO <sub>2</sub> D <sup>12</sup>	
		Inductively coupled plasma <sup>6</sup>	200.7 <sup>2</sup>		4500-Si F	
					4500-SiO <sub>2</sub> E <sup>12</sup>	
					3120 B <sup>11</sup>	
Sulfate	1055	Ion chromatography	300.0 <sup>7</sup>	D4327-97	4110 <sup>11</sup>	
		Automated methylthymol blue	375.2 <sup>7</sup>		4500-SO <sub>4</sub> F <sup>11</sup>	
		Gravimetric			4500-SO <sub>4</sub> C <sup>11</sup>	
					4500-SO <sub>4</sub> D <sup>11</sup>	
		Turbidimetric		D516-90	4500-SO <sub>4</sub> E <sup>11</sup>	
Temperature	1996	Thermometric			2550 B <sup>11</sup>	
Total Filterable Residue (TDS)	1930	Gravimetric			2540 C <sup>11</sup>	

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 of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at (800)426-4791. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

<sup>1</sup>"Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1983. Available at NTIS as PB84-128677.

<sup>2</sup>"Methods for the Determination of Metals in Environmental Samples," EPA-600/4-91-010, June 1991. Available at NTIS as PB91-231498.

<sup>3</sup>Annual Book of ASTM Standards, 1994, 1996, or 1999, Vols. 11.01 and 11.02, American Society for Testing and Materials, International; any year containing the cited version of the method 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 the Annual Book of ASTM Standards, 1994, Volume 11.01. Copies may be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

<sup>4</sup>18th and 19th editions of Standard Methods for the Examination of Water and Wastewater, 1992 and 1995, respectively, American Public Health Association. Either edition may be used. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

<sup>5</sup>Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989. Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

<sup>6</sup>Samples may not be filtered. Samples that contain less than 1 NTU (Nephelometric turbidity unit) 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.

<sup>7</sup>"Methods for the Determination of Inorganic Substances in Environmental Samples," EPA/600/R-93/100, August 1993. Available at NTIS as PB94-120821.

<sup>8</sup>"Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of Inorganic and Organic Constituents in Water and Fluvial Sediments, Open File Report 93-125." Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

<sup>9</sup>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.

<sup>10</sup>The description for Method 1001 is available from Palintest, Ltd., 21 Kenton Lands Road, P.O. Box 18395, Erlanger, KY 41018; or from the Hach Company, P.O. Box 389, Loveland, CO 80538.

<sup>11</sup>The 18th, 19th, and 20th editions of Standard Methods for the Examination of Water and Wastewater, 1992, 1995, and 1998, respectively, American Public Health Association. Any edition may be used. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

<sup>12</sup>The 20th edition of Standard Methods for the Examination of Water and Wastewater, 1998, American Public Health Association. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

(2) Certified laboratory requirements. Lead and copper analyses under this subrule shall only be conducted by laboratories that have been certified by the department and are in compliance with the requirements of 567—Chapter 83.

(3) All lead and copper levels measured between the practical quantitation limit (PQL) and method detection limit (MDL) must be either reported as measured or they can be 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.* Reserved.

### **567—41.5(455B) Organic chemicals.**

**41.5(1)** *MCLs and other requirements for organic chemicals.* Maximum contaminant levels for two classes of organic chemical contaminants specified in 41.5(1) "b" apply to community water systems and nontransient noncommunity water systems as specified herein. The two referenced organic chemical classes are volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs).

The requirements also contain analytical method requirements and monitoring requirements referenced in 41.5(1) "b" and "c." Best available technology (BAT) for control of these organic contaminants is referenced in 567—paragraph 43.3(10) "a."

*a. Applicability.* The maximum contaminant levels for volatile and synthetic organic contaminants apply to community and nontransient noncommunity water systems. Compliance with the volatile and synthetic organic contaminant maximum contaminant level is calculated pursuant to 41.5(1) "b."

*b. Maximum contaminant levels (MCLs) and analytical methodology for organic compounds.* The maximum contaminant levels for organic chemicals are listed in the table in subparagraph 41.5(1) "b"(1). Analyses for the contaminants in this subrule shall be conducted using the following methods, or their equivalent as approved by EPA.

(1) Table:

ORGANIC CHEMICAL CONTAMINANTS, CODES, MCLS, ANALYTICAL METHODS,  
AND DETECTION LIMITS

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology <sup>1</sup>	Detection Limit (mg/L)
Volatile Organic Chemicals (VOCs):				
Benzene	2990	0.005	502.2, 524.2	0.0005
Carbon tetrachloride	2982	0.005	502.2, 524.2, 551.1	0.0005
Chlorobenzene (mono)	2989	0.1	502.2, 524.2	0.0005
1,2-Dichlorobenzene (ortho)	2968	0.6	502.2, 524.2	0.0005
1,4-Dichlorobenzene (para)	2969	0.075	502.2, 524.2	0.0005
1,2-Dichloroethane	2980	0.005	502.2, 524.2	0.0005
1,1-Dichloroethylene	2977	0.007	502.2, 524.2	0.0005
cis-1,2-Dichloroethylene	2380	0.07	502.2, 524.2	0.0005
trans-1,2-Dichloroethylene	2979	0.1	502.2, 524.2	0.0005
Dichloromethane	2964	0.005	502.2, 524.2	0.0005
1,2-Dichloropropane	2983*	0.005	502.2, 524.2	0.0005
Ethylbenzene	2992	0.7	502.2, 524.2	0.0005
Styrene	2996	0.1	502.2, 524.2	0.0005
Tetrachloroethylene	2987	0.005	502.2, 524.2, 551.1	0.0005
Toluene	2991	1	502.2, 524.2	0.0005
1,1,1-Trichloroethane	2981	0.2	502.2, 524.2, 551.1	0.0005
Trichloroethylene	2984	0.005	502.2, 524.2, 551.1	0.0005
1,2,4-Trichlorobenzene	2378	0.07	502.2, 524.2	0.0005
1,1,2-Trichloroethane	2985	0.005	502.2, 524.2, 551.1	0.0005
Vinyl chloride	2976	0.002	502.2, 524.2	0.0005
Xylenes (total)	2955*	10	502.2, 524.2	0.0005
Synthetic Organic Chemicals (SOCs):				
Alachlor <sup>3</sup>	2051	0.002	505, 507, 508.1, 525.2, 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 <sup>3</sup>	2050	0.003	505, 507, 508.1, 525.2, 551.1, Syngenta AG-625	0.0001
Benzo(a)pyrene	2306	0.0002	525.2, 550, 550.1	0.00002
Carbofuran	2046	0.04	531.1, 531.2, 6610	0.0009
Chlordane <sup>3</sup>	2959	0.002	505, 508, 508.1, 525.2	0.0002
2,4-D <sup>6</sup> (as acids, salts, and esters)	2105	0.07	515.1, 515.2, 515.3, 515.4, 555, D5317-93	0.0001
Dalapon	2031	0.2	515.1, 515.3, 515.4, 552.1, 552.2	0.001
1,2-Dibromo-3-chloropropane (DBCP)	2931	0.0002	504.1, 551.1	0.00002
Di(2-ethylhexyl)adipate	2035	0.4	506, 525.2	0.0006
Di(2-ethylhexyl)phthalate	2039	0.006	506, 525.2	0.0006
Dinoseb <sup>6</sup>	2041	0.007	515.1, 515.2, 515.3, 515.4, 555	0.0002
Diquat	2032	0.02	549.2	0.0004
Endothall	2033	0.1	548.1	0.009

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology <sup>1</sup>	Detection Limit (mg/L)
Endrin <sup>3</sup>	2005	0.002	505, 508, 508.1, 525.2, 551.1	0.00001
Ethylene dibromide (EDB)	2946	0.00005	504.1, 551.1	0.00001
Glyphosate	2034	0.7	547, 6651	0.006
Heptachlor <sup>3</sup>	2065	0.0004	505, 508, 508.1, 525.2, 551.1	0.00004
Heptachlor epoxide <sup>3</sup>	2067	0.0002	505, 508, 508.1, 525.2, 551.1	0.00002
Hexachlorobenzene <sup>3</sup>	2274	0.001	505, 508, 508.1, 525.2, 551.1	0.0001
Hexachlorocyclopentadiene <sup>3</sup>	2042	0.05	505, 508, 508.1, 525.2, 551.1	0.0001
Lindane (gamma BHC) <sup>3</sup>	2010	0.0002	505, 508, 508.1, 525.2, 551.1	0.00002
Methoxychlor <sup>3</sup>	2015	0.04	505, 508, 508.1, 525.2, 551.1	0.0001
Oxamyl	2036	0.2	531.1, 531.2, 6610	0.002
Pentachlorophenol	2326	0.001	515.1, 515.2, 515.3, 515.4, 525.2, 555, D5317-93	0.00004
Picloram <sup>3,6</sup>	2040	0.5	515.1, 515.2, 515.3, 515.4, 555, D5317-93	0.0001
Polychlorinated biphenyls <sup>4</sup> (as decachlorobiphenyl) (as Arochlors) <sup>3</sup>	2383	0.0005	508A 505, 508, 508.1, 525.2	0.0001
Simazine <sup>3</sup>	2037	0.004	505, 507, 508.1, 525.2, 551.1	0.00007
2,3,7,8-TCDD (dioxin)	2063	3x10 <sup>-8</sup>	1613	5x10 <sup>-9</sup>
2,4,5-TP <sup>6</sup> (Silvex)	2110	0.05	515.1, 515.2, 515.3, 515.4, 555, D5317-93	0.0002
Toxaphene <sup>3</sup>	2020	0.003	505, 508, 508.1, 525.2	0.001

\*As of January 1, 1999, the contaminant codes for the following compounds were changed from the Iowa Contaminant Code to the EPA Contaminant Code:

Contaminant	Iowa Contaminant Code (Old)	EPA Contaminant Code (New)
1,2 Dichloropropane	2325	2983
Xylenes (total)	2974	2955

<sup>1</sup>Analyses for the contaminants in this section 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, EPA West, 1301 Constitution Avenue NW, Room B102, Washington, DC 20460 (telephone: (202) 566-2426); or at the Office of the Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

The following methods are available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161 (telephone: (800)553-6847).

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.

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

The following American Public Health Association (APHA) documents are available from APHA, 1015 Fifteenth Street NW, Washington, DC 20005.

Supplement to the 18th Edition of Standard Methods for the Examination of Water and Wastewater, 1994, Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995, or 20th edition, 1998 (any of the three editions may be used), APHA: Method 6610.

Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, 19th edition, 1995, or 20th edition, 1998, (any of the three editions may be used), APHA: Method 6651.

The following American Society for Testing and Materials (ASTM) method is available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

Annual book of ASTM Standards, 1999, Vol. 11.02 (or any edition published after 1993), ASTM: D5317-93.

Methods 515.3 and 549.2 are available from U.S. 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, available at [www.epa.gov/safewater/methods/sourcalt.html](http://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 Photocol-umn Derivatization,” Revision 1.0, September 2001, EPA 815/B-01/002, available at [www.epa.gov/safewater/methods/sourcalt.html](http://www.epa.gov/safewater/methods/sourcalt.html).

Syngenta AG-625 Method, “Atrazine in Drinking Water by Immunoassay,” February 2001, is available from Syngenta Crop Protection, Inc., 410 Swing Road, P.O. Box 18300, Greensboro, NC 27419, telephone (336)632-6000.

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).

<sup>2</sup>Reserved.

<sup>3</sup>Substitution of the detector specified in Method 505, 507, 508, or 508.1 for the purpose of achieving lower detection limits is allowed as follows. Either an electron capture or nitrogen-phosphorus detector may be used provided all regulatory requirements and quality control criteria are met.

<sup>4</sup>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.

<sup>5</sup>Reserved.

<sup>6</sup>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.

(2) Organic chemical compliance calculations. Compliance with 41.5(1)“b”(1) shall be determined based on the analytical results obtained at each sampling point. If one sampling point is in violation of an MCL listed in 41.5(1)“b”(1), 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. If the system is in violation of an MCL, the water supplier is required to give notice to the department in accordance with 567—subrule 42.4(1) and to notify the public as required by 567—42.1(455B).

1. Systems monitoring more than once per year for VOC or SOC contaminants. For systems which monitor more than once per year, compliance with the MCL is determined by a running annual average of all samples collected at each sampling point.

2. Systems monitoring annually or less frequently for VOC contaminants. Systems which 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 running annual average to exceed the MCL at any sampling point, the system is immediately out of compliance with the MCL.

3. Systems monitoring annually or less frequently for SOC contaminants. Systems which monitor annually or less frequently and whose SOC sample result exceeds the regulatory detection limit specified

in subparagraph 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 running annual average to exceed the MCL at any sampling point, the system is immediately out of compliance with the MCL.

(3) Treatment techniques for acrylamide and epichlorohydrin. Each public water supply system 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 levels specified as follows:

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

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

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

*c. Organic chemical monitoring requirements.* Each public water system 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 time period specified by the department. The system must also comply with the initial sampling frequencies specified by the department to ensure the system can demonstrate compliance with the MCLs. A source of water that is determined by the department to be a new source/entry point is considered to be a new source for the purposes of paragraph 41.5(1)“c.” Routine and increased monitoring frequencies shall be conducted in accordance with the requirements in this paragraph.

(1) Routine volatile organic chemical (VOC) monitoring requirements. Beginning on January 1, 1993, community water supplies and NTNC water supplies shall conduct monitoring of the contaminants listed in 41.5(1)“b”(1) for the purpose of determining compliance with the maximum contaminant level.

(2) VOC monitoring protocol.

1. VOC groundwater monitoring protocol. Groundwater 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). 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. VOC surface water monitoring protocol. Surface water systems (and combined surface/groundwater systems) shall take a minimum of one sample at each entry point to the distribution system after treatment (hereafter called a source/entry point). 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 the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used). If a representative sample of all water sources cannot be obtained, as determined by the department, separate source/entry points with the appropriate monitoring requirements will be assigned by the department.

4. Initial VOCs monitoring frequency. Each community and nontransient noncommunity water system shall take four consecutive quarterly samples for each contaminant listed in 41.5(1)“b”(1) during each compliance period, beginning in the initial compliance period. If the initial monitoring for contaminants listed in 41.5(1)“b”(1) has been completed by December 31, 1992, and the system did not detect any contaminant listed in 41.5(1)“b”(1), then each groundwater and surface water system shall take one sample annually beginning with the initial compliance period.

5. Reduced VOC monitoring for groundwater systems. After a minimum of three years of annual sampling, the department may allow groundwater systems with no previous detection of any contaminant listed in 41.5(1)“b”(1) to take one sample during each compliance period.

6. VOC monitoring waivers. Each community and nontransient noncommunity groundwater system which does not detect a contaminant listed in 41.5(1)“b”(1) may apply to the department for a waiver from the requirements of 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 the department finds that there has not been any 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, then the following factors shall be used to determine whether a waiver is granted.

- Previous analytical results.
- The proximity of the system 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, or from hazardous and municipal waste landfills and other waste handling or treatment facilities.
- The environmental persistence and transport of the contaminants.
- The number of persons served by the public water system and the proximity of a smaller system to a larger system, and
- How well the water source is protected against contamination, such as whether it is a surface or groundwater system. Groundwater systems must consider factors such as depth of the well, the type of soil, and wellhead protection. Surface water systems must consider watershed protection.

8. VOC monitoring waiver requirements for groundwater systems. As a condition of the waiver, a groundwater system must take one sample at each sampling point during the time the waiver is effective (i.e., one sample during two compliance periods or six years) and update its vulnerability assessment considering the factors listed 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, then the waiver is invalidated and the system is required to sample annually as specified in 41.5(1)“c”(2)“4.”

9. VOC monitoring waiver requirements for surface water systems. Each community and nontransient noncommunity surface water system which does not detect a contaminant listed in 41.5(1)“b”(1) may apply to the department for a waiver from the requirements of 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 frequency specified by the department (if any).

10. Increased VOC monitoring. If a contaminant listed in 41.5(1)“b”(1) is detected at a level exceeding 0.0005 mg/L in any sample, then:

The system must monitor quarterly at each sampling point which resulted in a detection.

The department may decrease the quarterly monitoring requirement specified in 41.5(1)“c”(2)“4” provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case shall the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

If the department determines that the system is reliably and consistently below the MCL, the department may allow the system to monitor annually. Systems which monitor annually must monitor during the quarter(s) which previously yielded the highest analytical result.

Systems which have three consecutive annual samples with no detection of a contaminant may apply to the department for a waiver as specified in 41.5(1)“c”(2)“6.”

Groundwater systems which 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 monitoring frequency of vinyl chloride monitoring to one sample during each compliance period. Surface water systems are required to monitor for vinyl chloride as specified by the department.

11. VOCs reliably and consistently below the MCL. Systems which violate the MCL requirements of 41.5(1)“b”(1) must monitor quarterly. After a minimum of four consecutive quarterly samples which show the system is in compliance and the department determines that the system is reliably and consistently below the maximum contaminant level, the system may monitor at the frequency and times specified in 41.5(1)“c”(2)“10,” third unnumbered paragraph (following approval by the department).

(3) Routine and repeat synthetic organic chemical (SOC) monitoring requirements. Analysis of the synthetic organic contaminants listed in 41.5(1)“b”(1) for the purposes of determining compliance with the maximum contaminant level shall be conducted as follows:

1. SOC groundwater monitoring protocols. Groundwater 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). 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 surface water monitoring protocols. Surface water systems shall take a minimum of one sample at each entry point to the distribution system after treatment (hereafter called a source/entry point). 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, surface water systems include systems with a combination of surface and ground sources.

3. Multiple sources. If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used). If a representative sample of all water sources cannot be obtained, as determined by the department, separate source/entry points with the appropriate monitoring requirements will be assigned by the department.

4. SOC monitoring frequency. Community and nontransient noncommunity water systems shall take four consecutive quarterly samples for each contaminant listed in 41.5(1)“b”(1) during each compliance period beginning with the compliance period starting January 1, 1993. Systems serving more than 3,300 persons which do not detect a contaminant 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 which do not detect a contaminant 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 community and nontransient water system 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 the department finds that there has been 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, then the department shall determine whether a waiver may be granted by considering:

- Previous analytical results.
- The proximity of the system 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, or from hazardous and municipal waste landfills and other waste handling or treatment facilities. Nonpoint sources include the use of pesticides to control insect and weed pests on agricultural areas, forest lands, home and gardens, and other land application uses.
  - The environmental persistence and transport of the pesticide or PCBs.
  - How well the water source is protected against contamination due to such factors as depth of the well and the type of soil and the integrity of the well casing.
  - Elevated nitrate levels at the water supply source, and
  - Use of PCBs in equipment used in the production, storage, or distribution of water (i.e., PCBs used in pumps and transformers).

7. Increased SOC monitoring. If a synthetic organic contaminant listed in 41.5(1)“b”(1) 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 requirement if the system is reliably and consistently below the maximum contaminant level. In no case shall the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

- After the department determines the system is reliably and consistently below the maximum contaminant level, the system may monitor annually. Systems which monitor annually must monitor during the quarter that previously yielded the highest analytical result.

- Systems which have three consecutive annual samples with no detection of a contaminant may apply to the department 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), then subsequent monitoring shall analyze for all related contaminants.

8. MCL violation and reliably/consistently below the MCL. Systems which 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) Organic chemical (SOC and VOC) confirmation samples. The department may require a confirmation sample for positive or negative results. If a confirmation sample is required by the department, the result must be averaged with the first sampling result and the average is 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 organic chemical (SOC and VOC) 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 Section 1445 of the Safe Drinking Water Act for purposes of initial monitoring compliance. If the data are generally consistent with the other requirements in this subparagraph, the department may use such data (i.e., a single sample rather than four quarterly samples) to satisfy the initial monitoring requirement for the initial compliance period beginning January 1, 1993. Systems which 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 organic chemical (SOC and VOC) monitoring. The department may increase the required monitoring frequency, where necessary, to detect variations within the system (e.g., fluctuations in concentration due to seasonal use, changes in water source, changes to treatment facilities or normal operation thereof).

(7) Organic chemical (SOC and VOC) vulnerability assessment criteria. Vulnerability of each public water system shall be determined by the department based upon an assessment of the following factors.

1. VOC vulnerability assessment criteria—previous monitoring results. A system will be classified vulnerable if any sample was analyzed to contain one or more contaminants listed in 41.5(1)“b”(1)-(VOCs) or 41.5(1)“b”(3) except for trihalomethanes or other demonstrated disinfection by-products.

2. SOC vulnerability assessment criteria—previous monitoring results. A system will be classified vulnerable if any sample was analyzed to contain one or more contaminants listed in 41.5(1)“b”(2)-(SOCs) or 41.5(1)“b”(3) except for trihalomethanes or other demonstrated disinfection by-products.

3. Proximity of surface water supplies to commercial or industrial use, disposal or storage of volatile synthetic organic chemicals. Surface waters which 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 such as primary highways or railroads or any of the contaminant sources listed in this subparagraph. Surface water supplies which 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 such as primary highways or railroads or any of the contaminant sources listed in this subparagraph.

4. Proximity of supplies to commercial or industrial use, disposal or storage of volatile synthetic organic chemicals. Wells that are not separated from sources of contamination by at least the following distances will be considered vulnerable.

<u>Sources of Contamination</u>	<u>Shallow Wells as defined in 567—40.2(455B)</u>	<u>Deep Wells as defined in 567—40.2(455B)</u>
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 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

5. A system is deemed to be vulnerable for a period of three years after any positive measurement of one or more contaminants listed in 41.5(1) "b"(1) except for trihalomethanes or other demonstrated disinfection by-products.

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

1. Each system which 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

<u>Aroclor</u>	<u>Detection Limit (mg/L)</u>
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.

*d. Best available technology(ies) (BATs).* Rescinded IAB 8/11/99, effective 9/15/99.

*e. Total trihalomethanes sampling, analytical and other requirements.* Rescinded IAB 1/7/04, effective 2/11/04.

*f. Analytical procedures—organics.* Rescinded IAB 1/7/04, effective 2/11/04.

**41.5(2) Organic chemicals occurring as (nontrihalomethane) disinfection by-products.** Reserved.  
[ARC 9915B, IAB 12/14/11, effective 1/18/12]

**567—41.6(455B) Disinfection byproducts maximum contaminant levels and monitoring requirements.**

**41.6(1) Stage 1 disinfection byproducts requirements.**

*a. Applicability.*

(1) This rule establishes criteria under which CWS and NTNC public water supply systems 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 listed in this rule and the maximum residual disinfectant levels (MRDL) and treatment technique requirements for disinfection byproduct precursors listed in 567—43.6(455B).

(2) Rescinded IAB 1/7/04, effective 2/11/04.

(3) 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 compliance with the maximum contaminant level is not required until the dates stated below.

1. CWS and NTNC systems which use surface water or groundwater under the direct influence of surface water 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 CWS and NTNC systems covered by 41.6(1)“a”(1) must comply with this rule by January 1, 2004.

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

(5) Systems with multiple water sources. 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 conduct the monitoring for the applicable disinfectants or oxidants and disinfection byproducts during operation of each source. The system must comply with this rule during the use of each water source.

*b. Maximum contaminant levels for disinfection byproducts.*

(1) The maximum contaminant levels (MCLs) for disinfection byproducts are as follows:

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

\*The TTHM MCL changed from 0.10 mg/L to 0.080 mg/L effective January 1, 2002, for CWS serving at least 10,000 people and effective January 1, 2004, for all other CWS and NTNC systems which are subject to this rule.

(2) Beginning on the date listed in the following table, a system must comply with the total trihalomethanes MCL and the haloacetic acid MCL as a locational running annual average 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 Size (number of people served)	Date system must comply with MCL at each sampling location*
System serving 10,000-49,999 people	October 1, 2013
System serving fewer than 10,000 people	<ul style="list-style-type: none"> <li>• October 1, 2013, for all groundwater systems and for SW/IGW systems that did not collect <i>Cryptosporidium</i> source water samples</li> <li>• October 1, 2014, for SW/IGW systems that collected <i>Cryptosporidium</i> source water samples</li> </ul>
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 operational evaluation levels if the system requires capital improvements to comply with an MCL.

*c. Monitoring requirements for disinfection byproducts.*

(1) General requirements.

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 a running annual average of monthly or quarterly samples or averages, and the system’s failure to monitor makes it impossible to determine compliance with MCLs.

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 surface water or groundwater under the direct influence of surface water 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 at least 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 treatment techniques.

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

(2) Bromate. Community and nontransient noncommunity systems using ozone for disinfection or oxidation must conduct monitoring 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 source/entry point to the distribution system while the ozonation system is operating under normal conditions.

2. Reduced monitoring. A system may reduce monitoring from monthly to quarterly, if the system’s running annual average bromate concentration is less than or equal to 0.0025 mg/L based on monthly bromate measurements for the most recent four quarters. If the system previously qualified for reduced bromate monitoring and is on quarterly sampling frequency, it may remain on reduced monitoring as long as the running annual average of the bromate samples is less than or equal to 0.0025 mg/L. If the running annual average 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. Community and nontransient noncommunity water systems using chlorine dioxide, for disinfection or oxidation, must conduct monitoring for chlorite. If the system does not use chlorine dioxide on a daily basis, the system 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 take daily samples at the entrance to the distribution system. For any daily sample that exceeds the chlorite MCL, the system must take additional samples in the distribution system the following day at the locations required by 41.6(1) "c"(3)"3," which are in addition to the sample required at the entrance to the distribution system. These daily entry point to the distribution system 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 in the distribution system. Any additional routine sampling must be conducted in the same manner (as three-sample sets, at the specified locations). The system may use the results of additional monitoring conducted in accordance with 41.6(1) "c"(3)"3" to meet the requirement for monitoring in 41.6(1) "c"(3)"2." These monthly distribution system 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 entrance to the distribution system, 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 maximum residence time in the distribution system). These additional distribution system 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 entrance to the distribution system required by 41.6(1) "c"(3)"1" may not be reduced.

- The department may allow systems with monthly chlorite monitoring in the distribution system required by 41.6(1) "c"(3)"2" to be reduced to a requirement of 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 monitoring under 41.6(1) "c"(3)"3" of this rule, at which time the system 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 <sup>3</sup> system serving $\geq 10,000$ persons	Four water samples per quarter per treatment plant	At least 25 percent of all samples collected each quarter at locations representing maximum residence time. Remaining samples taken at locations representative of at least average residence time in the distribution system and representing the entire distribution system, taking into account number of persons served, different sources of water, and different treatment methods. <sup>1</sup>
SW/IGW <sup>3</sup> system serving 500-9,999 persons	One water sample per quarter per treatment plant	Locations representing maximum residence time. <sup>1</sup>
SW/IGW <sup>3</sup> system serving $< 500$ persons	One sample per year per treatment plant during month of warmest water temperature	Locations representing maximum residence time. <sup>1</sup> If the sample (or average of annual samples, if more than one sample is taken) exceeds MCL, system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until system meets reduced monitoring criteria in 41.6(1) "c"(4)"2," second bulleted paragraph.
System using only non-IGW groundwater using chemical disinfectant and serving $\geq 10,000$ persons	One water sample per quarter per treatment plant <sup>2</sup>	Locations representing maximum residence time. <sup>1</sup>
System using only non-IGW groundwater using chemical disinfectant and serving $< 10,000$ persons	One sample per year per treatment plant during month of warmest water temperature	Locations representing maximum residence time. <sup>1</sup> If the sample (or average of annual samples, if more than one sample is taken) exceeds MCL, system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until system meets reduced monitoring criteria in 41.6(1) "c"(4)"2," second bulleted paragraph.

<sup>1</sup>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 maximum residence time of the water in the distribution system. The remaining samples must be taken at locations representative of at least average residence time in the distribution system.

<sup>2</sup>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.

<sup>3</sup>SW/IGW indicates those systems that use either surface water (SW) or groundwater under the direct influence of surface water (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 your ...	You may reduce monitoring to this level
SW/IGW <sup>1</sup> system serving $\geq 10,000$ persons which has a source water annual average TOC level, before any treatment, of $\leq 4.0$ mg/L.	TTHM annual average $\leq 0.040$ mg/L and HAA5 annual average $\leq 0.030$ mg/L	One sample per treatment plant per quarter at distribution system location reflecting maximum residence time.
SW/IGW <sup>1</sup> system serving 500 - 9,999 persons that has a source water annual average TOC level, before any treatment, of $\leq 4.0$ mg/L.	TTHM annual average $\leq 0.040$ mg/L and HAA5 annual average $\leq 0.030$ mg/L	One sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature.
SW/IGW <sup>1</sup> system serving $< 500$ persons	Any SW/IGW <sup>1</sup> system serving $< 500$ persons may not reduce its monitoring to less than one sample per treatment plant per year.	
System using only non-IGW groundwater using chemical disinfectant and serving $\geq 10,000$ persons	TTHM annual average $\leq 0.040$ mg/L and HAA5 annual average $\leq 0.030$ mg/L	One sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature.
System using only non-IGW groundwater using chemical disinfectant and serving $< 10,000$ persons	TTHM annual average $\leq 0.040$ mg/L and HAA5 annual average $\leq 0.030$ mg/L for two consecutive years; or, TTHM annual average $\leq 0.020$ mg/L and HAA5 annual average $\leq 0.015$ mg/L for one year.	One sample per treatment plant per three-year monitoring cycle at distribution system location reflecting maximum residence time during month of warmest water temperature, with the three-year cycle beginning on January 1 following quarter in which system qualifies for reduced monitoring.

<sup>1</sup>SW/IGW indicates those systems that use either surface water (SW) or groundwater under the direct influence of surface water (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 which must monitor quarterly) or the result of the sample (for systems which must monitor no more frequently than annually) is less than or equal to 0.060 mg/L for TTHMs and is 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 groundwater not under the direct influence of surface water 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 the department's discretion.

d. *Analytical requirements for disinfection byproducts.*

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

(2) Systems must measure disinfection byproducts by the methods (as modified by the footnotes) listed in the following table:

## Approved Methods for Disinfection Byproduct Compliance Monitoring

Contaminant and Methodology	EPA Method <sup>1</sup>	Standard Method <sup>2</sup>	ASTM Method <sup>3</sup>
TTHM			
P&T/GC/EICD & PID	502.2 <sup>4</sup>		
P&T/GC/MS	524.2		
LLE/GC/ECD	551.1		
HAA5			
LLE (diazomethane)/GC/ECD		6251 B <sup>5</sup>	
SPE (acidic methanol)/GC/ECD	552.1 <sup>5</sup>		
LLE (acidic methanol)/GC/ECD	552.2, 552.3		
Bromate			
Ion chromatography	300.1		D 6581-00
Ion chromatography & postcolumn reaction <sup>9</sup>	317.0 Rev. 2.0 <sup>6</sup> , 326.0 <sup>6</sup>		
IC/ICP-MS <sup>9</sup>	321.8 <sup>6,7</sup>		
Chlorite			
Amperometric titration		4500-ClO <sub>2</sub> E <sup>8</sup>	
Spectrophotometry	327.0 Rev. 1.1 <sup>8</sup>		
Ion chromatography	300.0, 300.1, 317.0 Rev. 2, 326.0		

ECD = electron capture detector

IC = ion chromatography

P&T = purge and trap

EICD = electrolytic conductivity detector

LLE = liquid/liquid extraction

PID = photoionization detector

GC = gas chromatography

MS = mass spectrometer

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 of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at (800)426-4791. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC 20408.

<sup>1</sup>EPA: The following methods are available from the National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161 (telephone: (800)553-6847):

Methods 300.0 and 321.8: Methods for the Determination of Organic and Inorganic Compounds in Drinking Water, Volume 1, USEPA, August 2000, EPA 815-R-00-014 (available through 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 (available through 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," USEPA, 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," USEPA, 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," USEPA, 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 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," USEPA, July 2003, EPA-815-B-03-002.



<sup>2</sup>4500-CIO2 E: Standard Methods for the Examination of Water and Wastewater, 19th and 20th editions, American Public Health Association, 1995 and 1998, respectively, which is available from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

<sup>3</sup>Method D 6581-00: American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428: Annual Book of ASTM Standards, Volume 11.01, American Society for Testing and Materials, 2001 (or any year containing the cited version).

<sup>4</sup>If TTHMs are the only analytes being measured in the sample, then a PID is not required.

<sup>5</sup>The samples must be extracted within 14 days of sample collection.

<sup>6</sup>Ion chromatography and postcolumn reaction or IC/ICP-MS must be used for bromate analysis for purposes of demonstrating eligibility of reduced monitoring.

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

<sup>8</sup>Amperometric titration or spectrophotometry may be used for routine daily monitoring of chlorite at the entrance to the distribution system, as prescribed in 41.6(1) "c"(3)"1." Ion chromatography must be used for routine monthly monitoring of chlorite and additional monitoring of chlorite in the distribution system, as prescribed in 41.6(1) "c"(3)"2" and "3."

<sup>9</sup>These are the only methods approved for reduced bromate monitoring under 41.6(1) "c"(2)"2."

(3) Certified laboratory requirements. Analyses under this rule for disinfection byproducts shall only be conducted by laboratories that have been certified by the department and are in compliance with the requirements of 567—Chapter 83, except as specified under 41.6(1) "d"(4). The performance evaluation sample acceptance limits and minimum reporting levels are listed in 567—subparagraph 83.6(7) "a"(6).

(4) Daily chlorite samples at the entrance to the distribution system must be measured by a Grade II, III or IV operator meeting the requirements of 567—Chapter 81, any person under the supervision of a Grade II, III or IV operator meeting the requirements of 567—Chapter 81, or a laboratory certified by the department to perform analysis under 567—Chapter 83.

*e. Compliance requirements for disinfection byproducts.*

(1) General requirements.

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

2. 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 paragraph 41.6(1) "c," any individual quarter's average will cause the running annual average of that system to exceed the MCL, the system is out of compliance at the end of that quarter.

(2) Bromate. Compliance must be based on a running annual arithmetic average, computed quarterly, of monthly samples (or, for months in which the system takes more than one sample, the average of all samples taken during the month) collected by the system as prescribed by 41.6(1) "c"(2). If the average of samples covering any consecutive four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 567—42.1(455B), in addition to reporting to the department pursuant to 567—paragraph 42.4(3) "d." If a PWS fails to complete 12 consecutive months' monitoring, compliance with the MCL 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 41.6(1) "c"(3)"2." If the arithmetic average of any three-sample set exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 567—42.1(455B), in addition to reporting to the department pursuant to 567—paragraph 42.4(3) "d."

(4) TTHM and HAA5.

1. For systems monitoring quarterly, compliance with MCLs in 41.6(1) "b" must be based on a running annual arithmetic average, computed quarterly, of quarterly arithmetic averages of all samples collected by the system as prescribed by 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 the provisions of 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 running annual average to exceed the MCL, in which case the system is in violation at the end of that quarter. Systems required to increase to quarterly monitoring must calculate compliance by including the sample that triggered the increased monitoring plus the following three quarters of monitoring.

3. If the running annual arithmetic average of quarterly averages covering any consecutive four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 567—42.1(455B) in addition to reporting to the department pursuant to 567—paragraph 42.4(3) "d."

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

*f. Reporting requirements for disinfection byproducts.* 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 public notification provisions of 567—42.1(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 disinfection byproducts are listed in 567—subparagraph 42.4(3) "d"(2).

**41.6(2) Stage 2 initial distribution system evaluation.** The department is adopting by reference the requirements for the Stage 2 initial distribution system evaluation (IDSE) listed in 40 CFR 141.600-605 as adopted on January 4, 2006. This regulation establishes monitoring and other requirements for identifying compliance monitoring locations that will be used to determine compliance with maximum contaminant levels for total trihalomethanes and haloacetic acids. All CWS required to comply with 41.6(1) and all NTNC serving at least 10,000 people that are 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 disinfection byproducts requirements.** The requirements of this subrule constitute national primary drinking water regulations. This subrule establishes monitoring and other requirements for achieving compliance with MCLs 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 ultraviolet light or deliver water that has been treated with a primary or residual disinfectant other than ultraviolet light must comply with the requirements in this subrule.

(1) *Schedule.* Systems must comply with the dates listed in the appropriate schedule. For the purposes of this subrule, the combined distribution system (CDS) as defined in 567—40.2(455B) 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 combined distribution system. 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	<ul style="list-style-type: none"> <li>• October 1, 2013, for all GW systems and any SW/IGW systems that did not conduct <i>Cryptosporidium</i> sampling under 567—paragraph 43.11(3)“b”(2)“4”</li> <li>• October 1, 2014, for SW/IGW systems that conducted <i>Cryptosporidium</i> sampling under 567—paragraph 43.11(3)“b”(2)“4”</li> </ul>

(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 conduct quarterly monitoring 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 conduct monitoring 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 to the department for 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 conduct quarterly monitoring 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 the MCL to be exceeded regardless of the results of subsequent sampling. Compliance determination must continue at the end of each subsequent quarter.

2. Systems required to conduct monitoring 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, the system must calculate the compliance with the MCL 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 the requirements of 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 system 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 disinfection byproduct monitoring plan, which 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) report, that report contains all of the plan elements and meets this requirement.

(2) If the system does not have an approved IDSE-SMP report and does not have sufficient monitoring locations from its initial disinfection byproduct sampling plan, the system 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 report and has more monitoring locations from its initial Stage 1 disinfection byproduct sampling plan than the number of locations required under the Stage 2 compliance monitoring, the system 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 (such as changes in water quality or hydraulics, etc.).

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. The system must consult with the department regarding the need for changes and the appropriateness of changes. The 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 the 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 disinfection byproducts 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 disinfection byproducts monitoring plan and on the schedule specified in 41.6(3) "a"(1). Each system must monitor the disinfection byproducts at the minimum number of locations identified in the Routine Monitoring table.

Routine Monitoring

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
	10,000-49,999	per quarter	4
	50,000-249,999	per quarter	8
Groundwater	<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 disinfection byproduct 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 listed in 41.6(1) “d”(2) for TTHM and HAA5 analyses pursuant to this subrule. Analyses must be conducted by laboratories certified for disinfection byproducts analyses in accordance with 567—Chapter 83.

*d. Reduced monitoring.* A system may reduce monitoring to the level specified in the Reduced Monitoring table anytime the locational running annual average 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 the provisions of this rule may be used to qualify for reduced monitoring.

#### Reduced Monitoring

Source water type	Population size category	Monitoring frequency <sup>1</sup>	Distribution system monitoring location sites per monitoring period <sup>2</sup>
SW/IGW	<500	per year	Monitoring may not be reduced
	500-3,300	per year	1 sample per year at the 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: one at the location and during the quarter with the highest TTHM single measurement; one at the location and during the quarter with the highest HAA5 single measurement
	10,000-49,999	per quarter	2 samples: one at the highest TTHM LRAA location and one at the highest HAA5 LRAA location
	50,000-249,999	per quarter	4 samples: one sample each at the highest two TTHM LRAA locations and one sample each at the highest two HAA5 LRAA locations
Groundwater	<500	every third year	1 sample per year at the 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 the 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: one at the location and during the quarter with the highest TTHM single measurement; one at the location and during the quarter with the highest HAA5 single measurement
	100,000-499,999	per quarter	2 samples: one at the highest TTHM LRAA location and one at the highest HAA5 LRAA location

<sup>1</sup>Systems on a quarterly monitoring frequency must collect the sample(s) every 90 days.

<sup>2</sup>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 running annual average TOC level, before any treatment, must be less than or equal to 4.0 mg/L at each treatment plant treating surface water or influenced groundwater, 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 running annual average 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 listed 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 disinfection byproduct 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. The 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 MCL for TTHM or HAA5, based upon the LRAA, must increase monitoring to quarterly at all locations. The quarterly samples must be analyzed for both TTHM and HAA5 components. The LRAA is calculated based on four consecutive quarters of monitoring or based on fewer quarters of data 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 the system 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 the system 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. The system may not have any monitoring violations during the most recent four consecutive quarters.

*f. Operational evaluation level (OEL).*

(1) TTHM operational evaluation level. The TTHM operational evaluation level is determined by the sum of the two previous quarters' TTHM results plus twice the current quarter's TTHM result, divided by 4 to determine an average. If that average exceeds 0.080 mg/L, the system has exceeded the TTHM operational evaluation level.

(2) HAA5 operational evaluation level. The HAA5 operational evaluation level is determined by the sum of the two previous quarters' HAA5 results plus twice the current quarter's HAA5 result, divided by 4 to determine an average. If that average exceeds 0.060 mg/L, the system has exceeded the HAA5 operational evaluation level.

(3) A system must calculate the operational evaluation level 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) Requirements when the operational evaluation level is exceeded. The system must conduct an operational evaluation and submit a written report of the evaluation to the department within 90 days after the system is notified of the analytical result that caused the system to exceed the operational evaluation level. The written report must be made available to the public upon request. The report must include an examination 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 disinfection byproduct formation, and what steps could be considered to minimize future exceedances.

1. The system may make a request to the department to limit the scope of the examination if the system is able to identify the cause of the operational evaluation level exceedance. The 90-day deadline for submitting the written report cannot be extended.

2. The system must have department approval to limit the scope of the examination. The approval must be in writing and kept with the completed report.

*g. Reporting.* All systems required to comply with this rule must meet the reporting requirements pursuant to 567—paragraph 42.4(3) “d.”

*h. Record keeping.* All systems required to comply with this rule must retain the monitoring plans and analytical results as required by 567—paragraph 42.5(1) “h.”

[ARC 9915B, IAB 12/14/11, effective 1/18/12]

**567—41.7(455B) Physical properties maximum contaminant levels (MCL or treatment technique requirements) and monitoring requirements.** Rescinded IAB 10/18/00, effective 11/22/00.

**567—41.8(455B) Radionuclides.**

**41.8(1) Radionuclides.**

*a. Applicability.*

(1) This rule applies to all community public water supplies, and specifies the radionuclide maximum contaminant levels, analytical methodology requirements, and monitoring requirements. The radionuclide reporting requirements are listed in 567—subrule 42.4(1), the public notice requirements are listed in rule 567—42.1(455B), and the best available technology is listed in 567—subparagraph 43.3(10) “b”(3). All CWSs must comply with the requirements and maximum contaminant levels 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 by the department to be relevant to the vulnerability determination.

(2) Compliance dates. Community water systems must comply with the MCLs listed in 41.8(1)“b”(1) beginning December 8, 2003. Compliance shall be determined in accordance with 41.8(1)“c” through 41.8(1)“f.” Compliance with the radionuclides reporting requirements is required by December 8, 2003. All CWSs must conduct initial monitoring to determine compliance with 41.8(1)“b”(1) by December 31, 2007.

*b. Maximum contaminant levels for radionuclides.*

(1) Gross alpha particle activity, radium-226, radium-228, and uranium MCLs. The following table specifies the MCLs for gross alpha particles, radium, and uranium radionuclides:

Contaminant	Maximum Contaminant Level
Gross alpha particle activity, including Radium-226 but excluding radon and uranium	15 pCi/L
Combined Radium-226 and Radium-228	5 pCi/L <sup>1</sup>
Uranium	30 µg/L

<sup>1</sup>The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.

(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 millirem/year.

2. Except for the radionuclides listed below, the concentration of man-made radionuclides causing 4 millirems 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, United States 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 millirems/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. Compliance determinations.* Compliance with 41.8(1)“b” 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 the 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 42.4(1) and to notify the public as required by 567—42.1(455B).

(1) Detection limits. For the purposes of monitoring gross alpha particle activity, radium-226, radium-228, uranium, and beta particle and photon radioactivity in drinking water, “detection limit” is defined in this subparagraph.

1. For the purpose of monitoring 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).

2. To determine compliance with 41.8(1)“b”(1), 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
Radium-228	1 pCi/L
Uranium	1 µg/L

3. To determine compliance with 41.8(1)“b”(2), 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 (i.e., quarterly), compliance with the MCL is determined by a running annual average at each sampling point. If the average of any sampling point is greater than the MCL, the system is immediately in violation of the MCL. If any sample result causes the running annual average to exceed the MCL at any sample point, the system is immediately in violation of the MCL.

2. Systems monitoring annually or less frequently (i.e., one-, three-, six-, or nine-year frequency), and 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 source/entry point at which the sample was collected and for the specific contaminant that triggered the system into 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 running annual average 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 a running annual average 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, a value of zero will be used to calculate the annual average.

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

7. Averaging and significant figures. To judge compliance with the maximum contaminant levels listed in 41.8(1)“b,” averages of data shall be used and shall be rounded to the same number of significant figures as the maximum contaminant level for the substance 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 as it deems necessary to protect the public health, including public notification requirements.

*d. Analytical methodology for radionuclides.* Analysis for the following contaminants shall be conducted to determine compliance with 41.8(1) "b" in accordance with the methods in the following table, or equivalent methods determined in accordance with 567—41.12(455B).

- (1) Radionuclide Analytical Methodology Table.

### RADIONUCLIDE ANALYTICAL METHODOLOGY

Contaminant	Methodology	Reference (method or page number)								
		EPA <sup>1</sup>	EPA <sup>2</sup>	EPA <sup>3</sup>	EPA <sup>4</sup>	SM <sup>5</sup>	ASTM <sup>6</sup>	USGS <sup>7</sup>	DOE <sup>8</sup>	Other
Naturally occurring:										
Gross alpha <sup>11</sup> & beta	Evaporation	900.0	p. 1	00-01	p. 1	302, 7110B		R-1120-76		
Gross alpha <sup>11</sup>	Co-precipitation			00-02		7110C				
Radium-226	Radon emanation	903.1	p. 16	Ra-04	p. 19	305, 7500-Ra C	D 3454-97	R-1141-76	Ra-04	NY <sup>9</sup>
	Radiochemical	903.0	p. 13	Ra-03		304, 7500-Ra B	D 2460-97	R-1140-76		
Radium-228	Radiochemical	904.0	p. 24	Ra-05	p. 19	7500-Ra D		R-1142-76		NY <sup>9</sup> NJ <sup>10</sup>
Uranium <sup>12</sup>	Radiochemical	908.0				7500-U B				
	Fluorometric	908.1				7500-U C	D 2907-97	R-1180-76 R-1181-76	U-04	
	Alpha spectrometry			00-07	p. 33	7500-U C	D 3972-97	R-1182-76	U-02	
	Laser phosphorimetry						D 5174-97			
Man-made:										
Radioactive Cesium	Radiochemical	901.0	p. 4			7500-Cs B	D 2459-72	R-1111-76		
	Gamma ray spectrometry	901.1			p. 92	7120	D 3649-91	R-1110-76	4.5.2.3	
Radioactive Iodine	Radiochemical	902.0	p. 6 p. 9			7500-I B 7500-I C 7500-I D	D 3649-91			
	Gamma ray spectrometry	901.1			p. 92	7120	D 4785-93		4.5.2.3	
Radioactive Strontium 89, 90	Radiochemical	905.0	p. 29	Sr-04	p. 65	303, 7500-Sr B		R-1160-76	Sr-01 Sr-02	
Tritium	Liquid scintillation	906.0	p. 34	H-02	p. 87	306, 7500-3H B	D 4107-91	R-1171-76		
Gamma emitters	Gamma ray spectrometry	901.1 902.0 901.0			p. 92	7120 7500-Cs B 7500-I B	D 3649-91 D 4785-93	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 of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at (800)426-4791. Documents may be inspected at EPA's Drinking Water Docket, EPA West, 1301 Constitution Avenue NW, Room B135, Washington, DC 20460 (telephone (202)566-2426); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

<sup>1</sup>“Prescribed Procedures for Measurement of Radioactivity in Drinking Water,” EPA 600/4-80-032, August 1980. Available at the US Department of Commerce, NTIS, 5285 Port Royal Road, Springfield, VA 22161 (telephone (800)553-6847) PB 80-224744.

<sup>2</sup>“Interim Radiochemical Methodology for Drinking Water,” EPA 600/4-75-008(revised), March 1976. Available at NTIS, *ibid.* PB 253258.

<sup>3</sup>“Radiochemistry Procedures Manual,” EPA 520/5-84-006, December 1987. Available at NTIS, *ibid.* PB 84-215581.

<sup>4</sup>“Radiochemical Analytical Procedures for Analysis of Environmental Samples,” March 1979. Available at NTIS, *ibid.* EMSL LV 053917.

<sup>5</sup>Standard Methods for the Examination of Water and Wastewater, 13th, 17th, 18th, 19th or 20th editions, 1971, 1989, 1992, 1995, 1998. Available at American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005. Methods 302, 303, 304, 305, and 306 are only 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, and 20th editions. Method 7110C is in the 18th, 19th, and 20th editions. Method 7500-U C Fluorimetric Uranium is only in the 17th edition. Method 7500-U C Alpha spectrometry is only in the 18th, 19th, and 20th editions. Method 7120 is only in the 19th and 20th editions.

<sup>6</sup>Annual Book of ASTM Standards, Vol. 11.02, 1999. Any year containing the cited version of the method may be used. Available at ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

<sup>7</sup>“Methods for Determination of Radioactive Substances in Water and Fluvial Sediments,” Chapter A5 in Book 5 of Techniques of Water-Resources Investigations of the United States Geological Survey, 1977. Available at US Geological Survey (USGS) Information Services, Box 25286, Federal Center, Denver, CO 80225-0425.

<sup>8</sup>“EML Procedures Manual,” 28th (1997) or 27th (1990) editions, 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. Available at the Environmental Measurements Laboratory, US Department of Energy (DOE), 376 Hudson Street, New York, NY 10014-3621.

<sup>9</sup>“Determination of Ra-226 and Ra-228 (Ra-02),” January 1980, revised June 1982. Available at Radiological Sciences Institute Center for Laboratories and Research, New York State Department of Health, Empire State Plaza, Albany, NY 12201.

<sup>10</sup>“Determination of Radium-228 in Drinking Water,” August 1980. Available at 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.

<sup>11</sup>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.

<sup>12</sup>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.

(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 are to 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, Environmental Protection Agency, 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 requirements.

1. Monitoring frequency and confirmation samples. The department may require more frequent monitoring than specified in this paragraph. The department 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) Applicability and sampling locations.

1. Existing systems and sources. All existing CWSs must sample at every entry point to the distribution system that is representative of all sources being used under normal operating conditions. The system must take each sample at the same source/entry 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 41.8(1)“e”(3)“4.” 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 to conduct 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 the 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 a source/entry point is above the MCL, the system must collect and analyze quarterly samples at that source/entry point until the system has results from four consecutive quarters that are at or below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the department.

1. Systems without historical monitoring data. Systems without historical monitoring data must collect four consecutive quarterly samples at all source/entry sampling points before December 31, 2007. The department may waive the final two quarters of initial monitoring from a source/entry point if the results of the samples from the previous two quarters are below the detection limit.

2. Systems with historical monitoring data and one source/entry point. Systems with only one source/entry point 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 source/entry point to satisfy the initial monitoring requirement.

3. Systems with historical source/entry point monitoring data and multiple source/entry points. Systems with multiple source/entry points that also have appropriate historical monitoring data for each source/entry point 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 source/entry points. Systems with appropriate historical data for a representative point in the distribution system and multiple source/entry points 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 source/entry point is expected to be in compliance based upon the historical data and reasonable assumptions about the variability of contaminant levels between source/entry points. 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 frequency of monitoring from once every three years to once every six or nine years at each source/entry point, 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 (e.g., if a system’s source/entry point is on a nine-year frequency, and the sample result is above half of the MCL, then the next monitoring frequency for that source/entry point is three years). If a system has a monitoring result that exceeds the MCL while on reduced monitoring, the system must collect and analyze quarterly samples at that source/entry point until the system has results from four consecutive quarters that are below the MCL, unless the system 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 detection limit specified in 41.8(1)“c”(1)“2,” the system must collect and analyze for that contaminant using at least one sample at that source/entry point 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 that contaminant, the system must collect and analyze for that contaminant using at least one sample at that source/entry point 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 that contaminant, the system must collect and analyze for that contaminant using at least one sample at that source/entry point 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 compliance with the MCLs 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 maximum contaminant levels in 41.8(1)“b”(2) for beta particle and photon radioactivity, a system must monitor at a frequency specified in 41.8(1)“f.”

(1) General requirements.

1. Monitoring frequency and confirmation samples. The department may require more frequent monitoring than specified in 41.8(1)“f.” The department 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 entry point to the distribution system, 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 frequency of monitoring 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 a source/entry point has a running annual average (computed quarterly) of less than or equal to 50 pCi/L (screening level). Systems must collect all of the samples required in 41.8(1)“f”(2)“1” 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 the system’s source/entry point(s), where the department determines such data is applicable to a particular water system. In the event that there is a release from a nuclear facility,

systems which are using surveillance data must begin monitoring at the system's source/entry point(s) in accordance with 41.8(1) "f"(2).

(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 entry point to the distribution system, beginning within one quarter after being notified by the department. 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 by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure 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 a running annual average (computed quarterly) less than or equal to 15 pCi/L (screening level), the department may reduce the frequency of monitoring at that sampling point to every three years. Systems must collect all samples required in 41.8(1) "f"(3) during the reduced monitoring period.

3. Data substitution. For systems in the vicinity of a nuclear facility, the department may allow the 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 to a particular water system. In the event that there is a release from a nuclear facility, systems which are using surveillance data must begin monitoring at the CWS source/entry point 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 specified in 41.8(1) "f"(2) or (3).

(5) Community water systems 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, an analysis of the sample must be performed to identify the major radioactive constituents present in the sample, and the appropriate doses must be calculated and summed to determine compliance with 41.8(1) "b"(2) "1," using the formula in 41.8(1) "b"(2) "2." Doses must also be calculated and combined 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) which exceed the maximum contaminant level in 41.8(1) "b"(2) beginning the month after the exceedance occurs. Systems must continue monthly monitoring until the 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 set forth in 41.8(1) "f"(2) or 41.8(1) "f"(3) "2."

**41.8(2) Reserved.**

[ARC 9915B, IAB 12/14/11, effective 1/18/12]

**567—41.9(455B) Sampling and analytical requirements for radionuclides.** Rescinded IAB 1/7/04, effective 2/11/04.

**567—41.10(455B) Reporting, public notification and record keeping.** Rescinded IAB 8/11/99, effective 9/15/99.

**567—41.11(455B) Special monitoring.**

**41.11(1) Special monitoring for sodium.** Suppliers of water for community public water systems shall collect and have analyzed one sample per source or plant, for the purpose of determining 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. Surface water systems.* Systems utilizing a surface water source, in whole or in part, shall monitor for sodium at least once annually at the entry point to the distribution system.

*b. Groundwater systems.* Systems utilizing groundwater sources shall monitor at least once every three years at the entry point to the distribution system.

*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.* Analyses for sodium 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 community public water supply 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 of 41.11(1) “e”(1), the community public water supply shall include the sodium level in its annual consumer confidence report, pursuant to 567—paragraph 42.3(3) “c”(1) “12.”

*f. CWSs using cation exchange treatment.* Community water systems which utilize cation exchange treatment are required to collect one sodium sample of the finished water per year after all treatment. Analysis and reporting must be done in accordance with 41.11(1) “d” and “e.”

**41.11(2) Special monitoring for ammonia.** Ammonia in the groundwater is a precursor to the development of nitrite and nitrate in a drinking water system. Both nitrite and nitrate are 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:

Methodology	EPA <sup>1</sup>	Standard Methods (20th edition)	ASTM	USGS <sup>2</sup>	Other
Manual distillation at pH 9.5 <sup>4</sup> , followed by:	350.2	4500-NH3 B			973.49 <sup>3</sup>
Titration	350.2	4500-NH3 C			
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 <sup>5</sup>

<sup>1</sup>“Methods for Chemical Analysis of Water and Wastes,” Environmental Protection Agency, EPA-600/4-79-020, Revised March 1983 and 1979 where applicable.



<sup>2</sup>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 U.S. Geological Survey, Denver, CO, Revised 1989, unless otherwise stated.

<sup>3</sup>"Official Methods of Analysis of the Association of Official Analytical Chemists," 15th edition, 1990.

<sup>4</sup>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.

<sup>5</sup>Ammonia, Automated Electrode Method, Industrial Method Number 379-75 WE, dated February 19, 1976, Bran & Luebbe (Technicon) Auto Analyzer II, Bran & Luebbe Analyzing Technologies, Inc., Elmsford, NY 10523.

*b. Sample preservation and holding time.* The system 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<sub>2</sub>SO<sub>4</sub>) 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—41.12(455B) Alternative analytical techniques.** With the written permission of this department, concurred in by the EPA, an alternative analytical technique may be employed. An alternative technique shall be acceptable only if it is substantially equivalent to the prescribed test in both precision and accuracy as it relates to the determination of compliance with any maximum contaminant level. The use of the alternative analytical technique shall not decrease the frequency of monitoring required by 567—41.2(455B) through 567—41.8(455B).

**567—41.13(455B) Monitoring of interconnected public water supply systems.** When a public water supply system supplies water to one or more other public water supply systems, the department may modify the monitoring requirements imposed by this part 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 in by the administrator of the U.S. Environmental Protection Agency.

**567—41.14(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 maximum contaminant levels, action levels, or treatment techniques listed in 567—Chapters 41 and 43 or for initiating remedial action with respect to these violations.

**567—41.15(455B) Monitoring of other contaminants.** If the department determines that other contaminants are present in a public water supply, and the contaminants are known to pose, or scientific evidence strongly suggests that they pose, a threat to human health, the supplier of water may be required to monitor for such contaminants. The supplier of water 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 approved EPA methods and all analytical results will be 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.

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<sup>◇</sup> Two or more ARCs

<sup>1</sup> Effective date of [ARC4359A] 41.3(1) “b”(2)“3”; 41.3(1) “c”(2)“4,” new sentence at end; 41.3(1) “c”(3)“6,” “10”; 41.3(1) “c”(8), first sentence; 41.4(1) “d”(5)“4”; 41.5(1) “a”; 41.10(7) “a”(3); 41.11(2) “a”; 41.11(2) “c”(4); 41.11(2) “c”(5), first sentence, delayed 70 days by the Administrative Rules Review Committee at its meeting held November 9, 1993; delay lifted by the Committee December 14, 1993.