

**567—41.5(455B) Organic chemicals.**

**41.5(1) MCLs and other requirements for organic chemicals.** Maximum contaminant levels for three 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 three referenced organic chemical classes are volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), and trihalomethanes. The requirements also contain monitoring requirements, best available technology (BAT) identification, and analytical method requirements referenced in 41.5(1)“c,” “d,” and “f,” respectively.

*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.” The maximum contaminant level of 0.10 mg/L for total trihalomethanes (the sum of the concentrations of bromodichloromethane, tribromomethane (bromoform), dibromochloromethane, and trichloromethane (chloroform)) applies to all surface water community public water systems (CWS) serving 10,000 or more persons and all IGW CWS serving 10,000 or more persons until December 31, 2001, after which time the systems must comply with 41.6(455B). This 0.10 mg/L MCL also applies to all groundwater CWS serving 10,000 or more persons until December 31, 2003, after which time the systems must comply with 41.6(455B). Compliance with the maximum contaminant level for total trihalomethanes is calculated pursuant to 41.5(1)“e”(4).

*b. Maximum contaminant levels (MCLs) and analytical methodology for organic compounds.* The maximum contaminant levels for organic chemicals are listed in the following table. 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):
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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	0.0001
Benzo(a)pyrene	2306	0.0002	525.2, 550, 550.1	0.00002
Carbofuran	2046	0.04	531.1, 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, or esters)	2105	0.07	515.1, 515.2, 515.3, 555, D5317-93	0.0001
Dalapon	2031	0.2	515.1, 515.3, 552.1, 552.2	0.001
Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology <sup>1</sup>	Detection Limit (mg/L)
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, 555	0.0002
Diquat	2032	0.02	549.2	0.0004
Endothall	2033	0.1	548.1	0.009
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, 6610	0.002
Pentachlorophenol	2326	0.001	515.1, 515.2, 515.3, 525.2, 555, D5317-93	0.00004
Picloram <sup>3,6</sup>	2040	0.5	515.1, 515.2, 515.3, 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, 555, D5317-93	0.0002
Toxaphene <sup>3</sup>	2020	0.003	505, 508, 508.1, 525.2	0.001
Total Trihalomethanes (TTHMs) <sup>5</sup> :				
Total Trihalomethanes (the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform))	2950	0.10	502.2, 524.2, 551.1	

\*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, effective January 4, 1995. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460; 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, or Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 (either publication may be used), APHA: Method 6610.

Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and 19th edition, 1995 (either edition may be used), APHA: Method 6651.

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

Annual book of ASTM Standards, 1996, 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.

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> The TTHM MCL for surface water or influenced groundwater CWS and NTNC systems serving over 10,000 persons will be changed to 0.080 mg/L on January 1, 2002. All remaining CWS and NTNC will be required to comply with the 0.080 mg/L MCL on January 1, 2004. See rule 41.6(455B) for additional requirements.

<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, and 555, and ASTM Method D5317-93.

(2) Organic chemical compliance calculations (other than total trihalomethanes). Compliance with 41.5(1) "b"(1) shall be determined based on the analytical results obtained at each sampling point.

1. For systems which are conducting monitoring at a frequency greater than annual, compliance is determined by a running annual average of all samples taken at each sampling point. If the annual average of any sampling point is greater than the MCL, then the system is out of compliance. If the initial sample or a subsequent sample causes the annual average to be exceeded, then the system is out of compliance immediately. Any samples below the detection limit shall be calculated as zero for purposes of determining the annual average.

2. If monitoring is conducted annually, or less frequently, the system is out of compliance if the level of a contaminant at any sampling point is greater than the MCL. If a confirmation sample is required by the department, the determination of compliance will be based on the average of two samples.

3. If a public water system has a distribution system separable from other parts of the distribution system with no interconnections, the department may allow the system to give public notice to only that portion of the system which is out of compliance.

(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.

(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. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is less than one-fifth of the MCL. 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) Organic chemical (SOC and VOC) composite samples. The department may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite samples from a maximum of five sampling points 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 and analyzed within 14 days of sample collection.

1. If the concentration in the SOC or VOC composite sample is greater than or equal to 0.0005 mg/L for any contaminant listed in 41.5 (1)“b”(1), then a follow-up sample must be taken and analyzed within 14 days from each sampling point included in the composite.

2. If duplicates of the original sample taken from each sampling point used in the composite are available, the system may use these instead of resampling, provided the holding time of the samples is not exceeded. The duplicates must be analyzed and the results reported to the department within 14 days after completing analysis of the composite sample.

3. Compositing may only be permitted by the department at sampling points within a single system, unless the population served by the system is less than 3,300 persons. 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.

4. Compositing samples prior to gas chromatographic analysis.

- Add 5 mL or equal larger amounts of each sample (up to five samples are allowed) to a 25-mL glass syringe. Special precautions must be made to maintain zero headspace in the syringe.
- The samples must be cooled at 4 degrees Celsius during this step to minimize volatilization losses.

- Mix well and draw out a 5-mL aliquot for analysis.
  - Follow sample introduction, purging, and desorption steps described in the method.
  - If less than five samples are used for compositing, a proportionately small syringe may be used.
5. Compositing samples prior to gas chromatographic/mass spectrometric analysis.

- Inject 5 mL or equal larger amounts of each aqueous sample (up to five samples are allowed) into a 25-mL purging device using the sample introduction technique described in the method.

- The total volume of the sample in the purging device must be 25 mL.
- Purge and desorb as described in the method.

6. 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.

7. 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).

8. 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.

- 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.

- 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.

- 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.

- 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



- 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”(3) except for trihalomethanes or other demonstrated disinfection by-products.

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

e. *Total trihalomethanes sampling, analytical and other requirements*. The maximum contaminant level for total trihalomethanes applies to community water systems which serve a population of 10,000 or more individuals and which add a disinfectant (oxidant) to the water in any part of the treatment process. Compliance with the maximum contaminant level is calculated pursuant to 41.5(1) “b”(1). Total trihalomethanes is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform).

(1) *Applicability*. Community water systems which use a groundwater source, serve a population of 10,000 or more individuals, and which add disinfectant (oxidant) to the water in any part of the drinking water treatment process shall analyze for total trihalomethanes in accordance with this subrule, until December 31, 2003, after which time the systems must comply with 41.6(455B). The requirements of this subrule also apply to community water systems which use surface water or IGW in whole or in part and serve 10,000 or more persons, until December 31, 2001, after which time the systems must comply with 41.6(455B). After December 31, 2003, paragraph 41.5(1) “e” is no longer applicable to any Iowa public water supply.

1. For the purpose of this subrule, samples to be taken by the system shall be based on the number of treatment plants used by the system, except that multiple wells drawing water from a single aquifer may, with approval of the department, be considered as one treatment plant for determining the minimum number of samples.

2. All samples required within a calendar quarter shall be collected within a 24-hour period.

(2) *General sampling requirements*.

1. For all community water systems utilizing surface water sources in whole or in part, and for all community water systems utilizing only groundwater sources that have not been determined by the department to qualify for the monitoring requirements of 41.5(1) “e”(3), analyses for total trihalomethanes shall be performed at quarterly intervals on at least four water samples for each treatment plant used by the system. At least 25 percent of the samples shall be taken at locations within the distribution system reflecting the maximum residence time of the water in the system. The remaining 75 percent shall be taken at representative locations in the distribution system, taking into account number of persons served, different sources of water and different treatment methods employed. The results of all analyses per quarter shall be arithmetically averaged. All samples collected shall be used in the computation of the average, unless the analytical results are invalidated for technical reasons. Sampling and analyses shall be conducted in accordance with the methods listed in 41.5(1) “e”(5).

2. The department may allow a community water system to reduce the monitoring frequency required by 41.5(1) “e”(2)“1” to a minimum of one sample analyzed for TTHMs per quarter taken at a point in the distribution system reflecting the maximum residence time of the water in the system, upon a determination by the department that the data from at least one year of monitoring in accordance with 41.5(1) “e”(2)“1” and local conditions demonstrate that total trihalomethane concentrations will be consistently below the maximum contaminant level.

3. If at any time during which the reduced monitoring frequency prescribed under 41.5(1) “e”(2)“2” applies, the results from any analysis exceed 0.10 mg/L of TTHMs and such results are confirmed by at least one check sample taken promptly after such results are received, or if the system makes any significant change to its source of water or treatment program, the system shall immediately begin monitoring in accordance with the requirements of 41.5(1) “e”(2)“1” which monitoring shall continue for at least one year before the frequency may be reduced again. The department may increase a system’s monitoring frequency above the minimum in those cases where the department determines it is necessary to detect variations of TTHM levels within the distribution system.

(3) *Groundwater sampling requirements*.

1. The department may allow a community water system utilizing only groundwater sources to reduce the monitoring frequency required by 41.5(1) “e”(2)“1” to a minimum of one sample for

maximum TTHM potential per year for each treatment plant used by the system taken at a point in the distribution system reflecting maximum residence time of the water in the system. The system's monitoring frequency may only be reduced upon a determination by the department that, based upon the data submitted by the system, the system has a maximum TTHM potential of less than 0.10 mg/L and that, based upon an assessment of the local conditions of the system, the system is not likely to approach or exceed the maximum contaminant level for TTHMs. All samples collected shall be used for determining whether the system must comply with the monitoring requirements of 41.5(1)"e"(2), unless the analytical results are invalidated for technical reasons. Sampling and analyses shall be conducted in accordance with the methods listed in 41.5(1)"e"(5).

2. If at any time during which the reduced monitoring frequency prescribed under 41.5(1)"e"(3)"1" applies, the results from any analysis taken by the system for the maximum TTHM potential are equal to or greater than 0.10 mg/L, and such results are confirmed by at least one check sample taken promptly after such results are received, the system shall immediately begin monitoring in accordance with the requirements of 41.5(1)"e"(2) and such monitoring shall continue for at least one year before the frequency may be reduced again. In the event of any significant change to the system's raw water or treatment program, the system shall immediately analyze an additional sample for maximum TTHM potential taken at a point in the distribution system reflecting maximum residence time of the water in the system for the purpose of determining whether the system must comply with the monitoring requirements of 41.5(1)"e"(2). The department may increase monitoring frequencies above the minimum in those cases where the department determines it is necessary to detect variation of TTHM levels within the distribution system.

(4) Compliance calculation. Compliance with 41.5(1)"b"(3) shall be determined based on a running annual average of quarterly samples collected by the system as prescribed in 41.5(1)"e"(2)"1" or 41.5(1)"e"(2)"2." If the average of samples covering any 12-month period exceeds the maximum contaminant level, the supplier of water shall notify the public pursuant to 567—42.1(455B). Monitoring after public notification shall be at a frequency designated by the department and shall continue until a monitoring schedule as a condition to an operation permit or enforcement action shall become effective.

(5) Sampling and analytical methodology. Sampling and analyses made pursuant to this subrule shall be conducted by one of the approved total trihalomethane methods listed in 41.5(1)"b."

Samples for TTHM shall be dechlorinated upon collection to prevent further production of trihalomethanes, according to the procedures described in the above-referenced methods, except acidification is not required if only THMs or TTHMs are to be determined. Samples for maximum TTHM potential should not be dechlorinated or acidified, and should be held for seven days at 25 degrees Celsius (or above) prior to analysis.

(6) System modification. Before a community water system makes any modifications to its existing treatment process for the purposes of achieving compliance with the TTHM MCL, such system must submit and obtain department approval of a plan setting forth its proposed modification and any safeguards that it will implement to ensure that the bacteriological quality of the drinking water served by such system will not be adversely affected by such modification.

Each system shall comply with the provisions set forth in the department-approved plan. At a minimum, a department-approved plan shall require any system modifying its disinfection practice to:

1. Evaluate the water system for sanitary defects and evaluate the source for biological quality;
2. Evaluate its existing treatment practices and consider improvements that will minimize disinfectant demand and optimize finished water quality throughout the distribution system;
3. Provide baseline water quality survey data of the distribution system required by the department;
4. Conduct any additional monitoring determined by the department to be necessary to ensure continued maintenance of optimal biological quality in the finished water; and
5. Demonstrate an active disinfectant residual throughout the distribution system at all times during and after the modification.

Before a community water system makes any modifications to its existing physical treatment plant for the purpose of achieving compliance with 41.5(1) "b"(3), such system must obtain department approval in accordance with 567—43.3(455B).

(7) Maximum total trihalomethane potential methodology. The water sample for determination of maximum total trihalomethane potential is taken from a point in the distribution system that reflects maximum residence time. Procedures for sample collection and handling are given in the methods. No reducing agent is added to "quench" the chemical reaction producing THMs at the time of sample collection. The intent is to permit the level of THM precursors to be depleted and the concentration of THMs to be maximized for the supply being tested. Four experimental parameters affecting maximum THM production are pH, temperature, reaction time, and the presence of a disinfectant residual. These parameters are dealt with as follows:

1. Measure the disinfectant residual at the selected sampling point. Proceed only if a measurable residual is present.
2. Collect triplicate 40 mL water samples at the pH prevailing at the time of sampling and prepare a method blank according to the methods.
3. Seal and store these samples together for seven days at 25 degrees Celsius or above.
4. After this time period, open one of the sample containers and check for disinfectant residual. Absence of a disinfectant residual invalidates the sample for further analysis.
5. Once a disinfectant residual has been demonstrated, open another of the sealed samples and determine THM concentration using an approved analytical method.

*f. Analytical procedures—organics.*

(1) Volatile organic chemical (VOC) and synthetic organic chemical (SOC) analytical methods. Analysis for the VOC and SOC contaminants listed in 41.5(1) "b"(1) must be conducted using the specified EPA methods. Other analytical test procedures are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994, NTIS PB95-104766.

(2) 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.

**41.5(2)** *Organic chemicals occurring as (nontrihalomethane) disinfection by-products.* Reserved.