

**APPENDIX D
SURFACE WATER TREATMENT**

801-D ANALYTICAL AND SAMPLING REQUIREMENTS

A. ANALYTICAL REQUIREMENTS. Only the analytical method(s) specified in this subsection, or otherwise approved by the EPA, may be used to demonstrate compliance with the requirements of §§ 803, 804, and 805. Measurements for pH, temperature, turbidity, and residual disinfectant concentrations must be conducted by a party approved by the Director. Measurements for total coliforms, fecal coliforms, and HPC must be conducted by a laboratory certified by the EPA to do such analysis. Until laboratory certification criteria are developed for the analysis of HPC and fecal coliforms, any laboratory certified for total coliform analysis by EPA is deemed certified for HPC and fecal coliform analysis. The following procedures shall be conducted in accordance with the publications listed in the following section. Copies of the methods published in *Standard Methods for the Examination of Water and Wastewater* may be obtained from the American Public Health Association et al., 1015 Fifteenth Street, NW., Washington, DC, 20005; copies of the Minimal Medium ONPG-MUG Method as set forth in the article "National Field Evaluation of a Defined Substrate Method for the Simultaneous Enumeration of Total Coliforms and *Escherichia coli* from Drinking Water: Comparison with the Standard Multiple Tube Fermentation Method" (Edberg et al.), *Applied and Environmental Microbiology*, Volume 54, PP. 1595-1601, June 1988 (as amended under Erratum, *Applied and Environmental Microbiology*, Volume 54 p. 3197, December, 1988), may be obtained from the American Water Works Association Research Foundation, 6666 West Quincy Avenue, Denver, Colorado, 80235; and copies of the Indigo Method as set forth in the article "Determination of Ozone in Water by the Indigo Method" (Bader and Hoigne), may be obtained from Ozone Science & Engineering, Pergamon Press Ltd., Fairview Park, Elmsford, New York, 10523. Copies may be inspected at the U.S.EPA, Room EB15, 401 M Street, SW., Washington, DC, 20460 or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

1. Public water systems must conduct analysis of pH in accordance with one of the methods listed in Appendix A § 403-A (A)(1) Table 400-A-3. Water systems must conduct analyses of total coliforms, fecal coliforms, heterotrophic bacteria, and turbidity in accordance with one of the following analytical methods, or one of the alternative methods listed in Appendix A to subpart C of 40 C.F.R. pt. 141, and by using analytical test procedures contained in *Technical Notes on Drinking Water Methods*, EPA-600/R-94-173, October 1994. This document is available from the National Service Center for Environmental Publications (NSCEP), P.O. Box 42419, Cincinnati, OH 45242-0419 or <http://www.epa.gov/nscep/>.

TABLE 800-D-1 ANALYTICAL METHODS

Organism	Methodology	Citation ¹
Total Coliforms ²	Total Coliform Fermentation technique ^{3,4,5} Total Coliform Membrane Filter technique ⁶ ONPG-MUG Test ⁷	9221A, B, C 9222A, B, C 9223
Fecal Coliforms ²	Fecal Coliform Procedure ⁸ Fecal Coliforms Filter Procedure	9221E 9222D
Heterotrophic bacteria ²	Pour Plate Method	9215B
Turbidity	Nephelometric Method Nephelometric Method Great lakes instruments	2130B 180.1 ⁸ Method 2 ⁹
Temperature		2550

The procedures shall be done in accordance with the documents listed below. 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, 1200 Pennsylvania Ave., NW., Washington, D.C. 20460 (Telephone: 202-260-3027); or at the Office of the Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, D.C. 20408.

¹ Except where noted, all methods refer to *Standard Methods for the Examination of Water and Wastewater*, 18th edition, 1992, and 19th edition, 1995, American Public Health Association, 1015 Fifteenth Street NW, Washington, D.C., 20005.

² The time from sample collection to initiation of analysis may not exceed 8 hours. Systems must hold

samples below 10°C during transit.

³ 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%.

⁴ Media should cover inverted tubes at least one-half to two-thirds after the sample is added.

⁵ No requirement exists to run the completed phase on 10% of all total coliform-positive confirmed tubes.

⁶ The ONPG-MUG test is also known as the Autoanalysis Colilert System.

⁷ A-1 Broth may be held up to three months in a tightly closed screwcap tube at 4°C.

⁸ "Methods for the Determination of Inorganic Substances in Environmental Samples", EPA-600/R-93-100, August 1993. Available at NTIS, PB94-121811.

⁹ GLI Method 2, "Turbidity," November 2, 1992, Great Lakes Instruments, Inc., 8855 North 55th Street, Milwaukee, Wisconsin 53223.

2. Water systems must measure residual disinfectant concentrations with one of the analytical methods in the following table or one of the alternative methods listed in Appendix A to subpart C of 40 C.F.R. pt. 141. If approved by the Director, residual disinfectant concentrations for free chlorine and combined chlorine also may be measured by using DPD colorimetric test kits. In addition, the Director may approve the use of the ITS free chlorine test strip for the determination of free chlorine. Use of the test strips is described in Method D99-003, "Free Chlorine Species (HOCl- and OCl-) by Test Strip," Revision 3.0, November 21, 2003, available from Industrial Test Systems, Inc., 1875 Langston St., Rock Hill, SC 29730. Free and total chlorine residuals may be measured continuously by adapting a specified chlorine residual method for use with a continuous monitoring instrument provided the chemistry, accuracy, and precision remain the same. Instruments used for continuous monitoring must be calibrated with a grab sample measurement at least every five days, or with a protocol approved by the Director.

Table 800-D-2 RESIDUAL DISINFECTANT CONCENTRATIONS ANALYTICAL METHODS

Residual	Methodology	Methods
Free chlorine	Amperometric Titration DPD Ferrous Titrimetric DPD Colorimetric Syringaldazine (FACTS)	4500-Cl D 4500-Cl F 4500-Cl G 4500-Cl H
Total Chlorine	Amperometric Titration Amperometric Titration (low level measurement) DPD Ferrous Titrimetric DPD Colorimetric Iodometric Electrode	4500-Cl D 4500-Cl E 4500-Cl F 4500-Cl G 4500-Cl I
Chlorine dioxide	Amperometric Titration DPD Method Amperometric Titration Spectrophotometric	4500-ClO ₂ C 4500-ClO ₂ D 4500-ClO ₂ E EPA Method 327.0, Rev. 1.1
Ozone	Indigo Method	4500-O ₃ B

¹ EPA Method 327.0, Rev. 1.1, "Determination of Chlorine Dioxide and Chlorite Ion in Drinking Water Using Lissamine Green B and Horseradish Peroxidase with Detection by Visible Spectrophotometry," USEPA May 2005, EPA 815-R-05-008. Available online at <http://www.epa.gov/safewater/methods/sourcalt.html>.

- B. Sampling requirements for systems that do not provide filtration. A public water system that uses a surface water source and does not provide filtration treatment must begin sampling unless the Director has determined in writing that filtration is required pursuant to § 305 of the NNSDWA, 22 N.N.C. § 2535, in which case the Director may specify alternative sampling requirements, as appropriate, until filtration is in place. A water system that uses a groundwater source under the direct influence of surface water and does not provide filtration treatment must begin sampling 6 months after the Director determines that the groundwater source is under the direct influence of surface water, unless the Director has determined that filtration is required in writing pursuant to § 305 of the NNSDWA, 22 N.N.C. § 2535, in which case the Director may specify alternative sampling requirements, as appropriate, until filtration is in place.

1. Fecal coliform or total coliform density measurements as required by § 803 (A)(1) must be

performed on representative source water samples immediately prior to the first or only point of disinfectant application. The system must sample for fecal or total coliforms at the following minimum frequency each week the system serves water to the public:

TABLE 800-D-3 SAMPLE FREQUENCY

SYSTEM SIZE (persons served)	SAMPLES/WEEK ¹
≤500	1
501 TO 3,300	2
3,301 TO 10,000	3
10,001 TO 25,000	4
>25,000	5

¹ Must be taken on separate days.

Also, one fecal or total coliform density measurement must be made every day the system serves water to the public and the turbidity of the source water exceeds 1 NTU (these samples count towards the weekly coliform sampling requirement) unless the Director determines that the system, for logistical reasons outside the system's control, cannot have the sample analyzed within 30 hours of collection.

2. Turbidity measurements as required by § 803 (A)(2) must be performed on representative grab samples of source water immediately prior to the first or only point of disinfectant application every four hours (or more frequently) that the system serves water to the public. A public water system may substitute continuous turbidity sampling for grab sample sampling if it validates the continuous measurement for accuracy on a regular basis using a protocol approved by the Director.
3. The total inactivation ratio for each day that the system is in operation must be determined based on the CT_{99.9} values in Tables 800-D-4 through 800-D-11 of this section, as appropriate. The parameters necessary to determine the total inactivation ratio must be monitored as follows:
 - a. The temperature of the disinfected water must be measured at least once per day at each residual disinfectant concentration sampling point.
 - b. If the system uses chlorine, the pH of the disinfected water must be measured at least once per day at each chlorine residual disinfectant concentration sampling point.
 - c. The disinfectant contact time(s) ("T") must be determined for each day during peak hourly flow.
 - d. The residual disinfectant concentration(s) ("C") of the water before or at the first customer must be measured each day during peak hourly flow.
 - e. If a system uses a disinfectant other than chlorine, the system may demonstrate to the Director, through the use of a Director-approved protocol for on-site disinfection challenge studies or other information satisfactory to the Director, that CT_{99.9} values other than those specified in Tables 800-D-10 and 800-D-11 in this section or other operational parameters are adequate to demonstrate that the system is achieving the minimum inactivation rates required by § 804 (A)(1).

TABLE 800-D-4 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY FREE CHLORINE AT 0.5°C OR LOWER¹

Residual mg/L	pH						
	≤6.0	6.5	7.0	7.5	8.0	8.5	≤9.0
≤0.4	137	163	195	237	277	329	390

0.6	141	168	200	239	286	342	407
0.8	145	172	205	246	295	354	422
1.0	148	176	210	253	304	365	437
1.2	152	180	215	259	313	376	451
1.4	155	184	221	266	321	387	464
1.6	157	189	226	273	329	397	477
1.8	162	193	231	279	338	407	489
2.0	165	197	236	286	346	417	500
2.2	169	201	242	297	353	426	511
2.4	172	205	247	298	361	435	522
2.6	175	209	252	304	368	444	533
2.8	178	213	257	310	375	452	543
3.0	181	217	261	316	382	460	552

¹ These CT values achieve greater than a 99.99 % inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperature of different tables may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature and at the higher pH.

TABLE 800-D-5 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY FREE CHLORINE AT 5.0 °C¹

Free Residual mg/L	pH						
	≤6.0	6.5	7.0	7.5	8.0	8.5	≤9.0
≤0.4	97	117	139	166	198	236	279
0.6	100	120	143	171	204	244	291
0.8	103	122	146	175	210	252	301
1.0	105	125	149	179	216	260	312
1.2	107	127	152	183	221	267	320
1.4	109	130	155	187	227	274	329
1.6	111	132	158	192	232	281	337
1.8	114	135	162	196	238	287	345
2.0	116	138	165	200	243	294	353
2.2	118	140	169	204	248	300	361
2.4	120	143	172	209	253	306	368
2.6	122	146	175	213	258	312	375
2.8	124	148	178	217	263	318	382
3.0	126	151	182	221	268	324	389

¹ These CT values achieve greater than a 99.99 % inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperature of different tables may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature, and at the higher pH.

TABLE 800-D-6 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY FREE CHLORINE

AT 10.0 °C¹

Free Residual mg/L	pH						
	≤6.0	6.5	7.0	7.5	8.0	8.5	≤9.0
≤0.4	73	88	104	125	149	177	209
0.6	75	90	107	128	153	183	218
0.8	78	92	110	131	158	189	226
1.0	79	94	112	134	162	195	234
1.2	80	95	114	137	166	200	240
1.4	82	98	116	140	170	206	247
1.6	83	99	119	144	174	211	253
1.8	86	101	122	147	179	215	259
2.0	87	104	124	150	182	221	265
2.2	89	105	127	153	186	225	271
2.4	90	107	129	157	190	230	276
2.6	92	110	131	160	194	234	281
2.8	93	111	134	163	197	239	287
3.0	95	113	137	166	201	243	292

¹ These CT values achieve greater than a 99.99 % inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature, and at the higher pH.

TABLE 800-D-7 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY FREE CHLORINE AT 15.0 °C¹

Free Residual mg/L	pH						
	≤6.0	6.5	7.0	7.5	8.0	8.5	≤9.0
≤0.4	49	59	70	83	99	118	140
0.6	50	60	72	86	102	122	146
0.8	52	61	73	88	105	126	151
1.0	53	63	75	90	108	130	156
1.2	54	64	76	92	111	134	160
1.4	55	65	78	94	114	137	165
1.6	56	66	79	96	116	141	169
1.8	57	68	81	98	119	144	173
2.0	58	69	83	100	122	147	177
2.2	59	70	85	102	124	150	181
2.4	60	72	86	105	127	153	184
2.6	61	73	88	107	129	156	188
2.8	62	74	89	109	132	159	191
3.0	63	76	91	111	134	162	195

¹ These CT values achieve greater than a 99.99 % inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature, and at the higher pH.

TABLE 800-D-8 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY FREE CHLORINE AT 20.0°C¹

Free Residual mg/L	pH						
	≤6.0	6.5	7.0	7.5	8.0	8.5	≤9.0
≤0.4	36	44	52	62	74	89	105
0.6	38	45	54	64	77	92	109
0.8	39	46	55	66	79	95	113
1.0	39	47	56	67	81	98	117
1.2	40	48	57	69	83	100	120
1.4	41	49	58	70	85	103	123
1.6	42	50	59	72	87	105	126
1.8	43	51	61	74	89	108	129
2.0	44	52	62	75	91	110	132
2.2	44	53	63	77	93	113	135
2.4	45	54	65	78	95	115	138
2.6	46	55	66	80	97	117	141
2.8	47	56	67	81	99	119	143
3.0	47	57	68	83	101	122	146

¹These CT values achieve greater than a 99.99 % inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature, and at the higher pH.

TABLE 800-D-9 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY FREE CHLORINE AT 25.0 °C¹ AND HIGHER

Free Residual mg/L	pH						
	≤6.0	6.5	7.0	7.5	8.0	8.5	≤9.0
≤0.4	24	29	35	42	50	59	70
0.6	25	30	36	43	51	61	73
0.8	26	31	37	44	53	63	75
1.0	26	31	37	45	54	65	78
1.2	27	32	38	46	55	67	80
1.4	27	33	39	47	57	69	82
1.6	28	33	40	48	58	70	84
1.8	29	34	41	49	60	72	86
2.0	29	35	41	50	61	74	88

2.2	30	35	42	51	62	75	90
2.4	30	36	43	52	63	77	92
2.6	31	37	44	53	65	78	94
2.8	31	37	45	54	66	80	96
3.0	32	38	46	55	67	81	97

¹ These CT values achieve greater than a 99.99 % inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature, and at the higher pH.

TABLE 800-D-10 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY CHLORINE DIOXIDE AND OZONE¹

Temperature	≤1°C	5 °C	10 °C	15 °C	20 °C	≥25 °C
Chlorine Dioxide	63	26	23	19	15	11
Ozone	2.9	1.9	1.4	0.95	0.72	0.48

¹ These CT values achieve greater than 99.99 % inactivation of viruses. CT values between the indicated temperatures may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature for determining CT_{99.9} values between indicated temperatures.

TABLE 800-D-11 CT VALUES (CT_{99.9}) FOR 99.9 PERCENT INACTIVATION OF GIARDIA LAMBLIA CYSTS BY CHLORAMINES¹

Temperature					
≤1 °C	5 °C	10 °C	15 °C	20 °C	25 °C
3,800	2,200	1,850	1,500	1,100	750

¹ These values are for pH values of 6 to 9. These CT values may be assumed to achieve greater than 99.99 % inactivation of viruses only if chlorine is added and mixed in the water prior to the addition of ammonia. If this condition is not met, the system must demonstrate, based on on-site studies or other information, as approved by the Director, that the system is achieving at least 99.99 % inactivation of viruses. CT values between the indicated temperatures may be determined by linear interpolation. If no interpolation is used, use the CT_{99.9} value at the lower temperature for determining CT_{99.9} values between indicated temperatures.

4. The total inactivation ratio must be calculated as follows:
 - a. If the system uses only one point of disinfectant application, the system may determine the total inactivation ratio based on either of the following two methods:
 1. One inactivation ratio (CT_{calc}/CT_{99.9}) is determined before or at the first customer during peak hourly flow and if the CT_{calc}/CT_{99.9} ≥ 1.0, the 99.9 % *Giardia lamblia* inactivation requirement has been achieved; or
 2. Successive CT_{calc}/CT_{99.9} values, representing sequential inactivation ratios, are determined between the point of disinfectant application and a point before or at the first customer during peak hourly flow. Under this alternative, the following method must be used to calculate the total inactivation ratio:

- (1) Determine $\frac{CT_{calc}}{CT_{99.9}}$ for each sequence.
- (2) Add the $\frac{CT_{calc}}{CT_{99.9}}$ values together $\left(\sum \frac{CT_{calc}}{CT_{99.9}}\right)$
- (3) If $\sum \left(\frac{CT_{calc}}{CT_{99.9}}\right) \geq 1.0$, the 99.9 percent Giardia

Lambda inactivation requirement has been achieved.

- b. If the system uses more than one point of disinfectant application before or at the first customer, the system must determine the CT value of each disinfection sequence immediately prior to the next point of disinfectant application during peak hourly flow. The $CT_{calc}/CT_{99.9}$ value of each sequence and

$$\sum \frac{CT_{calc}}{CT_{99.9}}$$

must be calculated using the method in subsection (B)(4)(a)(2) of this section to determine if the system is in compliance with § 804 (A).

- c. Although not required, the total percent inactivation for a system with one or more points of residual disinfectant concentration sampling may be calculated by solving the following equation:

$$\text{Percent inactivation} = 100 - \frac{100}{10^z}$$

$$\text{where } z = 3 \times \sum \left(\frac{CT_{calc}}{CT_{99.9}}\right)$$

5. The residual disinfectant concentration of the water entering the distribution system must be monitored continuously, and the lowest value must be recorded each day, except that if there is a failure in the continuous sampling equipment, grab sampling every 4 hours may be conducted in lieu of continuous sampling, but for no more than 5 working days following the failure of the equipment, and systems serving 3,300 or fewer persons may take grab samples in lieu of providing continuous sampling on an ongoing basis at the frequencies prescribed below:

TABLE 800-D-12 SAMPLING INTERVALS

SYSTEM SIZE BY POPULATION	SAMPLES/DAY ¹
<500	1
501 to 1,000	2
1,001 to 2,500	3
2,501 to 3,300	4

¹The day's samples cannot be taken at the same time. The sampling intervals are subject to the Director's review and approval.

If at any time the residual disinfectant concentration falls below 0.2 mg/l in a system using grab sampling in lieu of continuous sampling, the system must take a grab sample every 4 hours until the residual concentration is equal to or greater than 0.2 mg/l.

6. a. The residual disinfectant concentration must be measured at least at the same points in the distribution system and at the same time as total coliforms are sampled, as specified in § 404, except that the Director may allow a public water system which uses both a surface water source or a groundwater source under direct influence of surface water, and a groundwater source, to take disinfectant residual samples at points other than the total coliform sampling points if the Director determines that such points are more representative of treated (disinfected) water quality within the distribution system. Heterotrophic bacteria, measured as heterotrophic plate count (HPC) as specified in subsection (A)(1) of this section, may be measured in lieu of residual disinfectant concentration.
- b. If the Director determines, based on site-specific considerations, that a system has no means for having a sample transported and analyzed for HPC by a certified laboratory under the requisite time and temperature conditions specified by subsection (A)(1) of this section and that the system is providing adequate disinfection in the distribution system, the requirements of subsection (B)(6)(a) of this section do not apply to that system.

C. Sampling requirements for systems using filtration treatment.

A public water system that uses a surface water source or a groundwater source under the influence of surface water and provides filtration treatment must monitor in accordance with this subsection (C) when filtration is installed.

1. Turbidity measurements as required by § 805 must be performed on representative samples of the system's filtered water every four hours (or more frequently) that the system serves water to the public. A water system may substitute continuous turbidity sampling for grab sampling if it validates the continuous measurement for accuracy on a regular basis using a protocol approved by the Director. For any systems using slow sand filtration or filtration treatment other than conventional treatment, direct filtration, or diatomaceous earth filtration, the Director may reduce the sampling frequency to once per day if it determines that less frequent sampling is sufficient to indicate effective filtration performance. For systems serving 500 or fewer persons, the Director may reduce the turbidity sampling frequency to once per day, regardless of the type of filtration treatment used, if the Director determines that less frequent sampling is sufficient to indicate effective filtration performance.
2. The residual disinfectant concentration of the water entering the distribution system must be monitored continuously, and the lowest value must be recorded each day, except that if there is a failure in the continuous sampling equipment, grab sampling every 4 hours may be conducted in lieu of continuous sampling, but for no more than 5 working days following the failure of the equipment, and systems serving 3,300 or fewer persons may take grab samples in lieu of providing continuous sampling on an ongoing basis at the frequencies each day prescribed below:

TABLE 800-D-13 SAMPLING FREQUENCIES

SYSTEM SIZE BY POPULATION	SAMPLES/DAY ¹
<500	1
501 to 1,000	2
1,001 to 2,500	3
2,501 to 3,300	4

¹ The day's samples cannot be taken at the same time. The sampling intervals are subject to the Director's review and approval.

If at any time the residual disinfectant concentration falls below 0.2 mg/l in a system using grab sampling in lieu of continuous sampling, the system must take a grab sample every 4 hours until the residual disinfectant concentration is equal to or greater than 0.2 mg/l.

3. a. The residual disinfectant concentration must be measured at least at the same points in the distribution system and at the same time as total coliforms are sampled, as specified in § 404, except that the Director may allow a public water system which uses both a surface water source or a groundwater source under direct influence of

surface water, and a groundwater source to take disinfectant residual samples at points other than the total coliform sampling points if the Director determines that such points are more representative of treated (disinfected) water quality within the distribution system. Heterotrophic bacteria, measured as heterotrophic plate count (HPC) as specified in subsection (A)(1) of this section, may be measured in lieu of residual disinfectant concentration.

- b. If the Director determines, based on site-specific considerations, that a system has no means for having a sample transported and analyzed for HPC by a certified laboratory under the requisite time and temperature conditions specified by subsection (A)(1) of this section and that the system is providing adequate disinfection in the distribution system, the requirements of subsection (C)(3)(a) of this section do not apply to that system.

Addendum: Baffling Classification-Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems using Surface Water Sources, March, 1991 Edition, Science and Technology Branch Criteria and Standards Division, Office of Drinking Water, U.S. Environmental Protection Agency, Washington, D.C.

TABLE 800-D-14 BAFFLING CLASSIFICATION

BAFFLING CONDITION	T₁₀/T	BAFFLING DESCRIPTION
Unbaffled (mixed flow)	0.1	None, agitated basin, very low length to width ratio, high inlet and outlet flow velocities.
Poor	0.3	Single or multiple unbaffled inlets and outlets, no intra-basin baffles.
Average	0.5	Baffled inlet or outlet with some intra-basin baffles.
Superior	0.7	Perforated inlet baffle, serpentine or perforated intra-basin baffles, outlet weir or perforated launders.
Perfect (plug flow)	1.0	Very high length to width ratio (pipeline flow), perforated inlet, outlet, and intra-basin baffles.