TITLE 179 PUBLIC WATER SYSTEMS

CHAPTER 13 SURFACE WATER TREATMENT

SECTION	PAGE
13-001 SCOPE AND AUTHORITY	1
13-002 DEFINITIONS	1
13-003 GENERAL REQUIREMENTS	3
13-004 CRITERIA FOR AVOIDING FILTRATION	4
13-005 DISINFECTION	7
13-006 FILTRATION	10
13-007 ANALYTICAL AND MONITORING REQUIREMENTS	11
13-008 REPORTING AND RECORDKEEPING REQUIREMENTS	25
Attachment 1, Minimum Detectable Residuals	32
Attachment 2, Protocol for the Determination of Influence of Surface Water on Ground Water Sources	34
Attachment 3	
PWS 403, CT Determination for Unfiltered Systems – Monthly Report to the Department	37
PWS 404, Disinfection Information for Unfiltered Systems– Monthly Report to the Department	38
PWS 405, Distribution System Disinfectant Residual Date for Unfiltered and Filtered Systems Monthly Report for the Department	39
PWS 408, Monthly Report to the Department for Compliance Determination – Filtered Systems	40
Attachment 4, Sampling Training For Individuals Other Than ~~Certified~~ Licensed Operators	41

TITLE 179 PUBLIC WATER SYSTEMS

CHAPTER 13 SURFACE WATER TREATMENT

13-001 SCOPE AND AUTHORITY: These regulations establish treatment technique requirements in lieu of maximum contaminant levels for the following contaminants: *Giardia lamblia*, viruses, heterotrophic plate count bacteria, *Legionella*, and turbidity. The authority is found in Neb. Rev. Stat. §§ 71-5301 to 71-5313.

13-002 DEFINITIONS

Conventional filtration treatment means a series of processes including coagulation, flocculation, sedimentation, and filtration resulting in substantial particulate removal.

CT or CTcalc means the product of "residual disinfectant concentration" (C) in milligrams per liter determined before or at the first customer, and the corresponding "disinfectant contact time" (T) in minutes, i.e., "C" x "T".

$CT_{(99.9)}$ means the CT value required for 99.9% (3-log) inactivation of *Giardia lamblia* cysts. $CT_{(99.9)}$ for a variety of disinfectants and conditions appear in Tables 13.1 to 13.8 of 179 NAC 13-007.02C.

Department means the Division of Public Health of the Department of Health and Human Services.

Diatomaceous earth filtration means a process resulting in substantial particulate removal in which

1. A precoat cake of diatomaceous earth filter media is deposited on a support membrane (septum), and
2. While the water is filtered by passing through the cake on the septum, additional filter media known as body feed is continuously added to the feed water to maintain the permeability of the filter cake.

Direct filtration means a series of processes including coagulation and filtration but excluding sedimentation resulting in substantial particulate removal.

Director means the Director of Public Health of the Division of Public Health or his/her authorized representative.

Disinfection means a process which inactivates pathogenic organisms in water by chemical oxidants or equivalent agents.

Disinfection contact time ("T" in CT calculations) means the time in minutes that it takes for water to move from the point of disinfectant application or the previous point of disinfectant residual measurement to a point before or at the point where residual disinfectant concentration ("C") is measured.

Filtration means a process for removing particulate matter from water by passage through porous media.

Flocculation means a process to enhance agglomeration or collection of smaller floc particles into larger, more easily settleable particles through hydraulic or mechanical means.

Ground water under the direct influence of surface water (GWUDI) means any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium*, or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions. Direct influence must be determined for individual sources in accordance with criteria established by the Director. The Director determination of direct influence may be based on site-specific measurements of water quality and/or documentation of well construction characteristics and geology with field evaluation as described in 179 NAC 13 Attachment 2 which is hereby incorporated by reference.

Halogen means one of the chemical elements chlorine, bromine, or iodine.

Inactivation ratio means the ratio of CT to $CT_{(99.9)}$, *i.e.*, CT divided by $CT_{(99.9)}$.

Legionella means a genus of bacteria, some species of which have caused a type of pneumonia called Legionnaires Disease.

Sedimentation means a process for removal of solids before filtration by gravity or separation.

Slow sand filtration means a process involving passage of raw water through a bed of sand at a low velocity (generally less than 0.4 m/h) resulting in substantial particulate removal by physical and biological mechanisms.

Surface water means all water which is open to the atmosphere and subject to surface runoff.

Surface water system means a water system utilizing surface water as the source of water.

Treatment technique means the use of aeration, settling, filtration, or other physical process and/or the addition of any chemical or chemicals for the purpose of removing, deactivation, or adjusting the level of one or more contaminants present in the raw water source.

Trihalomethane (THM) means one of a family of organic compounds, named as derivatives of methane, wherein three of the four hydrogen atoms in methane are each substituted by a halogen atom in the molecular structure.

Total trihalomethanes (TTHMs) means the sum of the concentration in milligrams per liter of the trihalomethane compounds [trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, and tribromomethane (bromoform)], rounded to two significant figures.

Virus means a virus of fecal origin which is infectious to humans by waterborne transmission.

Waterborne disease outbreak means the significant occurrence of acute infectious illness, epidemiologically associated with the ingestion of water from a public water system which is deficient in treatment as determined by the Director.

13-003 GENERAL REQUIREMENTS

13-003.01 Each public water system with a surface water source or a ground water source under the direct influence of surface water must provide treatment of that source water that complies with these treatment technique requirements. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

1. At least 99.9% (3-log) removal and/or inactivation of *Giardia lamblia* cysts between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer, and

2. At least 99.99% (4-log) removal and/or inactivation of viruses between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer.

13-003.02 Each ground water source providing water to a public system will be examined to determine whether or not it is under the direct influence of surface water. The examination will be performed in accordance with the protocol described in Attachment 2 to 179 NAC 13.

13-003.02A Each ground water source for a community water system must have been examined no later than June 19, 1994.

13-003.02B Each ground water source for a non-community system must have been examined by June 19, 1999.

13-003.02C If the Director determines that a ground water source is under the direct influence of surface water, s/he will so indicate in writing to the owner of the public water system.

13-003.03 A public water system using surface water as a source must include filtration which meets the requirements of 179 NAC 13-006.

13-003.04 A public water system using a ground water source under the direct influence of surface water is considered to be in compliance with the requirements of 179 NAC 13-003 if:

1. It meets the requirements for avoiding filtration in 179 NAC 13-004 and meets the disinfection requirements in 179 NAC 13-005; or

2. It meets the filtration requirements in 179 NAC 13-006 and the disinfection requirements in 179 NAC 13-005.

13-003.05 Additional Requirements for Systems Serving at Least 10,000 People: In addition to complying with the requirements in 179 NAC 13, systems serving at least 10,000 people must also comply with the requirements in 179 NAC 17.

13-003.06 Additional Requirements for Systems Serving Fewer Than 10,000 People: In addition to complying with the requirements in 179 NAC 13, systems serving fewer than 10,000 people must also comply with the requirements in 179 NAC 19.

13-004 CRITERIA FOR AVOIDING FILTRATION: A public water system that uses a ground water source under the direct influence of surface water must meet all of the conditions of 179 NAC 13-004.01 and 13-004.02 and is subject to 179 NAC 13-004.03 beginning 18 months after the Director determines that it is under the direct influence of surface water. Within 18 months of the failure of a system using a ground water source under the direct influence of surface water to meet any one of the requirements of 179 NAC 13-004.01 to 13-004.06 the system owner must have installed filtration and meet the criteria for filtered systems specified in 179 NAC 13-006.

13-004.01 Source Water Quality Conditions

13-004.01A The fecal coliform concentration must be equal to or less than 20 per 100 ml or the total coliform concentration must be equal to or less than 100 per 100 ml (measured by the Department Laboratory or an approved laboratory pursuant to 179 NAC 3-009) in representative samples of the source water immediately prior to the first or only point of disinfection application in at least 90% of the measurements made for the six previous months that the system served water to the public on an ongoing basis. If a system measures both fecal and total coliforms, the fecal coliform criterion, but not the total coliform criterion, in this paragraph must be met.

13-004.01B The turbidity level cannot exceed 5 NTU (measured as specified in 179 NAC 13-007.01A and 13-007.02B) in representative samples of the source water immediately prior to the first or only point of disinfectant application unless:

1. The Director determines that any such event was caused by circumstances that were unusual and unpredictable; and

2. As a result of any such event, there have not been more than two events in the past 12 months the system served water to the public, or more than five events in the past 120 months the system served water to the public, in which the turbidity level exceeded 5 NTU. An "event" is a series of consecutive days during which at least one turbidity measurement each day exceeds 5 NTU.

13-004.02 Site-Specific Conditions

13-004.02A The public water system must meet the requirements of 179 NAC 13-005.01A at least 11 of the 12 previous months that the system served water to the public on an ongoing basis, unless the system fails to meet the requirements during 2 of the 12 previous months that the system served water to the public and the Director determines that at least one of these failures was caused by circumstances that were unusual and unpredictable.

13-004.02B The public water system must meet the requirements of 179 NAC 13-005.01B at all times the system serves water to the public.

13-004.02C The public water system must meet the requirements of 179 NAC 13-005.01C at all times the system serves water to the public unless the Director determines that any such failure was caused by circumstances that were unusual and unpredictable.

13-004.02D The public water system must meet the requirements of 179 NAC 13-005.01D on an ongoing basis unless the Director determines that failure to meet these requirements was not caused by a deficiency in treatment of the source water.

13-004.02E The public water system owner must develop and implement a wellhead protection program sufficient to exclude potential sources of microbiological contamination within a one year time-of-travel from the well or well field. A wellhead protection program must consist of the following:

1. A Wellhead Protection Area Delineation: The area delineated must be based on a one year time-of-travel and must be determined by use of a computer model acceptable to the Department or by the following formula:

   $T = 3.14nbL^2$ divided by Q

Where T = Time-of-Travel (days)
L = Distance from the well (feet)
n = Effective porosity (assumed to be 0.2 unless supporting evidence indicates otherwise)
b = Aquifer thickness (feet)
Q = Pumping rate (cubic feet per day)

2. Identification of all sources of microbiological contamination within the delineated area.

3. Management of all sources identified in 179 NAC 13-004.02E item 2 to prevent contamination from the sources.

13-004.03 The public water system must be subject to an annual on-site inspection to assess the wellhead protection program specified in 179 NAC 13-004.02E and the disinfection treatment process. Either the Director or a party approved by the Director must conduct the on-site inspection. The inspection must be conducted by competent individuals such as sanitary and civil engineers, sanitarians, or technicians who have experience and knowledge about the operation and maintenance of a public water system, and who have a sound understanding of public health principles and waterborne diseases. A report of the on-site inspection must be prepared every year and indicate to the Director's satisfaction that the disinfection treatment process is adequately designed and maintained. The on-site inspection must include:

1. A review of the effectiveness of the wellhead protection program required by 179 NAC 13-004.02E;

2. A review of the physical condition of the well and the extent of protection provided;

3. A review of the system's equipment maintenance program to ensure there is low probability for failure of the disinfection process;

4. An inspection of the disinfection equipment for physical deterioration;

5. A review of operating procedures;

6. A review of data records to ensure that all required tests are being conducted and recorded and disinfection is effectively practiced; and

7. Identification of any improvements which are needed in the equipment, system maintenance and operation, or data collection.

13-004.04 The public water system must not have been identified as a source of a waterborne disease outbreak, or if it has been so identified, the system must have been modified sufficiently to prevent another such occurrence, as determined by the Director.

13-004.05 The public water system must comply with the maximum contaminant level (MCL), for total coliforms in 179 NAC 2-002.~~02C~~ 04C at least 11 months of the 12 previous months that the system served water to the public, on an ongoing basis, unless the Director determines that failure to meet this requirement was not caused by a deficiency in treatment of the source water.

13-004.06 The public water system ~~must~~ was required to comply with the requirements for trihalomethanes in 179 NAC 2-002.~~02B1~~ 04B1 and 179 NAC 3-006 until December 31, 2001 ~~which is included for informational purposes only~~. After December 31, 2001, the system must comply with the requirements for total trihalomethanes, haloacetic acids (five), bromate, chlorite, chlorine, chloramines, and chlorine dioxide in 179 NAC 16.

13-004.07 A system that fails to meet any one of the criteria in 179 NAC 13-004.01 and 13-004.02, and/or for which filtration is required, and fails to install filtration is in violation of a treatment technique requirement.

13-004.08 A system that has not installed filtration is in violation of a treatment technique requirement if:

1. The turbidity level (measured as specified in 179 NAC 13-007.01A) in a representative sample of the source water immediately prior to the first or only point of disinfection application exceeds 5 NTU; or

2. The system is identified as a source of a waterborne disease outbreak.

13-005 DISINFECTION: A public water system that uses a ground water source under the direct influence of surface water and does not provide filtration treatment must provide disinfection treatment specified in 179 NAC 13-005.01 beginning 18 months after the Director determines that the ground water source is under the direct influence of surface water. If filtration is required in accordance with 179 NAC 13-006, the system must comply with any interim disinfection requirements the Director deems necessary before filtration is installed. A system that uses a surface water source and provides filtration treatment must provide the disinfection treatment specified in 179 NAC 13-005.02 beginning June 29, 1993, or beginning when filtration is installed, whichever is later. A system that uses a ground water source under the direct influence of surface water and provides filtration treatment must provide disinfection treatment as specified in 179 NAC 13-005.02 by June 29, 1993, or beginning when filtration is installed, whichever is later. Failure to meet any requirement of 179 NAC 13-005 is a treatment technique violation.

13-005.01 Disinfection Requirements for Public Water Systems That Do Not Provide Filtration: Each public water system that uses a ground water source under the direct influence of surface water and does not provide filtration treatment must provide disinfection treatment as follows:

13-005.01A The disinfection treatment must be sufficient to ensure at least 99.9% (3-log) inactivation of *Giardia lamblia* cysts and 99.99% (4-log) inactivation of viruses, every day the system serves water to the public, except any one day each

month. Each day a system serves water to the public, the public water system must calculate the CT value(s) from the system's treatment parameters, using the procedure specified in 179 NAC 13-007.02D and determine whether this value(s) is sufficient to achieve the specified inactivation rates for *Giardia lamblia* cysts and viruses. If a system uses a disinfectant other than chlorine, the system owner may demonstrate to the Director that $CT_{(99.9)}$ values other than those specified in Tables 13.7 and 13.8 in 179 NAC 13-007.02C or other operational parameters are adequate to demonstrate that the system is achieving minimum inactivation rates required by 179 NAC 13-005.

13-005.01B The disinfection system must have either redundant components, including an auxiliary power supply with automatic start-up and alarm to ensure that disinfectant application is maintained continuously while water is being delivered to the distribution system, or automatic shut-off of delivery of water to the distribution system whenever there is less than 0.2 milligrams (mg) per liter of residual disinfectant concentration in the water. If the Director determines that automatic shut-off would cause unreasonable risk to health or interference with fire protection, the system must have the above redundant components.

13-005.01C The residual disinfectant concentration in the water entering the distribution system, measured as specified in 179 NAC 13-007.01B and 13-007.02E cannot be less than 0.2 mg per liter for more than four hours.

13-005.01D Residual Disinfectant Concentration

13-005.01D1 The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide as specified in 179 NAC 13-007.01B and 13-007.02F must be detectable, as defined in Attachment 1 which is hereby incorporated by reference, in at least 95% of the samples each month for any two consecutive months that the system serves water to the public. Thus, the value "V" in the following formula cannot exceed 5% in one month for any two consecutive months.

$$V = \frac{c+d+e}{a+b} \times 100$$

Where:

a = number of instances where residual disinfectant concentration is measured;
b = number of instances where the residual disinfectant concentration is not measured, but heterotrophic bacteria plate count (HPC) is measured;
c = number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

d = number of instances where the residual disinfectant concentration is measured but not detected and where the HPC is greater than 500 ml;

e = number of instances where the residual disinfectant concentration is not measured and HPC is greater than 500 per ml; and

V = percent of samples with undetectable residual disinfectant concentration.

13-005.01D2 If the Director determines, based on site-specific considerations, that a system does not have the means for having a sample transported and analyzed for heterotrophic plate count (HPC) by the Department Laboratory or an approved laboratory under the requisite time and temperature conditions required of the laboratory and that the system is providing adequate disinfection in the distribution system, the requirements of 179 NAC 13-005.01D1 do not apply to that system.

13-005.02 Disinfection Requirements for Public Water Systems Which Provide Filtration: Each public water system that provides filtration treatment must provide disinfection treatment as follows:

13-005.02A The disinfection treatment must be sufficient to ensure that the total treatment processes of that system achieve at least 99.9% (3-log) inactivation and/or removal of *Giardia lamblia* cysts and at least 99.99% (4-log) inactivation and/or removal of viruses, as determined by the Director.

13-005.02B The residual disinfectant concentration in the water entering the distribution system, measured as specified in 179 NAC 13-007.01B and 13-007.03B cannot be less than 0.2 mg per liter for more than four hours.

13-005.02C The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide, as specified in 179 NAC 13-007.01B and 13-007.03B must be detectable, as defined in Attachment 1 in at least 95% of the samples each month, for any two consecutive months that the system serves water to the public. Thus, the value “V” in the following formula cannot exceed 5% in one month, for any two consecutive months.

$$V = \frac{c+d+e}{a+b} \times 100$$

Where:

a = number of instances where the residual disinfectant concentration is measured;

b = number of instances where the residual disinfectant concentration is not measured but heterotrophic bacteria plate count (HPC) is measured;

c = number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;
d = number of instances where no residual disinfectant concentration is detected and where the HPC is greater than 500 per ml;
e = number of instances where the residual disinfectant concentration is not measured and HPC is greater than 500 per ml; and
V = percent of samples with undetectable residual disinfectant concentration.

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 the Department Laboratory or an approved laboratory under the requisite time and temperature conditions required of the laboratory and that the system is providing adequate disinfection in the distribution system, the requirements of 179 NAC 13-005.02C do not apply.

13-006 FILTRATION: A public water system that uses a surface water source must provide treatment consisting of both disinfection, as specified in 179 NAC 13-005.02 and filtration treatment which complies with the requirements of 179 NAC 13-006.01 to 13-006.04 by June 29, 1993. A public water system that uses a ground source which is under the direct influence of surface water and does not meet all the criteria in 179 NAC 13-004 for avoiding filtration, must provide treatment consisting of both disinfection, as specified in 179 NAC 13-005.02 and filtration which complies with the requirements of 179 NAC 13-006.01 to 13-006.04 within 18 months of the failure to meet any one of the criteria for avoiding filtration in 179 NAC 13-004. Failure to meet any requirement of 179 NAC 13-006 is a treatment technique violation.

13-006.01 Conventional Filtration Treatment or Direct Filtration

13-006.01A For systems using conventional filtration or direct filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 0.5 NTU in at least 95% of the measurements taken each month, measured as specified in 179 NAC 13-007.01A and 13-007.03A, except that if the Director determines that the system is capable of achieving at least 99.9% removal and/or inactivation of *Giardia lamblia* cysts at some turbidity level higher than 0.5 NTU in at least 95% of the measurements taken each month, the Director may substitute this higher turbidity limit for that system. However, in no case may the Director approve a turbidity limit that allows more than 1 NTU in more than 5% of the samples taken each month, measured as specified in 179 NAC 13-007.01A and 13-007.03A.

13-006.01B The turbidity level of representative samples of a system's filtered water must at no time exceed 5 NTU, measured as specified in 179 NAC 13-007.01A and 13-007.03A.

13-006.01C Beginning January 1, 2002, systems serving at least 10,000 people must meet the turbidity requirements in 179 NAC 17-006.01.

13-006.01D Beginning January 14, 2005, systems serving fewer than 10,000 people must meet the turbidity requirements in 179 NAC 19-009.01 through 19-009.04.

13-006.02 Slow Sand Filtration

13-006.02A For systems using slow sand filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 1 NTU in at least 95% of the measurements taken each month, measured as specified in 179 NAC 13-007.01A and 13-007.03A, except that if the Director determines there is no significant interference with disinfection at a higher turbidity level, the Director may substitute this higher turbidity limit for that system.

13-006.02B The turbidity level of representative samples of a system's filtered water must at no time exceed 5 NTU, measured as specified in 179 NAC 13-007.01A and 13-007.03A.

13-006.03 Diatomaceous Earth Filtration

13-006.03A For systems using diatomaceous earth filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 1 NTU in at least 95% of the measurements taken each month, measured as specified in 179 NAC 13-007.01A and 13-007.03A.

13-006.03B The turbidity level of representative samples of a system's filtered water must at no time exceed 5 NTU, measured as specified in 179 NAC 13-007.01A to 13-007.03A

13-006.04 Other Filtration Technologies: A public water system may use a filtration technology not listed in 179 NAC 13-006.01 to 13-006.03 if it demonstrates to the Director using pilot plant studies or other means, that the alternative filtration technology, in combination with disinfection treatment that meets the requirements of 179 NAC 13-005.02, consistently achieves 99.9% removal and/or inactivation of *Giardia lamblia* cysts and 99.99% removal and/or inactivation of viruses. For a system that makes this demonstration, the requirements of 179 NAC 13-006.02 apply. Beginning January 1, 2002, systems serving at least 10,000 people must meet the requirements for other filtration technologies in 179 NAC 17-005.02. Beginning January 14, 2005, systems serving fewer than 10,000 people must meet the requirements for other filtration technologies in 179 NAC 19-009.01 through 19-009.04.

13-007 ANALYTICAL AND MONITORING REQUIREMENTS

13-007.01 Analytical Requirements: Only the analytical method(s) specified in 179 NAC 13-007 can be used to demonstrate compliance with the requirements of 179 NAC 13-004, 13-005, and 13-006. Measurements for pH, temperature, turbidity, and residual disinfectant concentrations must be conducted by a Grade I, II, III, or IV operator or a person who has been trained to take the samples. Attachment 4 (which is hereby

incorporated by reference), which states that the person taking the samples has been trained to take them, must be completed, dated, and signed by the person doing the training (a Grade I, II, III, or IV ~~certified~~ licensed water operator) as well as the person trained. That form must be sent to the Department. Measurements for total coliforms, fecal coliforms, and heterotrophic plate count (HPC) must be conducted by the Department Laboratory or an approved laboratory as required in 179 NAC 3-009. Until laboratory certification criteria are developed for the analysis of fecal coliforms and HPC, any laboratory certified for total coliforms analysis by the Department or EPA is deemed certified for fecal coliforms and HPC analysis.

13-007.01A Public water systems must conduct analysis of pH and temperature in accordance with one of the methods listed in 179 NAC 3-005.11A. Public water systems must conduct analysis of total coliforms, fecal coliforms, heterotrophic bacteria, and turbidity in accordance with one of the following analytical methods or an equivalent method approved by EPA and by using analytical test procedures contained in *Technical Notes on Drinking Water Methods*, EPA-600/R-94-173, October 1994, which is available at NTIS PB95-104766.

Organism	Methodology	Citation[1]
Total Coliforms[2]	Total Coliform Fermentation Technique[3,4,5]	9221A, B, C
	Total Coliform Membrane Filter Technique[6]	9222A, B, C
	ONPG-MUG Test[7]	9223
Fecal Coliforms[2]	Fecal Coliform Procedure[8]	9221E
	Fecal Coliform Filter Procedure	9222D
Heterotrophic bacteria[2]	Pour Plate Method	9215B
	SimPlate[11]	
Turbidity[13]	Nephelometric Method	2130B
	Nephelometric Method	180.1[9]
	Great Lakes Instruments	Method 2[10]
	Hach Filter Trak	10133[12]

The procedures must be done in accordance with the documents listed below which are hereby incorporated by reference. Copies of the documents may be obtained from the sources listed below or the documents may be viewed at the Public Health Division of the Nebraska Department of Health and Human Services, 301 Centennial Mall South, Lincoln, NE 68509.

[1]Except where noted, all methods refer to *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, D.C. 20005. The cited methods published in any of these three editions may be used. In addition, the following online versions may also be used: 2130 B-01, 9215 B-00, 9221 A, B, C, E-99, 9222 A, B, C, D-97, and 9223 B-97. Standard Methods Online are available at http://www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[2]The time from sample collection to initiation of analysis may not exceed 8 hours. Systems must hold samples below 10ºC during transit.

[3]Lactose broth, as commercially available, may be used in lieu of lauryl triptose broth, if the system conducts at least 25 parallel tests between this medium and lauryl triptose 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]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, Appl. Environ. Microbiol. 59:3534-3544. Also available from the Office of Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NE, Washington, D.C. 20460, EPA 600/J-99/225. Verification of colonies is not required.
[7]The ONPG-MUG Test is also known as the Autoanalysis Colilert System.
[8]A-1 broth may be held up to seven days in a tightly closed screw cap tube at 4ºC.
[9]"*Methods for the Determination of Inorganic Substances In Environmental Samples*," EPA-600/R-93/100, August 1993. Available at NTIS, PB94-121811.
[10]GLI Method 2, "Turbidity," November 2, 1992, Great Lakes Instruments, Inc., 8855 North 55th Street, Milwaukee, Wisconsin 53223.
[11]A description of the SimPlate method, "IDEXX SimPlate TM HPC Test Method for Heterotrophs in Water," November 2000, can be obtained from IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, Maine 04092, Phone 800-321-0207.
[12]A description of the Hach FilterTrak Method 10133, "Determination of Turbidity by Laser Nephelometry," January 2000, Revision 2.0 can be obtained from: Hach Co., P.O. Box 389, Loveland, Colorado 80539-0389. Phone 800-227-4224.
[13]Styrene divinyl benzene beads (e.g. AMCO-AEPA-1 or equivalent) and stabilized formazin (e.g. Hach StablCal™ or equivalent) are acceptable substitutes for formazin.

13-007.01B ~~Residual~~ Public water systems must measure residual disinfectant concentrations ~~must be measured~~ with one of the analytical methods in the following table or an equivalent method approved by EPA. Except for the method for ozone residuals, the disinfectant residual methods are contained in the 18th, 19th, and 20th editions of *Standard Methods for the Examination of Water and Wastewater*, 1992, 1995, and 1998; the cited methods published in any of these three editions may be used. Copies of the documents may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005, or the documents may be viewed at the Division of Public Health of the Department of Health and Human Services, 301 Centennial Mall South, Lincoln, NE 68509. The ozone method, 4500-O3 B, is contained in both the 18th and 19th editions of *Standard Methods for the Examination of Water and Wastewater,* 1992 and 1995; either edition may be used. Residual disinfectant concentrations for free chlorine and combined chlorine may also be measured by using DPD colorimetric test kits. 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.

Residual	**Methodology**	**SM[1]**	**SM On-line[2]**	**Other**
Free Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D-00	D1253-03[3]
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F-00	
	DPD Colorimetric	4500 Cl G	4500-Cl G-00	
	Syringaldazine (FACTS)	4500 Cl H	4500-Cl H-00	
Total Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D-00	D1253-03[3]
	Amperometric Titration	4500-Cl E	4500-Cl E-00	
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F-00	
	DPD Colorimetric	4500-Cl G	4500-Cl G-00	
	Iodometric Electrode	4500-Cl I	4500-Cl I-00	

Chlorine Dioxide	Amperometric Titration	4500-ClO_2 C	4500-ClO_2 C-00	
	DPD Method	4500-ClO_2 D		
	Amperometric Titration	4500-ClO_2 E	4500-ClO_2 E-00	
	Spectrophotometric			327.0, Revision 1.1[4]
Ozone	Indigo Method	4500-O_3 B	4500-O_3 B-97	

[1] All the listed methods are contained in the 18th, 19th, and 20th editions of *Standard Methods for the Examination of Water and Wastewater*, 1992, 1995, and 1998; the cited methods published in any of these three editions may be used.
[2] Standard Methods Online are available at http://www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only Online versions that may be used.
[3] *Annual Book of ASTM Standards*, Vol. 11.01, 2004; ASTM International; any year containing the cited version of the method may be used Copies of this method may be obtained from ASTM International, 100 Barr Harbor Drive, P. O. Box C700, West Conshohocken, PA 19428-2959.
[4] EPA Method 327.0 Revision 1.1, "Determination of Chlorine Dioxide and Chlorite Ion in Drinking Water Using Lissamine Green B and Horseradish Peroxidase with Detection of Visible Spectrophotometry," USEPA, May 2005. EPA 815-R-05-008. Available online at http://www.epa.gov/safewater/methods/sourcalt.html.

13-007.02 Monitoring Requirements for Systems That Do Not Provide Filtration: A public water system that uses a ground water source under the direct influence of surface water and does not provide filtration treatment must begin monitoring as specified in 179 NAC 13 beginning six months after the Director determines that the ground water source is under the direct influence of surface water, unless filtration is required, in which case the Director may specify alternative monitoring requirements, as appropriate, until filtration is in place.

13-007.02A Fecal coliform or total coliform density measurements as required by 179 NAC 13-004.01A must be performed on representative source water samples immediately prior to the first or only point of disinfectant application. The owner of the system must sample for fecal or total coliforms at the following minimum frequency each week the system serves water to the public:

System size (~~persons~~ individuals served)	**Samples per week[1]**
500 or less	1
501 to 3,300	2
3,301 to 10,000	3
10,001 to 25,000	4
Over 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 toward 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.

13-007.02B Turbidity measurements as required by 179 NAC 13-004.01B 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 owner may substitute continuous turbidity monitoring for grab sample monitoring if it validates the continuous measurement for accuracy on a regular basis.

13-007.02C 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 13.1 through 13.8 of 179 NAC 13-007. The parameters necessary to determine the total inactivation ratio must be monitored as follows:

13-007.02C1 The temperature of the disinfected water must be measured at least once per day at each residual disinfectant concentration sampling point.

13-007.02C2 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.

13-007.02C3 The disinfectant contact time(s) ("T") must be determined for each day during peak hourly flow.

13-007.02C4 The residual disinfectant concentration(s) ("C") of the water before or at the first customer must be measured each day during peak hourly flow.

13-007.02C5 If a system uses a disinfectant other than chlorine, the system may demonstrate to the Director that $CT_{(99.9)}$ values other than those specified in Tables 13.7 and 13.8 in 179 NAC 13-007 or other operational parameters are adequate to demonstrate that the system is achieving the minimum inactivation rates required by 179 NAC 13-005.

TABLE 13.1

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY FREE CHLORINE AT 0.5ºC OR LOWER*

	pH						
Residual mg/l	**≤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

*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 13.2

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY FREE CHLORINE AT 5.0ºC *

	pH						
Residual mg/l	**≤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

*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 13.3

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY FREE CHLORINE AT 10.0ºC *

	pH						
Residual mg/l	**≤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

*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 13.4

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY FREE CHLORINE AT 15.0ºC *

	pH						
Residual mg/l	**≤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

*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 13.5

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY FREE CHLORINE AT 20.0ºC *

	pH						
Residual mg/l	**≤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

*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 13.6

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY FREE CHLORINE AT 25.0ºC AND HIGHER*

	pH						
Residual mg/l	**≤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

*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 13.7

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY CHLORINE DIOXIDE AND OZONE*

	Temperature					
	<1ºC	5ºC	10ºC	15ºC	20ºC	25ºC
Chlorine dioxide	63	26	23	19	15	11
Ozone	2.9	1.9	1.4	0.95	0.72	0.48

*These CT values achieve greater than a 99.99% inactivation of viruses. 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 13.8

CT VALUES [$CT_{(99.9)}$] for 99.9% INACTIVATION OF *GIARDIA LAMBLIA* CYSTS BY CHLORAMINES*

	Temperature					
	<1ºC	5ºC	10ºC	15ºC	20ºC	25ºC
Chloramine	3,800	2,200	1,850	1,500	1,100	750

*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, in accordance with 179 NAC 13-006, 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.

13-007.02D The total inactivation ratio must be calculated as follows:

13-007.02D1 If the system uses only one point of disinfectant application, the system owner may determine the total inactivation ratio based on either of the following two methods:

1. One inactivation ratio [CTcalc divided by $CT_{(99.9)}$] is determined before or at the first customer during peak hourly flow and if CTcalc divided by $CT_{(99.9)}$ is greater than or equal to 1.0, the 99.9% *Giardia lamblia* inactivation requirement has been achieved; or

2. Successive CTcalc divided by $CT_{(99.9)}$ 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:

   a. Determine CTcalc divided by $CT_{(99.9)}$ for each sequence;
   b. Add the CTcalc divided by $CT_{(99.9)}$ values together; and
   c. If the sum of CTcalc divided by $CT_{(99.9)}$ is greater than or equal to 1.0, the 99.9% *Giardia lamblia* inactivation requirement has been achieved.

13-007.02D2 If the system used more than one point of disinfectant application before or at the first customer, the system owner must determine the CT value of each disinfection sequence immediately prior to the next point of disinfectant application during peak hourly flow. The CTcalc divided by $CT_{(99.9)}$ value of each sequence and the sum of CTcalc divided by $CT_{(99.9)}$ must be calculated using the method in 179 NAC 13-007.02D1 item 2 to determine if the system is in compliance with 179 NAC 13-005.01.

13-007.02D3 Although not required, the total percent inactivation for a system with one or more points of residual disinfectant concentration monitoring may be calculated by solving the following equation:

Percent inactivation = 100 - 100 divided by 10^Z

Where: Z = 3 times the sum of CTcalc divided by $CT_{(99.9)}$

13-007.02E 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 monitoring equipment, grab sampling every four hours may be conducted in lieu of continuous monitoring, but for no more than five working days following the failure of the equipment. Owners of systems serving 3,300 or fewer ~~persons~~ individuals may take

grab samples in lieu of providing continuous monitoring on an ongoing basis at the frequencies prescribed below:

System size by population	**Samples per day[1]**
500 or less	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 review and approval by the Director.

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

13-007.02F Measurement of Residual Disinfectant

13-007.02F1 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 179 NAC 3-004, except that the Director may allow a public water system which uses both a surface water source or a ground water source under the direct influence of surface water, and a ground water 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) by the Department Laboratory or an approved laboratory in accordance with 179 NAC 3-009 may be measured in lieu of residual disinfectant concentration.

13-007.02F2 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 an approved laboratory under the requisite time and temperature conditions required of the approved laboratory, and that the system is providing adequate disinfection in the distribution system, the requirements of 179 NAC 13-007.02F1 do not apply to that system.

13-007.03 Monitoring Requirements for Systems Using Filtration Treatment: A public water system that uses a surface water source or a ground water source under the influence of surface water and provides filtration treatment must monitor in accordance with 179 NAC 13-007 beginning June 29, 1993, or when filtration is installed, whichever is later.

13-007.03A Turbidity measurements as required by 179 NAC 13-006 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 public water system owner may substitute continuous turbidity monitoring for grab sample monitoring if the owner validates the continuous measurement for accuracy on a regular basis. 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 the Director determines that less frequent monitoring is sufficient to indicate effective filtration performance. For systems serving 500 or fewer ~~persons~~individuals, 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 monitoring is sufficient to indicate effective filtration performance.

13-007.03B 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 monitoring equipment, grab sampling every four hours may be conducted in lieu of continuous monitoring, but for no more than five working days following the failure of the equipment. Owners of systems serving 3,300 or fewer ~~persons~~ individuals may take grab samples in lieu of providing continuous monitoring on an ongoing basis at the frequencies each day prescribed below:

System size by population	**Samples per day[1]**
500 or less	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 review and approval by the Director.

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

13-007.03C Measurement of Residual Disinfectant: The residual disinfectant concentration must be measured at least at the same point in the distribution system and at the same time as total coliforms are sampled, as specified in 179 NAC 3-004.01B except that the Director may allow a public water system which uses both a surface water source or a ground water source under the direct influence of surface water, and a ground water 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 179 NAC 13-007.01 may be measured in lieu of residual disinfectant concentration.

13-008 REPORTING AND RECORDKEEPING REQUIREMENTS

13-008.01 A public water system that uses a ground water source under the direct influence of surface water and does not provide filtration treatment must report monthly to the Director the information specified in 179 NAC 13-008 beginning six months after the Director determines that the ground water source is under the direct influence of surface water, unless filtration is required, in which case the Director may specify alternative reporting requirements, as appropriate, until filtration is in place. The reports must be submitted on Forms PWS 403, PWS 404, and PWS 405 in Attachment 3 to 179 NAC 13 (which is hereby incorporated by reference) or in an alternate format that includes the same information as contained on the appropriate form.

13-008.01A Source water quality information must be reported to the Director within ten days after the end of each month the system serves water to the public. Information that must be reported includes:

1. The cumulative number of months for which results are reported.

2. The number of fecal and/or total coliform samples, whichever are analyzed during the month (if a system monitors for both, only fecal coliforms must be reported), the dates of sample collection, and the dates when the turbidity level exceeded 1 NTU.

3. The number of samples during the month that had equal to or less than 20 per 100 ml fecal coliforms and/or equal to or less than 100 per 100 ml total coliforms.

4. The cumulative number of fecal or total coliform samples, whichever are analyzed, during the previous six months the system served water to the public.

5. The cumulative number of samples that had equal to or less than 20 per 100 ml of fecal coliforms or equal to or less than 100 per 100 ml total coliforms, whichever are analyzed, during the previous six months the system served water to the public.

6. The percentage of samples that had equal to or less than 20 per 100 ml fecal coliforms or equal to or less than 100 per 100 ml total coliforms, whichever are analyzed, during the previous six months the system served water to the public.

7. The maximum turbidity level measured during the month, the date(s) of occurrence(s) for any measurement(s) which exceeded 5 NTU, and the date(s) the occurrence(s) was reported to the Director.

8. For the first 12 months of recordkeeping, the dates and cumulative number of events during which turbidity exceeded 5 NTU, and after one year of recordkeeping for turbidity measurement, the dates and cumulative number of events during which the turbidity exceeded 5 NTU in the previous 12 months the system served water to the public.

9. For the first 120 months of recordkeeping, the dates and cumulative number of events during which the turbidity exceeded 5 NTU, and after 10 years of recordkeeping for turbidity measurements, the dates and cumulative number of events during which the turbidity exceeded 5 NTU in the previous 120 months the system served water to the public.

13-008.01B Disinfection information specified in 179 NAC 13-007 must be reported to the Director within ten days after the end of each month the system serves water to the public. Information that must be reported includes:

1. For each day, the lowest measurement of residual disinfectant concentration in mg per liter in water entering the distribution system.

2. The date and duration of each period when the residual disinfectant concentration in water entering the distribution system fell below 0.2 mg per liter and when the Director was notified of the occurrence.

3. The daily residual disinfectant concentration(s) in mg per liter and disinfectant contact time(s) in minutes used for calculating the CT value(s).

4. If chlorine is used, the daily measurement(s) of pH of disinfected water following each point of chlorine disinfection.

5. The daily measurement(s) of water temperature in degrees Celsius following each point of chlorine disinfection.

6. The daily CTcalc and CTcalc divided by $CT_{(99.9)}$ values for each disinfectant measurement or sequence and the sum of all CTcalc divided by $CT_{(99.9)}$ values before or at the first customer.

7. The daily determination of whether disinfection achieves adequate *Giardia* cyst and virus inactivation, *i.e.*, whether CTcalc divided by $CT_{(99.9)}$ is at least 1.0 or, where disinfectants other than chlorine are used, other indicator conditions that the Director determines are appropriate, are met.

8. The following information on the samples taken in the distribution system in conjunction with total coliform monitoring pursuant to 179 NAC 13-005:

a. Number of instances where the residual disinfectant concentration is measured;

b. Number of instances where the residual disinfectant concentration is not measured but heterotrophic bacteria plate count (HPC) is measured;

c. Number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

d. Number of instances where the residual disinfectant concentration is detected and where HPC is greater than 500 per ml;

e. Number of instances where the residual disinfectant concentration is not measured and HPC is greater than 500 per ml;

f. For the current and previous month the system served water to the public, the value of "V" in the following formula:

$$V = \frac{c+d+e}{a+b} \times 100$$

Where:

a = the value in 179 NAC 13-008.01B item 8.a.
b = the value in 179 NAC 13-008.01B item 8.b.
c = the value in 179 NAC 13-008.01B item 8.c.
d = the value in 179 NAC 13-008.01B item 8.d.
e = the value in 179 NAC 13-008.01B item 8.e.

V = percent of samples with undetectable residual disinfectant concentration

g. 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 the Department Laboratory or an approved laboratory under the requisite time and temperature conditions required of the laboratory and that the system is providing adequate disinfection in the distribution system, the requirements of 179 NAC 13-008.01B item 8 do not apply to that system.

9. A system need not report the data listed in 179 NAC 13-008.01B item 1 and 13-008.01B items 3 to 6, if all data listed in 179 NAC 13-008.01B items 1 to 8 remain on file at the system, and the Director determines that:

1. The system owner has submitted to the Director all the information required by 179 NAC 13-008.01B items 1 to 8 for at least 12 months, and

2. The Director has determined that the system is not required to provide filtration treatment.

13-008.01C No later than ten days after the end of each federal fiscal year (September 30), each system owner must provide to the Director a report which summarizes its compliance with all wellhead protection requirements specified in 179 NAC 13-004.02E.

13-008.01D No later than ten days after the end of each federal fiscal year (September 30) each system must provide to the Director a report on the on-site inspection conducted during that year pursuant to 179 NAC 13-004.03, unless the on-site inspection was conducted by the Director.

13-008.01E Special Reports

13-008.01E1 Each system, upon discovering that a water-borne disease outbreak potentially attributable to the water system has occurred, must report that occurrence to the Director as soon as possible, but not later than by the end of the next business day.

13-008.01E2 If at any time the turbidity exceeds 5 NTU, the system must consult with the Department as soon as practical, but no later than 24 hours after the exceedance is known, in accordance with the public notification requirements under 179 NAC 4-005.02 item 3.

13-008.01E3 If at any time the residual falls below 0.2 mg per liter in the water entering the distribution system, the system must notify the Director as soon as possible, but no later than by the end of the next business day. The system also must notify the Director by the end of the next business day whether or not the residual was restored to at least 0.2 mg per liter within four hours.

13-008.02 A public water system that uses a surface water source or a ground water source under the direct influence of surface water and provides filtration treatment must report monthly to the Director the information specified 179 NAC 13-008 beginning June 29, 1993, or when filtration is installed, whichever is later. The reports must be submitted on Forms PWS 405 and PWS 408 in Attachment 3 to 179 NAC 13 (which is hereby incorporated by reference) or in an alternate format that includes the same information as contained on the appropriate form.

13-008.02A Turbidity measurements as required by 179 NAC 13-007.03A must be reported within ten days after the end of each month the system serves water to the public. Information that must be reported includes:

1. The total number of filtered water turbidity measurements taken during the month.

2. The number and percentage of filtered water turbidity measurements taken during the month which are less than or equal to the turbidity limits specified in 179 NAC 13-006.

3. The date and value of any turbidity measurements taken during the month which exceed 5 NTU.

13-008.02B Disinfection information specified in 179 NAC 13-007.03 must be reported to the Director within ten days after the end of each month the system serves water to the public. Information that must be reported includes:

1. For each day, the lowest measurement of residual disinfectant concentration in mg per liter in water entering the distribution system.

2. The date and duration of each period when the residual disinfectant concentration in water entering the distribution system fell below 0.2 mg per liter and when the Director was notified of the occurrence.

3. The following information on the samples taken in the distribution system in conjunction with total coliform monitoring pursuant to 179 NAC 13-005:

   a. Number of instances where the residual disinfectant concentration is measured;

   b. Number of instances where the residual disinfectant concentration is not measured but heterotrophic bacteria plate count (HPC) is measured;

   c. Number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

   d. Number of instances where no residual disinfectant concentration is detected and the HPC is greater than 500 per ml;

   e. Number of instances where the residual disinfectant concentration is not measured and HPC is greater than 500 per ml;

   f. For the current and previous month the system serves water to the public, the value of “V” in the following formula:

$$V = \frac{c+d+e}{a+b} \times 100$$

Where:

a = the value in 179 NAC 13-008.02B item 3.a.
b = the value in 179 NAC 13-008.02B item 3.b.
c = the value in 179 NAC 13-008.02B item 3.c.
d = the value in 179 NAC 13-008.02B item 3.d.
e = the value in 179 NAC 13-008.02B item 3.e.

V = percent of samples with undetectable residual disinfectant concentration

g. If the Director determines, based on site-specific considerations, that a system has no means of having a sample transported and analyzed for HPC by the Department Laboratory or an approved laboratory under the requisite time and temperature conditions required of the laboratory and that the system is providing adequate disinfection in the distribution system, the requirements of 179 NAC 13-008.02B items 3.a. to 3.f. do not apply.

4. A system need not report the data listed in 179 NAC 13-008.02B item 1 if all the data listed in 179 NAC 13-008.02B items 1 to 3 remain on file at the system and the Director determines that the system has submitted all the information required by 179 NAC 13-008.02B items 1 to 3 for at least 12 months.

13-008.02C Special Reports

13-008.02C1 Each system owner, upon discovering that a waterborne disease outbreak potentially attributable to that water system has occurred, must report that occurrence to the Director as soon as possible, but no later than by the end of the next business day.

13-008.02C2 If at any time the turbidity exceeds 5 NTU, the system must consult with the Director as soon as practical, but no later than 24 hours after the exceedance is known, in accordance with the public notification requirements under 179 NAC 4-005.02 item 3.

13-008.02C3 If at any time the residual falls below 0.2 mg per liter in the water entering the distribution system, the system owner must notify the Director as soon as possible, but no later than by the end of the next business day. The system owner must also notify the Director by the end of the next business day whether or not the residual was restored to at least 0.2 mg per liter within four hours.

179 NAC 13 Attachment 1

Minimum Detectable Residuals

A. The following requirements establish the minimum allowable disinfectant residuals for each type of system.

1. For systems that are utilizing surface water sources, or sources determined to be groundwater under the direct influence of surface water, one of the following options must be implemented to meet the minimum residual requirements.

   a. 0.2 ppm residual for free chlorine or 0.5 ppm for total chlorine or
   b. 0.1 ppm residual for free chlorine or 0.25 ppm for total chlorine provided the requirements in Section C items 1-5 of this attachment are met or
   c. HPC of <500 cfu/ml.

2. All groundwater systems serving water to the public that contains chlorine or chloramines as a chemical disinfectant or oxidant on a continuous basis must use one of the following criteria for minimum residuals.

   a. 0.1 ppm residual for free chlorine or
   b. 0.05 ppm for free chlorine if qualifying criteria in section C items 3-5 of this attachment are met or
   c. HPC of <500 cfu/ml.

B. If a system is required to disinfect under an Administrative Order (AO), the requirements listed in the AO will supersede any requirements for minimum residuals established in this attachment.

C. In order for a system to maintain the lower minimum residual requirement for free or total chlorine (referred to in A, items 1.b. and 2.b.), the following criteria must be met:

1. Any public water system using surface water or ground water under the direct influence of surface water must meet or exceed all CT inactivation requirements in 179 NAC 13., Tables 13.1 to 13.8 at all times through the treatment process in order to utilize the lower requirements of A, item 1.b.

2. Any public water system using surface water, or ground water determined to be under the direct influence of surface water, must maintain effluent turbidity levels of less than or equal to 0.3 NTU in 95% of all readings, and at no time exceed 1 NTU.

A system may submit a study to the Department showing that turbidity values in excess of the specified turbidity limits are a direct result of the treatment process and do not represent a threat to public health. The Department will review the study to determine the nature of the high turbidity levels and if they pose a threat to public health.

3. The system must demonstrate that the field test method being used can consistently, reliably, and precisely measure residuals less than or equal to the specified limit being used.

4. The system must document that the manufacturer's recommendations for calibration or standardization are being done according to manufacturer's specifications and frequency, and make this information available for review during sanitary surveys.

5. The system must demonstrate that there is no interference with the testing method, or document that interference has been corrected for. This can be done by any one of the following methods:

   a. Demonstration through historical source water data (a minimum of 12 months of data, or at least four quarterly samples for non-transient non-community systems) that no interference listed under the manufacturer's instructions is present in the system.

   b. Sampling for applicable interferences once each day that a residual disinfectant compliance sample(s) is taken to obtain a correction factor to be added to all residual compliance samples taken that day.

   c. Using an EPA approved method that provides a correction for interference as part of the procedure, and documenting all corrections.

   d. Adjusting all results based on stable historical data and adding the maximum interference obtained, with the Department's approval.

D. Disinfectant residuals must be at or above the required minimum residual limits in at least 95% of all distribution residuals taken for the month. If the system fails to meet the 95% requirement for two consecutive months, or for $\geq$ 50% of the previous 12 consecutive months, the system will be deemed to be in violation of prescribed treatment techniques and will be issued a Treatment Technique violation.

179 NAC 13 ATTACHMENT 2

Protocol for the Determination of Influence of Surface Water on Ground Water Sources

I. Background: The Surface Water Treatment Rule (SWTR) promulgated by EPA requires that treatment sufficient to produce a three-log (99.9%) reduction in *Giardia lamblia* cysts and a four-log (99.99%) reduction in viruses be provided for all surface water sources and all ground water sources under the direct influence of surface water. The basic criteria which determines direct influence of surface water on ground water sources, within the context of the SWTR, is the possibility of *Giardia* cysts being carried into the ground water by infiltrating surface water. The more recent Interim Enhanced Surface Water Treatment Rule (IESWTR) and Long Term 1 Enhanced Surface Water Treatment Rule (LT1) add the requirement for 2-log (99%) removal of *Cryptosporidium* oocysts for all surface water sources and all ground water sources under the direct influence of surface water.

II. Obvious Surface Water Sources: The Department has identified ponds, lakes, and streams as obvious sources of surface water.

III. Protocol for Ground Water Under the Direct Influence of Surface Water Determination: The definitive determination of the influence of surface water is to perform particulate analyses on water samples collected from public water sources.

A. New Sources: The following screening protocol will identify the sources for which particulate analysis will be necessary. Department personnel will examine information on file to determine if a source of water is potentially at risk to the direct influence of surface water. If any one of the following conditions is true, then the source of water is potentially at risk to the direct influence of surface water:

1. The source of water is a spring, horizontal/radial collector well, or an infiltration gallery;

2. The top of the uppermost intake structure of a well is less than or equal to 50 feet from the ground surface;

3. There is evidence of *E. coli* contamination of the discharge of the source;

4. The source of water is less than 200 feet from a source of surface water or the sloping margin of, or the ground bordering a stream that serves to confine the water to the natural channel during the normal course of flow. It is best marked where a distinct channel has been eroded in the valley floor, or where there is a cessation of land vegetation.

5. There are defects in the condition of the upper terminus (e.g., defective well seals, grouting, or other defects in the upper annulus);

6. There is inadequate information on file to assess whether the source of water meets one or more of the conditions in III.A.1 through III.A.4. In this case, owners of the public water system will be given the opportunity to provide the required information.

B. Existing Sources: Any existing source will be evaluated under the screening protocol for new sources if any one of the following conditions exists:

1. A waterborne disease outbreak takes place in the public water system service area and the public water system is suspected of being the cause;

2. There is evidence of *E. coli* contamination in the source water and the source water meets any of the criteria in III.A above; or

3. The public water system has continuous disinfection, the source water meets any of the criteria in III.A above, and the source has not been previously evaluated by the Department using temperature, pH, turbidity, or microscopic particulate analysis.

C. Not Under the Direct Influence: A source of water that does not meet **any of** the criteria in III.A or III.B above is not considered to be at risk to the direct influence of surface water and Title 179 regulations regarding surface water and ground water under the direct influence of surface water do not apply.

D. At Risk: If a source of water is determined to be potentially at risk to the direct influence of surface water in accordance with the criteria in III.A or III.B above, particulate analysis samples must be taken from the source as follows:

1. A minimum of a set of two samples must be collected and analyses performed for the presence of green algae, blue-green algae, diatoms, nematodes, flagellates, and gastrotrichs. The second sample must be taken a minimum of 24 hours after the conclusion of the previous sampling. Samples must be collected in accordance with the Consensus Method for Determining Groundwaters under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) which is incorporated herein by reference. This publication is available from the National Technical Information Service, NTIS PB93-180818, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800-553-6847. This document may be inspected at the Division of Public Health of the Department of Health and Human Services, 301 Centennial Mall South, Lincoln, NE 68509. Sample collection must be at such times as the ground water source is most vulnerable to surface water infiltration (e.g., during periods of high surface water stages, after heavy rainfall or runoff events); however, sample collection will not be required when the source would not be used due to abnormal conditions including but not limited to flooding and natural disasters. Sample volumes must be at least 500 gallons. Analysis must be made by a certified laboratory that has entered into an agreement with the Department laboratory as specified in 179 NAC 20.

2. The presence of any of the indicators given in III.D.1 in both samples will be considered conclusive evidence of surface water influence and the source is subject to Title 179 regulations regarding surface water and ground water under the direct influence of surface water unless the system is able to determine that a structural defect led to the presence of indicator organisms in the sample(s). If a structural defect is found and corrected, the system may

sample again in order to determine if the source is under the direct influence of surface water.

3. If sample results are inconsistent, an additional set of two samples must be taken as directed by the Department. If any two of the four samples taken contain any of the indicators listed in III.D.1, their presence will be considered conclusive evidence of surface water influence and the source is subject to Title 179 regulations regarding surface water and ground water under the direct influence of surface water.

179 NAC 13 Attachment 3

PWS 403[1]

CT DETERMINATION FOR UNFILTERED SYSTEMS – MONTHLY REPORT TO THE DEPARTMENT [3][2]

Month _____ System/Treatment Plant _____
Year _____ PWSID NE 31 -_____
Disinfectant/Sequence of Application _____

Date	Disinfectant [3] Concentration, C (mg/l)	Disinfectant [3] Contact Time, T (min)	CTcalc [4] (C x T)	pH [3,5]	Water [3] Temp. (deg. C)	$CT_{99.9}$ [6]	CTcalc/$CT_{99.9}$)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
				Prepared By			
				Date			

Notes: (1) To be included in the monthly report for at least 12 months after the initiation of the reporting. After that time, the Department may no longer require this form.
(2) Use a separate form for each disinfectant/sampling site. Enter disinfection and sequence position, e.g., "ozone/1st" or "c102/3rd."
(3) Measurement taken at peak hourly flow.
(4) CTcalc – c (mg/L) x T (Min.)
(5) Only required if the disinfectant is free chlorine.
(6) From Tables 13.1-13.8, 179 NAC 13-007.02C5

PWS 404

DISINFECTION INFORMATION
FOR UNFILTERED SYSTEMS – MONTHLY REPORT TO THE DEPARTMENT

Month _____ System/Treatment Plant _____
Year _____ PWSID NE 31-_____

Date	Minimum Disinfectant Residual at Point-of-Entry to Distribution System (mg/L) (1)	(~~Ctcalc~~CTcalc/$CT_{99.9}$) (from Table 6-3)						Sum (~~Ctcalc~~CTcalc/$CT_{99.9}$) (2)	Sum (~~Ctcalc~~CTcalc/$CT_{99.9}$)<1 (Yes or No)(3)
		Disinfectant Sequence							
		1st	2nd	3rd	4th	5th	6th		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									

Prepared By _____

Date _____

Notes:
(1) If less than 0.2 mg/L, the lowest level and duration of the period must be reported, e.g., "0.1-3 hrs."
(2) To determine SUM (~~Ctcalc~~CTcalc/$CT_{99.9}$), add (~~Ctcalc~~CTcalc/$CT_{99.9}$) values from the first disinfection sequence to the last.
(3) If SUM (~~Ctcalc~~CTcalc/$CT_{99.9}$) <1, a treatment technique violation has occurred, and a "yes" response must be entered.

PWS 405

DISTRIBUTION SYSTEM DISINFECTANT RESIDUAL DATA FOR UNFILTERED AND FILTERED SYSTEMS
MONTHLY REPORT FOR THE DEPARTMENT

Month _____ System/Treatment Plant _____
Year _____ PWSID NE 31-_____

Date	No. of sites where disinfectant residual was measured (=a)	No. of sites where no disinfectant residual was measured, but HPC measured (=b)	No. of sites where disinfectant residual was not detected, no HPC measured (=c)	No. of sites where disinfectant residual not detected, HPC > 500/ml (=d)	No. of sites where disinfectant residual not measured, HPC > 500 ml (=e)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
Total	a=	b=	c=	d=	e=

V = (c+d+e)/(a+b) x 100 = (___ + ____ + ____)/(____ + ____) x 100 = _____%

Prepared by _____
Date _____

PWS 408

MONTHLY REPORT TO THE DEPARTMENT FOR COMPLIANCE DETERMINATION – FILTERED SYSTEMS

Month _____ System/Treatment Plant _____
Year _____ Type of Filtration _____
Turbidity Limit _____ PWSID NE-31 _____

Turbidity Performance Criteria

A. Total number of filtered water turbidity measurements = _____
B. Total number of filtered water turbidity measurements that are less than or equal to the specified limits for the filtration technology employed = _____
C. The percentage of turbidity measurements meeting the specified limits = B/A x 100 = ____/____ x 100 = _____%
D. Record the date and turbidity value for any measurements exceeding 5 NTU: if none, enter "none."

Date	Turbidity, NTU

Disinfection Performance Criteria

A. Point-of Entry Minimum Disinfectant Residual Criteria

Date	Minimum Disinfectant Residual at Point-of-Entry to Distribution System (mg/L)	Date	Minimum Disinfectant Residual at Point-of-Entry to Distribution System (mg/L)	Date	Minimum Disinfectant Residual at Point-of Entry to Distribution System (mg/L)
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	
				31	

Days the Residual was <0.2 mg/L		
Day	Duration of Low Level (hrs.)	Date Reported to the Department

B. Distribution System Disinfectant Residual Criteria
The value of a, b, c, d, and e, from Title 179 NAC 13-008.02B item 3f:
a = _____, b = _____, c = _____, d = _____, e = _____

$$v = \frac{c + d + e}{a + b} \times 100 = _____\%$$

For previous month, V = _____%

Prepared by _____
Date _____

179 NAC 13 ATTACHMENT 4

Sampling Training For Individuals Other Than ~~Certified~~ Licensed Operators

PWS System or Community Name: _____

Name of person taking samples: _____

Parameter(s) sampled routinely by the above person:

_____

Trainer and Title: _____

Training material used: _____

Handouts given to the above person:

_____

I certify that on _____ I personally provided the necessary sampling
(Date)

training to assure quality data and approve the above person as qualified to perform the

above sampling tasks.

X_____
(Signature of Trainer) (~~Certification~~ License Number)

I certify that I did receive said training and I understand how to properly sample the above parameters.

X_____
(Signature of Approved Sampling Person)

When the above-named trained person no longer takes the samples the person has been trained to take, I will inform the Division of Public Health of the Nebraska Department of Health and Human Services, Field Services Program Manager at (402) 471-0521 within seven days. Acknowledged by System Owner or Operator in Charge:

X_____Date: _____
(Signature)
(Keep a copy for your records and submit original within seven days to DHHS Public Health Division, Public Water Program at P. O. Box 95026, Lincoln, NE 68509-5026)