Surface Water Treatment Rules A
Goal of SWTRs

To improve public health protection from pathogens:

- Protozoans
- Bacteria
- Viruses

Examples:
- Giardia Lamblia
- Cryptosporidium
- Rotavirus
- E. Coli
SWTRs

Consist of the following regulations (effective dates):

Surface Water Treatment Rule (SWTR) (06/29/1993)

Interim Enhanced Surface Water Treatment Rule (IESWTR) (01/01/2002)

Filter Backwash Recycling Rule (FBRR) (06/08/2004)

Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) (01/01/2005)

Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) (01/05/2006)
Regulated Pathogens  
*(Removal/Inactivation Requirements)*

**SWTR, IESWTR, LT1ESWTR**

Systems must comply with the removal/inactivation requirements established for regulated pathogens

<table>
<thead>
<tr>
<th>Microbial</th>
<th>MCLG</th>
<th>Removal/Inactivation Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viruses</strong></td>
<td></td>
<td><strong>99.99% (4-log)</strong></td>
</tr>
<tr>
<td><strong>Giardia Lamblia</strong></td>
<td>Zero</td>
<td><strong>99.9% (3-log)</strong></td>
</tr>
<tr>
<td><strong>Cryptosporidium</strong></td>
<td>Zero</td>
<td><strong>99% (2-log) (removal only)</strong></td>
</tr>
</tbody>
</table>
Who is affected by SWTRs?

All Public Water Systems that use:

- **Surface Sources**
  - Lakes
  - Rivers/Streams
  - Reservoirs
  - Springs

- **Ground Water Under the Direct Influence of surface water (GWUDI)**

Referred to as **Subpart H systems**
Multi-Barrier Treatment

Source Protection

Source → Flash Mix → Floc Basin → Sedimentation Basin → Filters → Contact Basin / Clearwell → To Dist.

Flash Mix

Coagulation/Sedimentation

Filtration

Disinfection
SWTR Requirements

Source Assessment Requirements for Groundwater Systems (GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Source Assessment Requirements

Groundwater Systems

All PWS groundwater well sources:
- Evaluated for direct surface water influence (i.e. GWUDI)

The evaluation process considers:
- Microbial and particulate analysis
- Historical water quality data
- Well construction
- Well siting with respect to:
  - Proximity to surface water sources and other potential sources of contamination
  - Surface drainage
- Subsurface geology and aquifer characteristics
Source Assessment Requirements
GWUDI Systems

If a well is determined GWUDI:

• Must be in full compliance with the SWTRs within 18 months after the determination has been finalized.

• Must comply with interim monitoring requirements and a compliance schedule set by the ADH until filtration is installed.
SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Water Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Source Monitoring Requirements

Source Water Monitoring
Monitor to determine *Cryptosporidium* and/or indicator levels (24 samples)
What is Cryptosporidium?

- A small, single celled parasite which causes the intestinal illness cryptosporidiosis

- Found and transmitted in soil, food, water, or surfaces that have been contaminated with infected human or animal feces

- Protected by an outer shell (oocyst) that allows it to survive in the environment for long periods of time and makes it very resistant to chlorine-based disinfectants
Cryptosporidiosis

How long after infection do symptoms appear?

• Generally begin 2 to 10 days (average 7 days) after becoming infected with the parasite.

How long will symptoms last?

• In persons with healthy immune systems, symptoms usually last about 1 to 2 weeks.
• The symptoms may go in cycles in which you may seem to get better for a few days, then feel worse again before the illness ends.
## Recorded *Cryptosporidium* Outbreaks in the U.S.

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Infected Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>Texas</td>
<td>First recorded outbreak</td>
</tr>
<tr>
<td>1987</td>
<td>Carrollton, Georgia</td>
<td>13,000 infected</td>
</tr>
<tr>
<td>1993</td>
<td>Milwaukee, Wisconsin</td>
<td>400,000 infected</td>
</tr>
<tr>
<td>1994</td>
<td>Las Vegas, Nevada</td>
<td>unknown</td>
</tr>
<tr>
<td>2005</td>
<td>Upstate, New York</td>
<td>35,000 infected</td>
</tr>
<tr>
<td>2013</td>
<td>Baker City, Oregon</td>
<td>28% infected</td>
</tr>
</tbody>
</table>
## Source Monitoring Timeline

<table>
<thead>
<tr>
<th>Sch</th>
<th>Retail Pop Served</th>
<th>1st Round Monitoring</th>
<th>2nd Round Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt;100,000</td>
<td>October 1, 2006</td>
<td>April 1, 2015</td>
</tr>
<tr>
<td>2</td>
<td>50,000 – 99,999</td>
<td>April 1, 2007</td>
<td>Oct 1, 2015</td>
</tr>
<tr>
<td>3</td>
<td>10,000 – 49,999</td>
<td>April 1, 2008</td>
<td>Oct 1, 2016</td>
</tr>
<tr>
<td>4</td>
<td>&lt;10,000</td>
<td>E. Coli October 1, 2008</td>
<td>E. Coli Oct 1, 2017</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crypto April 1, 2010</td>
<td>Crypto Apr 1, 2019</td>
</tr>
</tbody>
</table>
Source Monitoring Requirements

Source Water Monitoring
Monitor to determine Cryptosporidium and/or indicator levels
(2 year period – 24 samples)

Treatment Bins and the Microbial Toolbox
Assignment to “bins” based on monitoring results. Additional treatment based on the requirements for each bin, choosing from a set of treatment options.

LT2ESWTR
## Source Water Monitoring

### Bin Classification and Treatment

#### Conventional Filtration

<table>
<thead>
<tr>
<th>Bin Number</th>
<th>Cryptosporidium Concentration (in oocysts/L)</th>
<th>Additional Treatment Beyond Current Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Crypto</em> &lt; 0.075</td>
<td>No additional treatment</td>
</tr>
<tr>
<td>2</td>
<td>$0.075 \leq <em>Crypto</em> &lt; 1.0</td>
<td>1.0 log (90%)</td>
</tr>
<tr>
<td>3</td>
<td>$1.0 \leq <em>Crypto</em> &lt; 3.0</td>
<td>2.0 log (99%)</td>
</tr>
<tr>
<td>4</td>
<td>$3.0 \leq <em>Crypto</em></td>
<td>2.5 log (99.7%)</td>
</tr>
</tbody>
</table>

*LT2ESWTR*
• Options can be used singly or in combination to meet treatment requirements
• Systems must meet criteria specific to each option to be granted treatment credit
• EPA has made removal/inactivation credit recommendations for each “tool”
• There is a 6-year compliance period from initial monitoring.
## Requirements For BIN 2 and Using Toolbox Option: “Treatment Performance”

<table>
<thead>
<tr>
<th>Monitoring Requirement</th>
<th>Monitoring Frequency</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFE</td>
<td>At least every 4 hours</td>
<td>≤ 0.15 NTU in 95% of CFE Measurements</td>
</tr>
<tr>
<td>IFE</td>
<td>Continuously</td>
<td>≤ 0.15 NTU in 95% of IFE Measurements</td>
</tr>
<tr>
<td>IFE</td>
<td>Continuously</td>
<td>NONE &gt;0.3 NTU in 2 Consecutive 15 Min. Measurements</td>
</tr>
</tbody>
</table>
Source Water Monitoring
Monitor to determine *Cryptosporidium* and/or indicator levels (24 samples)

Treatment Bins and the Microbial Toolbox
Assignment to “bins” based on monitoring results. Additional treatment based on the requirements for each bin, choosing from a set of treatment options.

“Future” Monitoring
Six years after initial source water monitoring ends, monitor again to confirm or revise bin classification. (Doing now.)
SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Conventional or Direct Filtration (Rapid Sand Filters)

- Combined Filter Effluent (CFE)
- Individual Filter Effluent (IFE)
**Turbidity Performance Standards**

**CFE Requirements**

(Conventional and Direct Filtration)

<table>
<thead>
<tr>
<th>Monitoring Requirement</th>
<th>Monitoring Frequency</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFE 95% Value</td>
<td>At least every 4 hours</td>
<td>$\leq 0.3 \text{ NTU}$</td>
</tr>
<tr>
<td>CFE Maximum Value</td>
<td>At least every 4 hours</td>
<td>$1 \text{ NTU}$</td>
</tr>
</tbody>
</table>

IESWTR and LT1ESWTR
## Turbidity Performance Standards

### CFE Requirements

(Alternate Filtration)

<table>
<thead>
<tr>
<th>Filter Rating</th>
<th>Monitoring Location</th>
<th>Monitoring Frequency</th>
<th>Turbidity Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-micron nominal</td>
<td>CFE</td>
<td>≤ 4 hours</td>
<td>95% of time ≤ 0.3 NTU</td>
</tr>
<tr>
<td>1-micron absolute</td>
<td>CFE</td>
<td>≤ 4 hours</td>
<td>95% of time ≤ 1.0 NTU</td>
</tr>
</tbody>
</table>

IESWTR and LT1ESWTR
Monitored:

- Every 4 hours that the system produces water
- Continuous turbidity monitors can be substituted for grab samples provided that:
  - Continuous monitoring results are manually or automatically recorded
  - Continuous monitor is calibrated on a regular basis
- ADH may reduce sampling frequency for systems serving <500 people to once per day
  - If ADH determines that less frequent monitoring is sufficient to indicate effective filtration
Turbidity Performance Standards

- Turbidimeter calibration requirements:

  • Must use procedure specified by manufacturer

  • ADH recommends calibration w/ primary standards at least every 3 months.
Turbidity Performance Standards

If turbidimeter fails:

Conduct grab sampling every 4 hours until repaired

**Large Systems** (≥10,000 pop.)
- must repair turbidimeter within 5 working days

**Small Systems** (<10,000 pop.)
- must repair turbidimeter within 14 days

Periodic backup of data is recommended for systems using computers to log data.
# Turbidity Performance Standards

## IFE Requirements

(Conventional and Direct Filtration only)

<table>
<thead>
<tr>
<th>Pop. Served</th>
<th>Monitoring Location</th>
<th>Monitoring Frequency</th>
<th>Turbidity Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 10,000</td>
<td>IFE</td>
<td>Continuously</td>
<td>≤ 0.5 NTU</td>
</tr>
<tr>
<td>&lt; 10,000</td>
<td>* IFE</td>
<td>Continuously</td>
<td>≤ 1.0 NTU</td>
</tr>
</tbody>
</table>

* If system has 2 filters or less...monitoring location may be CFE.

IESWTR and LT1ESWTR
LT1ESWTR: 1.0 NTU exceedance in two consecutive readings taken 15 minutes apart, system must report date, filter number, turbidity value and reason (if known) for exceedance.
## Monitoring / Reporting Requirements

### IFE Follow-up Steps

*(Systems serving at least 10,000 people)*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 consecutive measurements &gt;0.5 NTU taken 15 minutes apart at the end of the first 4 hours of continuous filter operation after backwash/ offline</td>
</tr>
<tr>
<td>2</td>
<td>2 consecutive measurements &gt;1.0 NTU taken 15 minutes apart during normal operation</td>
</tr>
<tr>
<td>3</td>
<td>2 consecutive measurements &gt;1.0 NTU taken 15 minutes apart at the same filter for 3 months in a row</td>
</tr>
<tr>
<td>4</td>
<td>2 consecutive measurements &gt;2.0 NTU taken 15 minutes apart at the same filter for 2 months in a row</td>
</tr>
</tbody>
</table>
## Monitoring / Reporting Requirements

### IFE Follow-up Steps
*(Systems serving less than 10,000 people)*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 consecutive measurements &gt;1.0 NTU taken 15 minutes apart</td>
</tr>
<tr>
<td>2</td>
<td>2 consecutive measurements &gt;1.0 NTU taken 15 minutes apart at the same filter for 3 months in a row</td>
</tr>
<tr>
<td>3*</td>
<td>2 consecutive measurements &gt;2.0 NTU taken 15 minutes apart at the same filter for 2 months in a row</td>
</tr>
</tbody>
</table>

*Exception if a CPE was done in the last 12 months*
Monitoring / Reporting Requirements
Filter Profile

Continuous turbidity measurements of a typical filter run in graphical form.

- Starting at filter startup after backwash
- Ending at filter startup after next backwash

1. Must include the filter performance while another filter is being backwashed.

2. Must include explanations of the cause of performance spikes.

- Flow rate increase, adjoining filter backwash, filter backwash, etc.
Monitoring / Reporting Requirements

Filter Profile — Good Performance

Turbidity (NTU)

Backwashes
Peaks: < 0.3 NTU
Monitoring / Reporting Requirements

Filter Profile — Turbidity Excursion

- Chemical Feed Failure
- Filter Backwash
- Initiate Filter Backwash

<table>
<thead>
<tr>
<th>Time</th>
<th>NTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 am</td>
<td>0.1</td>
</tr>
<tr>
<td>6 am</td>
<td>0.2</td>
</tr>
<tr>
<td>12 pm</td>
<td>0.4</td>
</tr>
<tr>
<td>6 pm</td>
<td>0.1</td>
</tr>
<tr>
<td>12 am</td>
<td>0.2</td>
</tr>
<tr>
<td>12 pm</td>
<td>0.1</td>
</tr>
<tr>
<td>6 am</td>
<td>0.2</td>
</tr>
<tr>
<td>12 pm</td>
<td>0.1</td>
</tr>
</tbody>
</table>
• A general description of the filter.
• The development of a filter profile.
• An assessment of the hydraulic loading conditions of the filter.
• An assessment of the actual condition and placement of the filter media.
• A description of backwash practices.
• An assessment of the condition of the support media/underdrain.
• An assessment of the filter rate-of-flow controllers and filter valving adequacy.
Monitoring / Reporting Requirements

Comprehensive Performance Evaluation (CPE)

- Is a thorough review and analysis conducted to identify factors that may be adversely impacting the plant’s capability to achieve compliance and/or optimal performance.

- Evaluates:
  - Design
  - Operation
  - Administration
  - Maintenance
SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling Rule

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Disinfection Performance Standards

CT

Plant Effluent Disinfectant Residual
Distribution Disinfectant Residual
Disinfection Profiling and Benchmarking

SWTR, IESWTR, LT1ESWTR
Disinfection Performance Standards

“CT” = C x T; where

- (C) is the residual disinfectant concentration (mg/L)
  - The residual disinfectant is measured at the effluent of a basin or pipeline

- (T) is the time credited for disinfectant contact
  - “T” is the time it takes for 10% of the water entering the treatment unit to exit at peak flow
  - Contact time is determined by tracer study or application of a baffle factor

“CT” is an ADH assigned value based on the flow characteristics through the treatment unit and historical data
Disinfection Performance Standards

“CT”

Common Disinfectants in Water Treatment:

- Chlorine
- Chloramines
- Chlorine Dioxide
- Ozone
- Ultraviolet Radiation (UV)
Monitoring / Reporting Requirements

“CT”

- Peak plant flow rate (raw or plant flow rate)
- Peak high service flow rate
- Minimum clearwell depth
- Water temperature at peak flow rate
- Identify disinfection injection points
- Identify CT monitoring points
- pH & disinfectant residual (free chlorine) at each monitoring point at peak flow rate
- Determine CT compliance
Disinfection Performance Standards

"CT"

Source

Potential Disinfection Points

Flash Mix
Floc Basin
Sedimentation Basin
Filters
Contact Basin / Clearwell

To Dist.
Disinfection Performance Standards

“CT”

Disinfection treatment (CT) must be sufficient to ensure the total treatment processes achieve inactivation of:

ADH establishes removal and inactivation criteria

<table>
<thead>
<tr>
<th>Treatment Method</th>
<th>Microbial</th>
<th>MCLG</th>
<th>Minimum Inactivation Requirements by Disinfection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>Viruses</td>
<td></td>
<td>99% (2-log)</td>
</tr>
<tr>
<td></td>
<td><em>Giardia Lamblia</em></td>
<td>Zero</td>
<td>68% (0.5-log)</td>
</tr>
<tr>
<td>Direct</td>
<td>Viruses</td>
<td></td>
<td>99.9% (3-log)</td>
</tr>
<tr>
<td></td>
<td><em>Giardia Lamblia</em></td>
<td>Zero</td>
<td>90% (1.0-log)</td>
</tr>
</tbody>
</table>
Disinfection Performance Standards

“CT”

\[ \text{HOCl} = \text{Hypochlorous Acid} \quad \text{OCI}^- = \text{Hypochlorite Ion} \]

No CT credit given by ADH for pH above 9.0.
Disinfection Performance Standards
“CT Letter”

Arkansas Department of Health

CERTIFIED
February 26, 2018

Mr. Operator
Public Water System
1001 E. Pumphouse Road
Somewhere, AR 72000

RE: Public Water System, PWS ###
Calculated/Tracer CT Analysis Report
Required Inactivation: 0.5 log cyst/2.5 log virus
Revised CT Compliance

2.5 log Giardia & 1.5 log Virus Credits

Dear Mr. Operator:

The CT criteria for the Public Water System have been revised to meet the required inactivation of 0.5 log cyst/2.5 log virus. This inactivation requirement is based on the results of the plant removal credit evaluation performed by this office.

The CT criteria for the Public Water System have been finalized. Based on current conditions, CT compliance can be achieved. This compliance is based on the following:
Disinfection Performance Standards

“CT Letter”

1. A maximum plant flow rate of 1,000 gpm and a maximum high service flow rate of 1,300 gpm with an approved T1o time of 72 minutes in the clearwell. This time is based on 0.5 battle factor and a minimum water depth of 10 feet in the clearwell.

2. The following parameters must be met and reported daily on the monthly operation report for CT compliance:
   
   A. The maximum pH ≤ 9.0.
   B. The minimum water temperature ≥ 0.5 °C (33°F)
   C. The minimum free chlorine residual ≥ 1.1 mg/l at the high service pumps.

3. The water quality parameters in Item 2 must be monitored daily at the high service pumps.

4. The maximum plant and high service flow rates and minimum clearwell levels in Item 1 must be met and reported daily on the monthly operation report for CT compliance.
Disinfection Performance Standards
“CT Letter”

CT compliance is based on the specific chlorination points as outlined below:

Post-chlorination following filtration and prior to entering the baffled clearwell.

Therefore, no deletion or relocation of a chlorination point for CT compliance is to be completed without first notifying this office and receiving written confirmation of the proposal.

If the above conditions cannot be met, the water system must reanalyze its CT compliance as soon as possible. If necessary, contact this office for assistance. The water system must immediately begin to monitor the above plant parameters to ensure SWTR compliance is being achieved.

As a reminder, the SWTR also requires a chlorine residual be maintained throughout the distribution system and that the residual be recorded when monthly bacteriological samples are taken. Therefore, unless the water system has distribution booster chlorination, the treatment plant residual must be high enough to not only meet CT requirements but also maintain a residual throughout the distribution system.

Measures should also be taken to ensure that the SWTR/IESWTR finished water turbidity requirement of 0.3 NTU in 95% of samples can also be met.

This letter should remain a permanent part of the water system’s compliance file for the SWTR/IESWTR until notified or superseded in writing by this office.

If you have any questions concerning the CT analysis or subsequent steps to take for compliance, feel free to contact Vickie Welytok or myself at 501-661-2623.

Sincerely,
Monitoring / Reporting Requirements

"CT"

EPA approved test methods must be used for CT compliance.

<table>
<thead>
<tr>
<th></th>
<th>Peak</th>
<th>Peak</th>
<th>Minimum</th>
<th>Water</th>
<th>Raw / Plant</th>
<th>High</th>
<th>Minimum</th>
<th>Was</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1: Flash Mix</td>
<td>#2: Filter Influent</td>
<td>#3: Clearwell Inf.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Flow</td>
<td>Service</td>
<td>Clearwell</td>
<td>Temp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>Rate</td>
<td>Flow</td>
<td>Level*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Rate</td>
<td>Flow</td>
<td>Level*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(RECORD DISINFECTANT INJECTION POINTS BELOW)

(RECORD MONITORING LOCATIONS BELOW)

<table>
<thead>
<tr>
<th>Date</th>
<th>Rate</th>
<th>Flow</th>
<th>Level*</th>
<th>pH</th>
<th>Residual</th>
<th>pH</th>
<th>Residual</th>
<th>pH</th>
<th>Residual</th>
<th>met this</th>
<th>12 hours?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75</td>
<td>100</td>
<td>6</td>
<td>68</td>
<td>6.8</td>
<td>0.3</td>
<td>6.5</td>
<td>0.2</td>
<td>7.8</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>100</td>
<td>8</td>
<td>70</td>
<td>7.1</td>
<td>0.5</td>
<td>6.8</td>
<td>0.4</td>
<td>7.6</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Disinfection Performance Standards
Plant Effluent and Distribution Residuals

<table>
<thead>
<tr>
<th>Population</th>
<th>Treatment Plant Effluent</th>
<th>Distribution System</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Subpart H Systems</td>
<td>Cannot be (&lt; 0.2 \text{ mg/L} ) for more than 4 hours</td>
<td>Detectable in at least 95% of samples in a month for any 2 consecutive months</td>
</tr>
</tbody>
</table>

* Heterotrophic plate counts \(<500 \text{ colonies} / \text{ mL} \) are deemed to equal to a detectable residual (not used in Arkansas)
**Monitoring / Reporting Requirements**

**Distribution Entry Point Residual**

Record lowest measured value each day.

<table>
<thead>
<tr>
<th>Population Served</th>
<th>Samples Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 500</td>
<td>1</td>
</tr>
<tr>
<td>501 - 1000</td>
<td>2</td>
</tr>
<tr>
<td>1001 - 2500</td>
<td>3</td>
</tr>
<tr>
<td>2501 - 3300</td>
<td>4</td>
</tr>
<tr>
<td>&gt; 3300</td>
<td>Continuously</td>
</tr>
</tbody>
</table>

Record results on Operations Report Form

**Note:** If plant effluent residual <0.2 mg/L, the system must notify ADH and monitor every 4 hours until >0.2 mg/L.
Monitoring / Reporting Requirements
Distribution Entry Point Residual

Systems using Chlorine Dioxide:

- Monitor ClO₂ at the entry point to the distribution system daily.

- For any daily sample exceeding 0.8 mg/L, the system must:
Monitoring / Reporting Requirements
Distribution Disinfectant Residual

- Monitor at same points and frequency as TCR samples.
- Failure to meet distribution system residuals is a treatment technique violation (if non-detect in > 5% of samples for two months).
- Maximum Residual Disinfectant Levels (MRDL).

Chlorine = 4.0 mg/L (as Cl₂) Yearly Avg
Chloramines = 4.0 mg/L (as Cl₂) Yearly Avg
Chlorine Dioxide = 0.8 mg/L (as ClO₂) Max
## Monitoring / Reporting Requirements

### Distribution Disinfectant Residual

**Chlorite Monitoring** (For Systems Using Chlorine Dioxide)

<table>
<thead>
<tr>
<th>Low est Measured Value*</th>
<th>Effluent Cl2 (ppm)</th>
<th>Entry Point Chlorite (ppm)</th>
<th>Dist. Samples Collected (Y / N)</th>
<th>D</th>
<th>A</th>
<th>T</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>0.1</strong></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*4 Hr Effluent Residual Monitoring Required if < 0.2 PPM

<table>
<thead>
<tr>
<th>Date</th>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.1</td>
<td>0.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 -- 4</td>
<td>4 -- 8</td>
<td>8 -- 12</td>
</tr>
<tr>
<td>4 -- 8</td>
<td>8 -- 12</td>
<td>12 -- 4</td>
</tr>
</tbody>
</table>

* Effluent Cl2 monitoring required if < 0.2 ppm.
Disinfection Performance Standards

Disinfection Profiling

Monitor and record *giardia* and *virus* inactivation throughout plant.

Develop **Disinfection Benchmark**

Establish representative benchmark of microbial protection throughout plant based on monitoring results.

**Consultation with State**

Consult with state prior to making significant changes to disinfection practices.
SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Filter Backwash Recycling Rule

- **General Description**
  - Requires that all recycle flows be returned through all treatment processes (i.e., at or prior to the point of primary coagulation).
  - Applies to:
    - All Subpart H systems that uses conventional or direct filtration treatment, and
    - Recycles water from:
      - Filter Backwash
      - Thickener Supernatant
      - Dewatering Processes
Monitoring / Reporting Requirements

Filter Backwash Recycling Rule

– Copy of recycle notification and information submitted to the State.

– List of all recycle flows and frequency with which they are returned.

– Average and maximum backwash flow rates & average and maximum duration of backwash process (in minutes.)
Monitoring / Reporting Requirements

Filter Backwash Recycling Rule

– Typical filter run length and written summary of how filter run length is determined.

– Type of treatment provided for recycle flows.
  • Physical dimension of recycle equalization and/or treatment units
  • Typical and maximum hydraulic loading rates
  • Types of chemicals used and average dose
  • Frequency of use
  • Frequency at which solids are removed
SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

- Source Monitoring Requirements
- Turbidity Performance Standards
- Disinfection Performance Standards
- Monitoring and Reporting Requirements

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Sanitary Surveys

Significant deficiencies

• Defect in a system’s design, operation, maintenance, or administration.

• Failure or malfunction of any system component, that the State (ADH) determines to cause, or have the potential to cause, risk to health or safety.
If determined to have significant deficiencies:

• Respond in writing to the ADH within 45 days of written notification.
• Provide a corrective action plan and time table for resolving significant deficiencies.
• Correct significant deficiencies according to time table submitted to and approved by ADH.
Sanitary Surveys
Records and Reports

The system must have, at a minimum, the following records on file and available for review during Sanitary Surveys.

- Sanitary Surveys
- Bacteriological and Chemical Analysis Reports
- Source Water Assessment Report
- Sample Site Plans
- Optimal Corrosion Control and Treatment Plan (If Applicable)
- Disinfection Profile and Benchmark Report (If Applicable)
- Individual Filter Monitoring Data (If Applicable)
- Filter Profile Report (If Applicable)
- Filter Self-Assessment Report (If Applicable)
- CPE Report (If Applicable)
SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Monitoring and Reporting Requirements

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Covered Finished Reservoirs/Water Storage Facilities

Uncovered Finished Water Reservoirs (LT2)
Systems with uncovered reservoirs must either cover, treat, or implement risk mitigation plan.
SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Monitoring and Reporting Requirements

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification
Operator Certification

All Subpart H systems must be operated by qualified personnel

To be qualified:

- Treatment License
  - Must be Grade II or higher
    (based on system size and job duties)

- Three months to obtain license, however
  - The system will be in violation of the SWTR during this period
  - Violations will be reported to EPA
Analytical Techniques
Analytical Techniques

- Turbidity must be measured in accordance with:
  - EPA Method 180.1, or
  - Method 214A in the 16\textsuperscript{th} or later edition of Standard Methods (2130 B in 22\textsuperscript{nd} edition)

- Chlorine residual (free or combined) must be measured in accordance with:
  - Method 408C (Amperometric Titration Method),
  - Method 408D (DPD Ferrous Titrimetric Method), or
  - Method 408E (DPD Colorimetric Method) in the 16\textsuperscript{th}, or later, edition of Standard Methods (4500-Cl X-00 (X = D, F, or G) in SM Online)
  - EPA Method 334.0 (On-line analyzer)
  - DPD colorimetric field test kits are also acceptable.
Analytical Techniques

• Ozone
  • Residual concentration must be measured by:
    • Method 4500-O3 B of the 17th, or later, edition of Standard Methods

• Chlorine Dioxide
  • Residual concentration must be measured by:
    • Method 410B or 410C (Amperometric Titration) of the 16th, or later, edition of Standard Methods
    (Method 4500-ClO₂ D or E in 19th or 20th edition)
    (Method 4500-ClO₂ C or E in 22nd edition)
    (Method 4500-ClO₂ E-00 in SM Online)
    • EPA Method 327.0 Rev. 1.1
    • Amperometric Sensor using ChlordioX™ Plus
Analytical Techniques

• **pH**
  • Measurements must be in accordance with:
    • Method 423 in the 16th, or later, edition of Standard Methods (4500-$H^+$ B-00 in Standard Methods Online)
    • (Note: This method requires the use of a specific ion electrode for pH measurements, colorimetric methods are not acceptable.
    • EPA Method 150.1
    • EPA Method 150.2

• **Temperature**
  • Measurements must be in accordance with:
    • Method 212 in the 16th, or later, edition of Standard Methods (2550-00 in Standard Methods Online)
Analytical Techniques

• Total Trihalomethanes (TTHMs)
  • Must be collected, handled, and analyzed by one of the following analytical methods:
    • EPA 502.2, EPA 524.2 or EPA 551.1

• Haloacetic Acids (five) (HAA5s)
  • Must be collected, handled, and analyzed by one of the following analytical methods:
    • EPA 552.1, EPA 552.2 (or 552.3), or
Questions?

Copy of the SWTRs:
Safe Drinking Water Hotline at (800) 426-4791 or
https://www.epa.gov/dwreginfo/water-system-implementation-resources

Technical information on the SWTRs:
ADH-Engineering Section
Source Protection Program (501) 661-2623

Aaron Hilborn  Aaron.Hilborn@arkansas.gov
Vickie Welytok  Victoria.Welytok@arkansas.gov
Chris Roberts  Christopher.Roberts@arkansas.gov
To which of the following sources do the SWTRs **NOT** apply?

A. Rivers
B. Springs
C. Reservoirs
D. Wells
Under the *Surface Water Treatment Rule*, “CT” stand for __________.

A. Concentration X Time  
B. Contact Time  
C. Cryptosporidium Total  
D. Clearwell Turbulence  

A. Concentration X Time
Individual filters must be monitored for turbidity ___________.

A. every 4 hours
B. continually
C. once per day
D. once per shift

B. continually
A filter with an average pore size of 1 micron is designated ____________.

A. 1 micron absolute
B. 1 micron nominal
C. uniformly coefficient
D. 1 micron median

B. 1 micron nominal
If 99.9% of Giardia Lamblia is removed from a water source, that removal is rated as __________.

A. 1 log
B. 2 log
C. 3 log
D. 4 log

C. 3 log
A failure of a system component that poses a threat to health or safety is referred to as a ________________.

A. significant deficiency
B. sanitary hazard
C. MRDL
D. filter profile

A. significant deficiency
The “cloudiness” of water, measured in NTUs is called _____________.

A. alkalinity
B. turgor potential
C. combined filter effluent
D. turbidity

D. turbidity
If a turbidimeter fails, the system must _________________.

A. repair turbidimeter within 24 hours
B. submit Tier 2 Public Notification
C. take grab samples every 4 hours
D. apply for a CPE

C. Take grab samples every 4 hours
The maximum turbidity measurement for combined or individual filter effluent (conventional or direct) is \[ \text{B. 1.0 NTU} \]
NTU stands for _____________.

A. North Thornton University
B. Nonbiodegradable Turgor Units
C. Nostalgic Teletubby Union
D. Nephelometric Turbidity Unit

D. Nephelometric Turbidity Unit