

# SDWA Compliance for Surface Water Systems



NMED Drinking Water Bureau

# Background

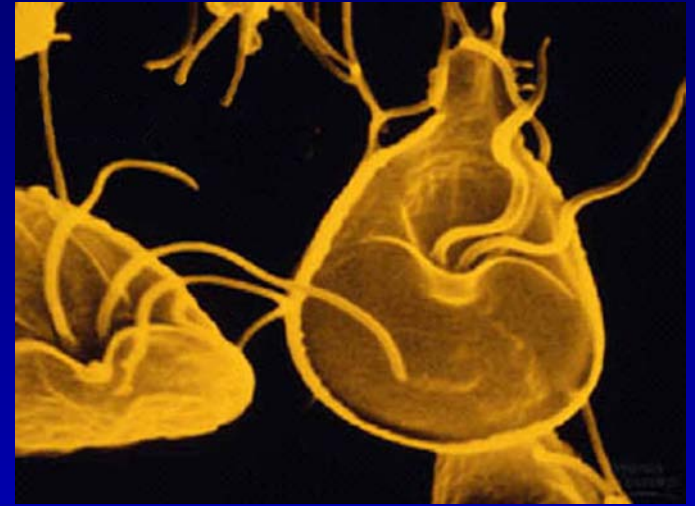
Why regulate surface water systems differently than groundwater systems?



- Surface water has a much higher likelihood of microbiological contamination.
- Surface water has historically caused more disease outbreaks.
- Surface water treatment is much more complex.
- Surface water is more likely to result in Disinfection Byproducts.

# Background

There are three classes of waterborne pathogens. Some of the common waterborne diseases they cause are:

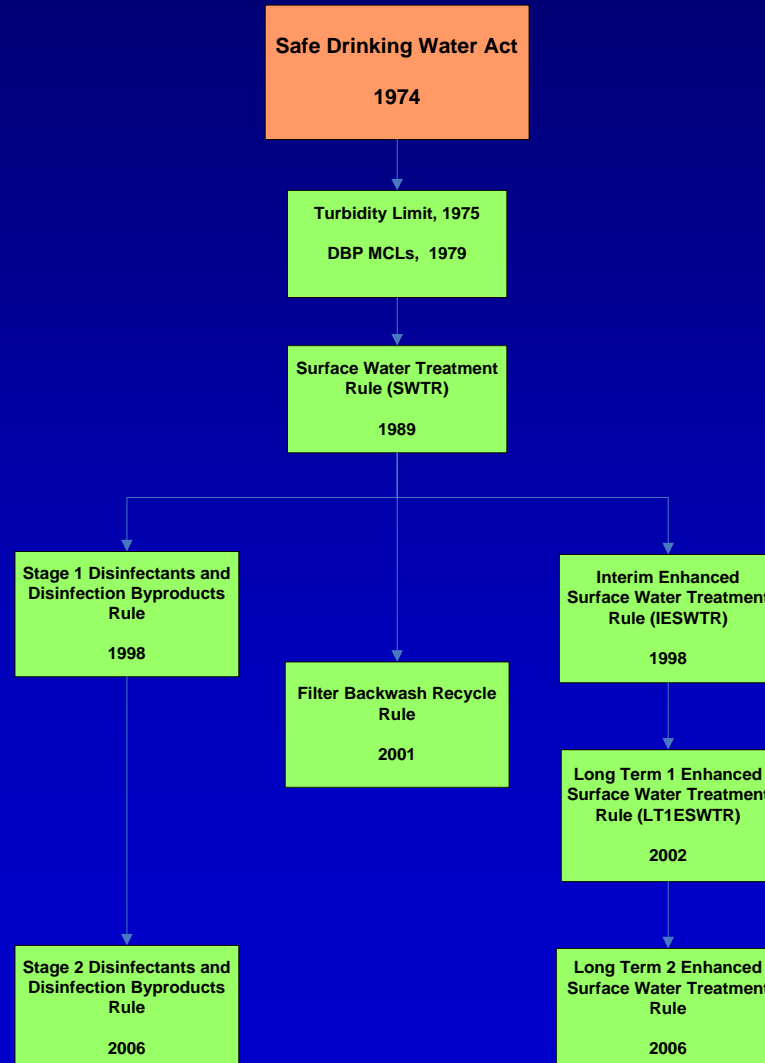


1. Bacteria: Salmonella, Cholera, Typhoid
2. Viruses: Hepatitis A, Meningitis
3. Protozoa: Giardia, Cryptosporidiosis

# Regulation History

- First federal of drinking water regulation date from 1914, when the U.S. Public Health Service (PHS) set standards for bacteriological quality for interstate carriers.
- By 1962 PHS regulated 28 contaminants, including turbidity.
- All 50 states eventually adopted these standards for public water systems.
- The Safe Drinking Water Act (SDWA) was passed in 1974.

# Regulation History



# SDWA Definitions

- Surface water: all water which is open to the atmosphere and subject to surface runoff.
- Conventional Filtration Treatment: A series of processes including coagulation, flocculation, sedimentation and filtration.
- Direct Filtration: A series of processes including coagulation and filtration, but excluding sedimentation.

# Surface Water Treatment Rule

- Published in 1989
- Subpart H, 141.70 – 76 of SDWA regs
- Applies to all PWS with a surface water source or a groundwater source under direct influence of surface water (GWUDI) which are referred to as Subpart H systems.

# Surface Water Treatment Rule

## General requirements:

- Treatment technique
  - At least 99.9 % (3 log) removal and/or inactivation of Giardia
  - At least 99.99% (4 log) removal and/or inactivation of viruses
- Treatment system must be operated by a state-certified operator.

# Surface Water Treatment Rule

## Filtration:

- All Subpart H systems that do not meet the criteria for avoiding filtration must provide filtration treatment.
- Conventional and direct filtration systems must meet a turbidity level  $\leq 0.5$  NTU for filtered water (combined filter effluent) in at least 95% of measurements taken (NOTE: since superseded by 0.3 NTU).
- Filtered water may at no time exceed 5 NTU.
- Turbidity measurements must be made every 4 hours by grab-sampling or continuous monitoring.

# Surface Water Treatment Rule

## Disinfection :

- Disinfection must be sufficient to ensure the treatment technique goals are achieved by the entire treatment process
- Disinfectant residual at entry point cannot be less than .2 mg/l for more than 4 hours
- There must be a detectable residual in distribution in at least 95% of samples collected each month
- Continuous monitoring of residual required at entry point. Systems serving under 3,300 may take grab samples

# Surface Water Treatment Rule

How to meet the treatment technique requirements for Giardia:

- Log inactivation credit earned from disinfection through CT.
- Log removal credits for various removal processes have been recommended by EPA. Engineers reviewing plans for treatment reserve the right adjust the credits based on plan specifics.
- For conventional treatment, log removal for Giardia would probably be 2 - 3 and viruses would be 1 – 3.

# Interim Enhanced SWTR

- Published 1998
- Subpart P, 141.170 – 175
- Applies to all Subpart H systems serving 10,000 or more.
- Strengthen requirements for treatment and monitoring and target treatment of cryptosporidium.

# Interim Enhanced SWTR

## General requirements:

- Treatment Technique
  - 99% (2 log) removal of cryptosporidium.
  - Compliance with profiling and benchmarking requirements.
- New uncovered finished-water reservoirs are not permitted.

# Interim Enhanced SWTR

IESWTR requirements for conventional and direct filtration :

- 95% of all Combined Filter Effluent (CFE) samples must be below .3 NTU.
- At no time may CFE exceed 1 NTU.
- Individual Filter Effluent (IFE) must be monitored continuously.

# Interim Enhanced SWTR

What is required for continuous monitoring?

- Continuous monitoring of turbidity requires recording a measurement at least every 15 minutes.
- Turbidity is recorded only while filters are in production (i.e. not while off-line or during backwash).
- Turbidity data is a tool for understanding your plant! It's strongly recommended that data be recorded in a database instead of using a chart recorder.

# Interim Enhanced SWTR

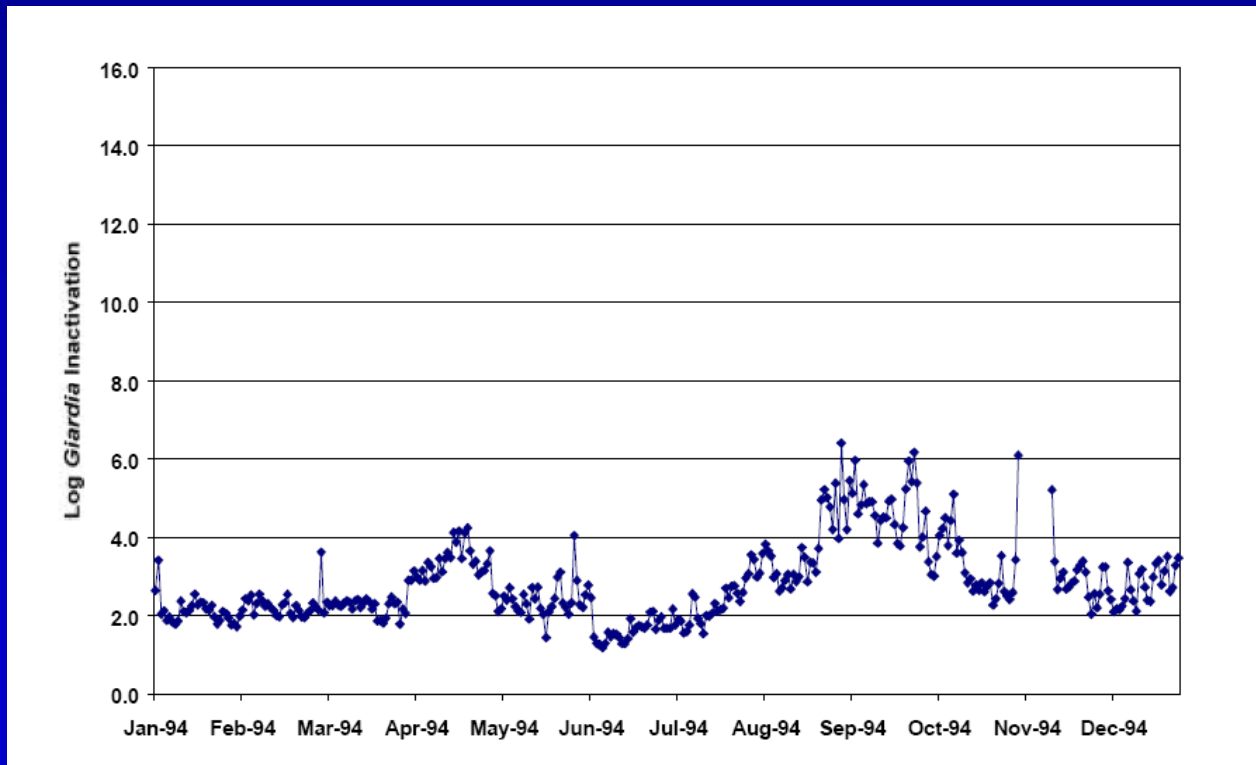
- If any filter has 2 consecutive 15 minute readings  $> 1$  NTU, or if has 2 consecutive 15 minute readings  $> .5$  NTU after 4 hours of being returned to production, this must be reported in MOR and a *filter profile* must be done within 7 days.
- If for any filter there are 2 consecutive 15 minute readings  $> 1$  NTU in each of 3 consecutive months, this must be reported in MOR and that filter must undergo a *filter assessment* within 14 days.
- If for any filter there are 2 consecutive 15 minute readings  $> 2$  NTU in each of 2 consecutive months, this must be reported in MOR and a *Comprehensive Performance Evaluation (CPE)* must be completed within 90 days.

# Interim Enhanced SWTR

- Systems are required to develop a disinfection profile for *Giardia* if their distribution system DBP RAA for either TTHM or HAA5 concentrations in distribution  $\geq 0.064$  mg/L or 0.048 mg/L, respectively.
- Must be based on one year of daily monitoring.

# Interim Enhanced SWTR

- Disinfection profile plots log *Giardia* inactivation over time



# Long Term 1 Enhanced SWTR

- Published 2002
- Subpart T, 141.500 – 571
- Applies to all Subpart H systems serving under 10,000
- Almost identical to IESWTR with a few modifications.

# Long Term 1 Enhanced SWTR

Differences from IESWTR include :

- Systems with 2 filters only have to monitor CFE continuously instead of IFE. If filter assessment is required, must assess both filters.
- No reporting or action requirements based on IFE turbidity after 4 hours continuous service following backwash/online.
- If CPE is required, must be done within 120 days.
- Disinfection profile data collected once per week on the same day.

# Long Term 2 Enhanced SWTR

- Published 2006
- Subpart W, 141.700 – 723
- Applies to all Subpart H systems
- Designed to reduce the risk of cryptosporidium outbreaks through sampling and possibly additional removal/inactivation.
- Cryptosporidium is resistant to chemical disinfectants and so must be treated through removal or UV.

# Long Term 2 Enhanced SWTR

Systems are classified by size:

- Schedule 1 serve  $\geq 100,000$
  - Schedule 2 serve 50,000 – 99,999
  - Schedule 3 serve 10,000 – 49,000
  - Schedule 4 serve  $< 10,000$
- Subpart H systems must conduct 2 rounds of source water monitoring for E Coli or cryptosporidium. First round begins 2006 – 2010. Second round begins 2015 – 2019.

# Long Term 2 Enhanced SWTR

Source water monitoring schedule:

Schedule	Duration	Monitoring Parameters and frequency		
		Cryptosporidium	E. coli	Turbidity
1	2 years	Minimum 1 sample/month	Minimum 1 sample/month	Minimum 1 sample/month
2	2 years	Minimum 1 sample/month	Minimum 1 sample/month	Minimum 1 sample/month
3	2 years	Minimum 1 sample/month	Minimum 1 sample/month	Minimum 1 sample/month
4	1 year	See next row	Every 2 weeks	N/A
Schedule 4 systems exceed the E. coli trigger		2 crypto/month for 1 year Or 1 crypto/month for 2 years	N/A	N/A

# Long Term 2 Enhanced SWTR

- Schedule 4 systems must sample for cryptosporidium if:
  - Source is lake or reservoir and annual mean *E. coli* concentration is greater than 10 *E. coli*/100 ml from initial monitoring
  - Source is a flowing stream and annual mean *E. coli* concentration is greater than 50 *E. coli*/100 ml from initial monitoring
  - System fails to complete initial *E. coli* monitoring

# Long Term 2 Enhanced SWTR

- Systems that complete cryptosporidium monitoring will be in one of the following bins:

Crypto Concentration	Bin	Additional Treatment	
		Conventional Filtration	Direct Filtration
< 0.075 oocysts/L or no crypto sampling required	1	No additional treatment	No additional treatment
.075 oocysts/L ≤ crypto ≤ 1.0 oocysts/L	2	1 log	1.5 log
1.0 oocysts/L ≤ crypto ≤ 3.0 oocysts/L	3	2 log	2.5 log
≥ 3.0 oocysts/L	4	2.5 log	3 log

# Long Term 2 Enhanced SWTR

To meet the additional log reduction, systems can select options from the Microbial Toolbox. This includes:

- Source water protection (.5 log)
- CFE  $\leq 0.15$  NTU in 95% of monthly measurements (.5 log)
- IFE  $\leq 0.15$  NTU in 95% of monthly measurements and never exceeds 0.3 NTU (.5 log)
- UV disinfection (log reduction depends on dose as given in regs or by demonstration of equivalent dose)

# GWUDI Systems

- A source may be designated as Groundwater Under Direct Influence of Surface Water (GWUDI) by the state.
- GWUDI systems are Subpart H systems and subject to the surface water regulations.
- Wells, springs and infiltration galleries are all possible GWUDI sources.

# GWUDI Systems

- A GWUDI determination is based on several factors including:
  - Results of Microscopic Particulate Analysis (MPA) testing and other water quality parameters
  - Proximity to surface water
  - Well construction
  - Flooding potential

# Questions

- A small surface water system has 2 filters and only monitors CFE for turbidity. What is required if they have 3 consecutive months where CFE exceeds 1 NTU?
- A Schedule 2 system with conventional treatment is in Bin 2 after crypto sampling. It had previously met treatment technique requirements. Is it required to add additional treatment?