

Federal Regulations

Design of Small Community Water
Systems

Wyoming Water Quality Division
March Conference

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Safe Drinking Water Act (SDWA)

In Wyoming, EPA implements and enforces the National Primary Drinking Water Regulations (NPDWR) and WDEQ administers the DWSRF, operator certification, construction permits, and capacity development

Why Comply with the SDWA?

- Avoid costly enforcement penalties
- Waterborne diseases are a **REAL** possibility - lower exposure to contaminants – lower health risk
- Customers expect safe drinking water
- Avoid potential **legal liabilities** – Compliance with the regulations may not be enough to protect against a lawsuit; therefore always do better than regulation required to provide the highest possible drinking water quality

Current Drinking Water Regulations

- Total Coliform Rule (TCR)
- Inorganic and Organic Contaminants
- Radionuclides Rule
- Lead and Copper Rule (LCR)
- Disinfectants and Disinfection Byproducts Rule (Stage 1 & 2 D/DBPR)
- Surface Water Treatment Rules (SWTRs)

Current Drinking Water Regulations (con.)

- Ground Water Rule (GWR)
- Consumer Confidence Report (CCR)
- Public Notification (PN)
- Unregulated Contaminants Monitoring Rule (UCMR)
- Aircraft Drinking Water Rule (ADWR)

Who is Regulated?

- **Public Water Supply System (PWS):**
A system for a provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least **15 service connections** or regularly serves an average of at least **25 individuals** daily at least **60 days** out of the year.....

PWS Classification

- **Community Water System (CWS)** – a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
- **Non-community Water System (NC)** – a public water system that is not a Community water system. A NC system is either a “transient non-community water system (TWS)” or a “non-transient non-community water system (NTNCWS)”

Non-community Water System (NC)

- **Transient (TNCWS)** – a non-community water system that does not regularly serve at least 25 of the same person over 6 months per year.
- **Non Transient (NTNCWS)** – a public water system that is not a Community water system and that regularly serves at least 25 of the same persons over 6 months per year.

TCR Monitoring

- Routine monitoring – must sample according to a written Sample Siting Plan
- Repeat monitoring – must sample within 24 hours of being notified of any TC+ result
- Additional routine monitoring - the following month with any TC+ result
- All regulated PWSs must comply

MCL

- MCL is based on presence/absence of total coliforms in samples
- Violations of TCR (3 types)
 - ◇ Monthly MCL
 - ◇ Acute MCL
 - ◇ Monitoring and reporting
- No MCL exemption allowed
- MCL variance allowed only when due to persistent growth of total coliform in the distribution system but may not increase risk to the public health

Monthly MCL Violation

| Number of samples per month | System is in compliance with the MCL , if |
|------------------------------------|--|
| At least 40 | No more than 5 % can be total coliform positive |
| Fewer than 40 | No more than 1 sample/month can be total coliform positive |

Acute MCL (examples)

| | Total Coliform | Fecal Coliform |
|---------|----------------|----------------|
| Routine | + | - |
| Repeat | + | + |
| | | |
| | Total Coliform | Fecal Coliform |
| Routine | + | + |
| Repeat | + | - |

BAT for Microbiological Contaminations

- Appropriate placement and construction of wells
- Maintenance of disinfectant residual throughout the distribution system
- Proper maintenance of distribution system
- Filtration and disinfection of surface water, or disinfection of ground water
- Wellhead protection programs

TCR Rule Manager

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Ground Water Rule (GWR)

- To increase public health protection against fecal contamination, especially viral and bacterial pathogens, in public water supply systems that use ground water sources
- Applies to all systems using ground water except those combining **ALL** their ground water with surface water or with GWUDI prior to treatment under the SWTR

4 Components of GWR

- 1) Sanitary surveys
- 2) Monitoring Options:
 - a) Triggered source water monitoring
OR
 - b) Compliance monitoring
- 3) Corrective actions
- 4) Source water assessments
(optional and EPA R8 is not currently implementing)

Sanitary Survey Evaluations

- Source
- Treatment
- Distribution system
- Finished water source
- Pumps, pump facilities, and control
- Monitoring, reporting, and data verification
- System management and operation
- Operator compliance with State requirement
- ❖ **A way to identify significant deficiencies**

Triggered Source Water Monitoring

- All WY systems conduct this type of monitoring
 - Triggered source water sampling is required if:
 - System has TC+ for any routine TCR result
- AND**
- System calls the GWR Manager and is notified to sample all the GW sources **or** the system chooses not to call the GWR Manager
 - Collect source samples w/in 24-hour of being notified of any TC+ result at **EACH** GW source.
 - This source water sampling is **in addition** to the required repeat TCR sampling in the distribution system

Compliance Monitoring

- A system installs treatment to achieve at least 4-log of inactivation/removal of viruses is required to conduct compliance monitoring to ensure the effectiveness and reliability of that treatment
- Currently no WY systems are conducting this type of monitoring.

Significant Deficiencies

- Any defects in design, operation, or maintenance, or a failure or malfunction of the source, treatment, storage, or distribution system that the State determines to be causing, or have potential for causing, the introduction of contamination into the water delivered to consumers
- Significant deficiencies **MUST** be responded to, and corrected, or the system will receive a violation

4 Corrective Action Alternatives

- 1) Correct all significant deficiencies (within 120 days, or follow the schedule on the State approved plan)
- 2) Provide an alternative source of water
- 3) Eliminate the source of contamination
- 4) Provide treatment that can reliably achieve at least 4-log of inactivation/removal of viruses

GWR Rule Manager

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Inorganic and Organic Contaminants

- Regulated in several rules
 - 8 VOCs in 1987
 - 33 IOCs & SOCs in 1991
 - 23 IOCs & SOCs in 1992
 - Fluoride in 1986
- Standardize, simplify and consolidate monitoring requirements across contaminants group

Nitrate/Nitrite

- All PWSs must comply
- Sampling at every entry point to the distribution system which is representative of each well (GW) or each source (SW) after treatment (SP)

Compliance Monitoring

- CWS & NTNCWS:
GW – initial monitoring annually
SW – initial monitoring quarterly
- TNCWS: annually
- Confirmation sample – within 24 hours
- MCL Nitrate=10 mg/L, Nitrite=1 mg/L
 Total=10 mg/L

Chem/Rad Rule Managers

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Surface Water Treatment Rules (SWTRs)

- Surface waters are more susceptible to microbial contaminations
- Treatment technique (TT) – use multiple barriers (source water protection, filtration, and disinfection)
- Indicator – Turbidity
- Indicator organisms – *Giardia*, Viruses, & *Cryptosporidium*

SWTRs

- Surface Water Treatment Rule
(June/1989 SWTR)
- Interim Enhanced SWTR
(Dec/1998 IESWTR)
- Long Term 1 Enhanced SWTR
(Jan/2002 LT1ESWTR)
- Long Term 2 Enhanced SWTR
(Jan/2006 LT2)

SWTRs Microbial Reductions

All surface water or GWUDI (Subpart H) systems must achieve at least the following microbial reductions by combining filtration (removal) and disinfection (inactivation) treatments:

- Viruses – 99.99% (4 logs)
- *Giardia* – 99.9% (3 logs)
- *Legionella*
- *Cryptosporidium* (IESWTR & LT1) – 99% (2 logs, pending on BIN number, LT2 may require more than 2 logs)

Turbidity limits to meet Cryptosporidium Removal Credit

- Conventional or direct filtration
0.3 NTU ($\geq 95\%$) & 1 NTU (max)
- Slow sand or Diatomaceous earth
1.0 NTU ($\geq 95\%$) & 5 NTU (max)
- Membrane
0.3 NTU ($\geq 95\%$) & 1 NTU (max)
- Bag or Cartridge
1 NTU ($\geq 95\%$) & 5 NTU (max)

Other SWTR Requirements

- Backwash Recycle provision
- Disinfection profiling and benchmarking
- Combined and individual filter effluent monitoring
- E Coli or Cryptosporidium monitoring to determine BIN number for additional Cryptosporidium treatment if necessary (LT2)
- Sanitary survey
- Correct significant deficiencies (or a plan submitted) within 45 days

SWTR Rule Manager

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Disinfectants and Disinfection Byproducts Rules

- **Purpose of Disinfection** - To Kill or to inactivate disease-causing microorganisms that cause serious illness and death (for example: typhoid, hepatitis, and cholera)
- **Disinfection Byproducts** - Disinfectants used to treat drinking water can react with naturally occurring materials in the water (e.g., natural organic matter, bromide, or DBP precursors) to form unintended disinfection by-products (DBPs)

How Are DBPs Formed?

DBP Precursor in Water

Natural Organic Matter (NOM-TOC)

Bromide

+

Added Disinfectant

Chlorine

Chloramines

Chlorine Dioxide

Ozone

=

Disinfection Byproducts (DBP)

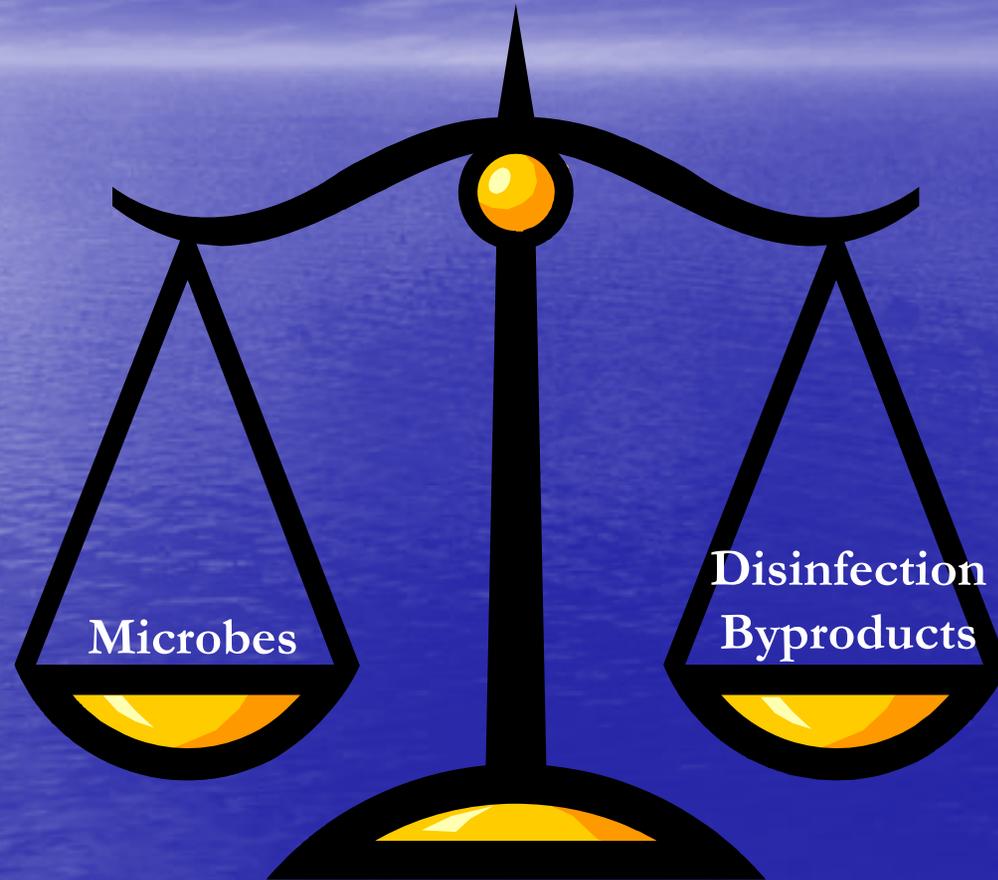
TTHM

HAA5

Chlorite

Bromate

Risk-Risk Trade off A Delicate Balance



Enhanced Coagulation

The addition of sufficient coagulant for improved removal of disinfection byproduct precursors by **conventional** filtration treatment

Stage 1 DBPR Components

- **DBPs (TTHM/HAA5, chlorite, and bromate)**
Monitor TTHM/HAA5 during the month with the warmest water temperature at a location representing the longest residence time in the distribution system
- **Maximum chlorine residual levels (MRDL)**
Monitoring at the same time and same location as the TCR sampling
- **Enhanced Coagulation**
Monitoring TOC (DBP precursors) in the raw and finished water and alkalinity in the raw water to determine adequate TOC is removed in the finished water

Compliance Determination

- TTHM/HAA5, MRDL, and Enhanced coagulation compliances are calculated based on the **running annual average (RAA)**
- TTHM MCL=0.080 mg/L
HAA5 MCL=0.060 mg/L
MRDL \leq 4.0 mg/L
TOC removal ratio \geq 1.0

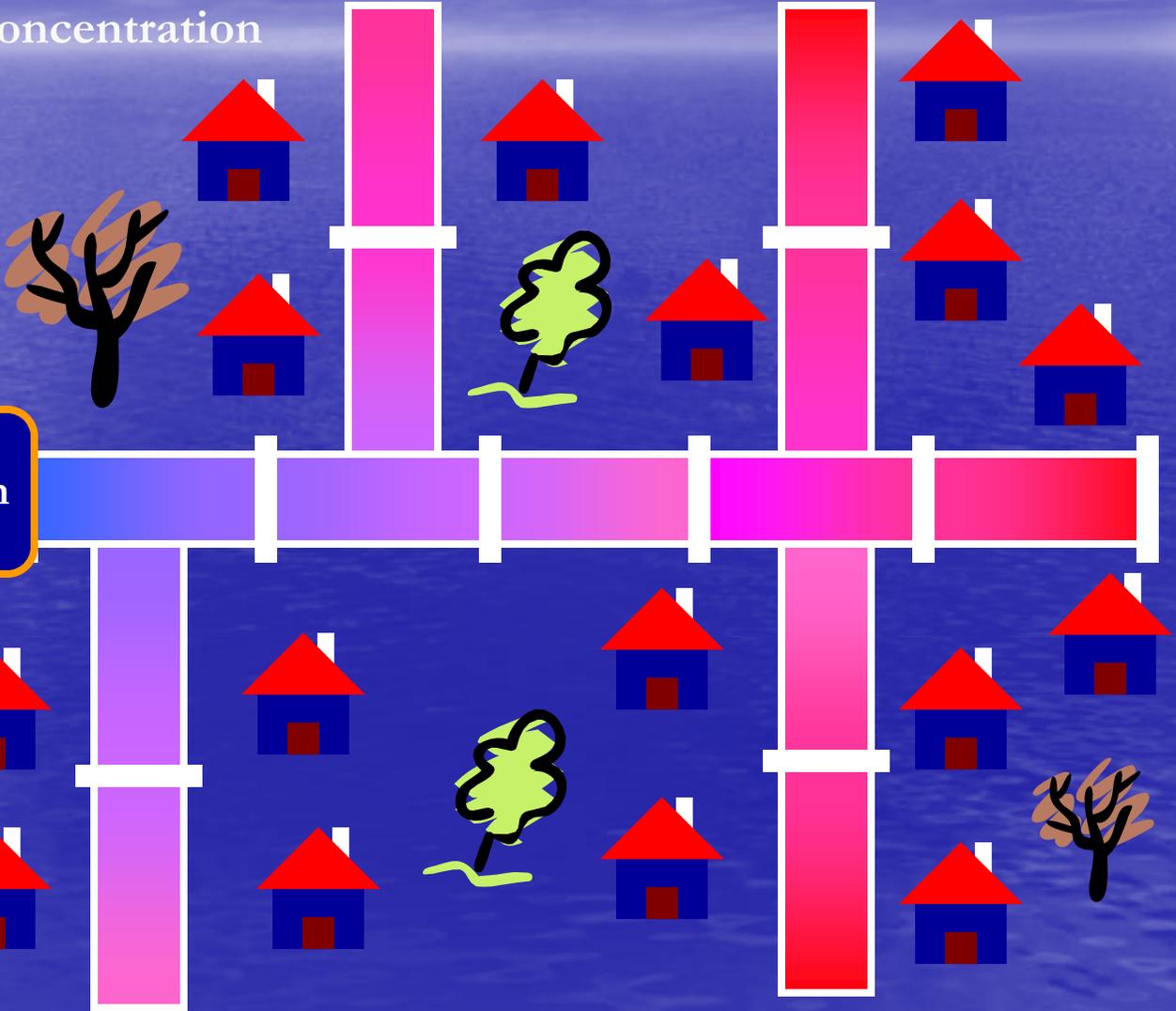


High TTHM concentration



Organics

Disinfection

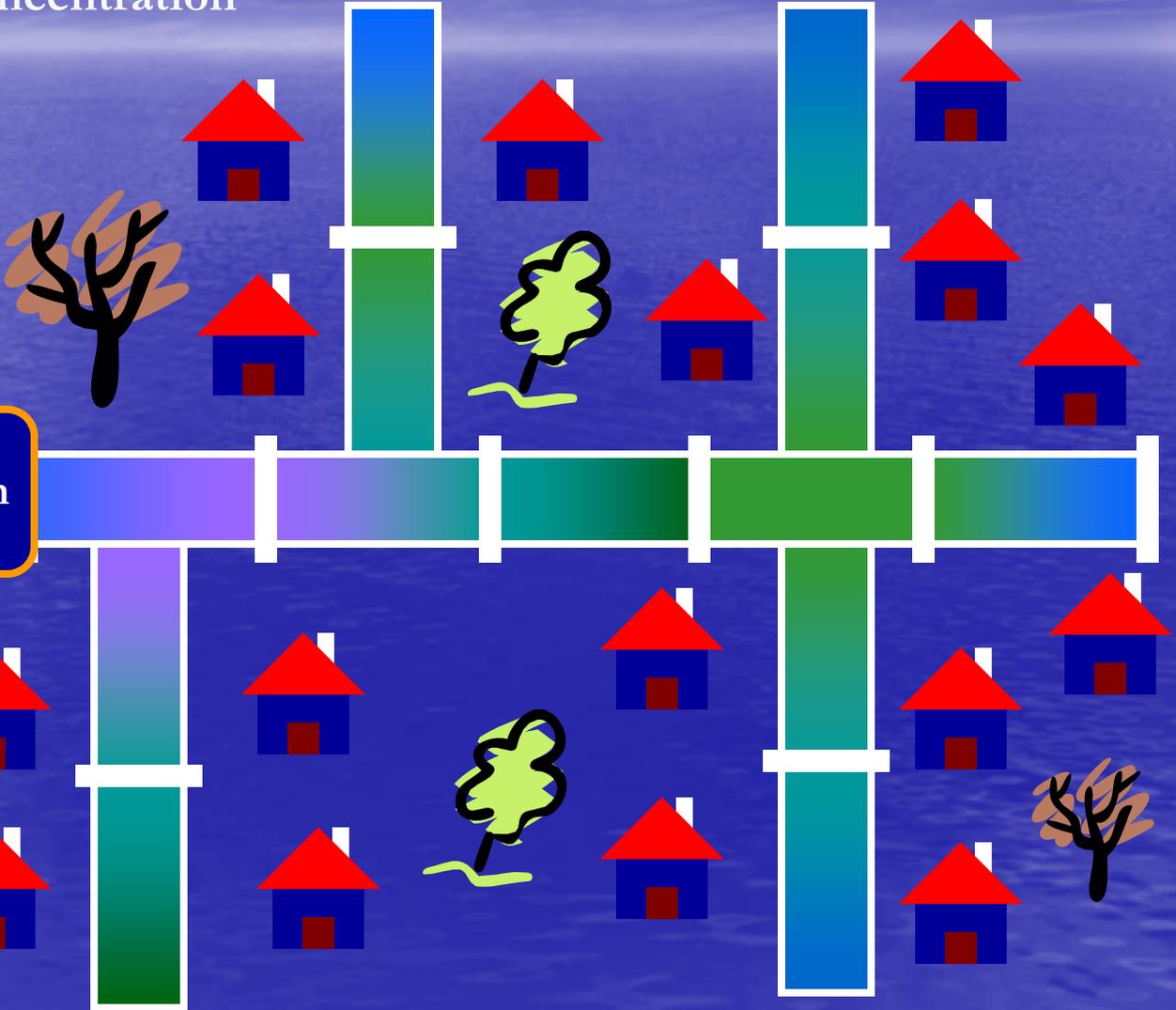




High HAA5 concentration

Organics

Disinfection



Stage 2 DBPR

- First phase of the Stage 2 is to conduct an Initial Distribution System Evaluation (IDSE) to identify the compliance sampling locations for TTHM/HAA5
- Consecutive systems must comply with the Stage 2
- TTHM/HAA5 Compliance is based on the **locational running annual average (LRAA)**

DBPR Rule Manager

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Consumer Confidence Reports (CCRs)

- All Community water systems must mail or directly deliver a CCR to their customers no later than July 1 of each year
- Required by the 1996 SDWA Amendments, centerpiece of public “right-to-know”

CCR Rule Manager

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Public Notification (PN)

- All PWSs must notify customers of violations
- Types of PN:
 - Tier 1 – Acute violations; require PN within 24 hours
 - Tier 2 – Serious violations but do not represent an acute health risk; require PN within 30 days
 - Tier 3 – Less serious than Tier 2; require PN within 1 year

Additional Contact Information

- John Gillis – Wyoming Team Liaison
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- Jim Gindleberger – Sanitary survey
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- Tsegaye Hailu – Drinking Water Watch
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- Jack Rychecky- DW Unit A Chief
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Information Resources

- SDWA Hotline

- 1-800-426-4791
- email: hotline-sdwa@epamail.epa.gov

- Websites

- Office of Ground Water and Drinking Water:
<http://water.epa.gov/drink/>
- Drinking Water Online (R8):
<http://www.epa.gov/region8/waterops/>
- Drinking Water Watch (R8, restricted access):
<http://www.epa.gov/region8/waterops/dww/>

Emerging Issues with the DBPR

- Adequate DBP Precursor removal by chemical pre-treatment to reduce DBP formation
 - Chemical pre-treatment = enhanced coagulation
 - Enhanced coagulation only required for conventional filtration
 - Enhanced coagulation requires higher dosage than to meet turbidity criteria
 - Meeting enhanced coagulation **NOT** equate to adequate DBP Precursors removal

Emerging Issues with the DBPR (con.)

- Aquifer Storage and Recovery (ASR)
 - Store non-hazardous water in underground formations with the intention of future withdrawal and use
 - UIC Program permits injection activities
 - DW Program regulates withdrawal for DW use
 - Interactions between the injected water and the geological formation to release heavy metals (Fe & Mn), and potential high levels of radionuclide and arsenic
 - Continue formation of DBPs when chlorinated water is injected