The Ground Water Rule

Significant Deficiencies

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The Ground Water Rule & Significant Deficiencies

- The Ground Water Rule (GWR) is the first time that federal requirements for sanitary surveys of all groundwater systems are mandated.
- The GWR establishes a required frequency for sanitary surveys of all groundwater systems and the identification of “Significant Deficiencies”.
- EPA recognized that sanitary surveys are an important tool for identifying potential vulnerabilities to fecal contamination at groundwater systems.
- Studies correlated correction of sanitary survey deficiencies to a decrease in total coliform, fecal coliform and E.coli.
- EPA also found that deficiencies identified during a sanitary survey frequently remained uncorrected at the next survey.
Sanitary Surveys & Significant Deficiencies

- One study found that as many as 60% of deficiencies identified during surveys were also identified at the previous survey.
- The GWR requires corrective action when a significant deficiency is identified.
- Title 40 C.F.R. defines a significant deficiency to “include, but are not limited to, defects in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing, or have the potential for causing, the introduction of contamination into the water delivered to consumers.”
- The GWR requires each state to identify at least one significant deficiency for each of the eight elements of a sanitary survey.
The Eight Elements of a Sanitary Survey
Identifying Violations and Significant Deficiencies

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Sanitary Survey – 8 Elements

- Sources
- Treatment
- Distribution system
- Finished water storage
- Pumps, pump facilities, and controls
- Monitoring, reporting, and data verification
- System management and operation
- Operator compliance with state requirements
Sanitary Survey Frequency

- Community PWS: Every 3 years
- NTNC PWS: Every 5 years
- TNC PWS: Every 5 years

"Sanitary survey" means an onsite inspection of the water source, treatment, distribution system, finished water storage, pumping facilities and controls, monitoring and reporting data, system management and operation, and operator compliance with department requirements. Components of the sanitary survey may be completed as part of a staged or phased review process by the Department within the established frequency.
Sanitary surveys will continue to assess the water system components for existing requirements of the Regulations of Connecticut State Agencies.

Significant deficiencies that are identified in any of the 8 sanitary survey elements must be corrected in a designated time period or within the time period designated in an approved corrective action plan.
Sanitary Survey Element #1
Sources of Supply

Types of Ground Water Supplies:
- Bedrock Drilled Wells
- Gravel Packed Wells
- Shallow Dug Wells
- Springs
Regulatory Requirements
Drilled or Gravel Packed Wells
Well Construction

- Well casing projects at least 6 inches above the established grade at the well.
- Well is not subject to surface wash.
- Well is equipped with a watertight well cap and all connections to the well casing are watertight.
- Well is equipped with a shielded and screened air vent when the drawdown is 10 or more feet.
- Well casing is made of steel.
- Well casing has no flaws or defects.
- Well pits are either watertight or suitably drained in compliance with code requirements to ensure dryness of the pit.
- RCSA Section 19-13-B51 (d), (f), (j), (h) and (i)
Regulatory Requirements
Well Pits

- Well pits shall be avoided whenever practical.
- Well pits must be watertight or suitably drained to ensure dryness of the pit.
- Well pits must be accessible (not buried).
- When equipped with a drain, the drain must extend at least 25 feet from the pit and drain to the surface of the ground.
- The well pit drain must slope at least 1/8 inch per foot toward the outlet and be screened.
- The well pit drain must not be connected to any sewer, house drain, or storm drain.
- When a well pit is constructed in impervious soil, no porous material shall be used under the well pit floor.
- RCSA Section 19-13-B51 (h) and (i)
Regulatory Requirements
Dug Well Construction

- The casing must extend at least 6 inches above grade.
- The casing must be constructed of watertight concrete a minimum of 4 inches thick to a depth of at least 10 feet below grade.
- The well must have a reinforced concrete cover a minimum of 4 inches thick and overlaps the sidewalls at least 2 inches.
- The well must have a watertight joint between the cover and sidewalls.
- If equipped with a manhole, it must have a minimum of 2 inches curbing above the concrete slab and a watertight overlapping cover. The manhole cover must be equipped with a lock or be bolted in place.

- RCSA Section 19-13-B51 (f) and (g)
Regulatory Requirements
Spring Construction

- Springs must have the same protection requirements of a dug well.
- Overflows must be screened.
- The spring house must be properly sealed.
  - RCSA Section 19-13-B51 (a), (f) and (g)

Common Problems:
- Contamination most commonly occurs from inability to protect the spring from surface water contamination.
- Spring houses also commonly provide shelter to insects and/or rodents resulting in an increased risk of contamination.
Regulatory Requirements
Well Location

- Wells must meet minimum separation distances to systems for disposal of sewage or other sources of pollution, sewer lines, the high water mark of a surface water body, drains carrying surface water, and/or foundation drains based on the well pump’s withdrawal rate.
  - RCSA Section 19-13-B51 (d)
- Wells are evaluated for potentially being under the direct influence of a surface water body (GWUDI).
Separation distances for a well approved for a withdrawal rate less than 10 gallons per minute:
Separation distances for a well approved for a withdrawal rate between 10 to 50 gallons per minute:
Separation distances for a well approved for a withdrawal rate between greater than 50 gallons per minute:
Figure 1 - EXAMPLE OF WELLS NEEDING EVALUATION UNDER THE SURFACE WATER TREATMENT RULE

 Regulations of Connecticut State Agencies Section 19-13-B102(j)
 (Groundwater Under the Direct Influence of Surface Water)

Well # 1 needs to be evaluated.
It is within 200 ft of a surface water.
See note

Well # 4 does not need to be evaluated.
It is more than 200 ft from a surface water
AND more than 200 ft from a well potentially under the direct influence of a surface water (Well # 3)

Well # 5 does not need to be evaluated.
It is more than 200 ft from a surface water

Well # 2 needs to be evaluated.
It is within 200 ft of a well which is potentially under the direct influence of a surface water (Well # 3).
See note

Well # 3 needs to be evaluated.
It is within 200 ft of a surface water
See note

NOTE:
Demonstration of a “confining layer” above the well screen (see criteria in Table 2) may allow for the reduction of the 200-foot horizontal distance between the well and the surface water body to 50-feet.
What are the regulatory violations?

1. RCSA 19-13-B51j (a) – The well cap is not sealed watertight to the well casing.

2. RCSA 19-13-B51f (a) – The well casing is not free from defects or flaws.
Are there any significant deficiencies?

1. The well casing is improperly constructed, is not free from flaws or defects or exhibits signs of significant deterioration indicating that the sanitary or structural integrity of the casing is impaired.

2. Equipment, piping or appurtenances, including well caps, are not joined watertight to the well casing.
What are the regulatory violations?

1. RCSA 19-13-B51h (i) – Well pit is not watertight or suitably drained

2. RCSA 19-13-B51j (b) – Air vent is not 12 inches above possible high water level.
Are there any significant deficiencies?

1. There is physical evidence that the structure housing the well is or has been flooded.
What are the regulatory violations?

1. RCSA 19-13-B51d (b)(3): The well (withdrawal rate 40 gpm) is not located at least 50 feet to the high water mark of a surface water body.

* GWUDI study or other approved corrective action would be required if well was to remain as a source of supply.
What are the significant deficiencies?

1. There is evidence that surface water located within the protective radius of the well has an elevated risk of introducing microbial pathogens into the well.
What are the regulatory violations?

1. RCSA 19-13-B51f (b) – The casing of the dug well is not 4 inches thick and is not constructed of watertight concrete to a depth of at least 10 feet below the ground surface.

2. RCSA 19-13-B51g – The cover of the dug well is not 4 inches thick and does not overlap the casing by at least 2 inches.

3. RCSA 19-13-B51d (a)(3) – The dug well is not located at least 25 feet from the high water mark of a surface water body.

* GWUDI study or other approved corrective action would be required if well was to remain as a source of supply.
What are the significant deficiencies?

1. There is evidence that surface water located within the protective radius of the well has an elevated risk of introducing microbial pathogens into the well.

2. The well casing is improperly constructed, is not free from flaws or defects or exhibits signs of significant deterioration indicating that the sanitary or structural integrity of the casing is impaired.

3. The cover of a dug well or the joint between the casing and cover are not watertight or are not constructed in a manner that will maintain water tightness.
Sanitary Survey Element #2
Treatment

- Approval of treatment before installation
- Reason for treatment
- Treatment effectiveness
- Contact time
- Duplicate or backup chemical injection pumps
- Chemical solution tanks sealed and sanitary
- Sampling taps before and after treatment processes
- Treatment effluent logs
- Operation and maintenance logs
- ANSI/NSF standard 61 for drinking water chemicals
- Cross connections
FILTRATION

- What type of media is in the filter vessel?
  - GAC
  - Calcite
  - Greensand
  - Birm
  - Multimedia
  - Other

- Number of filters and filter size?

- Does the treatment system backwash?
  - If so, automatically or manually?

- Does an air gap exist between potable water lines and any treatment automatic or manual backwash discharge lines?

- Can filtration be bypassed?
CHEMICAL INJECTION

- What type of chemicals are being injected?
  - Chlorine
  - Sodium Hydroxide
  - Potassium Hydroxide
  - Potassium Carbonate
  - Potassium Permanganate

- Is the feed rate proportional to flow?
- Is there a device in place to disengage the feed pump in a no flow condition?
- Is the condition of the treatment tanks satisfactory?
  - Is secondary containment provided?
- Are replacement chemicals stored in containment?
- Is there an air gap or backflow prevention on the make up water line for the chemical solution tank?
- What testing methods or other approved devices are used for measuring treatment effluent?
What are the regulatory violations?

1. **RCSA 19-13-B38a (b)** – An air gap is required between all potable water lines and equipment or systems which may be subject to contamination.
Are there any significant deficiencies?

1. Yes, the treatment system has a cross connection.
Sanitary Survey Element #3
Distribution System

- Does the PWS have a cross connection control program?
  - Have all categories of concerns been identified?
  - Have all cross connection violations been corrected?
  - Have all backflow prevention devices been tested?
  - Has the cross connection report been submitted to DPH?
- Does the PWS have a sampling site plan with sampling points representative of water delivered to all customers?
- Does the PWS have an annual flushing program?
- Does the PWS maintain a minimum of 25 psi under normal conditions to all service connections?
- Does the PWS have a program to reduce the amount of unaccounted for water (i.e. leak survey, calibration of meters, etc.)?
- RCSA Section 19-13-B102
What is the significant deficiency associated with a public water system’s Distribution System?

1. Positive pressures are not maintained in the distribution system under normal operating conditions.
Sanitary Survey Element #4
Finished Water Storage

Regulatory Requirements

- All finished water tanks must be adequately constructed to protect them from contamination and prevent the entrance of storm water and precipitation.
- Vents and overflows must be provided and suitably protected and screened to prevent entry of insects, birds or other foreign matter.
- Atmospheric storage tanks shall minimally be inspected once every 10 years for sanitary and structural integrity. The inspection report shall be retained for reference and be made available on request.
- Uncovered finished water tanks, basins and clear wells are prohibited.
- RCSA Section 19-13-B102f (5)
Finished Water Storage

**Regulatory Requirements (continued)**

- In-Ground Finished Water Storage Tanks shall be located at least:
  - 50 feet from any part of the nearest subsurface sewage disposal system
  - 25 feet from the nearest watercourse or storm drain or other source of pollution
  - 50 feet from the nearest sanitary sewer unless the sewer is constructed in accordance with the Technical Standards for Subsurface Sewage Disposal in which the tank must be at least 25 feet from the sewer.
- RCSA Section 19-13-B102f (5)
What are the regulatory violations?

1. RCSA 19-13-B102f (5)(a): …Finished water storage tanks, basins and clearwells shall be properly constructed in a sanitary manner to prevent stormwater and precipitation from entering; and vents and overflows shall be provided and suitably protected and screened to prevent entry of insects, birds or other foreign matter.
What are the significant deficiencies?

1. Finished water storage tank vents and overflows are not provided or not suitably protected with a screen, flap valve, or duckbill valve to prevent entry of birds, vermin, or other foreign matter.
Sanitary Survey Element #5
Pumps, Pump Facilities, and Controls

• Duplication of pumps
• Pumps should run lead/lag with alternating starts
• Pumps must supply enough water to meet system demands
  – Combined flow of well pumps to supply Average Daily Demand
  – Transfer pumps sized to supply Peak Hour Demands
• Pumps should be sized to have adequate run times to avoid short cycling of the pump motor
• Pumps should be properly maintained
Are there any regulatory violations?

YES, RCSA Section 19-13-B102 (p):
Sources of supply, treatment, pumping, transmission and storage facilities of sufficient capacity shall be maintained to provide flows in excess of the maximum flows experienced in the community public water system.

54,000 gallons (18 hour pump day)

6,000 gallons per hour

2 wells @ 25 gpm each

25,000 gallon atmospheric tank

2 transfer pumps @ 50 gpm each

ADD: 21,000 gallons

PHD: 7,000 gallons

I’m out of water

I have no pressure

Here we go again...

Yes, there is inadequate pumping capacity to meet system demands.
Sanitary Survey Element #6
Monitoring, Reporting, and Data Verification

• Review of the water quality testing schedule to check for any:
  – Monitoring/reporting violations
  – Outstanding public notification requirements
  – Inventory of water system facilities
  – Inventory of sampling locations
  – Contact updates

• Record keeping requirements
  – Maps
  – Water quality results
  – Public notice documents
  – Water meter readings
  – Treatment effluent logs
  – Customer complaints
  – Records of actions taken to correct violations
### Record Keeping Requirements
**RCSA Section 19-13-B102(l)**

<table>
<thead>
<tr>
<th>Item to maintain on record</th>
<th>Time frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total coliform bacteria test results</td>
<td>Five years</td>
</tr>
<tr>
<td>Chemical test results</td>
<td>Ten years</td>
</tr>
<tr>
<td>Actions taken to correct violations</td>
<td>Three years</td>
</tr>
<tr>
<td>Sanitary survey reports and responses to such</td>
<td>Ten years</td>
</tr>
<tr>
<td>Records concerning a variance granted to the water system</td>
<td>Five years</td>
</tr>
<tr>
<td>Maps and records showing location of mains, hydrants and other facilities (community water systems)</td>
<td>Integrated map to be filed and updated every five years</td>
</tr>
<tr>
<td>Complaint log (community water systems)</td>
<td>Three years following resolution</td>
</tr>
<tr>
<td>Lead and copper records</td>
<td>Twelve years</td>
</tr>
<tr>
<td>Cross-connection control records</td>
<td>Five years</td>
</tr>
<tr>
<td>Consumer confidence reports (community water systems)</td>
<td>Five years</td>
</tr>
<tr>
<td>Filter turbidity measurements (surface water treatment plants)</td>
<td>Three years</td>
</tr>
<tr>
<td>Public notices issued and certification forms</td>
<td>Three years</td>
</tr>
<tr>
<td>Meter readings (community water systems)</td>
<td>Readings taken weekly from each source of supply</td>
</tr>
</tbody>
</table>
## Review of Water Quality Monitoring Schedule

**Water System Facility:** DISTRIBUTION SYSTEM (WSF ID: 00600)

**Sampling Point:** Select from Inventory of Active Sampling Points for WSF ID: 00600

<table>
<thead>
<tr>
<th>Analyte / Analyte Group (Code)</th>
<th>Monitoring Requirement</th>
<th>Monitoring Period</th>
<th>Seasonal Collection Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliform (3100)</td>
<td>1 every quarter</td>
<td>1/1/09 - 3/31/09</td>
<td>PN Due 6/27/2009</td>
<td></td>
</tr>
<tr>
<td>Total Coliform (3100)</td>
<td>1 every quarter</td>
<td>4/1/09 - 6/30/09</td>
<td>PN Due 9/25/2009</td>
<td></td>
</tr>
<tr>
<td>Total Coliform (3100)</td>
<td>1 every quarter</td>
<td>7/1/09 - 9/30/09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Coliform (3100)</td>
<td>1 every quarter</td>
<td>10/1/09 - 12/31/09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Coliform (3100)</td>
<td>1 every quarter</td>
<td>1/1/10 - 3/31/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Parameters (PPS)</td>
<td>1 every quarter</td>
<td>1/1/09 - 3/31/10</td>
<td>PN Due 5/28/2010</td>
<td></td>
</tr>
<tr>
<td>Physical Parameters (PPS)</td>
<td>1 every quarter</td>
<td>4/1/09 - 6/30/09</td>
<td>PN Due 8/26/2010</td>
<td></td>
</tr>
<tr>
<td>Physical Parameters (PPS)</td>
<td>1 every quarter</td>
<td>7/1/09 - 9/30/09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Parameters (PPS)</td>
<td>1 every quarter</td>
<td>10/1/09 - 12/31/09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Parameters (PPS)</td>
<td>1 every quarter</td>
<td>1/1/10 - 3/31/10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Public Notification Requirements

**Maximum Contaminant Level Violations (MCL)**

<table>
<thead>
<tr>
<th>Analyte / Analyte Group (Code)</th>
<th>Monitoring Period</th>
<th>Violation Tier</th>
<th>Public Notification Required Performed</th>
<th>Certification Due</th>
<th>Certification Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliform (3100)</td>
<td>4/1/07 - 8/30/07</td>
<td>2</td>
<td>7/26/2007</td>
<td>8/5/2007</td>
<td></td>
</tr>
<tr>
<td>Total Coliform (3100)</td>
<td>7/1/07 - 7/31/07</td>
<td>2</td>
<td>8/31/2007</td>
<td>9/10/2007</td>
<td></td>
</tr>
<tr>
<td>Total Coliform (3100)</td>
<td>8/1/07 - 8/31/07</td>
<td>2</td>
<td>9/14/2007</td>
<td>9/24/2007</td>
<td></td>
</tr>
</tbody>
</table>

Note: Violation Tier 1: Public Notification required no later than 24 hours after the system learns of the violation.

Violation Tier 2: Public Notification required no later than 30 days after the system learns of the violation.

Violation Tier 3: Public Notification required no later than 365 days after the system learns of the violation.

Public Notification Certification of Compliance is required no later than 10 days after completing the Public Notification Requirements.
Are there any significant deficiencies?

Yes, RCSA Section 19-13-B102 (n): Well B is not metered.
Yes, there is not a sampling tap installed on Well B to allow for the collection of a raw water sample.

Meters shall be provided at all sources of water supply for community water systems so that that amount of water delivered to the distribution system can be measured.
Sanitary Survey Element #7
System Management and Operation

Maintaining system capacity

- Technical
- Managerial
- Financial
System Capacity

Technical

- Having the technical background or experience with operation and maintenance of a water system.
- Having knowledge of system infrastructure and operations:
  - Locations of well sources
  - Well pump withdrawal rates
  - Size of storage tanks
  - Chemicals used in treatment processes
  - Capacity of transfer pumps
  - Calculations of supply versus demand
  - Average Daily and Peak Hour Demand rates
System Capacity

Managerial

- Familiar with the drinking water regulations
- Knowledgeable about the system infrastructure, operation, and maintenance
- Responsive to system needs
- Properly maintaining records
- Having standard operating procedures developed for the water system
- Maintaining certified operators on staff or through contract
System Capacity

Financial

- Adequate funds to maintain compliance
- Having a capital improvement plan
- Having a reserve fund for emergencies and system maintenance
- Having an asset management program
  - Understanding that water system is an asset that depreciates over time
What is the significant deficiency associated with a public water system’s System Management and Operation?

- A significant deficiency will be cited when there are connections between the public water system and unauthorized water sources.

Example:
- An inactive well that is physically connected to the PWS and does not have up to date water quality testing per RCSA Section 19-13-B102.
Sanitary Survey Element #8
Operator Compliance with State Requirements

- Having an operator who is certified at the appropriate plant class level or higher
  - Small Water System
  - Distributions System Operator
  - Treatment Plant Operator
- Having certified operators who are designated by the system as the chief operator
- Submitting an Operator Verification Form to DPH to change or designate certified operator assignments
- Having a designated backup chief operator
Certified Operator Requirements

- **RCSA Section 25-32-9a**: Every Community and Non-Transient Non-Community Public Water System must have an operator who is certified at the plant's class or higher and who shall be designated by the system as the chief operator.

- Chief Operators shall have “Direct Responsible Charge”
- "Direct Responsible Charge" means active, daily responsibility for the operation of a plant, distribution system, or small water system.
Operator Compliance with State Requirements

Community Public Water System Owner

Certified Operator

Regulatory Violation: RCSA Section 25-32-9a

…Every community and non-transient non-community water system shall have at least one operator who is certified at the plant’s class or higher and who shall be designated by the system owner as the chief operator. A significant deficiency will be cited when the PWS fails to have a certified operator in direct responsible charge. I quit!
Thank You

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Focus

• Sampling Logistics

• Corrective Action/Treatment
GWR Preparation/Implementation

• Groundwater Systems (Public Water Systems (PWS) that use wells in whole or part) are now operating under the requirements of the GWR. This presentation will clarify some of the responsibilities that PWSs are now confronted with.
Triggered Source Water Monitoring
Source water monitoring will target and identify ‘at-risk’ systems by requiring them to test their wells for the presence of fecal indicators (normally *E. Coli*; possibly enterococci or coliphage).
Review: Triggered Monitoring

- A groundwater system must sample all active groundwater sources for E.coli within 24 hours following any total coliform-positive routine sample under Total Coliform Rule sampling in the distribution system.
Review: Triggered Monitoring

- If the triggered source water sample is positive for a fecal indicator, the water system must collect 5 additional source water samples within 24 hours unless immediate corrective action is required by the state.
- Water systems must provide appropriate public notice. A Tier 1 Public Notice is required whenever a triggered source water sample is positive for E.coli.
Review: Triggered Monitoring

- States may extend the 24 hour time limit on a case by case basis.
- Triggered monitoring does not apply if the water system provides at least 4-log treatment (99.99% virus inactivation/removal) before the first customer.
Review: Triggered Monitoring

- Source water samples are to be analyzed for E.coli (unless specified otherwise by the DWS) using one of the following methodologies:

<table>
<thead>
<tr>
<th>Fecal indicator</th>
<th>Methodology</th>
<th>Method citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>Colilert(^3)</td>
<td>9223 B.(^2)</td>
</tr>
<tr>
<td></td>
<td>Colisure(^3)</td>
<td>9223 B.(^2)</td>
</tr>
<tr>
<td></td>
<td>Membrane Filter Method with MI Agar</td>
<td>EPA Method 1604.(^4)</td>
</tr>
<tr>
<td></td>
<td>m-ColiBlue24 Test(^5)</td>
<td>9221 F.(^2)</td>
</tr>
<tr>
<td></td>
<td>E*Colite Test(^6)</td>
<td>9222 G.(^2)</td>
</tr>
<tr>
<td></td>
<td>EC-MUG(^7)</td>
<td>9221 F.(^2)</td>
</tr>
<tr>
<td></td>
<td>NA-MUG(^7)</td>
<td>9222 G.(^2)</td>
</tr>
</tbody>
</table>

\(^1\)Methods acceptable for TCR are not acceptable for the GWR.

*A few methodologies acceptable for TCR are not acceptable for the GWR.
Review: Triggered Monitoring

- If it confirmed that a groundwater source is fecally contaminated, the PWS will be required to take corrective action:
  - Alternate source of supply
  - Remove source of pollution
  - Correct deficiency that caused contamination
  - Install treatment
  (more detail to come....)
Triggered Monitoring Preparation

- Water systems and certified laboratories should be working together to ensure compliance with the Rule.
- If you haven’t done so already, establish a plan to conduct source sampling ASAP.....
Triggered Monitoring Preparation

- It is very important that the sample collector has enough knowledge of the system to ensure that the appropriate source samples are collected within the appropriate timeframe. If you have not done so already, groundwater systems and their laboratories and/or sample collectors need to interact immediately, to ensure that this occurs.
Triggered Monitoring Preparation

The following issues should be resolved:

• Does the sample collector know where the groundwater source(s) is/are located?

• Does the sample collector know where the appropriate sampling taps are located for the groundwater source(s) (pumphouse, basement, sample enclosure)? Are the taps accurately labeled?

• Does the sample collector have access to the raw water sampling tap(s) within 24 hours of the TCR positive? (property accessibility, weekends, locked gates, building accessibility (locks, alarms), etc.)
Triggered Monitoring Preparation

• Is the sample collector able to collect a true source sample? This typically cannot be accomplished without a sample tap located directly on the well discharge line and a verification that the well pump is pumping water through the discharge line at the time the sample is collected. The well’s meter should be checked to verify that flow through the pipe on which the sample tap is located is coming only from the well. Ideally, a check valve should be installed immediately downstream of the raw water sample tap to ensure that the sample collected can only be from the source. It is imperative that the required source of supply sample is truly representative of ONLY the appropriate well source.
Triggered Monitoring Preparation/Sampling Taps

• Systems will be required to have the capability of collecting samples from each source individually.
• A sampling tap should be installed for each source of supply. The tap should be located prior to any treatment system or storage tanks. The tap shall be pointed downward and free of any obstructions to allow easy access with an adequate clearance for sampling containers. It should be of the chrome, threadless type or equivalent.
• If there is not already an instantaneous and totalizing flow meter and a check valve on the well discharge line, the sampling tap installation would be a good time to install them.
Source Water Sample Taps

- Example….. A community PWS with two wells. Will they be able to comply with the source water monitoring requirements?
Drinking Water Section

Chrome, threadless sampling tap for each source; adequate clearance

Each well metered.

Wells clearly identified.

Check valve for each individual well discharge line

Not visible - Hand-off-auto switches for each well.

Bottom Line: Sample will be a true source sample.
Common Question:

• “I am an operator or lab collector and I recently added a client. I am now responsible for collecting samples at ‘Shady Acres’ PWS. When I got out there, I had no way of telling if what I was collecting was a source sample. What do I do?”
Answer:

- If it is not very clear to you that the sample you are collecting is a ‘true’ source sample, then it should not be submitted to the Department for compliance with the GWR sampling requirements.
- This is why these issues need to be resolved now, and not after the notification of a TCR positive, which will happen to almost all systems eventually.
Sampling Site Plans

Pressure Zone 1
TC X

Pressure Zone 2
TC Y
TC Z

Well 1
Well 2
Well 3

Drinking Water Section
Representative Monitoring under the Groundwater Rule

Tiziana C. Shea
Sanitary Engineer 2
Information Systems Unit
CT DPH Drinking Water Section
What is Triggered Monitoring?

As of December 1, 2009, “Triggered Source Water Monitoring” is required at all PWS’ with at least one groundwater source (GWS). These systems must test all GWSs for a fecal indicator (E. coli) whenever there is a Total Coliform Rule (TCR) positive sample in distribution.
Triggered Monitoring

Systems with approved 4-log treatment of viruses, that perform the related compliance monitoring are not subject to triggered source water monitoring requirements. 

*GWSs* without approved 4-log treatment of viruses must monitor for fecal indicators if triggered by a TCR-related Total Coliform (TC)-positive routine sample in the distribution system.
Triggered Monitoring

Under the GWR a GWS has to collect, within 24 hours of being notified of a TC positive sample(s), one sample from each GWS in use at the time, for every TC-positive routine sample collected under the TCR ... unless the system has approval from the Department of Public Health – Drinking Water Section (DPH-DWS) to conduct Representative Triggered Source Water Monitoring at a representative GWS or sources.
A Representative Triggered Source Water Monitoring Plan allows PWS with multiple GWS and/or mixed sources to determine which GWS(s) must be sampled for each coordinating TCR sample site location, (i.e., triggered monitoring GWS samples may not be required at every source). PWSs with multiple wells and TCR sample locations could greatly reduce the number of GW samples necessary when TCR positive samples are detected in distribution. *Plans must be reviewed / approved by the DPH beforehand.*
Representative Triggered Source Water Monitoring Plan

- Representative Monitoring Plans coordinate specific TCR sample sites to the appropriate GWS. In order to gain approval from the DPH to conduct triggered source water monitoring at a representative GWS or sources, a PWS with more than one GWS or with mixed sources (GW and SW) may submit a Representative Triggered Source Water Monitoring Plan for review and approval to the DPH.
Representative Triggered Source Water Monitoring Plans identify GWS that are representative of each distribution TCR sample site (TCR sample site plan).

The plan will propose conducting “representative” monitoring only at those wells that accurately represent the affected distribution TCR sampling site.

*All plans must be reviewed and approved by the DPH before being applied by a PWS!
What Should be Included in The Plan?

Triggered source water monitoring plans:

- Map / schematic of the system, including the following:
  - Pressure zone boundaries in the distribution system.
  - TCR routine monitoring sample locations, labeled.
  - Well fields / wells clearly labeled.
  - Interconnections to other systems with status (S, E, P).
  - Reservoirs, storage tanks.
  - Pressure regulation facilities (reducing stations).
  - Other infrastructure that may affect pressure / flow in distribution.
  - Booster pump stations.
  - Critical valves.
What Should be Included in The Plan?

Triggered source water monitoring plans:
- **Source type and treatment provided for each source/point of entry and whether it is seasonal, emergency, ground water, surface water, a wholesale supply, etc.**
- The source(s) serving each TCR compliance monitoring location (see next slide for example); and,
- **Basis** for the determination: system hydraulics, operation, water quality data, etc. (*Hydraulic modeling can be used to determine the flow path from one point to another in distribution and can benefit systems with complex systems and numerous pressure zones.*)
## Example Public Water System - Representative Triggered Source Water Monitoring Spreadsheet

<table>
<thead>
<tr>
<th>TCR Sample Location</th>
<th>Description</th>
<th>North Well Field</th>
<th>South Well Field</th>
<th>Western Well Field</th>
<th>Surface Water Treatment Plant 1</th>
<th>Surface Water Treatment Plant 2</th>
<th>Interconnection – Notify PWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Pharmacy</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>002</td>
<td>High School</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>003</td>
<td>Doughnut Shop</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>004</td>
<td>Auto Shop</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>005</td>
<td>Town Office</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
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<td>x</td>
</tr>
<tr>
<td>006</td>
<td>Shopping Plaza</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>007</td>
<td>555 Main St</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>008</td>
<td>Post Treatment Plant</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>009</td>
<td>Police Dept.</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>010</td>
<td>Main Office</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>011</td>
<td>Post Office</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>012</td>
<td>Rec Center</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>013</td>
<td>Dr.'s Office</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>014</td>
<td>555 Town St</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>015</td>
<td>Gas Station</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>016</td>
<td>Elementary School</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CC** - Generalville Water Supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>CC** - Everytown Water Dept</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

*Provide appropriate justification for each point.

**CC = Consecutive Connection (Interconnection)
Example, cont’d:

Aquafun Water Department - Representative Triggered Source Water Monitoring Spreadsheet

<table>
<thead>
<tr>
<th>TCR Sample Location</th>
<th>Description</th>
<th>North Well Field</th>
<th>West Field</th>
<th>South Well Field</th>
<th>Surface Water Treatment Plant 1</th>
<th>Interconnection - Clean Water Dept</th>
<th>Interconnection - Notify Aquatics PWS (GW Fecal+)</th>
<th>Interconnection - Notify Customers (GW Fecal +)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Doughnut Shop</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>2</td>
<td>Treatment Plant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Town Office</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Pharmacy</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CC* - If Aquatics Water has TCR+</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC* - If Clean Water has GWR Fecal+</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CC* = Consecutive Connection (Interconnection)
* Seasonal (April - September)
Example Discussion:

This example shows a schematic of distribution and a table identifying routine TC sample sites and sources that can supply water to each site. In this example, South Pressure Zone is at the lowest elevation; and, West Pressure Zone is at a lower elevation than North Pressure Zone. Based on hydraulic reasoning, water flows from North Pressure Zone to both the West and South Pressure Zones and water flows from West Pressure Zone to South Pressure Zone.

Interconnections are considered in the plan so that if a TCR positive sample arises the same ‘Representative’ monitoring principals will apply. Interconnections not taken into consideration in a plan will likely result in having to collect samples from every GWS at the appropriate PWS.

(Tracer studies can strengthen the examples determination (i.e., Tracer is introduced at South Pressure Zone and not detected in the West or North Pressure Zones.))
Example Notes:

- Written justification must be provided with the submitted plan.
- Indicating if a GWS is seasonal / emergency, makes the DPH aware that the source needs to be sampled only if it is in use at the time of TCR sample collection. The status of such sources should be verified if / when triggered monitoring is required.
- Note that interconnections have clearly been identified and addressed in the example shown.
- Interconnecting PWS will be required by the GWR to provide proper and timely (24 hours) notification to their wholesaler and/or consecutive system when the coordinating PWS will either need to collect samples at their GWS or notify their customers of a fecal indicator positive GWS sample(s).
Consecutive System Guideline for the Ground Water Rule

CONTENTS

1. Introduction
   1.1 General requirements of the GWR

2. GWR Requirements for Consecutive and Wholesale Ground Water Systems
   2.1 Is triggered source water monitoring always required?
   2.2 What if you believe a fecal indicator-positive source water sample is due to caused rather than source water contamination?
   2.3 What does the GWR require for a consecutive system that has a TC-positive sample collected under TCR in its distribution system?
   2.4 What does the GWR require for wholesale systems that are notified that they have a TC-positive routine sample collected under TCR in the consecutive system?
   2.5 What are the GWR triggered source water monitoring requirements for a wholesale system with its own ground water source?
   2.6 What are the GWR triggered source water monitoring requirements for a wholesale system with more than one connection to a wholesale system (or connections to the same wholesale system)?
   2.7 What are the GWR triggered source water monitoring requirements for a wholesale system with multiple wells?
   2.8 What steps can a wholesale system take to facilitate meeting the requirements for triggered source water monitoring under the GWR?
   2.9 What steps can a consecutive system take to facilitate meeting the GWR notification requirements for TC-positive samples collected under TCR?
   2.10 What if a consecutive system is supplied with ground water by another consecutive system?

3. GWR Consecutive System Examples
   3.1 Example 1
   3.2 Example 2
   3.3 Example 3

4. Example: Triggered Source Water Monitoring Plan

5. Glossary

2.7 What are the GWR triggered source water monitoring requirements for a wholesale system with multiple wells?

Most wholesale ground water systems will have more than one well. The wells may not draw from the same aquifer or certain wells may not serve certain parts of the system or customers. Once the wholesale system is notified of a TC-positive routine sample collected under TCR by one of its consecutive systems it must decide (within 24 hours) where to collect the required source water samples and then collect the sample.

- If you are a wholesale system with more than one ground water source and you cannot identify which wells serve the consecutive system, or identify a well or wells representative of the ground water you supplied, you must sample all your sources.

- A representative well (or wells) should represent all your ground water sources that have the potential to serve the area that had the total-coliform positive sample. Use of a representative well (or wells) requires State approval.

- If a well (or wells) only serves some of the consecutive system(s) or portions of the wholesale distribution system and you provide this information to the State in a triggered source water monitoring plan, you may be able to sample only the source(s) that serves the system, or portions of the system, with a TC-positive routine sample collected under TCR.
Things to consider:

- A source water sample must be collected at each ‘representative’ GWS for each positive distribution TC site.
- Don’t overlook interconnections. Remember communication between wholesaler / consecutive system is VERY important!
- Don’t overlook justification! Proper justification is necessary for the review and approval of your plan!
- Don’t forget to indicate if a GWS or interconnection is Seasonal, Emergency, etc.! (Provide updated status to the DPH when triggered monitoring is required.)
- If a plan is approved and modifications are made at the PWS that would affect the Representative Triggered Source Water Monitoring Plan, an updated plan must be submitted for review/approval.
Helpful Information:

- DWS:  www.ct.gov/dph/publicdrinkingwater
- DWS GWR:  www.ct.gov/dph/publicdrinkingwater, Click on
  (“Modifying a sampling site plan to allow use of representative sampling locations for triggered source water monitoring”)
- US EPA:  www.epa.gov/ogwdw000/disinfection/gwr/compliancehelp.html (“GWR Triggered and Representative Source Water Monitoring Guidance (PDF)”)

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Sanitary Engineer 2
Information Systems Unit, CT DPH DWS
860-509-7333; Tiziana.Shea@ct.gov; www.ct.gov/dph/publicdrinkingwater
Corrective Action

Eric McPhee
Supervising Environmental Analyst
Source Water Protection Unit
DPH-Drinking Water Section (DWS)
Corrective Action

• Once a Significant Deficiency is identified or source is determined to be fecally contaminated (via Assessment Monitoring or Triggered Monitoring), GWS must either:
  → Complete the appropriate corrective action within 120 days; or
  → Be in compliance with a DWS approved corrective action schedule
Corrective Action

- 30 day consultation period between the GWS and DWS subsequent to written notice to discuss appropriate course of action
- Rule requires systems to notify customers of uncorrected significant deficiencies.
Corrective Action

• DWS may prescribe corrective actions and completion dates, including immediate and/or interim corrective actions, in lieu of the consultation process.
Mr. XXXX XXXXXXX
XXXXXXXX
XXXXXXXXX
Plainfield, CT 06354

PUBLIC WATER SYSTEM: XXXX
CLASSIFICATION TYPE: Transient Non-Community
TOWN: Plainfield, CT
PWSID: CT1095XXXX

SUBJECT: SANITARY SURVEY REPORT

Dear Mr. XXXXXXX:

A sanitary survey was performed at Country Farms on January 20, 2010 XXXXXXX. The findings of this survey with associated recommended actions are as follows:

System Description:

Groundwater Rule:

Effective December 1, 2009, public water systems (PWS’s) are required to comply with the provisions of the Groundwater Rule (GWR). The purpose of the GWR is to provide for increased protection against microbial pathogens (contamination) in all public water systems that use groundwater sources.

The GWR employs a targeted risk-based strategy to address risks through an approach that includes significant deficiencies identified during periodic sanitary surveys. A significant deficiency includes, but is not limited to, a defect in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the Connecticut Department of Public Health determines to be causing, or has the potential for causing, the introduction of contamination into the drinking water delivered to consumers. The GWR requires corrective action, within a stipulated timetable, for any system with a significant deficiency.

If there are any significant deficiencies in this sanitary survey report the date of this report will act as the beginning of a 30 day consultation period that provides an opportunity for a PWS to discuss the significant deficiencies and any proposed corrective action with the Connecticut Department of Public Health. The 30 day consultation period will end with the required formal response referenced later in this report. This sanitary survey report shall serve as the official PWS notification of any significant deficiencies under the GWR. Any significant deficiencies must be corrected within the timetable provided below:

Significant Deficiencies:

<table>
<thead>
<tr>
<th>Significant Deficiency</th>
<th>Recommended Corrective Action</th>
<th>Timetable</th>
</tr>
</thead>
</table>

Phone: (860) 509-7333
Telephone Device for the Deaf: (800) 509-7191
410 Capitol Avenue - MS # 511WAT
P.O. Box 340308 Hartford, CT 06114
Affirmative Action / An Equal Opportunity Employer
Groundwater Rule:

Effective December 1, 2009, public water systems (PWS’s) are required to comply with the provisions of the Groundwater Rule (GWR). The purpose of the GWR is to provide for increased protection against microbial pathogens (contamination) in all public water systems that use groundwater sources.

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Significant Deficiencies:

<table>
<thead>
<tr>
<th>Significant Deficiency</th>
<th>Recommended Corrective Action</th>
<th>Timetable</th>
</tr>
</thead>
</table>

Drinking Water Section
Sanitary Survey Report

• The sanitary survey report will clarify the timeframes and responsibilities of the water system if significant deficiencies are identified.

• If there is a significant deficiency, the water system will receive the sanitary survey report within 30 days of identification of the significant deficiency.
Significant Deficiencies

- Guidance Document is being made available via the DWS website.
- The Guidance clarifies what a significant deficiency is and provides a listing and explanation of all significant deficiencies.
What are the Options for Corrective Action?

- Correct all significant deficiencies
- Eliminate the source of contamination,
- Provide an alternate source of water, or
- Provide treatment which reliably achieves 99.99 percent (4-log) inactivation or removal of viruses.
Correct All Significant Deficiencies

Examples:
- Repair/replace well cap, vent
- Repair atmospheric tank vent screen
- Well casing extension
Eliminate The Source Of Contamination

• Examples:
  • Remove failing septic system
  • Redirect drainage or run-off
  • Relocate point source
Provide An Alternate Source Of Water

• Examples:
  • Replace well with one that is RCSA compliant
  • Interconnect with another viable PWS
Provide Treatment That Reliably Achieves $\geq 4$-log Treatment Of Viruses

- Examples:
  - Inactivation
  - Removal
  - State approved combination treatment
Interim Measures

- The Department may specify interim measures for the protection of public health pending approval of the corrective action plan and schedule, or pending completion of the corrective action plan.

- Examples...
Interim Measures

• Requiring the system to provide an alternate, temporary source of water;
• Requiring the system to provide customers with notices to boil all water to be used for consumption;
• Requiring the system to provide temporary disinfection in a manner prescribed by the department;
• Requiring the system to inactivate a water source or sources.
Treatment
Treatment

- GWSs that maintain 4-log inactivation and/or removal of viruses are exempt from the monitoring provisions of the GWR.
- Systems must demonstrate to the DWS that existing or proposed treatment meets this level.
Treatment technologies capable of providing at least a 4-log treatment of viruses include the following:

- Inactivation (Chlorine, ozone)
- Removal (Membrane technologies)
- Combination through alternative treatment technologies
There are several ways to achieve 4-log treatment of viruses:

- Adequate chlorination or ozonation (Cl\(^-\) CT of \(\approx 6\), O\(^3\) CT of \(\approx 1\))
- Combination of treatments that total 4-logs (UV+chlorine, membrane filtration+ UV, UV+UV+UV).
UV?

- New technologies may provide adequate UV dose
- Must have $\geq 4$-log inactivation of adenoviruses
I think my chlorination system will meet 4-log virus inactivation
Groundwater Public Water Systems that Utilize Chlorine, UV, or Ozone Treatment

On December 1, 2009, public water systems (PWSs) using groundwater sources will be required to comply with provisions of the Ground Water Rule (GWR). PWSs that use groundwater sources and use chlorination, ozonation or UV treatment systems may be affected differently by the monitoring provisions of the GWR.

PWSs that can substantiate that treatment of their groundwater sources is maintained to at least 4-log (99.99%) inactivation and/or removal of viruses will be exempt from the monitoring provisions of the GWR. PWSs that use chlorine, ozone or UV treatment that does not provide 4-log inactivation will likely be required to conduct additional monitoring to ensure the treatment is not masking microbial pathogen contamination.

If you believe that the treatment system that is installed for your groundwater source(s) will provide 4-log treatment of viruses please submit written documentation to the Drinking Water Section (DWS). If the DWS concurs you will receive a written acknowledgement exempting your PWS from the monitoring provisions of the GWR, provided the compliance monitoring requirements of the GWR for your treatment system(s) are maintained.

The DWS’s “Technical Guidelines for Determining Disinfection “CT” When Using Chlorination, Chloramines, UV, or Ozone Treatment of Groundwater Sources of Supply” should be utilized as guidance in calculating and documenting the log removal of chlorination treatment system(s). The DWS believes a CT value of 6 is necessary under normal circumstances to achieve 4-log treatment of viruses. If you believe that 4-log treatment can be achieved with a lower CT at your PWS, you may provide evidence supporting that. For ozone systems, a minimum CT of 1.0 is necessary.

If you wish to submit data substantiating that a membrane filtration unit, UV disinfection system, or combination of treatment systems provides at least 4-logs of virus treatment, you must minimally provide the following as evidence:

- Validation of the log treatment indicated for a treatment unit. Acceptable validation methods include, but are not limited to, verification through industry, state or federal studies, including USEPA’s ETV program or an actual in-situ validation conducted by the PWS.
- Verification that the UV dose can be reliably delivered with the site specific conditions of the system (if applicable), including water chemistry, flow rate changes, redundancy, backup power, etc.
- In the absence of DWS issued compliance monitoring requirements, a compliance monitoring plan that assures that the treatment unit(s) are being maintained to 4-log treatment of viruses.

Treatment systems installed in series can be approved provided that the sum total of treatment provides 4-log (e.g. UV+chlorine, membrane filtration+ UV, UV+UV+UV). There are currently no known single standalone UV units that will provide 4-log inactivation of viruses.

If you do not apply for and receive written approval from the DWS that your PWS achieves 4-log treatment prior to December 1, 2009, you will be required to comply with the monitoring provisions of the GWR until such time as DWS approval is granted.

Groundwater systems may wish to upgrade their existing treatment systems to provide 4-log treatment. An application for modifications or upgrades to treatment systems must be approved by the DWS prior to installation in accordance with Section 19-12-B102(d)(2) of the Regulations of Connecticut State Agencies.

If you have any questions, please contact Eric McPhee at eric.mcpee@ct.gov or 860.509.7333.
Treatment

• Step 1: Determine existing/proposed CT from the point of injection to the first customer.

• CT: per Section 19-13-B102(a)(17) of the RCSA “means the product of the residual disinfectant concentration (C) in milligrams per liter (mg/l) determined before or at the first customer, and the corresponding disinfectant contact time (T) in minutes (i.e., “C” X “T”).” CT is typically expressed as mg-min/L (milligrams per minute per liter).

• Guidance is available on DWS website.
Welcome to the CT Calculator

**Intended Audience:** Public drinking water systems that use ground water and want to determine if the chemical disinfection their system uses provides 4-log inactivation of viruses.

**Information Needed to for a Complete Data Point**
1. **Type of Disinfection (Free Chlorine, Chlorine Dioxide, Chloramines, or Ozone)**
2. For each data point being used:
   - Residual Disinfection Concentration
   - Water pH
   - Water Temperature in Celsius
   - Peak Flow in gallons per minute
3. For each data point being used either the:
   - Volume in Gallons.
   - OR
   - Total volume of water storage tank(s) for each GWTF.
   - Length (in feet) and diameter (in inches) for each GWTF that has a cylindrical pipe.

**Macros MUST be enabled in Microsoft Excel for CT Calculator to work**

**Links:**
Treatment

• Step 2: Determine log inactivation based on CT-value
• What is the pH?
• What is the water temperature between the point of injection and the first customer?
# Treatment

## EPA CT Value Table

| Degrees C | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Inactivation (log) |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2         | 5.8 | 5.3 | 4.9 | 4.4 | 4.0 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.8 | 1.6 | 1.4 | 1.2 | 1.0 |
| 3         | 8.7 | 8.0 | 7.3 | 6.7 | 6.0 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 |
| 4         | 11.6| 10.7| 9.8 | 8.9 | 8.0 | 7.6 | 7.2 | 6.8 | 6.4 | 6.0 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 |

CT values provided in the tables are modified by linear interpolation between 5°C increments.
Treatment

- Step 3: Is there adequate inactivation?
- If not: increase chlorine, increase contact time, or consider supplementing with an alternative treatment technology
• For systems that provide 4-log removal treatment, routine compliance monitoring must be performed to ensure that the treatment is effective and public health is protected.
Compliance Monitoring

• Step 4: Chlorine Compliance monitoring
  – >3,000 population – continuous monitoring at a location at least equivalent to 1\textsuperscript{st} customer.
  – <3,000 population – continuous monitoring at a location equivalent to 1\textsuperscript{st} customer or 1 grab sample/day at the time of peak hourly flow.
Compliance Monitoring

- What is “equivalent to 1st customer”?
- What is “peak hour flow”?
- How do I compile and submit the data?

- Contact us for technical assistance
More Information....
Where can I find more info? Start here......

Environmental Protection Agency

Part II

The Ground Water Rule (GWR) Implementation Guidance

Office of Water (4606M)
EPA 816-D-97-001
www.epa.gov/safewater
November 2007
Consecutive systems should consult the following guidance.....
(EPA 815-R-07-020)

Consecutive systems and wholesalers that use GW sources should interact prior to the Rule to ensure that notifications and sampling occur within the required timeframes.
Complying with the Ground Water Rule: Small Entity Compliance Guide

One of the Simple Tools for Effective Performance (STEP) Guide Series

http://www.epa.gov/safewater/disinfection/gwr/compliancehelp.html
Drinking Water Section

Welcome to the Drinking Water Section (DWS) website. The DWS is responsible for the administration of state and federal drinking water regulations and is dedicated to assuring the quality and adequacy of our State’s public drinking water sources. We provide technical assistance, education and regulatory enforcement to over 2,500 public drinking water systems, which provide drinking water to approximately 2.7 million persons on a daily basis. We maintain a continuing commitment to drinking water treatment and monitoring, drinking water source protection, and consumer education in order to assure and maintain the high standard of drinking water Connecticut’s citizens have come to expect and enjoy.

For the latest information on upcoming events, topics of interest and essential updates check our What’s New section frequently.


Public water systems using groundwater sources will be required to comply with the provisions of the Ground Water Rule on December 1, 2009. For updated information on the Ground Water Rule click here.

- Public Water Systems
- Certified Operators
Ground Water Rule

SUMMARY: The Environmental Protection Agency developed the Ground Water Rule (40 CFR Parts 9, 141 and 142) to provide for increased protection against microbial pathogens in public water systems that use ground water sources. This final rule is in accordance with the Safe Drinking Water Act. The final rule became effective on January 8, 2007. The compliance date for public water systems, unless otherwise noted, for rule requirements is December 1, 2009.

The Ground Water Rule establishes a risk-targeted approach for ground water systems that are susceptible to fecal contamination, instead of requiring disinfection for all ground water systems. The occurrence of fecal indicators in a drinking water supply is an indication of the potential presence of microbial pathogens that may pose a threat to public health. This rule requires ground water systems that are at risk of fecal contamination to take corrective action to reduce potential cases of illness and death from exposure to waterborne microbial pathogens.

Groundwater public water supply systems that are currently considering upgrades or improvements to their sources of supply, storage facilities, or treatment systems should pay particular attention to the requirements of the GWR and assess the Rule's potential impact on the design and configuration of any proposed upgrades. Please also note that the GWR requires that all groundwater systems have the capability of sampling the raw water at each of their groundwater sources before any treatment as of December 1, 2009.

- Conducting Source Water Sampling Under the Ground Water Rule (pdf)
- How groundwater systems with Chlorine, UV and/or Ozone Treatment Systems may be Affected by the GWR (pdf)
- Modifying a sampling site plan to allow use of representative sampling locations for triggered source water monitoring (pdf)
- Requirement to have raw water sampling taps for each groundwater source of supply (pdf)
- More information is available on EPA’s website
- Click Here to view a presentation that explains the Ground Water Rule (pdf)

Groundwater Rule Seminar, October 15, 2009

--Correcting Common Sanitary Deficiencies & Understanding the Groundwater Rule

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Additional Information

  Public Water Systems
  Statutes, Regulations and Federal Drinking Water Rules

- [http://www.epa.gov/ogwdw/disinfection/gwr/](http://www.epa.gov/ogwdw/disinfection/gwr/)

- or Contact:
  Eric McPhee
  (860) 509-7333
  eric.mcphee@ct.gov
Watershed Inspections: The Importance of Communication and Cooperation between Utilities and Local Health Departments

Eric McPhee
Supervising Environmental Analyst
Source Water Protection Unit
DPH-Drinking Water Section (DWS)
Focus

• Renewed DWS emphasis on Watershed Surveys:
  – Cooperation and communication with property owners and local health departments
  – Complete submissions to DPH
  – DWS staff site inspections with water systems on some surveys to provide technical assistance
What is a Watershed Survey?

- RCSA Section 19-13-B102(b): Watershed survey. A public water system using surface water as an active source of supply shall make a sanitary survey of the watershed to the intake at least annually. A report on the survey shall be submitted to the Department by March 1 each year covering the preceding calendar year.

- What elements should the survey include? It starts with.....
RCSA Section 19-13-B32
Sanitation of Public Water Supplies

• Applies to land and watercourses tributary to a public water supply including surface and groundwater sources

• Prohibits:
  – accumulation of animal wastes
  – sewage discharges to surface and groundwater
  – disposal of toxic metals, gasoline, oils & pesticides

• Regulates:
  – stormwater drainage facilities, road salt and fertilizer applications
Drinking Water Section

Connecticut General Statutes
www.cga.ct.gov/LCO/Statute_Web_Site_LCO.htm
Sec. 20-341(a-m)......Licensing of Septic System Installers and Pumpers
Sec. 22a-66z ......... Permits for Use of Pesticides in State Waters
Sec. 22a-417 ........... Discharge of Sewage to Water Supply Impoundment
Sec. 22a-329 ........... Erosion & Sediment Control Plan
Sec. 22a-430b .......... General Permit for Construction Activities
Sec. 22a-423.......... Definition of Sewage
Sec. 25-38 .............. Carcass of Animal in Water Supply
Sec. 25-43 .............. Bathing In & Pollution of Reservoirs
Sec. 26-128 ............. Carp & Goldfish
Sec. 25-51 .............. Utility Inspection Authority

Regulations of State Agencies- Connecticut Public Health Code
www.dir.ct.gov/dph/PHC/browse.asp
Sec. 19-13-B1......... Constitution of Public Nuisance
Sec. 19-13-B21........ Manure Storage
Sec. 19-13-B31....... Stagnant Water
Sec. 19-13-B32....... Watershed Sanitation
Sec. 19-13-B102..... Standards for Quality of Public Drinking Water
Sec. 19-13-B102(a-e)... Subsurface Sewage Disposal Criteria
Sec. 19-13-B102(b) . Utility Requirement for Watershed Inspection

Regulations of State Agencies- Connecticut Dept. Environmental Protection
www.ct.gov/dep/cwp/view.asp?a=2704&q=323518
Sec. 22a-449(d) ..... Residential and Nonresidential Underground Storage of Oil & Petroleum Liquids
Sec. 22a-462-3........ Registration & Labeling of Sewage System Additives
Guidance

- CT Section AWWA Source Water Protection Committee
- New revision currently underway

WATERSHED INSPECTION GUIDELINES

Prepared by
Source Water Protection Committee
Connecticut Section AWWA
[date]

These guidelines have been prepared to assist water utilities in developing a comprehensive watershed inspection program. These are only guidelines and are not meant to serve as rigid standards. Individual water utilities should tailor their inspection program to suit their staff availability and watershed characteristics. The protection of public drinking water supplies from potential pollution is a major concern of water utilities throughout the State. Section 19-13-B102(b) of the State Public Health Code (PHC) requires water utilities to perform an annual sanitary survey of their watershed areas and to submit a report to the Department of Public Health (DPH) by March 1 each year covering the preceding calendar year. Section 25-51 of the Connecticut General Statutes (CGS) authorizes utilities to enter and inspect premises located within the watershed area. Watershed inspections are an important component of a comprehensive source protection program, which may also include site plan reviews, monitoring, and cooperative efforts with municipal officials and state agencies.
Watershed Survey Report

• Submission to DPH should include all instances of concern within the watershed(s) that occurred in the past year, as well as the status of corrective action.
• Reports are due annually by March 1 of the following year.
• Electronic submission is acceptable.
• Format suggestions are forthcoming, in the interim, contact us with formatting/content questions
Water Utilities $\leftrightarrow$ LHDs

- Working together is critical to ensure that all concerns are identified and corrected in a timely manner.
- Share information:
  - Where are the watersheds, what addresses are relevant?
  - What activities are of concern?
  - Who should we contact?
  - Information sharing – inspection list, status of correction, survey report
  - Pool resources – staff, enforcement capabilities
Case Study: When the System Works

- Utility staff identified failed septic near reservoir
- Notification to DPH, LHD
- DPH opens investigation per CGS 25-34
- DOH issues orders to correct failing septic system
- Septic System repaired shortly after identification
DPH Technical Assistance

• DWS will accompany water system staff while they conduct a portion of their watershed survey.
• Why? Technical assistance.
  – Dissemination of useful materials
  – Consistency
  – Stress communication with property owners and LHDs
  – Help facilitate and expedite correction of violations (who to contact – DEP, etc.)
  – Will bring previous year’s report, and relay what should be included in current year.
• Goal: All SW PWSs within three years
CLEAN WATER AND YOUR HEALTH

Prepared by
The Source Water Protection Committee
of the Connecticut Section of the
American Water Works Association

EDUCATE!!
DISTRIBUTE!!

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Start a local conversation about drinking water protection.

Local officials want clean and plentiful drinking water for their communities. But because watersheds often cross multiple political boundaries, community leaders may not know what they can or should do to protect their water sources. This guide contains quick tips for concrete steps local officials can take to protect source water.

To highlight local water protection options that are both clear and obtainable, the national Source Water Collaborative has created Your Water. Your Decision.

Create a customized Your Water. Your Decision. guide for your local policymakers.

With our easy online tool, it takes just a few minutes to make a custom guide that can:

- Emphasize local or regional issues
- Provide community and state resources
- Include your organization's brand

Getting Started

Looking for the original PDF guide?
You can download it by clicking here.

"The guide provides accurate data for decision makers and can be customized for the individual system."

Robert Morgan, Manager of Environmental Quality
Branch Water District

Thanks!

Eric McPhee
Supervising Environmental Analyst
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