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Coliform Sampling for Public Water Systems

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Prepared by
Water Supply Division

RG-421
August 2012



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Introduction

This publication discusses how to comply with Title 30 of the Texas Administrative Code (30 TAC), Section 290.109: Microbial Contaminants.

This guide describes monitoring requirements for coliform organisms, but more detailed information is available in the rules. If there appears to be a discrepancy between this guidance and the rules, follow the rules.

In this guide, “you” refers to the operator of a public water system. “We” or “agency” refers to the Texas Commission on Environmental Quality and its Public Drinking Water program.

The TCEQ has links to the Secretary of State’s official version online at <www.tceq.texas.gov/goto/rules>.

What rules apply to public water systems in Texas?

The State of Texas has *primacy* over regulation of public drinking water. This means that the TCEQ writes, adopts, and enforces Texas rules that are at least as stringent as the rules promulgated by the United States Environmental Protection Agency. The Texas rules may be more specific than, or worded differently from, U.S. EPA rules, so public water systems should become familiar with the Texas-specific rules.

PWSs should be aware of the rules pertaining to drinking water as contained in various parts of the Texas regulations. A PWS must comply with the applicable requirements. Each rule explains who is affected by it. Some examples of important rules and their locations:

- **30 TAC 290, Subchapter D.** Rules and regulations of PWSs related to requirements for the design, operation, and maintenance of water sources, treatment plants, and distribution systems.
- **30 TAC 290, Subchapter F.** Requirements regarding harmful or potentially harmful drinking water constituents for PWSs.
- **30 TAC 290, Subchapter H.** The minimum requirements for the Consumer Confidence Report that community water systems must deliver annually to their customers.
- **30 TAC 291.** Rules and regulations for water utilities related to requirements for rates, capacity development, and Certificates of Convenience and Necessity (CCNs).

- **30 TAC 293.** Requirements for districts that are also PWSs.
- **30 TAC 30.** Requirements for licensing of water-works operators.

Who can answer questions?

For questions related to Chapters 290, 291, and 293 call Water Utilities Rates and Districts Section or Public Drinking Water Section at 512-239-4691. For questions related to Chapter 30 call Operator Licensing Section at 512-239-6133.

If you have questions about the Total Coliform Rule, call the TCR coordinator at 512-239-4691.

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To locate copies of our publications or forms online, visit www.tceq.texas.gov/goto/publications.

Our Publications personnel can also help you find what you need. Contact them in one of these ways:

- E-mail your order to puborder@tceq.texas.gov
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When ordering a publication (including rules) or a form, please give its number as well as its title.

Database of record for PWSs

The Safe Drinking Water Information System (SDWIS) is the database that the TCEQ uses to record compliance-sample data and to maintain all inventory information for Texas PWSs. Drinking Water Watch (DWW) is the external component used to view the data contained in SDWIS. Customers can go to dww.tceq.texas.gov/DWW/ and view their PWS's data online. DWW holds information on topics such as ownership, contacts, activity status, water-system

facilities, sample results and violations. To update or correct information in the DWW, e-mail <PWSInven@tceq.texas.gov>.

What is a PWS?

A PWS is a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, which includes all uses described under the definition for drinking water [water for human consumption or cleaning of utensils; for a precise definition, see 30 TAC 290.38(22)]. Such systems must have at least 15 service connections or serve at least 25 individuals at least 60 days out of the year. This term includes; any collection, treatment, storage, and distribution facilities under the control of the operator of such system and used primarily in connection with such a system, and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such a system. There are three different types of PWSs based on the type of customers served.

A community water system has the potential to serve at least 15 residential service connections, or serves at least 25 residents, year round.

A nontransient noncommunity water system regularly serves at least 25 of the same people at least six months out of the year.

A transient noncommunity system serves at least 25 persons at least 60 days out of the year but does not meet the definition of a nontransient noncommunity water system.

Which systems does the Total Coliform Rule apply to?

Every PWS is required to monitor for the presence of coliform bacteria. The specific monitoring requirements for your system are based on the number of customers you serve.

What is the purpose of the Total Coliform Rule?

The TCR requires monitoring for the presence of microbes, specifically for coliform bacteria, to determine whether the water in the distribution system of a PWS is contaminated with bacteria from fecal matter. Ingestion of these pathogens can cause gastroenteritis, hepatitis, myocarditis, paralysis, acute hemorrhagic conjunctivitis, and meningitis. Sensitive populations—children,

the elderly, the malnourished, pregnant women, chronically ill patients and those with compromised immune systems—have a greater risk of waterborne disease than the general population.

How can pathogens enter my water?

Contamination of drinking water can occur either before or after treatment. Treated water may become contaminated through improperly maintained water facilities or other problems in the distribution system. If cross-connection controls fail or if leaking pipes result in negative pressure, the infiltration of contaminants may occur. Pathogens can enter a drinking water well along the casing or through cracks in the sanitary seal if it is not properly constructed, protected or maintained. Groundwater contamination can come from septic systems, leaking sewer pipes, landfills, sewage lagoons, abandoned wells, and storm water runoff.

How can I protect my water system from contamination?

- Properly maintain all water facilities.
- Obtain a sanitary easement for each well.
- Control or eliminate fecal sources that are in close proximity to the well.
- Install backflow preventers.
- Maintain a minimum pressure of 35 psi at all points within the distribution system.
- Maintain a minimum disinfection residual of 0.2 mg/L free chlorine or 0.5 mg/L chloramines.

What are coliform organisms?

Coliform organisms are bacteria commonly found in humans, animals, and the environment. Their presence in drinking water indicates that conditions in the water system can support the existence of disease-causing pathogens. Coliform bacteria may not cause illness, but they indicate that conditions are suitable for the existence of other microbes that can cause illness. Pathogenic contamination is the greatest health risk to consumers who obtain their water from a PWS. In Texas, every PWS is required to disinfect the water to kill (inactivate) pathogens.

The different kinds of coliform organisms that are tested for include total coliform, fecal coliform, and *Escherichia coli*. If a sample tests positive for total coliform, it is then tested for fecal coliform or *E. coli* (or both). Both can cause illness.

What is the meaning of a total coliform–positive result?

It means coliform organisms were detected in your water. Although a single total coliform–positive sample does not always result in a violation of TCEQ rules, it is always a cause for corrective action on the part of the PWS. The degree of concern regarding the sample results depends on the type of coliform that is detected.

Although a total coliform–positive result may be due to contamination outside the water system, fecal and *E. coli* results are evidence of recent contamination of the water by animal or human feces. The detection of fecal coliform or *E. coli* in a single sample does not indicate that an outbreak of waterborne disease is imminent, but it should prompt the PWS to examine the source of contamination. A coliform-positive result is the early-warning system that alerts you to take action to keep your customers safe.

To determine whether you have a coliform-positive result, review the Microbial Monitoring Form (Appendix A) that your laboratory provides you. Sample results are typically reported as “Positive / Coliform found” or “Negative / Coliform not found.”

When coliform bacteria are present in any of your samples, the laboratory is required to contact the TCEQ. You should contact the TCEQ to ensure you are performing the correct corrective actions and taking any additional required samples.

What is the meaning of a total coliform–negative result?

If your sample result is negative, it indicates that no coliform organisms were detected in your water. A properly maintained and disinfected water system should produce negative sample results.

What is the Ground Water Rule and how does it relate to the TCR?

The GWR (a federal regulation implemented at the state level in various portions of 30 TAC 290) is meant to reduce the risk of illness from groundwater

by identifying and targeting systems susceptible to fecal contamination and ensuring that corrective action for source water fecal contamination or other significant deficiencies is identified. By requiring high-risk groundwater systems to monitor groundwater and correct significant deficiencies, the GWR provides for increased protection against viral and bacterial pathogens, and will protect more than 40 million Texans.

The GWR builds on the TCR by addressing the health risk associated with consuming water from a fecally contaminated source. The GWR requires follow-up monitoring of groundwater sources and corrective action when a significant deficiency has been identified or a fecal indicator has been found in the source sample. These requirements address the health risk associated with consuming water from a fecally contaminated source. A groundwater system must conduct triggered source-water monitoring when the system is notified of a total coliform-positive routine distribution sample. This monitoring allows the system to distinguish whether the positive sample was due to well contamination or a distribution-system problem.

What are the different types of TCR and GWR compliance samples?

TCR Compliance Samples

Distribution: Routine distribution coliform samples collected each month for the TCR. The number of samples required is based on population.

Repeat: Samples collected in response to any positive compliance-sample result.

Increased Monitoring: Samples that are required the month following a routine distribution total coliform-positive sample.

GWR Compliance Samples

Raw: samples collected prior to disinfection.

Triggered Source Monitoring: Raw samples collected from groundwater sources in response to a routine distribution total coliform-positive sample that was collected for TCR compliance.

Assessment Source Monitoring: Raw samples collected from groundwater sources in response to a corrective action, hydrogeological sensitivity assessment, or as a condition of a rule exception.

Non-Compliance Samples (Non-Regulatory)

Special: Special-purpose samples used as a diagnostic tool for water systems to determine water quality that do not count toward TCR or GWR compliance.

Construction: Samples collected in response to construction events in the distribution system that do not count toward TCR or GWR compliance.

How do I determine the number of routine distribution coliform samples that must be collected each month?

Routine distribution coliform samples are those that a PWS is required to collect each month. The number of samples collected depends on the size of the population the system serves. Table 1 shows the required minimum number of routine distribution coliform samples per month. Samples must be collected every month; to ensure data quality, samples will only be credited to your system in the month in which they are collected. For example, samples collected on May 1 will **not** be credited for your April requirement.

When do I have to collect my routine distribution coliform samples?

Routine distribution coliform samples can be collected any day during the month as long as they meet the intervals stated above. Samples must be collected during normal operating periods. The TCEQ strongly encourages PWSs not to wait until the last day of the month to collect samples. Collecting samples towards the beginning of the month will give a system time to collect repeat or replacement samples in the same month.

How do I determine the number of sites for routine distribution coliform samples?

Every PWS is required to prepare a site monitoring plan that contains both a list of sites for routine distribution coliform samples and a diagram showing their locations in the distribution system. For more information on this subject, see

Table 1. Required number of monthly routine distribution coliform samples and collection frequency.

Population Served	Minimum Number of Routine Distribution Coliform Samples per Month	Schedule
1 to 1,000	1	Sample once during the month
1,001 to 2,500	2	Sample may be collected on one day at two different sites or twice a month at regular intervals.
2,501 to 3,300	3	
3,301 to 4,100	4	
4,101 to 4,900	5	
4,901 to 5,800	6	
5,801 to 6,700	7	Sample twice a month at regular intervals.
5,701 to 7,600	8	
7,601 to 8,500	9	
8,501 to 12,900	10	
12,901 to 17,200	15	Sample three times a month at regular intervals.
17,201 to 21,500	20	Sample four times a month at regular intervals.
21,501 to 25,000	25	
25,001 to 33,000	30	Samples collected must be evenly distributed throughout the month.
33,001 to 41,000	40	
41,001 to 50,000	50	
50,001 to 59,000	60	
59,001 to 70,000	70	
70,001 to 83,000	80	
83,001 to 96,000	90	
96,001 to 130,000	100	
130,001 to 220,000	120	
220,001 to 320,000	150	
320,001 to 450,000	180	
450,001 to 600,000	210	
600,001 to 780,000	240	
780,001 to 970,000	270	
970,001 to 1,230,000	300	
1,230,001 to 1,520,000	330	
1,520,001 to 1,850,000	360	
1,850,001 to 2,270,000	390	
2,270,001 to 3,020,000	420	
3,020,001 to 3,960,000	450	
3,960,001 or more	480	

How to Develop a Monitoring Plan for a Public Water System, TCEQ publication RG-384. The selected sites must be representative of the entire distribution system. If a sample site changes, you must revise the monitoring plan to indicate

the new location. Table 2 presents the minimum number of sample sites required, based on total population. You may select more than the minimum number of sites.

Table 2. Number of routine distribution coliform samples and sample sites.

Population Served	Minimum Number of Routine Distribution Coliform Samples	Number of Routine Sample Sites
1 to 1,000 1,001 to 2,500 2,501 to 3,300 3,301 to 4,100 4,101 to 4,900	1 per month 2 per month 3 per month 4 per month 5 per month	At least 5.
4,901 to 5,800 5,801 to 6,700 6,701 to 7,600 7,601 to 8,500 8,501 to 12,900 12,901 to 17,200 17,201 to 21,500 21,501 to 25,000 25,001 to 33,000	6 per month 7 per month 8 per month 9 per month 10 per month 15 per month 20 per month 25 per month 30 per month	Same number of sample sites as samples. <i>Example:</i> a system that collects 9 samples must have 9 sample sites.
33,001 to 41,000 41,001 to 50,000	40 per month 50 per month	At least 30.
50,001 to 59,000 59,001 to 70,000 70,001 to 83,000 83,001 to 96,000	60 per month 70 per month 80 per month 90 per month	Half the number of sample sites as samples. <i>Example:</i> a system that collects 240 samples must have at least 120 sample sites.
96,001 to 130,000 130,001 to 220,000 220,001 to 320,000 320,001 to 450,000	100 per month 120 per month 150 per month 180 per month	
450,001 to 600,000 600,001 to 780,000 780,001 to 970,000 970,001 to 1,230,000	210 per month 240 per month 270 per month 300 per month	
1,230,001 to 1,520,000 1,520,001 to 1,850,000 1,850,001 to 2,270,000 2,270,001 to 3,020,000	330 per month 360 per month 390 per month 420 per month	
3,020,001 to 3,960,000 3,960,001 or more	450 per month 480 per month	

How do I determine the sites for routine and repeat distribution coliform samples?

There are many factors to consider when selecting distribution coliform sample sites. Failure to select an appropriate site may result in coliform-positive results that are not indicative of the water quality. Samples can be collected at a dwelling or business, but they need to be collected at a site that is accessible at all times. The sample must be collected at an active connection or adjacent to an active connection, not at a storage tank or treatment location. The PWS must make sure that routine distribution coliform sample sites are representative of water quality throughout the distribution system, and these sites must be listed in the system's monitoring plan. The TCEQ recommends that the system rotate through its distribution coliform sample sites.

The best option is to use a hose bib-type faucet located outdoors. Do not use a faucet located in a restroom, kitchen, or area where food (particularly raw meat) is prepared. Do not collect samples from a drinking fountain. Some water systems have reported problems sampling at vacuum breakers; therefore, we recommend avoiding those.

Bottled-water plants must sample after treatment and prior to the bottling plant. A sample cannot be taken from water that has already been bottled. Select a faucet with the following features:

- It does not leak;
- has an outlet at least 18 inches above the ground or floor;
- is constructed of materials that will allow it to be heated with a torch, or can be cleaned with a strong chlorine solution;
- has a downward-pointing outlet;
- is not located in or near tall grass or shrubs; and
- does not have any attachment such as a water hose.

Who is allowed to collect compliance samples?

TCEQ operator-licensing rules stipulate that only a licensed drinking-water operator may collect compliance samples for community (C) and non-transient non-community (NTNC) systems. A staff member employed by a transient non-community (TNC) system may collect compliance samples without a license. There are four classes of certified operators: A, B, C, and D. You must have at least a class D operator license to collect coliform samples at a C or NTNC public

water system. If you hire an operating company to collect samples for you, the operating company must employ licensed operators even if the system is a TNC.

To become licensed as a drinking-water operator, you must receive TCEQ training and obtain experience working at a PWS. For additional information, call the TCEQ's Operator Licensing Section, 512-239-6133.

The TCEQ website maintains a list of licensed drinking water operators in your county or area. To view this list, go to <www.tceq.texas.gov/goto/find-water-op>.

What do I need to know when I am ready to collect my sample?

Compliance samples must be submitted to a laboratory accredited or certified by the TCEQ. Samples that are analyzed at uncertified and unaccredited laboratories cannot be used for compliance requirements.

The PWS should not use its own containers but, rather, the bottle supplied by a laboratory. Each bottle has been sterilized and will contain a powder, pill, or liquid. This additive is meant to remove any disinfectant so that the laboratory can accurately analyze the sample. Do not accept or use bottles that are open, appear damaged, or have been improperly stored.

For questions concerning certified/accredited laboratories, call 512-239-6343 or visit <www.tceq.texas.gov/goto/pdw-labcert>. A list of laboratories can be found at <www.tceq.texas.gov/goto/labcred>.

If you have specific questions regarding your sample analysis, billing account, bottle storage or hold times contact the laboratory. The TCEQ does not retain copies of the Microbial Monitoring Form.

What are the proper procedures for collecting compliance samples?

It is important that you collect samples correctly; otherwise, they may be contaminated, and the results used to determine the condition of your water system can be inaccurate.

You must measure and record the disinfectant residual each time you collect a coliform sample. A disinfectant residual should always be present before you take a sample. If you determine that there is no disinfectant residual, we suggest that you collect a sample and give it a special marking to determine the water

quality. Lack of disinfectant residual indicates a problem that you should identify and repair immediately. You may need to determine if your chlorinator is working properly, or flush the transmission mains. You should repair any problems before collecting additional samples. Routine distribution coliform samples will still be required. If you cannot get a disinfectant residual, communicate with the TCEQ so that the situation can be resolved.

A coliform positive may be due to contamination in the distribution system or introduced during sampling. Repeated and triggered source-monitoring sampling will determine if there is contamination in the distribution system.

1. Wash your hands before you collect the samples. Poor hygiene is a common reason samples become contaminated. You may also use sterile gloves when taking the samples.
2. Let the water run out of the faucet for several minutes. This is called "flushing." Flush until the water is cold and you are able to obtain a measurement for disinfectant residual.
3. Measure the disinfectant residual. Record the result of this measurement in the space provided on the Microbial Monitoring Form.
4. Disinfect the faucet outlet by flaming with a torch for several seconds to ensure the destruction of any bacteria. You may instead wash the faucet with a strong chlorine-bleach solution, but the flame method is better because bleach takes more time to kill bacteria. If using bleach, keep it in contact with the outlet for several minutes.
5. Collect the sample. Using a pencil-sized stream of water (approximately $\frac{1}{4}$ inch diameter), fill the bottle to the 100 milliliter line. The discharge from the faucet should be a smooth stream, not a spray. Direct the stream downward to the inside of the bottle to make sure it does not splash.

Precautions to take when collecting compliance samples

If samples are collected by PWS personnel, prepare an SOP for collecting samples and have your operators review and understand the process. If you hire an operating company, make sure it has an SOP that is consistent with the practices described herein.

A proper technique will ensure that you collect samples that accurately describe the water quality of your system. Proper procedures include the following actions:

- Only use bottles that you have obtained from an accredited or certified laboratory. Have a few extra bottles on hand in case of improper sampling. Do not accept or use bottles that appear damaged or open.

- Store unused bottles in a cool, dry area and do not subject the bottles to high heat, damp conditions, direct sunlight, or contact with contaminants. Refer to your laboratory about bottle expiration times.
- Do not collect samples on windy or rainy days. Coliform bacteria are present in soil, so dust or wind-blown debris can contaminate your sample. Rainwater dripping from a roof may also contaminate the sample.
- The laboratory cannot accept samples that they deem are too old or unsuitable for analysis. Check with your lab for maximum sample hold times. You must replace each rejected sample with a suitable sample within 24 hours.
- Keep the samples cool during transport to the laboratory by storing them on reusable cooler packs. If you must store a sample on ice, you may place it in a plastic bag and ensure that the top of the bottle is not submerged in the melting water. The water can infiltrate the bottle and contaminate the sample. Warm temperatures allow bacteria to multiply. If you are going to hold the sample before delivery to the laboratory, refrigerate it.
- Do not touch the bottle or cap, blow into the inside of the bottle or cap, place the cap on the ground or hold the bottle upside down. Treat the bottle with care because it is sterile. Improper handling can contaminate the bottle and cause coliform-positive results.
- Do not rinse the bottle before collecting the sample. The pill, powder, or liquid inside is there for a purpose and does not affect the result.
- Fill the sample bottle to the shoulder only. There must be 100 mL of water in the bottle. Do not over- or under-fill the bottle.
- Do not store or transport compliance samples with other non-potable water samples, especially wastewater samples.

How do I properly fill out the TCEQ Microbial Monitoring Form?

If you fill out the form incorrectly or do not complete it, you will *not* receive credit for your results, and the TCEQ will consider it as if you had failed to collect a sample. If we receive incomplete, inaccurate, or mislabeled forms we cannot credit a sample to your system. The laboratory and the TCEQ cannot correct or fill out a Microbial Monitoring Form (Appendix A) for a customer.

The form is available online at <www.tceq.texas.gov/goto/forms>. Enter the form number, 10525, to download it. You must use this form—otherwise your samples will be rejected and your system will receive a notice of violation. Check with your laboratory to make sure that it is reporting in a manner specified by the TCEQ. The person collecting the sample should fill out all applicable information listed below and sign the

form. A supervisor or manager should not sign the form unless he or she is the person collecting the sample. There is also information to be filled out by the laboratory; the sample collector should leave these areas blank. Make sure that all writing on the form is legible. If it is not legible or you make a mistake, begin with a new form or use a single line to cross out the information, initial and date the mistake, and rewrite it.

After analysis the laboratory sends one copy of the completed form to the person named on it and one to the TCEQ. It is the responsibility of each PWS to retain these records for five years and supply copies to the TCEQ on request.

Sample Identification

PWS ID: The PWS ID is a seven-digit number assigned to each public water system in Texas by the TCEQ. The first three digits indicate the county where the system is located and the last four are assigned sequentially. The PWS ID cannot change locations and should always be used for the same source or sources in a specific location.

PWS Name: This is the name of your public water system. Generally the PWS name is the type of business and does not necessarily reflect the water system owner. You have to use the same name that the TCEQ uses. The PWS name can be changed but only upon request by the customer the TCEQ has on file.

Send Sample Results To: Write the address where you want the results sent. Do not enter TCEQ, the laboratory automatically sends us a copy regardless of the results. Make sure this is legible so that you receive a copy of the results.

Phone #, Sampler Name, Sampler Contact #: Write the name of the person collecting the sample and a phone number where he or she can be contacted if the laboratory has questions.

Owner/PWS, Operator, Other: Check the person or system sending in the sample. If samples are collected by a direct employee of the water system, check "Owner/PWS." If an operating company or contractor collects the samples, check "Operator." "Other" is for samples that are not collected at a PWS.

Sample Site; Collection Date and Time

System Type: To receive credit from the laboratory for your samples "Public" must be indicated as the system type.

Water Source: Indicate if the source is groundwater, surface water or groundwater with surface water influence.

Sample Identification/Location: Write the physical address or other site specific description of where the sample was collected. Your monitoring plan may contain a numbered list of sample sites, do not write the site number. Example: 239 Pine St or Kitchen faucet. For raw groundwater source samples only enter the TCEQ well source ID. This is a seven-digit number preceded by a G and followed by a letter. Example: G2270001A.

Collected: Write the date and time of day that the sample was collected.

Sample Type: **Do not mark more than one sample type.** Indicate the type as follows:

Distribution: Routine distribution coliform samples.

Repeat: Collected in response to any positive compliance sample result. You must include the laboratory ID of the original coliform-positive sample that the repeats are for.

Construction: Indicates the sample was collected following construction events in the distribution system

Raw: Samples collected before disinfection. If the raw sample is being collected for TSM in response to a routine distribution total coliform-positive sample, then you must include the TCEQ well-source ID and the laboratory sample ID of the original coliform-positive sample that it is being collected for. If the raw sample is being collected for assessment source monitoring, then only the well-source ID is needed.

Special: Special-purpose samples are used as a diagnostic tool for water systems to determine water quality and do not count toward TCR or GWR compliance. These may be collected in response to a customer complaint or during construction or repair of a water line.

Disinfectant Residual: All public water systems must monitor the residual disinfectant concentration each time a bacteriological sample is collected. If chlorine is used, measure the free chlorine residual. If chlorine and ammonia (chloramines) are used, measure the total chlorine residual. If you are taking a raw sample, there should be no disinfectant residual. In this case enter "0"—do not leave this field blank.

Laboratory Report (will be filled out by the laboratory)

Lab ID Received By, Tested By, Reported By: These are completed by the laboratory.

Test Method: The laboratory will indicate which approved analytical method was used, such as Colilert or Colisure.

Total Coliform, E. coli: This is where the laboratory will indicate whether coliform bacteria were found in your water sample. Checking “Found” means bacteria were present in the water sample. Upon receiving a routine distribution fecal coliform– or *E. coli*–positive result, we **strongly** encourage you to contact us at 512-239-4691 to ensure that you are taking the proper steps.

Unsuitable for Analysis: If a compliance sample is marked “Unsuitable for Analysis,” you must collect a replacement sample within 24 hours at the same location. The laboratory may not be able to analyze a sample for reasons such its being too old, insufficient quantity, an incomplete form, inaccuracy, illegibility, heavy silt, bacteria or turbidity, leakage in transit, or the presence of a chlorine residual.

When do I have to collect repeat and increased monitoring samples?

If a routine distribution coliform sample is total coliform–positive, you must collect repeat samples for each total coliform–positive sample within 24 hours of notification of the result by the laboratory. Repeat samples must all be collected on the same day. The number of repeat samples required depends on the number of routine distribution coliform samples the water system is required to collect. The system will also be required to collect increased samples the month following the total coliform–positive result. See Table 3 for the required number of samples. If a repeat sample is total coliform–positive the system must collect an additional set of repeat samples.

A system with a single service connection should collect repeat distribution coliform samples at intervals of 15 minutes or more on one day or collect daily repeat samples until it has collected the required number.

When a PWS receives a routine distribution fecal coliform– or *E. coli*–positive result, we **strongly** encourage the PWS to contact us at 512-239-4691 to ensure that it is taking the proper steps.

Table 3. Required number of repeat distribution coliform samples.

Number of required routine distribution coliform samples	Number of required repeat samples	Location of repeat samples	Required number of increased samples for the month following repeat samples
1	4	<ul style="list-style-type: none"> • Repeat 1: at original positive location • Repeat 2: upstream of positive within 5 connections • Repeat 3: downstream of positive within 5 connections • Repeat 4: upstream or downstream of positive within 5 connections 	5 distribution samples total
2–4	3	<ul style="list-style-type: none"> • Repeat 1: at original positive location • Repeat 2: upstream of positive within 5 connections • Repeat 3: downstream of positive within 5 connections 	
5 or more	3	<ul style="list-style-type: none"> • Repeat 1: at original positive location • Repeat 2: upstream of positive within 5 connections • Repeat 3: downstream of positive within 5 connections 	No increased sampling required

What documents or data are needed to invalidate a compliance sample?

The TCEQ will only invalidate a routine distribution total coliform–positive sample if:

1. the laboratory supplies written notice that improper sample analysis occurred or that the sample was unsuitable for analysis,
2. the result is due to a circumstance or condition which does not reflect the water quality, or
3. the result is due to a domestic or other non-distribution-system plumbing problem.

Sample invalidation due to domestic or non-distribution-system plumbing problems will only be invalidated after a repeat sample collected at the original tap is total coliform–negative and all repeat distribution coliform samples collected within five service connections of the original tap are total coliform–negative. If the TCEQ invalidates a sample, the system must collect another from the same location within 24 hours of notification.

The PWS must submit the following documents to the TCEQ for review in order for routine distribution total coliform–positive samples to be considered for invalidation. This does not guarantee the samples will be invalidated.

- The TCEQ’s invalidation checklist (Appendix B).
- Copies of the results of the required repeat samples.
- A brief explanation of why the sample is not representative of water quality.
- The protocol for sample collection.
- If applicable, weather data.

The TCEQ will only invalidate a fecal coliform–positive or *E. coli* –positive raw groundwater-source sample if (1) the laboratory indicates that improper sample analysis occurred or (2) the system submits substantial evidence that the well is not serving the distribution.

Routine distribution coliform samples that are fecal coliform–positive or *E. coli*–positive cannot be invalidated.

If any type of sample is invalidated, the system must collect a replacement sample from the same location within 24 hours of notification. We recommend that you call us as soon as you receive a sample result that you believe should be invalidated.

How do I know if I am in compliance with the TCR?

There are several ways in which a public water system can fail to comply with the TCR. A list of each type of violation is included below. Results of all distribution coliform samples that have not been invalidated must be included in determining compliance with the maximum contaminant level (MCL) for total coliform content. Invalidated samples will not be included in determining compliance with the MCL for the TCR.

You can always visit our DWW database at <dww.tceq.texas.gov/DWW/> to view violations and sample activity.

Special-purpose samples, such as those collected to determine whether disinfection levels are sufficient following pipe placement, replacement, or repair, are not used to determine compliance with the MCL for the TCR. A PWS that receives an MCL or a monitoring violation must post public notice in accordance with 30 TAC 290.122.

Acute MCL Violation

- When there is a combination of a total coliform–positive result and a fecal coliform–positive or *E. coli*-positive result in a routine or repeat sampling set.
 - A routine distribution total coliform–positive sample is followed by a repeat distribution coliform sample that is fecal coliform– or *E. coli*-positive; or
 - A fecal coliform– or *E. coli*-positive routine distribution sample is followed by a total coliform–positive repeat distribution sample.

If you have committed an acute MCL violation you must notify your customers by posting a public notice in accordance with 30 TAC 290.122.

Nonacute MCL Violation

- A system that collects at least 40 routine distribution coliform samples in a month and more than 5.0 percent of the samples collected are total coliform–positive but none of the initial or repeat samples are fecal coliform–or *E. coli*-positive; or
- a system that collects fewer than 40 routine distribution coliform samples in a month and, of which more than one is total coliform-positive, but none of the initial or repeat samples are fecal coliform– or *E. coli*-positive; or

If you have committed a nonacute MCL violation you must notify your customers by posting a public notice in accordance with 30 TAC 290.122.

Routine Monitoring Violation

A public water system fails to supply the required number of suitable distribution coliform samples.

If you fail to collect the required number of routine distribution coliform samples, you must notify your customers by posting a public notice in accordance with 30 TAC 290.122.

Reporting Violation

- A public water system fails to submit to the TCEQ a copy of the results of any test, measurement, or analysis required by 30 TAC 290.109.

If you fail to submit the required results, you must notify your customers by posting a public notice in accordance with 30 TAC 290.122.

Repeat Monitoring Violation

- A public water system fails to collect the required number of repeat distribution coliform samples.

If you fail to collect the required number of repeat samples, you must notify your customers by posting a public notice in accordance with 30 TAC 290.122.

Increased Monitoring Violation

- A public water system that fails to collect the required number of increased distribution coliform samples.

If you fail to collect the required number of increased samples, you must notify your customers by posting a public notice in accordance with 30 TAC 290.122.

Triggered Source Monitoring Violation

- A public water system that uses groundwater and fails to collect the required number of raw groundwater source samples.

If you fail to collect the required number of raw groundwater source samples, you must notify your customers by posting a public notice in accordance with 30 TAC 290.122.

Public Notice Reporting Violation

- A public water system fails to issue a required public notice or certify that notification has been performed.

If you fail to issue the required notice or certify that notification has been performed, you must notify your customer by posting a public notice in accordance with 30 TAC 290.122.

When do I need to issue a public notice or Boil Water notice?

The form and posting of a public notice (PN) varies, depending on the severity of the health threat involved. Depending on the length of the violation, an additional notice may be required, and if so it must be issued in the same manner as the initial notice. Once the violation has been corrected, the water system must issue a public notice. A Boil Water notice (BWN) is required in situations that pose an acute threat to public health and must be issued to customers within 24 hours of the circumstance and remain posted until the situation that is creating a public health risk is repaired and sampling shows that coliform bacteria are not present. If a PN or BWN is provided by posting, the posting must remain in place for as long as the violation exists or seven days, whichever is longer.

The required language and directions for posting PNs and certificates of delivery can be found at <www.tceq.texas.gov/goto/dw-pn>. A certificate of delivery must be filled out for each type of PN that is posted. If a system is required to post a single type of PN for several consecutive months, then one PN and one certificate of delivery may be used for the entire period. Anytime a PN is issued, the PWS must send both a copy of the PN and the certificate of delivery by fax to 512-239-3666 or by mail to:

Drinking Water Quality Team, MC 155
TCEQ
PO Box 13087
Austin TX 78711-3087

Circumstances Requiring a Boil Water Notice

A Boil Water notice is required in (but not limited to) any of the following circumstances:

- An acute MCL violation.
- Flooding or contamination of a well.
- Water outages.
- Pressure in the distribution system falls below 20 pounds per square inch and the lines cannot be adequately flushed or disinfected according to standards of the American Water Works Association. See 30 TAC 290.47(h) for a more comprehensive flowchart to determine if a BWN is required.
- The turbidity of finished water produced by a surface water treatment plant exceeds 5.0 NTU.

- Failure to maintain adequate chlorine residuals.
- New or substantially reworked wells. If it is necessary to place a new well into service before obtaining coliform-negative results on three consecutive sampling days, a PWS may issue a BWN to stay in effect until such negative results are obtained for three days in a row.
- Any other circumstance, at the discretion of the executive director.

Boil Water Notice

The most urgent form of public notice is the Boil Water notice, which must be issued within 24 hours of the occurrence of a circumstance that has the potential to compromise the integrity of the water and public health is at risk. You cannot rescind a BWN until the situation that is creating a public health risk is repaired and sampling shows that coliform bacteria are not present.

Possible methods of distributing a BWN vary based on the kind of system.

Community Water System (perform one of the following):

- Supply a copy of the Boil Water notice to the radio and television stations serving the area surrounding the public water system.
- Publish it in a local newspaper.
- Deliver it directly to each customer.
- Post it in conspicuous places within the affected area.

Non Community Water System (perform one of the following):

- Deliver the Boil Water notice directly to customers.
- Post it in public places within the area served by the system.

A bilingual notification may be appropriate based upon local demographics. Once the boil water notification is no longer in effect, customers must be issued a Boil Water Rescind notice in a manner similar to the original BWN.

A copy of the initial BWN, the Boil Water Rescind Notice, a signed Certificate of Delivery and special coliform sampling results must be provided to the TCEQ within 10 days of delivery to customers.

Public notice for an acute MCL violation

When a system commits an acute MCL violation, it must issue both a BWN and an initial acute PN as soon as possible, but no later than 24 hours after the violation is identified. Copies of all notifications and certificates of delivery required under this subsection must be submitted to the TCEQ within 10 days of its distribution.

The owner or operator of a *community* water system must furnish a copy of the notice to the radio and television stations in the area the system serves. He or she must also publish a notice in a general-circulation daily newspaper in the area the system serves. If the area is not served by such a newspaper, the system must instead issue notice by direct delivery or by continuous posting in conspicuous places within the area.

The owner or operator of a *noncommunity* water system must issue the notice by direct delivery or by continuously posting it in conspicuous places within the area the system serves.

If a notice is provided by posting, it must remain in place for as long as the violation persists or seven days, whichever is longer.

The owner or operator of a water system required to issue an initial notice for an acute MCL violation must also issue additional notices:

For either a community or noncommunity system, if the owner or operator issued the initial notice by mail or direct delivery, notice by mail or direct delivery must be repeated at least every three months for as long as the violation persists.

The owner or operator of a community system, within 45 days of the violation, must notify customers by mail or hand delivery. The TCEQ's executive director may waive this requirement in writing if the agency determines that the violation has been corrected within the 45-day period.

The owner or operator of a noncommunity water system issued the initial notice by continuous posting, posting must continue for as long as the violation exists and in no case less than seven days.

When the public water system has corrected the acute violation, it must issue a notice in the same manner as the original notice.

Public notice for a non-acute MCL violation

When a system commits a non-acute MCL violation, it must issue an initial PN as soon as possible but no later than 30 days after the violation is identified. The PWS must send the TCEQ copies of all required notices and certificates of delivery within 10 days of their distribution.

The owner or operator of a community water system must issue the notice by mail or direct delivery and any other method reasonably calculated to reach other customers if they would not normally be reached by direct delivery. Such persons may include those who do not pay water bills or do not have service-connection addresses (e.g., house renters, apartment dwellers, university students, nursing home patients, prison inmates, etc.).

The owner or operator of a noncommunity water system must issue the notice by mail or direct delivery, or by continuously posting the notice in conspicuous places within the area served by the system. If direct delivery or public posting may not reach all persons regularly served by the system, at least one additional method of delivery must be used. A posted notice must remain in place for as long as the violation persists or seven days, whichever is longer.

Additional methods may include:

- publication in a local newspaper or newsletter
- delivery of multiple copies for distribution by customers that provide drinking water to others (e.g., apartment building owners or large private employers)
- continuous posting in conspicuous public places
- post PN on the public water system website
- delivery to central locations
- e-mail to notify students or employees

The owner or operator of a water system required to issue an initial violation notice must also issue additional notices:

For either a community or noncommunity system, if the owner or operator issued the initial notice by mail or direct delivery, notice by mail or direct delivery must be repeated at least every three months for as long as the violation persists.

If the owner or operator of a noncommunity water system issued the initial notice by continuous posting, posting must continue for as long as the violation persists and in no case less than seven days.

When the public water system has corrected the violation, it must issue a notice in the same manner as the original notice.

Public notice for a routine, repeat, triggered source, or increased monitoring violation

When a system commits a monitoring violation, it must issue an initial PN within three months of the violation. Copies of all notifications and certificates of delivery required under this subsection must be submitted to the TCEQ within 10 days of their distribution.

The owner or operator of a community or noncommunity water system must issue the notice by mail or direct delivery to each customer receiving a bill and to other service connections to which water is delivered by the system. In addition, the system must use any other method reasonably calculated to reach other customers if they would not normally be reached by the direct delivery. Such persons may include those who do not pay water bills or do not have service connection addresses (e.g., house renters, apartment dwellers, university students, nursing home patients, prison inmates, etc.).

A posted notice must remain in place for as long as the violation persists or seven days, whichever is longer.

Additional methods may include:

- publication in a local newspaper or newsletter
- delivery of multiple copies for distribution by customers that supply drinking water to others (e.g., apartment-building owners or large private employers)
- continuous posting in conspicuous public places
- posting on the PWS's website
- delivery to central locations
- e-mail to students or employees

The owner or operator of a water system required to issue an initial violation notice must also issue additional notices:

- For a *community* system, at least once every 12 months by mail or hand delivery for as long as the violation persists or any variance or exemption remains in effect. Repeat public notice may be included as part of the Consumer Confidence Report.
- For a *noncommunity* system whose owner or operator issued the initial notice by continuous posting, posting must continue for as long as the violation exists and for at least seven days. Notice by direct delivery must be repeated at least every 12 months for as long as the violation persists.

When the public water system has corrected the violation, it must issue a notice in the same manner as the original notice.

Public notice for a fecal indicator–positive groundwater source sample

When a system receives a source water sample that is positive for *E. coli* or another fecal indicator, this situation is not considered a violation. The system must issue an initial acute PN as soon as possible, but no later than 24 hours after the violation is identified. The system must submit copies of all required notices and certificates of delivery to the TCEQ within 10 days of their distribution.

In this situation corrective action is mandatory and the TCEQ may, at its discretion, require issuance of a Boil Water notice. The owner or operator of a community water system must furnish a copy of the notice to the radio and television stations—and publish the notice in a general-circulation daily newspaper—in the area the system serves. If the area is not served by such a newspaper, the owner or operator must instead issue notice by direct delivery or by continuous posting in conspicuous places within the area.

The owner or operator of a noncommunity water system must issue the notice by direct delivery or by continuously posting it in conspicuous places within the area the system serves.

A posted notice must remain in place for as long as the violation persists or seven days, whichever is longer.

The owner or operator of a water system required to issue an initial notice for this situation must also issue additional notices:

- For either a community or noncommunity system, if the owner or operator issued the initial notice by mail or direct delivery, notice by mail or direct delivery must be repeated at least every three months for as long as the situation persists.
- The owner or operator of a community system, within 45 days of the onset of the situation, must notify customers by mail or hand delivery. The TCEQ's executive director may waive this requirement in writing if the agency determines that the situation has been corrected within the 45-day period.
- The owner or operator of a noncommunity water system issued the initial notice by continuous posting, posting must continue for as long as the situation exists and in no case less than seven days.

When the system has corrected the situation, it must issue a notice in the same manner as the original notice.

Other samples

When should I submit my water samples as “Construction,” “Special,” or “Raw Well”?

Some coliform samples are collected when the system is operating under nonstandard conditions (such as construction or operational testing). These samples may be marked as “Construction” or “Special” on the Microbial Monitoring Form. These sample types are not used for a system’s compliance requirement. Some systems monitor their raw water and collect samples from the source before the water has entered the treatment plant or distribution system. As a result, raw water samples will not have a disinfectant residual.

Construction Samples

A PWS performing construction on its distribution system lines risks contamination. For this reason the PWS is required to collect “Construction” samples after the lines have been closed and disinfected.

All newly installed lines and repaired mains must be disinfected and samples collected for microbiological analysis to check the effectiveness of disinfection. Lines may be placed into service only after sample results are coliform-negative.

A minimum of one sample for each 1,000 feet of completed, repaired or installed waterline will be required. If a coliform-positive result is reported, the process must be repeated until the sample results are coliform-negative. Construction samples are not used for compliance purposes.

Special Samples

Special samples are collected by a water system for its own purposes. For example, if the PWS collects a sample in response to a customer complaint or is attempting to diagnose a specific problem, the Microbial Monitoring Form should be marked “Special.” “Special” samples are not used for compliance.

Raw Groundwater Source Samples

Raw groundwater source samples are collected directly from a well and have not been treated with disinfectant. These samples should be marked “Raw” on the Microbial Monitoring Form. There are several situations requiring collection of a raw sample:

- If required by the GWR, a system must collect TSM samples within 24 hours after it receives a routine distribution total coliform–positive sample.
- Source-assessment raw-water monitoring is required monthly if well conditions indicate the groundwater may be susceptible to fecal contamination.
- Raw groundwater source samples required by the Technical Review and Oversight team for an exception are considered assessment-source-monitoring samples. Groundwater systems must comply with requirements of the GWR if samples required for an exception test positive for a fecal indicator.

Appendix B

Texas Commission on Environmental Quality TCR Positive Sample Invalidation Request

PWS Name: _____ PWS ID: _____

1. Sample to be invalidated

Sample ID: _____ Collection Date: _____ Time: _____

Sample Site: _____

2. Sample collector

Sampler's Name: _____ Operator License No.: _____

Years Experience: _____ Employed by (check one): PWS _____ Contract Operator _____

3. Sample collection info

Chlorine residual: _____ mg/L Disinfectant used (check one): Chlorine _____ Chloramine _____

Sample bottle more than 6 months old? Yes ___ No ___ Sample shipped on ice? Yes ___ No ___

Sample point disinfected using: Bleach _____ Flame _____ SOP followed? Yes _____ No _____

4. Weather conditions at time of collection (if applicable):

Wind speed: _____ mph Precipitation (check one)? Yes _____ No _____

5. Sample site

Active service connection? Yes ___ No ___ Interior location _____ Exterior location _____

Hose bib _____ Storage tank _____ Dedicated sample point _____

6. Distribution system

Cross-connection program? Yes ___ No ___ Flushing frequency: _____

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7. Conditions existing at time of collection

Water outage in area of positive sample? Yes ___ No ___ Lowest pressure: _____ psi

Date of most recent flushing: _____

Repair of well/distribution system in area of positive sample? Yes ___ No ___ Date _____

Special samples collected following repair? Yes ___ No ___ Any specials positive? Yes ___ No ___

Public Notices issued in last six months? Yes ___ No ___ Type of violation: _____

8. Corrective actions performed

SOP modified? Yes ___ No ___ Flushing? Yes ___ No ___ Operator training? Yes ___ No ___

Submitted by: _____ Title: _____

Phone number: _____ Date: _____

Email address for Invalidation Request result: _____

Instructions for submitting a TCR Positive Sample Invalidation Request packet:

Submit the following documents to the TCEQ for sample invalidation consideration. Please note: *E. coli* positive samples **cannot** be invalidated.

1. This checklist
2. Copies of all required Repeat sample results
3. Brief description of specific reason why sample is not representative of water quality
4. Procedure for sample collection
5. Weather data (if applicable)

Submit all required documents to the TCEQ by fax or mail:

Fax: (512) 239-3666

Mail: TCEQ TCR Program, MC-155, PO Box 13087, Austin, TX 78711

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Helpful Web Pages

EPA Ground Water Rule

water.epa.gov/lawsregs/rulesregs/sdwa/gwr/index.cfm

EPA GWR Basic Information

water.epa.gov/lawsregs/rulesregs/sdwa/gwr/basicinformation.cfm

EPA Compliance Help

water.epa.gov/lawsregs/rulesregs/sdwa/gwr/compliancehelp.cfm

TCEQ Ground Water Rule

www.tceq.texas.gov/goto/gwrule

TCEQ Consumer Confidence Reports

www.tceq.texas.gov/goto/ccr

TCEQ Drinking Water Watch

www.tceq.texas.gov/goto/dww

TCEQ “Am I a Public Water System?”

www.tceq.texas.gov/goto/ami-pws

TCEQ Drinking Water Quality

www.tceq.texas.gov/drinkingwater

TCEQ Source Water Protection

www.tceq.texas.gov/goto/swp

TCEQ Public Notice Language

www.tceq.texas.gov/goto/dw-pn

Abbreviations

AWWA: American Water Works Association

BWN: Boil Water notice

CCR: consumer confidence report

CT: concentration time

DLQOR: disinfectant-level quarterly operating report

DWW: Drinking Water Watch

EPA: United States Environmental Protection Agency

GWR: Ground Water Rule

MCL: maximum contaminant level

PN: public notice

PWS: public water system

SDWIS: Safe Drinking Water Information System

TCR: Total Coliform Rule

TSM: triggered source monitoring

Definitions

Assessment source monitoring. Raw groundwater source monitoring required by the executive director based on groundwater source susceptibility to fecal contaminants.

Coliphage. A bacteriophage that infects the bacterium *E. coli*, also used as a viral indicator.

Community water system. A public water system which has a potential to serve at least 15 residential service connections on a year-round basis or serves at least 25 residents on a year-round basis.

Contamination. The presence of any foreign substance (organic, inorganic, radiological or biological) in water which tends to degrade its quality so as to constitute a health hazard or impair the usefulness of the water.

Cross-connection. A physical connection between a public water system and either another supply of unknown or questionable quality, any source which may contain contaminating or polluting substances, or any source of water treated to a lesser degree in the treatment process.

E. coli (Escherichia coli). One of several types of bacteria that normally inhabit the intestine of humans and animals. Some strains of *E. coli* are capable of causing disease under certain conditions. The presence of this bacteria in drinking water indicates that potentially harmful bacteria may be present.

Enterococci. A bacterium normally present in the intestine but causes inflammation and blood infection introduced elsewhere in the body. Also used as a viral indicator.

Fecal coliform. A group of bacteria that includes coliphage, enterococci and *E. coli*. The presence of these bacteria in drinking water indicates that potentially harmful bacteria may be present.

Fecal indicators. Microbiological organisms used to indicate the presence of fecal contamination. Examples include coliphage, enterococci and *E. coli*.

Groundwater system. A public water system that provides, uses or distributes any groundwater except if the groundwater is combined with surface water (or with groundwater under the direct influence of surface water) prior to treatment.

Non-community water system. Any public water system which is not a community system.

Non-transient noncommunity water system. A public water system that is not a community water system and regularly serves at least 25 of the same persons at least six months of the year.

Public water system. A system that provides the public water for human consumption through pipes or other constructed conveyances that has at least 15 service connections or serve at least 25 individuals at least 60 days out of the year.

Raw water. Water prior to any treatment including disinfection that is intended to be used, after treatment, as drinking water.

TCR sample. A water sample that is collected on a monthly basis in the public water system's distribution area. The number of samples required to be taken are based on the population served by the public water system.

Total coliform. A group of closely related bacteria, mostly harmless, that live in soil, water and the intestines of small animals. This group of bacteria includes fecal coliform bacteria and other non-fecal bacteria that are very common in the natural world. The presence of these bacteria in drinking water indicates that potentially harmful bacteria may be present.

Transient noncommunity water system. A public water system that is not a community water system and serves at least 25 persons at least 60 days out of the year, yet by its characteristics, does not meet the definition of a nontransient noncommunity water system.

Triggered source water monitoring. Raw groundwater source monitoring required for systems not providing at least 4-log treatment of viruses when a routine distribution coliform sample is total coliform positive.