



PUBLIC WATER SYSTEM GUIDANCE FOR WATER QUALITY PARAMETER MONITORING AND SAMPLE COLLECTION

Introduction

The information provided in this guidance document is intended to help public water systems (PWSs) or their agents/samplers monitor and collect water quality parameter (WQP) samples in compliance with the Lead and Copper Rule (LCR) (30 Texas Administrative Code (TAC) §290.117).

WQP sample results are used to determine if drinking water is *corrosive* or *aggressive*. The Texas Commission on Environmental Quality (TCEQ) and the PWSs evaluate WQP data to determine effective types of corrosion control treatment. When required, corrosion control treatment is the primary mechanism for reducing lead and copper levels.

In this guidance, “you” refers to the PWS or their samplers. “We” refers to the TCEQ and its Public Water System Supervision (PWSS) Program.

The current version of this guidance document is located on the TCEQ web page at: <https://www.tceq.texas.gov/drinkingwater/chemicals/lead_copper/lead-copper.html>.

Where can you get answers to questions related to WQP monitoring and sample collection?

Information on WQP monitoring and sampling collection can be found on the TCEQ web page at <https://www.tceq.texas.gov/drinkingwater/chemicals/lead_copper/lead-copper.html>. For specific information related to this guidance, contact the TCEQ at (512) 239-4691 and ask for the PWSS Program QA Manager.

How do you know when to monitor and collect WQP samples?

PWSs that are required to monitor and collect WQP samples include, but are not limited to:

- Newly established PWSs of any size
- PWSs that have a population over 50,000
- PWSs that exceed the LCR lead and/or copper action levels

We contact each PWS to provide notification of upcoming WQP monitoring and sample collection requirements. The notification will include information on both sampling sites and the required number of samples. The following sections contain the information needed by PWSs to successfully collect WQP samples, and have them analyzed and the results reported.

Note: *There may be more situations, than those noted above, when you are required to collect WQP samples. For example, when you notify the TCEQ of a change in treatment or source water, we may require additional monitoring to ensure corrosion control is maintained.*

How do you find a laboratory to analyze WQP samples?

Laboratories must be approved and/or accredited by the TCEQ in order to run WQP analyses for compliance purposes. Information regarding laboratory approval is located on the TCEQ web page at https://www.tceq.texas.gov/drinkingwater/monitoring_plans/monitoring_plans.html.

Information concerning laboratory accreditation is located on the TCEQ's web page at https://www.tceq.texas.gov/field/qa/env_lab_accreditation.html.

For specific questions about either laboratory approval and/or accreditation, contact us at (512) 239-4691 and ask for the Laboratory Approval Coordinator.

Where do you get containers to collect WQP samples?

Your analyzing laboratory is responsible for providing you with laboratory grade, plastic, sample containers for each sampling site. A volume of water sufficient for the laboratory to conduct analysis of all necessary parameters is required. This may require more than one container for each sample site. The size of the containers is usually either 500 mL or 1000 mL (1 liter), but in some cases a smaller container may be provided.

Two sample containers may be used for each site. Analysis of total hardness and metals (calcium, iron, manganese, and sodium) requires preservation (acidification) at the time of laboratory receipt. Analysis of non-metals (total alkalinity, chloride, conductivity, sulfate, total dissolved solids, and orthophosphate or silica (depending on the inhibitor used) does not require preservation. When collecting two containers, together they count as one sample.

Alternatively, the laboratory may provide a single sample container of sufficient volume for all analyses. The laboratory will then split the sample in-house, preserving a portion of the sample for metals analysis.

What form do you fill out when collecting WQP samples?

Samplers must complete a WQP Monitoring Form (WQPMF) (TCEQ Form 20679) when they collect WQP samples. The current version of the form is located on the TCEQ web page at https://www.tceq.texas.gov/drinkingwater/chemicals/lead_copper/lead-copper.html. Instructions for completing the form are included with the form.

Note: *Laboratories may have their own version of the WQPMF form which they will give you when you pick up your sample containers. If this is the case, you should refer to the TCEQ web page to verify the lab is utilizing the most recent version of the form.*

You must fill out the WQPMF form completely and submit it to the lab when you deliver your samples. In addition to other information, you must accurately report the date and time each sample was collected and record the field measurement results of pH and temperature for each sample. The WQPMF also requires that you indicate whether you have TCEQ approval to measure and report pH and temperature results. (See next section.) Be very careful filling out this form as incomplete and/or inaccurate information may cause your samples to be rejected by the laboratory.

What is the process for getting TCEQ approval to measure pH and temperature in the field when you collect WQP samples?

PWSs (or their agents) must have documented TCEQ Laboratory Approval in order to measure pH and temperature in the field when collecting WQP samples. To gain approval, you must submit a Drinking Water Laboratory Approval Form as part of your monitoring plan. At the time of sample collection, field personnel document adherence to this requirement by checking "yes" to the question on the WQPMF - "*Are temperature and pH included on the sampling entity's Drinking Water Laboratory Approval Form on file at the TCEQ?*" It is the PWS's responsibility to ensure all field personnel are adequately trained to measure pH and temperature according to the approved methods. A lack of laboratory approval prior to collecting WQP samples and conducting field measurements for pH and temperature may result in monitoring violations.

Information regarding the approval process is located at https://www.tceq.texas.gov/drinkingwater/monitoring_plans/monitoring_plans.html. For specific questions, contact the TCEQ at (512) 239-4691 and ask for the Laboratory Approval Coordinator.

How do you measure pH and temperature in the field?

Field samplers are required to measure the pH and temperature of the water at the sample site, when they collect WQP samples for laboratory analysis. Temperature and pH are measured immediately (<15 minutes) upon sample collection. To ensure accuracy and consistency, you must measure temperature and pH using methods allowed by the EPA. The next two (2) sections describe the procedures for measuring pH and temperature in the field. The procedures outlined in the following sections are based on *Standard Methods for the Examination of Water and Wastewater* SM 2550 B (temperature) and SM 4500-H B (pH). We request that you measure pH and temperature by these methods. It is the PWS's responsibility to ensure field samplers follow these procedures. Refer to the individual methods for additional detail.

What is the proper procedure for measuring temperature using a hand-held thermometer?

Temperature measurements may be taken with any good quality, hand-held, Celsius thermometer. The following procedure describes the thermometer requirements and proper technique for measuring pH using a hand-held thermometer. This method is based on *Standard Methods for the Examination of Water and Wastewater* SM 2550 B. If an electronic meter is being used to measure temperature (or temperature and pH), skip this

section and go on to the next.

- The thermometer must have a scale marked for every 0.1°C, with markings etched on the capillary glass, and a minimal thermal capacity to permit rapid equilibration.
- Transport the thermometer in a metal or hard plastic case to prevent breaking.
- Check the thermometer at least quarterly against a precision thermometer certified by the National Institute of Standards and Technology (NIST, formerly National Bureau of Standards). Keep a record of these calibration checks. **Note:** *Quarterly thermometer calibration checks are required by the EPA Manual for the Certification of Laboratories Analyzing Drinking Water, Fifth Ed.*
- Before collecting a sample to measure temperature, remove the faucet aerator and run the water gently to flush the line.
- Fill the sample measurement bottle to slightly overflowing. Use a closed-system bottle—which allows you to insert the thermometer—to reduce measurement error.
- Insert the thermometer in the sample, allow to stabilize, and record the reading to the nearest 0.1°C.
- Record the temperature measurements on the WQPMF. Include the date and time of each measurement.

What is the proper procedure for measuring temperature and pH with a meter?

Temperature and pH measurements required for WQP monitoring may be taken separately or together, electronically with a meter(s). The following procedure describes the meter requirements and proper technique for measuring temperature and pH. This procedure is based on *Standard Methods for the Examination of Water and Wastewater* SM 2550 (temperature) and SM 4500-H B (pH). **Note:** *If field personnel measure temperature as described in the preceding section (i.e., using a hand-held thermometer), then only the pH portions of this section apply).*

- The meter must be capable of measuring both pH and temperature to 1/10 of a unit. Follow the manufacturer's instructions for meter operation, storage, maintenance, and use of electrodes.
- Check the temperature thermistor quarterly against a precision thermometer certified by the National Institute of Standards and Technology (NIST, formerly National Bureau of Standards). Keep a record of these calibration checks.
- Calibrate the pH electrode as described in the next 3 bullets. The purpose of standardization is to adjust the response of the electrode to the meter. Two to three calibration points should be used. When only occasional pH measurements are made, calibrate the meter before each measurement. When frequent measurements are made, and the meter is stable, standardize less frequently. If sample pH values vary widely, standardize for each sample with a buffer having a pH within 1 to 2 pH units of the sample. In routine use, store buffer solutions in polyethylene bottles. Replace buffer solutions every 4 weeks. Do not use expired buffers.

- Always use fresh buffers; pour out the required amount into a small cup and use once only. DO NOT return used buffers to the original container, discard after use. Reusing buffers will result in inaccurate pH measurements.
- Pour off a portion of the initial buffer solution into a clean or disposable container.
- Remove electrodes from the storage solution, rinse, blot dry with a soft tissue, place in the initial buffer solution, and adjust the meter.
- Select a second buffer within approximately 2 pH units of expected sample pH and bring sample and buffer to same temperature, which may be the room temperature, a fixed temperature such as 25°C, or the temperature of a fresh sample. Pour off a portion of the second buffer solution into a clean or disposable container. Remove electrodes from first buffer, rinse thoroughly with distilled water, blot dry, and immerse in the second buffer. Record temperature of measurement and adjust temperature dial on meter so that meter indicates pH value of buffer at test temperature (this is a slope adjustment). Use the pH value listed in the tables for the buffer used at the test temperature. Remove electrodes from second buffer, rinse thoroughly with distilled water and dry electrodes as indicated above.
- Depending on the range of pH to be measured, a third buffer may be required. Immerse in a third buffer below pH 10, approximately 3 pH units different from the second; the reading should be within 0.1 unit for the pH of the third buffer. If the meter response shows a difference greater than 0.1 pH unit from expected value, look for trouble with the electrodes or potentiometer.
- Before taking the temperature and pH measurements, remove the faucet aerator and run the water gently to flush the line.
- Fill a sample measurement bottle to slightly overflowing. Use a closed-system bottle—which allows you to insert the probe—to reduce measurement error.
- Rinse the pH probe, and then insert the probe into the sample immediately after filling the bottle. Measure temperature. Change the meter to measure pH levels and gently rotate the bottle until the pH reading stabilizes (may take several minutes). Establish equilibrium between electrodes and sample by stirring sample to insure homogeneity; stir gently to minimize carbon dioxide entrainment.
- For buffered samples or those of high ionic strength, condition electrodes after cleaning by dipping them into sample for 1 minute. Blot dry, immerse in a fresh portion of the same sample, and read pH. With dilute, poorly buffered solutions, equilibrate electrodes by immersing in three or four successive portions of sample. Take a fresh sample to measure pH.
- Record the pH and temperature measurements to the nearest 1/10 of a unit on the WQPMF. Include the date and time of each analysis.

Note: *The pH probe should be secured during transport. The probe's membranes are very delicate and should not come in contact with hard surfaces or be allowed to dry out. Pack a replacement probe just in case.*

How do you collect WQP samples?

You must collect WQP samples at sites described in your monitoring plan. The following information describes the proper technique for collecting water quality samples.

- Flush the tap prior to collecting the sample.
- Reduce the flow of water from the tap and fill a clean, spare container (plastic or glass) to measure pH and temperature in the field. See previous sections. During collection of the WQP samples, care should be taken to avoid the introduction of air bubbles into the sample which can affect the pH and conductivity of the sample.
- For each sample site, fill the container(s) provided by the laboratory leaving a small amount of airspace so that the lab can preserve the samples in the laboratory, and each sample can be mixed by shaking prior to extracting aliquots for analysis.

When you collect WQPs, container(s) of sufficient volume are required from each sampling site. See Section above - *Where do I get sample containers to collect my WQP samples?* You must use the sample containers provided by the laboratory. Laboratories will reject WQP samples outright at the time of receipt if they are delivered in the wrong containers, or if they are broken or leaking. The laboratory will also reject samples outright if there is insufficient sample volume, holding time exceedances, and temperature and pH was not measured and documented in the field, as indicated on the WQPMF.

How should you label the WQP sample containers after you collect the samples?

At the time of sample collection, field samplers must complete all information on the sample label attached to the container. You may attach your own labels, if they are not already attached to the containers when you get them from the laboratory. Alternatively, you can write the sample label information directly on the bottle with waterproof ink. This alternative is acceptable as long as the required information is included as follows:

- PWS ID Number
- Date and time sample was collected
- Sampler's initials
- Address where the sample was collected.

For distribution system samples, the address always begins with DS01 – followed by the location address. (Example: DS01 – 123 Main Street). For entry point samples, the address always begins with PBCU001 or PBCU002, or PBCU003, followed by the location or name. (Example: PBCU003 – Hillside WTP). PWSs can refer to the TCEQ's Drinking Water Watch website for entry point locations: <<http://dww2.tceq.texas.gov/DWW/>>

Should you acid-preserve samples at the time of collection?

No. To avoid the hazards of strong acids in the field and possible contamination, samples collected for metals analysis (calcium, iron, manganese, sodium, and hardness) are preserved upon receipt at the laboratory. Samples must be shipped/delivered, un-acidified, to the laboratory as soon as possible after collection to ensure sample holding times are not exceeded. See Section below - *Do sample holding times apply to WQP samples?*

How do you store and transport my samples to the laboratory?

Store samples in a cooler on ice for delivery to the laboratory. Preservation using ice is considered acceptable at the laboratory if the arrival temperature ranges above the freezing temperature of water up to 6°C. Samples that are delivered to the laboratory on the same day they are collected may not meet this requirement. In these cases, the samples are considered acceptable if the samples were received on ice. **Note:** *Icing of metal samples is not required during shipment/delivery to the laboratory; however, for practical purposes, it is recommended all samples (metals and non-metals) be stored together, in coolers during transit to the laboratory.*

Do sample holding times apply to WQP samples?

Holding time refers to the maximum time that samples may be held after sample collection until analysis and still be considered valid. The regulatory holding times for the WQPs are as follows:

- calcium, iron, manganese, sodium, and total hardness—6 months (after acid preservation)
- chloride, sulfate, and conductivity—28 days
- total alkalinity—14 days
- TDS—7 days
- silica—28 days
- orthophosphate—48 hours

Holding times cannot exceed those specified above; therefore field samplers or couriers should deliver samples to the laboratory on the day they are collected, whenever possible. In addition, you should be mindful of holding times relative to the end of each monitoring period. Federal and state regulations establish that the two LCR WQP monitoring periods end each year on June 30 and December 31. PWSs are required to monitor quarterly within each six-month monitoring period. TCEQ strongly encourages PWSs to sample as early as possible to meet quarterly monitoring requirements.

Will the laboratory reject the samples if I don't fill out my paperwork correctly or follow correct procedures?

Laboratories may reject samples at the time of receipt if they are collected or handled

incorrectly, and/or sample documentation is incomplete or incorrect. Reasons for rejecting samples include, but are not limited to:

- Insufficient/incorrect sample submittal information
 - Handwriting not legible
 - PWS side of WQPMF incomplete
 - WQPMF not included with samples at time of laboratory receipt
 - Not the current version of the WQPMF
 - Discrepancies between the completed WQPMF and sample label
 - Missing authorized PWS (or agent) signature
 - Invalid dates/times
 - Missing dates/times
- Broken container
- Leaking container
- Invalid containers
- Insufficient sample volume
- Exceeded holding time
- Improperly preserved samples (e.g., Samples requiring thermal preservation, not delivered to the laboratory in coolers, on ice; or samples delivered to the laboratory already acid-preserved)
- Temperature or pH not measured in the field. (See Table 5. Use Rejection Code “IP” – “Invalid Sampling Protocol.”)

How does the lab know what parameters to analyze?

An expanded list of WQPs as specified in the table below became mandatory on March 30, 2017 for initial and routine WQP monitoring. PWSs must ensure that this list of parameters is measured/analyzed, and all results are reported to the TCEQ. The WQPMF includes the analytes listed in the table below. The laboratory in coordination with the PWS will check the boxes on the WQPMF indicating which WQP parameters must be analyzed, depending on what inhibitor (if any) is used by the PWS.

WQPs to be Monitored and Reported

Analyte Code	Analyte Name
1927	Total alkalinity
1919	Calcium
1017	Chloride
1064	Conductivity
1915	Total hardness
1028	Iron
1032	Manganese
1925	pH (field measurement)
1052	Sodium
1055	Sulfate

1996	Temperature in Celsius (field measurement)
1930	Total dissolved solids (TDS)
1044	Orthophosphate ¹
1049	Silica ²

1. Orthophosphate must be measured if an inhibitor containing a phosphate compound is used.
2. Silica must be measured if an inhibitor containing a silicate compound is used.

How are WQP results reported to the TCEQ?

Your analyzing laboratory(s) will report all WQP results (including pH and temperature) to the TCEQ, as described in the TCEQ document *Guidance for the Analysis and Reporting of Water Quality Parameters under the Lead and Copper Rule*. This document is located on the TCEQ web page at

<https://www.tceq.texas.gov/drinkingwater/chemicals/lead_copper/lead-copper.html>

Laboratories are required to report WQP results to the TCEQ weekly, in the form of both an analytical test report and an electronic data deliverable. They also must submit a copy of the completed WQPMF, which you submitted to them at the time of sample delivery. Laboratories are responsible for ensuring that sample results are reported to the TCEQ as required, and that public water systems receive copies of the results at the same time.