United States Environmental Protection Agency
Region 8 Laboratory
16194 W. 45th Dr.
Golden, CO 80403
September 2016

United States Environmental Protection Agency

Quick Guide To Drinking Water Sample Collection

Second Edition, Update

Disclaimer

This document provides a general summary of techniques used by EPA Region 8 Laboratory staff for the collection of chemistry samples for drinking water analysis. Other approaches to sample collection may be acceptable or desirable under given conditions. This document is intended as a refresher for those already trained in sample collection. The user is urged to check with the laboratory performing the analysis to ensure that the bottles, preservatives, and holding times which are to be employed are compatible with the methods used by the laboratory.

The second edition corrects and expands on the guidance for sampling water lines for compliance with the lead/copper rule. The first edition should not be used. The second edition also updates sampling techniques for total coliforms and *E. coli* and provides a reference for the Revised Total Coliform Rule. In addition, it contains minor editorial corrections and updates.

The second edition update expands on the guidance for sampling water lines for compliance with the lead/copper rule.

Table of Contents

Section Page

General Sampling Procedures..... 4

Specific Sampling Procedures

Asbestos..... 6

Biological Contaminants

Bacteria and Coliphage..... 7
Total Coliform and *E. Coli*..... 8
Cryptosporidium and *Giardia*..... 9

Classical Chemistry Constituents and Nutrients (IOCs)

Unpreserved Nutrients, Anions, Etc..... 10
Preserved Nutrients, Anions, Etc..... 11
Cyanide..... 12

Colorimetric Analysis for Disinfectant Residuals..... 13

Haloacetic Acids (HAA5s)..... 14

Metals (IOCs)

Common Metal Contaminants..... 15

Radionuclides..... 16

Semivolatile Synthetic Organic Compounds (SOCs)..... 17

Total Organic Carbon (TOC)..... 18

Volatile Organic Compounds (VOCs)

Common VOCs..... 19
Total Trihalomethanes (TTHMs)..... 20

General Sampling Procedures

This summary document is designed to be used by personnel trained in the collection of drinking water samples and handling of sample preservatives. Follow the procedures described below to assist in the collection of an acceptable sample and to maintain the integrity of the sample after collection.

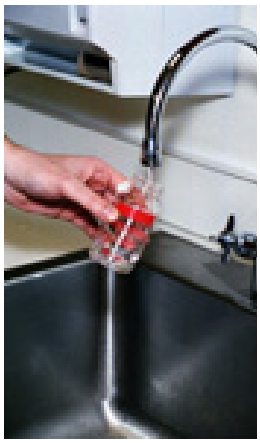
1. Prepare a Sampling and Analysis Plan (SAP) which describes the sampling locations, numbers and types of samples to be collected, and the quality control requirements of the project.

2. Check with the laboratory before collecting samples to ensure that sampling equipment, preservatives, and procedures for sample collection are acceptable. It is best to obtain sampling supplies directly from the laboratory performing the analyses. Gather all equipment and supplies necessary for the project.

3. The acids and bases used in preservation of many types of samples described in this document are dangerous and must be handled with care. Always wear gloves and eye protection when handling preservatives. When opening a preservative bottle, particularly a glass ampoule, break open the ampoule away from yourself and others. Have acid/base neutralization supplies (baking soda) on hand in the event of a spill. If acid spills on your skin or clothing, remove the contaminated clothing and rinse the area with water. Do not apply baking soda (the heat of reaction can cause burns).

4. Collect samples in an area free of excessive dust, rain, snow or other sources of contamination.

5. Select a cold water faucet for sampling which is free of contaminating devices such as screens, aeration devices, hoses, purification devices or swiveled faucets. Check the faucet to be sure it is clean. If the faucet is in a state of disrepair, select another sampling location.



6. Collect samples from faucets which are high enough to put a bottle underneath, generally the bath tub or kitchen sink, without contacting the mouth of the container with the faucet.

7. Open the faucet and thoroughly flush. Generally 2 to 3 minutes will suffice, however longer times may be needed, especially in the case of lead distribution lines. Typically the water temperature will stabilize which indicates flushing is completed. Once the lines are flushed, adjust the flow so it does not splash against the walls of the bathtub, sink or other surfaces.

8. Follow the collection instructions provided for the analytes of interest described on the following pages. Wear eye protection and gloves if you are handling containers with acidic/basic preservatives and when you are collecting samples.

9. **Lead and Copper Rule Compliance Samples:**
   Select a cold water faucet for sampling which is free from devices that are designed to change the water composition, such as water softeners or point of use filters. DO NOT remove any screens or aeration devices. If you are collecting a first-flush sample for lead/copper, allow the water to sit undisturbed for at least six hours. DO NOT intentionally flush the water line before the start of the 6 hour period. Place a wide-mouth 1 L bottle under the faucet. Open the faucet and collect the first water out of the tap.

   If you want to test a lead service line then 8 to 10 sequential sample bottles (the number depends on how far the lead service line is from the tap) would be needed to see the profile of lead distribution.

   For more detailed sampling instructions, refer to the EPA's "Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule" at: https://www.epa.gov/sites/production/files/2016-02/documents/epa_lcr_sampling_memorandum_dated_february_29_2016_508.pdf.

10. Fill out the chain of custody form with the sample collection information. Record the site location, name of the sampler, date and time of collection, method of collection, type of analysis to be completed, and preservative in use.

11. Deliver or ship samples to the laboratory to ensure that holding times are met. Holding time starts at sample collection and ends at preparation and/or analysis. Be sure to allow time for the laboratory to process the samples

12. Return empty preservative containers to the laboratory for proper disposal.

SAMPLING FOR ASBESTOS

Bottles to Use

Or

Plastic or glass bottles may be used but plastic is preferred.

Preservative to Use

Cool to ≤ 4 °C (≤ 39.2 °F)

Holding Times

48 Hours

Sampling Instructions

Check with the laboratory but generally 1 L is required for analysis. Wear gloves and eye protection when collecting samples. Rinse the bottle and cap three times with sample water and fill the bottle to within one to two inches from the top. Place the sample into a cooler with ice for immediate delivery or shipment to the laboratory.

SAMPLING FOR BIOLOGICAL CONTAMINANTS

Total coliforms; Fecal coliforms; *E. coli*;
Enterococci; Heterotrophic Bacteria; or Coliphage

Bottle to Use

Sterile 125 or 150 mL plastic bottles must be used.

Preservatives to Use

Sodium Thiosulfate if sample is chlorinated

and

Cool to < 10 °C (< 50 °F) for source water and groundwater samples (recommended for drinking water as well) but do not allow samples to freeze

Holding Times

Holding times are generally very short - 8 hours for source water compliance samples, 30 hours for drinking water samples, 48 hours for coliphage samples. Deliver samples to the lab the day of collection if possible or ship via overnight delivery.

Sampling Instructions

Wear gloves when collecting samples. Do not rinse the bottles. The bottles are sterile so care must be taken not to contaminate the bottle or cap. Once the distribution line is flushed and the flow reduced, quickly open the bottle (but do not set the cap down), hold the cap by its outside edges only, and fill the sample bottle to just above the 100 mL line leaving a one inch headspace. Cap the bottle immediately and place it into a cooler with ice for delivery or overnight shipment to the laboratory.

SAMPLING FOR BIOLOGICAL CONTAMINANTS

Tips and Guidance for Total Coliform and *E. coli* Sampling

Some Tips on Collecting Samples

- Remove any attachments on the faucet
- Allow water to flow for 5 or 6 minutes before sampling
- Do not rinse or overfill container
- Always collect cold water; never sample hot water
- Do not touch the inside of the sample bottle or its cap

Avoid These Sampling Sites for Total Coliform, if Possible

- Outdoor faucets
- Faucets connected to cisterns, softeners, pumps, pressure tanks or hot water heaters
- New plumbing and fixtures or those repaired recently
- Faucets that hot and cold water come through
- Threaded taps
- Swing spouts
- Faucets positioned close to sink or ground
- Leaky faucets

For guidance on sampling related to the Revised Total Coliform Rule (effective April 1, 2016), refer to EPA's "Quick Reference Guide", found under the **RTCR Implementation Materials** heading at:
http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation_revisions.cfm

SAMPLING FOR BIOLOGICAL CONTAMINANTS

Giardia* and *Cryptosporidium
using EPA Analytical Methods 1622 1623, or 1623.1
without filtration in the field

Bottle to Use

Plastic cubitainers or equivalent which can hold 10 L samples are used.

Preservatives to Use

Cool to ≤ 10 °C but do not freeze, keep at < 20 °C during shipment.

Holding Time

96 hours

Sampling Instructions

This method of sample collection is acceptable for EPA analytical methods 1622, 1623, and 1623.1 when sending water samples to the laboratory without filtering in the field. Talk to the lab to determine if this collection procedure is acceptable for the analytical method they plan to perform. Wear gloves when collecting samples. Rinse the sample bottle three times and fill the bottle completely to ensure 10 liters are collected. Chill samples to 1 – 10 °C as soon as possible by storing in a refrigerator or by pre-icing them in a cooler prior to shipment. Load samples into a cooler with fresh ice for either immediate delivery or overnight shipment to the laboratory. Complete any applicable sample collection forms.

Note: An additional 10 L matrix spike sample may be required by the laboratory.

For additional sampling instructions, including those for filtration refer to the EPA's "LT2 Rule *Cryptosporidium & E. coli* Sample Collection Recommendations Pocket Guide" found under the **Training Modules** heading at:
http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/lab_home.cfm

SAMPLING FOR UNPRESERVED CLASSICAL CHEMISTRY CONSTITUENTS INCLUDING NUTRIENTS, ANIONS, AND OTHER ANALYTES AS LISTED (IOCs)

Acidity, Alkalinity, Biological Oxygen Demand, Bromate, Chloride, Chlorite, Color, Conductivity, Fluoride, Foaming Agents, Nitrate, Nitrite, Odor, o-Phosphate, Residues, Silica, Sulfate, Surfactants, Total Dissolved Solids, Total Suspended Solids, Turbidity

Bottles to Use

Or

Plastic or glass bottles may be used but plastic is preferred.

Preservative to Use

Cool to ≤ 4 °C (≤ 39.2 °F)

Holding Times

Most of these analytes have short holding times. Deliver samples to the lab the same day if possible or ship via overnight delivery. Check with the lab regarding the holding times for the specific analytes of interest.

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves and eye protection when collecting samples. Rinse the bottle and cap three times with sample water and fill the bottle to within one to two inches from the top. Place the sample into a cooler with ice for immediate delivery or shipment to the laboratory.

SAMPLING FOR CLASSICAL CHEMISTRY CONSTITUENTS AND NUTRIENTS REQUIRING ACID PRESERVATION AS LISTED (IOCs)

Ammonia; Nitrate + Nitrite Combined; Kjeldahl and Organic Nitrogen; Total Phosphorus

Bottles to Use

Or

Plastic or glass bottles may be used but plastic is preferred.

Preservative to Use

Sulfuric Acid (H_2SO_4) to pH < 2

Holding Times

28 days

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves and eye protection when handling acids and while collecting samples. If the bottle contains a preservative, do not rinse the bottle. If the preservatives are not included in the bottle, rinse the bottle and cap three times with sample water, fill the bottle, and then carefully add the preservatives following the instructions provided by the laboratory. The bottle should be filled to within one to two inches from the top. Deliver or ship the sample to the laboratory.

SAMPLING FOR CYANIDE (IOC)

Bottles to Use

Or

Plastic or glass bottles may be used but plastic is preferred.

Preservatives to Use

0.6 g Ascorbic Acid if sample is chlorinated.

and

Sodium Hydroxide (NaOH) to pH >12

and

Cool to ≤ 4 °C (≤ 39.2 °F)

Holding Time

14 days

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves and eye protection when handling acids and other preservatives and while collecting samples. If the bottle contains a preservative, do not rinse the bottle. If the preservatives are not included in the bottle, rinse the bottle and cap three times with sample water, fill the bottle, and then carefully add the preservatives following the instructions provided by the laboratory. The bottle should be filled to within one to two inches from the top. Place the sample into a cooler with ice for delivery or shipment to the laboratory.

SAMPLING AND COLORIMETRIC ANALYSIS FOR DISINFECTANT RESIDUALS

Free Chlorine, Combined Chlorine, Chloramines, Total Chlorine,

Bottles to Use

Glass test tubes are generally used.

Preservative to Use

None

Holding Times

Analyze Immediately On-Site

Sampling and Analysis Instructions for the DPD Colorimetric Methods

Several methods are approved for analysis of disinfectant residuals. A common method is the DPD Colorimetric Method (*Standard Methods*, 18th edition or later 4500-Cl G). Test kits for the DPD method are available commercially. The analyst should follow the specific directions provided with the test kit.

In general, the analyst will need to measure out a known volume of sample using a test tube or flask provided with the kit and will need to add the DPD reagents in the order described, wait a specific reaction time, and then measure the pink color that develops in the sample. The intensity of the pink color that develops after the addition of a reagent is measured using a spectrophotometer or a color comparator and relates directly to the amount of disinfection residual present in the sample.

Example Test Kits

SAMPLING FOR HALOACETIC ACIDS (HAA5s)

Monochloroacetic Acid, Dichloroacetic Acid, Trichloroacetic Acid,
Monobromoacetic Acid, Dibromoacetic Acid

Bottles to Use

Glass bottles must be used.

Preservatives to Use

Ammonium Chloride

and

Cool to ≤ 4 °C (≤ 39.2 °F) but do not freeze

Keep samples in the dark

Holding Times

Holding times are either 14 or 28 days depending upon the laboratory method in use.

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves and eye protection when handling acids and other preservatives and while collecting samples. Do not rinse the bottle. If the preservatives are not included in the bottle, carefully add the preservatives following the instructions provided by the laboratory. Fill the bottle to within one to two inches from the top. Place the sample in a cooler with ice for delivery or shipment to the laboratory.

SAMPLING FOR METALS (IOCs)

Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium (total), Magnesium, Manganese, Mercury, Nickel, Selenium, Sodium, Silver, Thallium, Lead, Copper, Zinc, and other trace metals

Bottles to Use

*

Or

Or

Plastic or glass bottles may be used but plastic is preferred.

***Note:** 1000 mL wide-mouth bottles are recommended for collection of Lead and Copper Rule compliance samples

Preservative to Use

Nitric Acid (HNO_3) to pH < 2

Holding Times

28 days for mercury, 6 months for other metals

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves and eye protection when handling acid and while collecting samples. If the bottle contains a preservative, do not rinse the bottle. If the preservatives are not included in the bottle, rinse the bottle and cap three times with sample water, fill the bottle, and then carefully add the preservatives following the instructions provided by the laboratory. The bottle should be filled to within one to two inches from the top. Deliver or ship the samples to the laboratory.

Lead and Copper Rule Compliance Samples: Refer to Item #9 in the General Sampling Instructions above. Do not remove aerators or rinse bottles. Use the bathroom tap if the kitchen tap has a water softener or point of use filter on it.

Note: If samples are not acid preserved, they must be received by the laboratory within 14 days of sampling.

SAMPLING FOR SAMPLING FOR RADIONUCLIDES

Gross Alpha, Gross Beta, Strontium-89, Strontium-90, Radium-226, Radium-228, Cesium-134, Iodine-131, Tritium, Uranium, Photon emitters

Bottles to Use

Or

Plastic or glass bottles may be used but plastic is preferred.

Preservatives to Use

Hydrochloric Acid (HCl) or Nitric Acid (HNO_3) preservation for all analytes except Iodine-131 and Tritium which do not require acid preservation. For Cesium-134, only HCl may be used as a preservative.

Holding Times

8 days for Iodine-131, 6 months for all other radionuclides

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves and eye protection when handling acids and other preservatives and while collecting samples. If the bottle contains a preservative, do not rinse the bottle. If the preservatives are not included in the bottle, rinse the bottle and cap three times with sample water, fill the bottle, and then carefully add the preservatives following the instructions provided by the laboratory. The bottle should be filled to within one to two inches from the top. Deliver or ship samples to the laboratory.

SAMPLING FOR SYNTHETIC ORGANIC COMPOUNDS (SOCs)

Alachlor, Atrazine, Benzo(a)pyrene (PAHs), Carbofuran, Chlordane, 2,4-D, Dalapon, 1,2-Dibromo-3Chloropropane (DBCP), Di(2-ethylhexyl)adipate, Di(2-ethylhexyl)phthalate, Dinoseb, Endrin, Ethylene Dibromide (EDB), Heptachlor, Heptachlor Epoxide, Hexachlorobenzene, Hexachlorocyclopentadiene (HEX), Lindane, Methoxychlor, Oxamyl (Vydate), Pentachlorophenol, Picloram, PCBs, Simazine, Toxaphene, 2,4,5-TP (Silvex), Diquat, Endothall, Glyphosate, Dioxin

Bottles to Use

Or

Glass bottles must be used. The type of cap required will depend upon the analyte and method the lab is using. Talk to the lab to be sure.

Preservatives to Use

Check with the lab to verify the type of preservation required which depends on laboratory method in use

and

Cool to ≤ 4 °C (≤ 39.2 °F) but do not freeze

Holding Times

Holding times are generally short – call the lab to be sure.

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves and eye protection when handling acids and other preservatives and while collecting samples. Do not rinse the bottles. Ask the lab how to fill the bottle as this may depend on the bottle in use and the method used for analysis. Place the sample into a cooler with ice for immediate delivery or shipment to the laboratory.

SAMPLING FOR TOTAL ORGANIC CARBON

Bottles to Use

Or

Glass bottles are preferred but plastic may be used as well.

Preservatives to Use

Check with the lab to verify the type of preservation required which depends on laboratory method in use. Generally, preservation includes

Hydrochloric (HCl) or Sulfuric (H_2SO_4)
or Phosphoric Acid (H_3PO_4) to pH <2
and
Cool to ≤ 4 °C (≤ 39.2 °F) but do not freeze

Holding Time

28 days

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Wear gloves when handling acids and other preservatives and while collecting samples. If the bottle contains a preservative, do not rinse the bottle. If the preservatives are not included in the bottle, rinse the bottle and cap three times with sample water, fill the bottle, and then carefully add the preservatives following the instructions provided by the laboratory. The bottle should be filled to within one to two inches from the top. Place the sample into a cooler with ice for delivery or shipment to the laboratory.

SAMPLING FOR
VOLATILE ORGANIC COMPOUNDS (VOCs)

Benzene, Carbon Tetrachloride, o-Dichlorobenzene, p-Dichlorobenzene, 1,2-Dichloroethane, 1,1-Dichloroethylene, cis-1,2-Dichloroethylene, trans-1,2-Dichloroethylene, Dichloromethane, 1,2-Dichloropropane, Ethylbenzene, Monochlorobenzene, Styrene, Tetrachloroethylene, Toluene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethylene, Vinyl Chloride, Xylenes(total)

Bottles to Use

Or

Clear or amber volatile organic analysis (VOA) glass bottles with Teflon septum-cap must be used.

Preservatives to Use

Check with the lab to verify the type of preservation required which depends on laboratory method in use. Generally, preservation includes

Sodium Thiosulfate or Ascorbic Acid if sample chlorinated
and **Hydrochloric Acid (HCl) to pH <2** and
Cool to ≤ 4 °C (≤ 39.2 °F) but do not freeze

Holding Time

14 days

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Typically duplicate samples must be collected (triplicate preferred) at each sampling location. Wear gloves and eye protection when handling acids and other preservatives and while collecting samples. Do not rinse the bottle as it should contain the preservatives before it is filled. Check to make sure this is the case and if not add the preservative. Slowly fill the bottle by allowing the sample to gently flow down the inside of the bottle. Create a meniscus of water at the mouth so that the bottle is actually overfilled. Cap the bottle so that no air bubbles are present in the bottle and the excess water spills down the sides of the bottle. Check to make sure that the bottle does not contain bubbles by inverting the bottle several times. Place the sample into a cooler with ice for delivery or shipment to the laboratory.

SAMPLING FOR TOTAL TRIHALOMETHANES (TTHMs)

Bromodichloromethane, Dibromochloromethane, Tribromomethane (Bromoform), Trichloromethane (Chloroform)

Bottles to Use

Or

Clear or amber volatile organic analysis (VOA) glass bottles with Teflon septum-cap must be used.

Preservatives to Use

Check with the lab to verify the type of preservation required which depends on laboratory method in use. Generally, preservation includes the following…

Sodium Thiosulfate or Ascorbic Acid if sample chlorinated
and **Hydrochloric Acid (HCl) to pH < 2** and
Cool to ≤ 4 °C (≤ 39.2 °F) but do not freeze

Holding Time

14 days

Sampling Instructions

Check with the laboratory on the sample volume required for analysis. Typically duplicate samples must be collected (triplicate preferred) at each sampling location. Wear gloves and eye protection when handling acids and other preservatives and while collecting samples. Do not rinse the bottle as it should contain the preservatives before it is filled. Check to make sure this is the case and if not add the preservative. Slowly fill the bottle by allowing the sample to gently flow down the inside of the bottle. Create a meniscus of water at the mouth so that the bottle is actually overfilled. Cap the bottle so that no air bubbles are present in the bottle and the excess water spills down the sides of the bottle. Check to make sure that the bottle does not contain bubbles by inverting the bottle several times. Place the sample into a cooler with ice for delivery or shipment to the laboratory.