Annex 7: Standard operating procedures for field measurements and sample collection

Standard Operating Procedures

for Field Measurements and Sample Collection

Prepared by:

for

Example Water System

Final

Date

**Standard Operating Procedures**

**for Field Measurements and Sample Collection**

**Revision xx**

**Date**

Approving Officials: Approval Dates:

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Effective Date: MM/DD/YYYY

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| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure** General Sampling Requirements | |
| **Planning Steps**   1. Confirm that sampler has received all required training and certification (e.g. host country drinking water sampler certification or other international standard certification) 2. Review sampling locations in USAID approved WQAP. 3. Identify site-specific safety considerations (e.g. confined space entry, handling preservatives, construction activity) and necessary safety equipment. 4. Assemble equipment and supplies. 5. Check equipment functionality and batteries. 6. Check expiration dates on standard buffer solutions. 7. Schedule field visit. 8. At least one week before the sampling day, call laboratory to order sample bottles and chain of custody forms; check sample holding times and preservation requirements; review lab requirements for field duplicate samples and trip blank (i.e., reagent blank) samples to be provided by the lab; and days when samples are accepted. 9. Check meter calibration. 10. Clean cooler(s) with dilute bleach solution (1:6) and wipe dry. 11. Add ice to cooler(s). | |
| **Equipment and Supplies**   * Equipment to safely access the sampling point * Meter for field measurements * Spare parts (e.g. backup meter and electrodes) * Batteries * Standard buffer solutions for meter calibration Expiration Date\_\_\_\_\_\_\_\_\_\_\_\_\_ * Deionized water * Paper towels, tissues, or lab wipes * Germicidal wipes or dilute bleach solution (1:6) * Sample containers with labels * Log book or computer * Chain of custody forms * Ziploc bags * Strapping tape * Cooler(s) with ice or other means of refrigeration * Sterile gloves * Safety glasses * Other safety equipment as needed | |
| **General Calibration Verification Steps**   1. Review meter manufacturer’s instructions. 2. Rinse the probe thoroughly with deionized water, and blot dry with lab wipe or paper towel. 3. Compare field measurements with buffer solution value (temperature-corrected). 4. Repeat calibration with fresh buffer solutions if check was not satisfactory. 5. If calibration check fails a second time, replace the probe and repeat calibration steps. | |
| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure**  **General Sampling Requirements (Cont.)** | |
| **Labelling Sample Bottles**   1. Affix an adhesive label to each sample bottle. 2. Before sample collection, add the following information to each label with an indelible (waterproof) marker: 3. Project name or number 4. Sampling site name and number 5. Sampling date (mm/dd/yyyy) 6. Sampling time 7. Lab sample number 8. Sampler initials 9. Preservative (yes/no) 10. Preservative (name) 11. Analysis type (name) | |
| **General Sample Collection Steps (see SOP for each parameter for specific steps)**   1. Remove valve, or cap, or tap aerator (on faucet). 2. Put on required safety gear (e.g. gloves and safety glasses). 3. Turn on water and let run with a steady stream for 3 to 5 minutes. 4. Turn the water down to a thin stream (about the width of a pencil), then let the water run 1 minute. 5. Rinse the sample bottle and discard if required by SOP (if no preservative is present). 6. Collect samples. | |
| **Collection of Trip Blank Samples (if not provided by lab)**   1. Wash and sanitize hands. 2. For each sample type prepare an empty sample bottle. 3. Remove cap from sterile sample bottle. 4. Fill a sample bottle with analyte free water. 5. Seal the bottle. 6. Record the sample bottle on the chain of custody form. 7. Place in cooler with other samples. 8. Return to lab with other samples. | |
| **Sample Measurement Steps (See SOP for each Parameter)** | |
| **Preparing Sample Bottles for Shipment to Laboratory**   1. Contact lab to confirm sample shipment schedule. 2. Package paperwork in a waterproof Ziploc bag and tape it to the inside lid of the cooler. 3. Check that all sample bottle caps are securely fastened and not leaking. 4. Check that each cooler does not weigh more than 50 pounds. 5. Check that each cooler has adequate ice to maintain required temperature. 6. Close the cooler and secure with strapping tape if ready for final relinquish. 7. Place shipping label on outside of each cooler. 8. Deliver the sample bottles to the laboratory or relinquish to courier or shipping agent, indicating relinquishing on chain of custody form. | |
| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure**  **General Sampling Requirements (Cont.)** | |
| **Reporting**   1. Chain of custody (CoC) form:   a. One entry for each sample. Include all info on sample labels (see list above).   1. Sampler name, company, contact information, and certification status. 2. Field methods 3. Document problems or changed conditions (e.g. new faucet, faucet leaks). 4. Field measurements (e.g., pH, temperature, conductivity). 5. Sampler signature and date. 6. Give original CoC to laboratory and copies to water system personnel. 7. Call water system manager if water quality results are out of normal range. | |
| **References**  USEPA Region 3. 2014. Sample Submission Procedures for the Office of Analytical Services and Quality Assurance (OASQA) Laboratory Branch. Revision 13. January 29, 2014. | |

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| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure** Field Measurement of pH and Temperature | |
| **Planning Steps (see General SOP for additional steps)**   1. Periodically check temperature readings with a National Institute of Standards and Technology (NIST)-certified thermometer (per American Public Health Association (APHA (2012), Standard Method 2550 B). 2. Review manufacturer’s instructions for instrument conditioning, calibration, use, and maintenance. 3. Holding time: pH and temperature should be measured as soon as possible after collecting sample. | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * pH meter with temperature probe * Standard buffer solutions for pH values 4, 7 and 10 Expiration Date\_\_\_\_\_\_\_\_\_\_\_\_\_ * 125 mL plastic sample bottles | |
| **Calibration Verification Steps**   1. At the start of each day and for new probes, condition the probe by soaking it in tap water or pH 4 buffer solutions for at least 10 minutes prior to calibration. 2. At start of sample run, calibrate pH meter with standard buffer solutions: 3. Rinse the probe thoroughly with deionized water and blot dry with lab wipe or paper towel. 4. Place probe into a wide mouth sample jar containing approximately half an inch of pH 4 standard, and press the first calibration button. 5. Rinse the probe thoroughly with deionized water, and blot dry using a lab wipe or a paper towel. 6. Repeat the procedure with the pH 7 and pH 10 buffers. 7. Compare pH reading with pH value as shown in table below or in manufacturer supplied table corresponding to the sample temperature and buffer solution. If pH reading is more than one-tenth of a pH unit different than the standard buffer solution, the check is not satisfactory. 8. Repeat calibration with fresh buffer solutions if check was not satisfactory. 9. If calibration check fails a second time, replace the pH probe and repeat calibration steps. | |
| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure**  **Field Measurement of pH and Temperature (Cont.)** | |
| **Standard pH Values**   |  |  |  |  | | --- | --- | --- | --- | | **Temperature Deg. C** | **Standard buffer solution** | | | | **Phthalate (0.05M)** | **Phosphate (1:1)** | **Bicarbonate-Carbonate (0.025M)** | | 0 | 4.003 | 6.982 | 10.321 | | 5 | 3.998 | 6.949 | 10.248 | | 10 | 3.996 | 6.921 | 10.181 | | 15 | 3.996 | 6.898 | 10.120 | | 20 | 3.999 | 6.878 | 10.064 | | 25 | 4.004 | 6.863 | 10.014 | | 30 | 4.011 | 6.851 | 9.968 |   ***Data source:*** Table 4500-H+:II. Standard pH Values. APHA (2012) | |
| **Sample Collection Steps**   1. Remove tap aerator (if present). 2. Put on sterile gloves. 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Turn the water down to a thin stream (about the width of a pencil), then let the water run 1 minute. 5. Rinse the sample bottle thoroughly with tap water. 6. Collect sample for field measurement. | |
| **Sample Measurement Steps**   1. Measure pH using Standard Method 4500-H+ B (APHA 2012). 2. Rinse the probe thoroughly with deionized water, and blot dry using a lab wipe or paper towel. 3. Place the meter in the sample vial and let it equilibrate. 4. Stir the sample if possible to promote sample equilibration. 5. Once the meter reaches equilibrium, record the pH and temperature in log book or computer and chain of custody form. | |
| **Reporting**   1. Record field measurements in log book or computer and chain-of-custody form (if lab samples are also collected). 2. Call water system manager if pH reading is less than 7.4 or greater than 7.8. | |
| **References**  American Public Health Association. 2012. Method 2550 Temperature and Method 4500-H+ Section B. Electrometric Method. In *Standard Methods for the Examination of Water and Wastewater*. 22nd Edition. | |

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| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure** Field Measurement of Free and Total Chlorine | |
| **Planning Steps (see General SOP for additional steps)**   1. Confirm type of measurement(s) required (e.g. free chlorine, total chlorine or both). 2. Review instrument’s standard ranges (e.g. 0 – 2.2 mg/L, and 0 – 8 mg/L) and determine which range is applicable to the sampling site (i.e., if samples from the site typically have chlorine measurement < 2.0 mg/L, it would be appropriate to calibrate the instrument and take measurements using the 0 – 2.2 mg/L range). 3. Holding time: chlorine should be measured as soon as possible after collecting sample. | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * Chlorine meter (colorimeter) * Tissues or lab wipes * Standard gels Expiration Date\_\_\_\_\_\_\_\_\_\_\_\_\_ * DPD reagent packs for free and total chlorine Expiration Date\_\_\_\_\_\_\_\_\_\_\_\_\_ * Dilution standards * Scissors * 10 mL graduated cylinder * 5 ml and 10 mL vials | |
| **Calibration Verification Steps**   1. Calibrate chlorine meter with secondary verification (steps below) on a daily basis for each day that samples are collected. 2. Calibrate chlorine meter with secondary gel standards for low and high range (e.g. 0 – 2.2 mg/l; 0 – 8 mg/l): 3. Place each standard in the instrument and take a reading. 4. Record reading on calibration sheet. 5. Repeat the procedure with all standards. 6. Check readings with Table of Acceptable Ranges supplied with standards (see example below). 7. If readings are outside the acceptable range, check instrument’s batteries, re-zero, and repeat calibration. 8. If the readings are still unacceptable, call the manufacturer to service the instrument and use backup instrument. | |
| **Table 1. Example of Acceptable Ranges for Chlorine Residual Secondary Standards**   |  |  | | --- | --- | | **Standard** | **Acceptable Range of Chorine Residual (mg/L)** | | 1-low | 0.21 + 0.09 | | 2-low | 0.92 + 0.1 | | 3-low | 1.62 + 0.14 | | 1-high | 2.1 + 0.2 | | 2-high | 3.8 + 0.3 | | 3-high | 6.7 + 0.6 | | **Note: This table varies for each set of standards. Check the table that is supplied with the standards.** | | | |
| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure**  **Field Measurement of Free and Total Chlorine (Cont.)** | |
| **Sample Collection Steps**   1. Remove tap aerator (if present). 2. Put on required safety gear (e.g. gloves and safety glasses). 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Turn the water down to a thin stream (about the width of a pencil), then let the water run 1 minute. 5. Do not bleach the tap prior to field measurements of chlorine. 6. Rinse the sample vial thoroughly with tap water and discard. 7. Collect samples for field measurement. | |
| **Sample Measurement Steps**   1. Measure chlorine using Standard Method 4500-Cl G, DPD Colorimetric Method (APHA 2012). 2. Zero the chlorine meter: 3. Rinse an empty vial thoroughly with sample water then fill with sample water. 4. Dry the vial and place in chlorine meter to zero. 5. Take chlorine reading: 6. Rinse the same vial thoroughly with sample water and fill with sample water. 7. Discard excess water until the water level reaches the line on the vial and dry the vial. 8. Add reagent packet, place cap on the vial, and invert the vial several times to mix the reagent with the sample water. (*Do not mix by shaking the vial vigorously as this may introduce air bubbles into the sample. Do not use fingers to cover vial.)* 9. Wait 3 minutes before taking reading. 10. Place the vial in the meter and put the cover on. 11. Press the “read” button and read the chlorine measurements using the meter’s low range and then high range. Record measurements in log book or computer.   If sample is out of range (*meter may flash or give message*), empty the vial, rinse with sample water, and repeat the procedure, taking the measurement with the meter’s alternate range. | |
| **Reporting**   1. Record field measurements in log book or computer and chain-of-custody form (if lab samples are also collected). 2. Report any free or total chlorine residual less than 0.10 mg/L as Non Detect (ND). 3. Notify water system manager immediately if chlorine measurement is >4 mg/L or ND. | |
| **References**  American Public Health Association. 2012. Method 4500-Cl G, DPD Colorimetric Method. In *Standard Methods for the Examination of Water and Wastewater*. 22nd Edition.  USEPA. 2009. *Method 334.0, Determination of Residual Chlorine in Drinking Water Using an On-line Chlorine Analyzer*. EPA 815-B-09-013. | |

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| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure** Field Measurement of Conductivity | |
| **Planning Steps (see General SOP for additional steps)**   1. Prepare the conductivity meter for use by following manufacturer’s directions. 2. Use a conductivity standard solution (e.g., potassium chloride (KCl) or sodium chloride (NaCl)) to calibrate the meter for the expected range of measurements. See manufacturer’s directions or Standard Method 2510B for directions on preparing a standard solution. | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * Conductivity meter with built-in temperature sensor * Meter manual * Standard solution (KCl or NaCl) * Plastic sample bottles, 100-200 mL | |
| **Calibration Verification Steps**   1. At start of sample run, check the conductivity meter calibration by following instructions in the meter user manual. Typical instructions are as follows: 2. Rinse probe thoroughly with deionized water, and blot dry with lab wipe or paper towel. 3. Place probe into a wide mouth sample jar containing approximately 1/2 inch of sodium chloride standard solution with a conductivity value in the same range as the sample. 4. Perform the conductivity measurement as described in the meter user manual. 5. Check that conductivity measurement is within the accuracy limits as listed on the standard solution label. 6. If the check is not satisfactory, calibrate the meter using directions in the meter user manual and repeat steps above with a fresh standard solution. 7. If calibration check fails a second time, clean the probe with a diluted 1:1 hydrochloric acid solution to remove mineral build-up, and repeat steps above. 8. If calibration check fails a third time, replace the probe and repeat steps above. | |
| **Sample Collection and Measurement Steps**   1. Remove tap aerator (if present). 2. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 3. Turn the water down to a thin stream (about the width of a pencil), and let it run 1 minute. 4. Put on required safety gear (e.g. gloves and safety glasses). 5. Collect sample. 6. Rinse the probe thoroughly with deionized water. 7. Select the appropriate conductivity range. 8. Wait 2.5 to 3.5 minutes. 9. Read the sample conductivity and note temperature to + 0.1 degrees C. 10. If conductivity reading is in the lower 10 percent of the range, switch to the next lower range and take a reading. 11. Rinse the probe thoroughly with deionized water after each measurement. | |
| **Reporting**   1. Record field measurements in log book or computer and chain-of-custody form. | |
| **References**  American Public Health Association. 2012. Method 2510 Conductivity. In *Standard Methods for the Examination of Water and Wastewater*. 22nd Edition. Method 2510 Conductivity. | |
| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure**  **Collection of Alkalinity Samples for Laboratory Analysis** | |
| **Planning Steps (see General SOP)**   1. Holding time: samples should be analyzed within 14 days. | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * 500 mL plastic bottles | |
| **Sample Collection Steps**   1. Remove tap aerator (if present). 2. Put on sterile gloves. 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Turn the water down to a thin stream (about the width of a pencil), then let the water run 1 minute. 5. Rinse the sample bottle thoroughly with tap water. 6. Collect 500 mL samples for laboratory analysis. | |
| **Sample Collection Steps for Field Blank Samples**  Immediately after collecting the routine compliance samples, use the same tap to collect one field blank sample per sample set and send it to the laboratory for analysis with other samples.   1. Label bottle “Field Blank” (see General SOP). 2. Put on sterile gloves. 3. Fill 500 mL sample bottle with deionized water. 4. Place sample bottle in Ziploc bag, and store in iced cooler. | |
| **Reporting**   1. Chain of custody form (see General SOP). | |
| **References**  American Public Health Association. 2012. Method 2320 Alkalinity. In *Standard Methods for the Examination of Water and Wastewater*. 22nd Edition. | |

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| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure** Collection of Orthophosphate Samples for Laboratory Analysis | |
| **Planning Steps (see General SOP for additional steps)**   1. Sample preservation is not required. 2. Maximum sample holding time before analysis is 48 hours. | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * Plastic sample bottles (200 mL minimum) | |
| **Sample Collection Steps**   1. Remove tap aerator (if present). 2. Put on required safety gear (e.g. gloves). 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Turn the water down to a thin stream (about the width of a pencil), then let the water run 1 minute. 5. Rinse the sample bottle thoroughly with tap water. 6. Collect samples and field duplicate samples in plastic bottles for laboratory analysis. 7. Store samples in cooler and ship to laboratory. Samples must be stored at 4 degrees C until analyzed. | |
| **Sample Collection Steps for Field Blank Samples**  Immediately after collecting the routine compliance samples, use the same tap to collect one field blank sample per sample set and send it to the laboratory for analysis with other samples.   1. Label bottle “Field Blank” (see General SOP). 2. Put on sterile gloves. 3. Fill sample bottle with deionized water. 4. Place sample bottle in Ziploc bag, and store in iced cooler. | |
| **Reporting**   1. Chain of custody form (see General SOP). | |
| **References**  EPA. 1993. Method 300.0 Determination of Inorganic Anions by Ion Chromatography. Revision 2.1. August 1993. Cincinnati, OH: EPA Office of Research and Development, Environmental Monitoring Systems Laboratory. | |

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| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure** Collection of Fluoride Samples for Laboratory Analysis | |
| **Planning Steps (see General SOP for additional steps)**   1. Sample preservation is not required. 2. Maximum sample holding time before analysis is 28 days. | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * Plastic sample bottles (200 mL minimum) | |
| **Sample Collection Steps**   1. Remove tap aerator (if present). 2. Put on sterile gloves. 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Turn the water down to a thin stream (about the width of a pencil), then let the water run 1 minute. 5. Rinse the sample bottle thoroughly with tap water. 6. Collect samples and field duplicate samples in plastic bottles for laboratory analysis. 7. Pack samples in cooler. | |
| **Sample Collection Steps for Field Blank Samples**  Immediately after collecting the routine compliance samples, use the same tap to collect one field blank sample per sample set and send it to the laboratory for analysis with other samples.   1. Label bottle “Field Blank” (See General SOP). 2. Put on sterile gloves. 3. Fill sample bottle with deionized water. 4. Place sample bottle in Ziploc bag, and store in iced cooler. | |
| **Reporting**   1. Chain of custody form (see General SOP). | |
| **References**  EPA. 1993. Method 300.0 Determination of Inorganic Anions by Ion Chromatography. Revision 2.1. August 1993. Cincinnati, OH: EPA Office of Research and Development, Environmental Monitoring Systems Laboratory. | |

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| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure** Collection of Coliform Bacteria Samples for Laboratory Analysis | |
| **Planning Steps (see General SOP for additional steps)**   1. Note that samples should be delivered to the laboratory within 30 hours of sample collection (maximum 8 hour holding time if fecal coliform analysis is used instead of *E. coli*). | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * Germicidal wipes or dilute bleach solution (1:6) * Sterile 125 mL sample bottles containing sodium thiosulfate preservative placed in Ziploc bags or plastic seals to ensure sterile conditions. * Extra Ziploc bags * Custody seals | |
| **Sample Collection Steps for Routine Compliance Samples (adopted from Standard Methods, 22nd Edition, part 9060A)**   1. Label bottle per General SOP. 2. Remove the aerator from the sample faucet (if present). 3. Put on sterile gloves. 4. Open cold water valve completely and flush line with water running for 3 to 5 minutes. 5. Turn off the water and thoroughly clean inside and around faucet with germicidal wipe or a dilute bleach solution (1:6). 6. Open cold water valve completely again and reflush line for 1 minute. 7. Reduce water flow rate to a thin stream (about the width of a pencil) for actual sample collection. The rate should be low enough to accurately fill to the 100 mL mark, avoid dislodging material from the pipe wall, and avoid splashing during the fill. 8. Remove plastic seal and cap from sterile bottle. Place bottle under the steady stream of water from the faucet. Do not touch inside of bottle and do not place the cap on any surface; cap must be held while collecting sample. Do not pre-rinse sample bottle as preservative will be lost. 9. Fill the bottle with water to the 100 mL mark, do not fill completely (leave approximately 1 inch of airspace). 10. Cap bottle. 11. Place sample bottle in Ziploc bag, and store in iced cooler. | |
| **Sample Collection Steps for Field Blank Samples**  Immediately after collecting the routine compliance samples, use the same tap to collect one field blank sample per sample set and send it to the laboratory for analysis with the other samples.   1. Label bottle “Field Blank” (See General SOP). 2. Put on sterile gloves. 3. Remove plastic seal and cap from sterile bottle. Fill bottle with deionized water to the 100 mL mark (leave approximately 1 inch of airspace). Do not touch inside of bottle and do not place the cap on any surface, cap must be held while collecting sample. Do not pre-rinse sample bottle as preservative will be lost. Cap bottle. 4. Place sample bottle in Ziploc bag, and store in iced cooler. | |
| Water System Name  PWSID | Revision Date  Revision No. |
| **Standard Operating Procedure**  **Collection of Coliform Bacteria Samples for Laboratory Analysis (Cont.)** | |
| **Sample Collection Steps for Repeat Compliance Samples (adopted from Standard Methods, 22nd Edition, part 9060A)**  *For each positive total coliform (TC) sample, a set of repeat samples must be collected from the TCR site as well as the upstream and downstream locations and analyzed for total coliforms. If total coliforms are detected in any repeat sample, another set of repeat samples must be collected. Sampling methods for repeat samples are the same as for routine compliance samples.*  *For any routine or repeat TC sample that is positive, analysis for fecal coliform must be performed (E. coli can be tested in lieu of fecal coliforms). DC Water analyzes for E. coli because it is considered to be more directly related to external fecal contamination than fecal coliform, and does not typically reside in the biofilm on distribution system piping.* | |
| **Reporting**   1. Chain of custody form (see General SOP). | |
| **References**  American Public Health Association. 2012. Standard Methods for the Examination of Water and Wastewater. 22nd Edition. | |

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| Water System Name  PWSID | Revision Date  Revision No. | |
| **Standard Operating Procedure** Collection of TTHM and HAA5 Samples for Laboratory Analysis | | |
| **Planning Steps (see General SOP for additional steps)**   1. For Stage 2 Disinfection Byproducts Rule (DBPR) compliance, collect dual sample sets (i.e. TTHM and HAA5 samples must be collected at the same time). 2. Receive a trip blank sample from the laboratory. Mark bottle “Trip Blank” and place it in cooler that will be used to collect the day’s samples. 3. If water samples will contain a free chlorine residual, sample vials for haloacetic acid (HAA5) must contain 5 mg of ammonium chloride (crystalline or granular) to convert the free chlorine residual to a combined residual (chloramine). 4. If water samples will contain a combined chlorine residual, sample vials do not need to be prepared with ammonium chloride. 5. Note that synthetic ice is not recommended with DBP samples. 6. Maximum sample holding time is 14 days prior to extraction. | | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * For total Trihalomethane (TTHM) samples: pre-cleaned, 40-mL to 120-mL screw cap glass vials (amber or clear glass) with Teflon-faced silicone septum, containing dechlorinating agent (e.g., ascorbic acid or sodium thiosulfate). * For HAA5 samples: pre-cleaned, 50 mL or 250 mL amber glass bottles/vials with Teflon-lined screw caps (50 mL vials for EPA Methods 552.2 and 552.3; 250 mL bottles for EPA Method 552.1). Include 5 mg ammonium chloride per 50-mL bottle/vial if free chlorine residual is present. * Trip blank sample (supplied by laboratory). * 1:1 hydrochloric acid and dropper. * Clean Ziploc bags to hold sample bottle(s). | | |
| **Sample Collection Steps for TTHM (including field duplicate samples)**   1. Remove aerator (if present). 2. Put on sterile gloves. 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Reduce flow (pencil width), and let water run 1 minute. 5. Remove cap and fill vial to ½ inch from top. 6. Adjust the pH of the sample to <2 by adding 2 drops of 1:1 hydrochloric acid (note: this step can be omitted if sodium thiosulfate is used as the dechlorinating agent). 7. Finish filling the sample vial until a meniscus is formed. 8. Recap the vial, invert a few times, and inspect for air bubbles. 9. If air bubbles are present, remove cap and fill with water from tap until there is no headspace. 10. Repeat last step until no air bubbles are present. 11. Fill the next vial using the same procedure. 12. Place vials in a Ziploc bag and place in the cooler. 13. Keep trip blank sample (provided by laboratory) in cooler with field samples. 14. Maintain sample temperature <4 degrees C until analysis. Samples must be stored no longer than 14 days (for some methods it is 14 days until extraction) in a storage area that has no direct or intense light, and free of organic solvent vapors. | | |
| Water System Name  PWSID | Revision Date  Revision No. | |
| **Standard Operating Procedure**  **Collection of TTHM and HAA5 Samples for Laboratory Analysis (Cont.)** | | |
| **Sample Collection Steps for HAA5 (including field duplicate samples)**   1. Remove aerator (if present). 2. Put on sterile gloves. 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Reduce flow (pencil width), and let water run 1 minute. 5. Remove cap and fill bottle/vial to overflowing, taking care to not to flush out the ammonium chloride (if present). 6. If the bottle/vial contains ammonium chloride, cap the bottle/vial and agitate it by hand for 1 minute. 7. If the bottle/vial does not contain ammonium chloride, cap it, invert it a few times, and check for air bubbles. If air bubbles are present, remove cap and fill with water from tap until there is no headspace. Repeat last step until no air bubbles are present. 8. Place bottles/vials in a Ziploc bag and place in the cooler. 9. Keep trip blank sample (provided by laboratory) in cooler with field samples. 10. Maintain sample temperature <4 degrees C until analysis. Samples must be stored no longer than 14 days in a storage area that has no direct or intense light. | | |
| **Sample Collection Steps for Field Blank Samples**  Immediately after collecting the routine compliance samples, use the same tap to collect one field blank sample for TTHM analysis and one for HAA5 analysis and send them to the laboratory with the other samples.   1. Label bottle “Field Blank” (See General SOP). 2. Put on sterile gloves. 3. Fill sample bottle/vial with deionized water. Do not pre-rinse sample bottle/vial as preservative will be lost. Cap bottle/vial. 4. Place sample bottle/vial in Ziploc bag, and store in iced cooler. | | |
| **Reporting Steps**   1. Chain of custody form (see General SOP). | | |
| **References**  EPA. 1992. Method 552.1 Determination of Haloacetic Acids and Dalapon in Drinking Water by Ion-Exchange Liquid-Solid Extraction and Gas Chromatography with an Electron Capture Detector. Revision 1.0. Edited by J.W. Hodgeson and D. Becker. Cincinnati, OH: USEPA Office of Research and Development (ORD), Environmental Monitoring Systems Laboratory.  EPA. 1995a. Method 524.2 Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry. Revision 4.1. Edited by J.W. Munch (EPA). Cincinnati, OH: USEPA ORD National Exposure Research Laboratory (NERL).  EPA. 1995b. Method 552.2 Determination of Haloacetic Acids and Dalapon in Drinking Water by Liquid-Liquid Extraction, Derivatization and Gas Chromatography with Electron Capture Detection. Revision 1.0. Edited by D.J. Munch (EPA), J.W. Munch (EPA), and A.M. Pawlecki (International Consultants, Inc.). Cincinnati, OH: USEPA ORD NERL.  EPA. 2003. Method 552.3 Determination of Haloacetic Acids and Dalapon in Drinking Water by Liquid-Liquid Microextraction, Derivatization, and Gas Chromatography with Electron Capture Detection. Revision 1.0. EPA 815-B-03-002. July 2003. Cincinnati, OH: USEPA OGWDW. | | |
| Water System Name  PWSID | | Revision Date  Revision No. | |
| **Standard Operating Procedure** Collection of Nitrate and Nitrite Samples for Laboratory Analysis | | | |
| **Planning Steps (see General SOP for additional steps)**   1. Note that no sample preservation is required when collecting separate samples for nitrate and nitrite analysis. If samples are collected for combined nitrate/nitrite analysis, samples are preserved with concentration sulfuric acid to a pH<2. 2. Note maximum sample holding times before analysis is 48 hours. | | | |
| **Equipment and Supplies (see General SOP for additional equipment and supplies)**   * Plastic sample bottles (200 mL minimum) * Labels * Ziploc bags that fit sample bottles | | | |
| **Sample Collection Steps**   1. Remove tap aerator (if present). 2. Put on required safety gear (e.g. gloves and safety glasses). 3. Turn on cold water only and let run with a steady stream for 3 to 5 minutes. 4. Turn the water down to a thin stream (about the width of a pencil), then let the water run 1 minute. 5. Remove cap from sample bottle, fill to line, and recap. 6. Place sample bottle in a Ziploc bag and store in cooler. Maintain sample temperature <4 degrees C until analysis. | | | |
| **Sample Collection Steps for Field Blank Samples**  Immediately after collecting the routine compliance samples, use the same tap to collect one field blank sample per sample set and send it to the laboratory for analysis with other samples.   1. Label bottle “Field Blank” (See General SOP). 2. Put on sterile gloves. 3. Fill sample bottle with deionized water. 4. Place sample bottle in Ziploc bag, and store in iced cooler. | | | |
| **Reporting**   1. Chain of custody form (see General SOP). | | | |
| **References**  EPA. 1993. Method 300.0 Determination of Inorganic Anions by Ion Chromatography. Revision 2.1. August 1993. Cincinnati, OH: EPA Office of Research and Development, Environmental Monitoring Systems Laboratory. | | | |