TIDAL METHODS MANUAL

Chesapeake Monitoring Cooperative

Produced by the Chesapeake Monitoring Cooperative

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Contributors
This document was created through a collaborative effort of three organizations: The Alliance for the Chesapeake Bay, Alliance for Aquatic Resource Monitoring, and the University of Maryland Center for Environmental Science. The authors want to thank Mary Ellen Ley and James Beckley for their expert reviews of these protocols.

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Acknowledgments

Much of this manual was adapted with permission from the following sources:

RiverTrends Volunteer Water Quality Monitoring Manual. (2012). The Alliance for the Chesapeake Bay

Virginia Citizen Water Quality Monitoring Program Methods Manual. (2007).Virginia Department of Environmental Quality

EcoCheck. (2011). Sampling and data analysis protocols for Mid-Atlantic tidal tributary indicators. Wicks EC, Andreychek, ML, Kelsey RH, Powell SL (eds). IAN Press, Cambridge, Maryland, USA.

EcoCheck. (2013). Sampling and data analysis protocols for Mid-Atlantic non-tidal stream indicators. Wicks EC, Fries AS, Kelsey RH, (eds). IAN Press, Cambridge, Maryland, USA.

Chemical Monitoring Manual, (2010). Alliance for Aquatic Resource Monitoring

U.S. EPA. 1997. Volunteer Stream Monitoring: A Methods Manual. EPA 841-B-97-003.

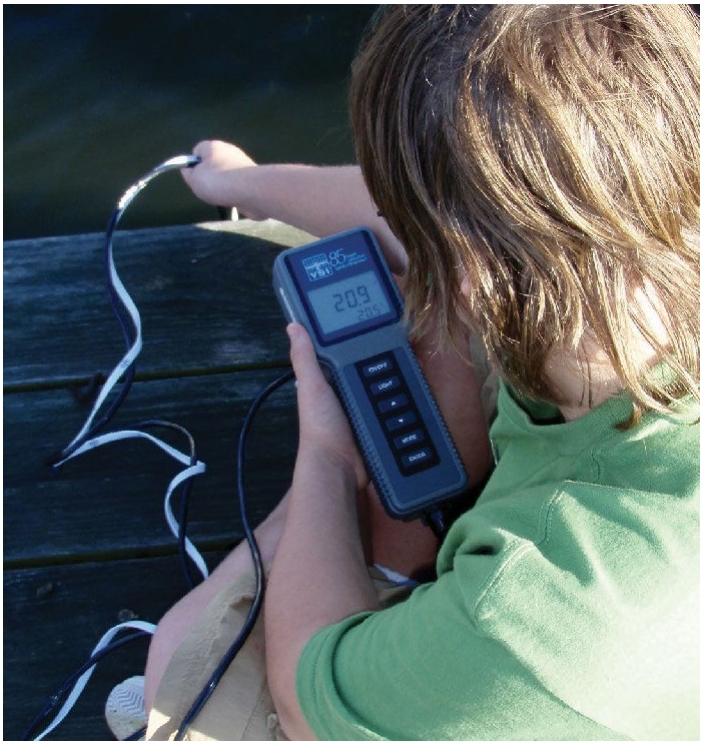
U.S. EPA. 1996. Recommended Guidelines for Sampling and Analyses in the Chesapeake Bay Monitoring Program. EPA 903-R-96-006.

Front cover photo credit: Chesapeake Bay Program.

Introduction

We rely heavily on the Chesapeake Bay and all its tributaries for our drinking water, food sources, recreation, and navigation. Since the initiation of the Chesapeake Bay Program in 1983, the communities in the watershed have been working towards improving the health of these waters. A significant portion of that work is tracking our progress through water quality monitoring. There are many sources of water quality data—including data collected by volunteers, local governments, conservations districts, and nongovernmental groups such as academia and watershed organizations that are not currently being used by the Chesapeake Bay Program to track Bay health and determine success of restoration efforts.

The Alliance for the Chesapeake Bay (ACB), Izaak Walton League of America (IWLA), Dickinson College's Alliance for Aquatic Resource Monitoring (ALLARM), and the University of Maryland Center for Environmental Science Integration and Application Network (IAN), have partnered to create the Chesapeake Monitoring Cooperative (CMC). The CMC provides technical, logistical, and outreach support for the integration of volunteer and citizen-based water quality and macroinvertebrate monitoring data into the Chesapeake Bay Program (CBP) partnership.



Credit: Peter Bergstrom

This is the first effort to integrate citizen science water quality data, that will inform policy management and water quality assessments, into a federal program. Not only are these data available to the CBP through the Chesapeake Data Explorer, but are also accessible to the public, local governments, universities, and others. The contributions of data by volunteer and citizen-based monitoring groups to the CMC and CBP monitoring network will provide valuable information that supports shared decision-making, adaptive management, and measuring progress towards the 2014 Chesapeake Bay Watershed Agreement.

Goals of the Chesapeake Monitoring Cooperative

- To build a cooperative network of volunteer and non-traditional monitoring groups that shares their water quality data with their local communities, the public, and the Chesapeake Bay Program.
- Provide technical assistance and support to monitoring groups and individuals to collect, analyze, and communicate about water quality data.
- Build relationships between the Chesapeake Bay Program Partnership and the volunteer water quality monitoring community.
- Develop consistent monitoring and training protocols, technical guidance, data gathering tools, quality assurance mechanisms, and data analysis and communication tools.
- Provide training and technical support to monitoring groups in order to ensure provision of consistent, high quality data to the Chesapeake Bay Program.

Credit: Will Parson/Chesapeake Bay Program

Purpose of this manual

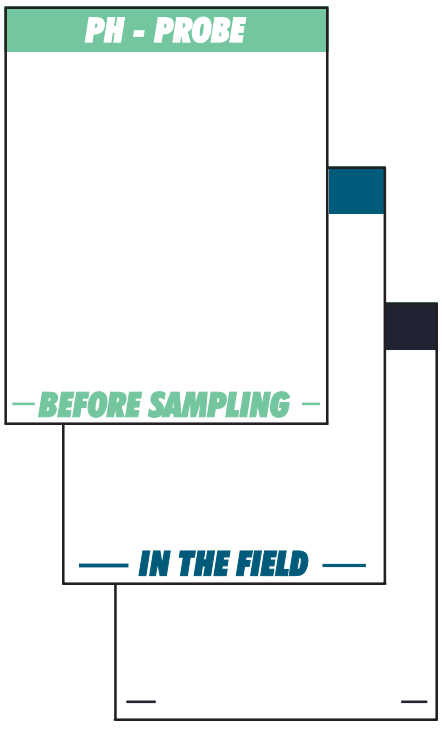
This manual was developed to support the wide variety of monitoring programs and research questions that communities have throughout the Chesapeake Bay watershed. The manual is intended to support the work of the Chesapeake Monitoring Cooperative and supply methodology for a large number of popularly used protocols and parameters in order to provide a menu of options to volunteers and monitoring groups.

This manual in no way can cover all the protocols and parameters that are used by volunteer water quality monitoring programs, nor does it suggest that a monitoring group should adopt each and every one of these parameters. Monitors that are coordinating with the Chesapeake Monitoring Cooperative are encouraged to have a conversation with their monitoring coordinator about which protocols and parameters will be most helpful for understanding their questions about water quality in their own community. A thoroughly thought out monitoring plan makes for sound science!

How this manual is organized

This manual is designed to be modular; this means that you can pull it apart into only the pieces that you need and it should still function as helpful step-by-step directions to successfully collect sound water quality data. Sections are numbered on the bottom of the page to help you keep the pieces assembled in order.

The manual is broken into two main sections: introductory materials that help you understand what you need and how to prep before getting out into the field, and the methods themselves. Each method is broken into three sections: before sampling, in the field, and after sampling. These method sections are marked by green, navy, and black footers, respectively. If you want to narrow down the amount of paper that you take with you in the field, you can pull out all the sheets for your methods that have a navy header and footer labeled “in the field”.



How the manual is organized

NOTE

There are notes highlighted in green (like this one) to remind you of important things such as safety, replicates, and best practices. Be sure to read these and take note of their contents.

Each method will have a few options for how to approach sampling. You will need to work with your monitoring coordinator to define the options that work for your monitoring plan.

In order to help you pin point what piece of a method you will be using, there are visual buttons to help you quickly find what you need.

Blue circular buttons represent the collection tool that you will use to collect your sample, including probe, bottle, or Secchi. The sampling pole and bucket methods assist in collection if direct collection is not possible at the site.

Green circles represent the sample methods from which you will be collecting your samples, including wading in the waterway, from a boat, from a bridge, and from a dock. If you are sampling from the shore, try to take note of the method for wading into the waterway and apply those concepts to your sampling.

TOOLS

Probe

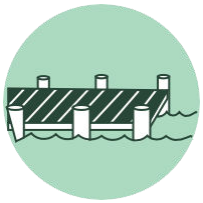
Secchi disk

Bucket

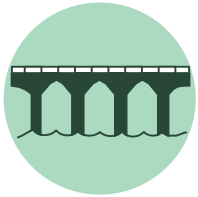
Sampling pole

SAMPLE METHODS

Boat



Dock



Bridge

Wade in

Field safety tips

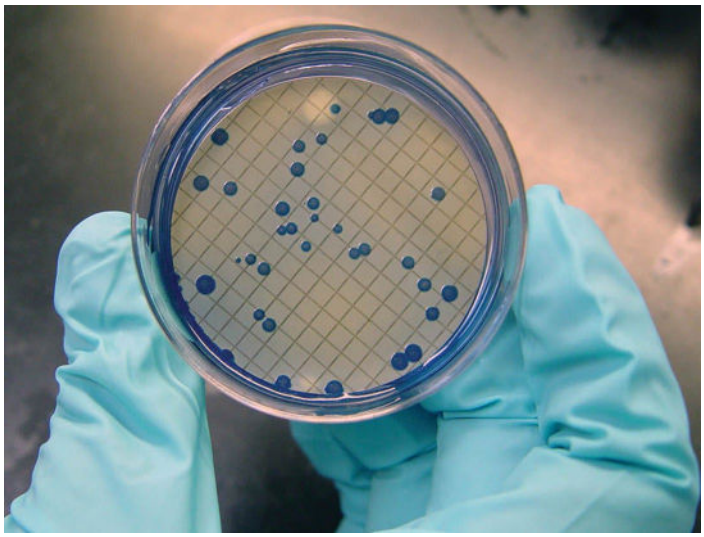
SAFETY CONSIDERATIONS WHEN VISITING YOUR MONITORING SITE

CMC recommends that you visit your monitoring site(s) with a partner, or at a minimum, notify someone when you leave your house (and return) from monitoring. You should always put safety considerations first, and should never monitor when you feel ill, during inclement weather (especially snowy or icy conditions), or under high-flow conditions. Take caution when entering and exiting the waterway and wear waders or close-toed shoes. It is good practice to have a first aid kit available to attend to cuts and scrapes.

SAFETY CONSIDERATIONS WHEN TESTING YOUR WATER SAMPLES

Before you begin testing your water sample, read through all of the instructions first to familiarize yourself with the procedures and to note any precautions that should be taken. Some of the reagents found in the water quality kits are classified as toxic, hazardous materials, and extra caution should be taken when using the reagents, including:

- Avoid skin, eye, nose, and mouth contact with all reagents.
- Wear safety glasses and latex or nitrile gloves for extra protection.
- Do not breathe in any dust, mist, or vapors.
- Immediately wash your hands after testing your water sample.
- Do not eat, drink, or smoke while testing your water sample.
- Do not dispose of reagents or waste on the ground or in the waterway. If permitted, pour the waste down your sink while flushing with cold tap water. Hazardous waste generated from some kits must be collected and given to your monitoring coordinator for proper disposal.
- If an accident or spill occurs while testing your sample, follow the first aid and clean-up procedures listed in the directions.



Credit: UMCES

Field safety tips

SAFETY CONSIDERATIONS WHEN CLEANING YOUR EQUIPMENT

Cleaning your equipment after each use is very important. Dirty glassware can signifigantly affect the results, which defeats the quality assurance measures built into the monitoring program. Follow all cleaning instructions for the specific parameter and equipment layed out in this manual. If the protocol calls for cleaning with lab-grade soap or a 10% hydrochloric acid solution, keep the following in mind:

- Avoid skin, eyes, nose, and mouth contact with the cleaning agent.
- Wear safety glasses and latex or nitrile gloves for extra protection.
- Do not breathe in any dust, mist, or vapors.
- Immediately wash your hands after cleaning your equipment.
- Do not eat, drink, or smoke while cleaning your equipment.

SAFETY CONSIDERATIONS WHEN STORING YOUR EQUIPMENT

Use the following best practices when storing your monitoring equipment and supplies:

- Store equipment in a dry, cool, well-ventilated place away from combustible materials and out of reach from children and pets.

Credit: Will Parson / Chesapeake Bay Program

Credit: UMCES

Best practices for monitoring

BEFORE GOING OUT INTO THE FIELD

- Samples should be taken at regular, weekly or monthly intervals, so choose a regular sampling day that is convenient for you. If it is not possible to sample on the same day each week, try to sample within 2 days (either side) of your regular day. Also, try to sample at the same time of day each time you go out.
- Always check your equipment before heading out into the field. Look for wear and tear that might affect the quality of your measurements. Make sure batteries are charged or carry a backup with you.
- Perform your calibration and standardization checks before you go out into the field.
- If you are not accessing a site that is public be sure to get a signed landowner permission form and mail a copy to your monitoring coordinator. A blank copy of the landowner permission form is located at the end of this manual.

IN THE FIELD

- Sample with a buddy. It is always better to have an extra pair of hands and another person to help out in a hard or dangerous situation.
- Always sample from the same location and using the same sample method. If you do move your site please let your monitoring coordinator know so that the site information can be updated.
- Collect your samples in the following order:

    i. Air temperature
    ii. Bacteria
    iii. Water temperature
    iv. Dissolved oxygen (DO)
    v. pH
    vi. Salinity
    vii. Water clarity
    viii. Lab or nutrient grab samples
    ix. Chlorophyll *a*

Best practices for monitoring

- Record data on a field data sheet provided by the CMC. Always record the test results as you go along. Keep a copy of the data collected for your records and to provide a backup copy should the original be lost.
- The "Comments" section on your field datasheet can be used to record general observations about the site, especially changes due to erosion, recent notable weather, and any problems you had with the sampling procedures or equipment.
- Be sure to keep all samples that need to be kept cool in a cooler with ice. It is best to use regular ice, not frozen ice packs, you can place the ice in zip lock bags if needed. Do not allow your samples to be submerged under icy water, this could dilute your samples.

AT THE LAB OR AT HOME

- Process your samples in a timely manner. Follow the holding times chart on page 1-13 to know how long you have to process your sample after collecting.
- Shake-up your sample before dispensing it into your testing containers to make sure it is well mixed and representative of the collected sample.
- Clean your equipment and glassware. If your methodology requires that you clean your glassware with an acid wash, be sure to do so in a safe manner and location.
- Avoid prolonged exposure of equipment and reagents to direct sunlight. Protect them from extremely high temperatures. Protect them from freezing.

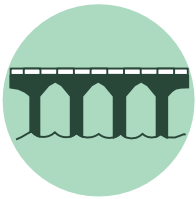
OVERALL

- Stay certified. Keep your monitoring certification up to date.
- Have fun!

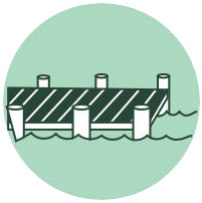
Sampling Methods

Water samples should be collected from the middle of the waterway or tributary at a point where the water is the deepest and, when possible, the flow is the fastest—do not sample stagnant water. The collection can be done by 1) wading into the waterway, 2) standing on a dock, 3) standing on a bridge, or 4) from a boat. If safety is an issue samples can be obtained from the streambank.

The sample method is chosen on a site by site basis based on accessibility. It is important that you use the same method of sample collection from the same location each time you monitor your site.

BRIDGE 

- Sample in the center of the main flow, or as close as you can get from the bridge.
- Sample from the upstream side of the bridge where contamination is least likely to occur. During rainy periods, avoid sampling where storm water runoff from the bridge can affect the sample.
- Pour rinses downstream or away from where you are sampling.

DOCK 

- From the end of the dock, sample as close as you can to the center of the main flow.
- Sample from the upstream side of the dock where contamination is least likely to occur. Be sure to avoid sampling downstream of any boats or other direct sources of contamination.
- Pour rinses downstream or away from where you are sampling.

Sampling Methods

BOAT

- Document GPS coordinates of the monitoring site to ensure the samples are collected within 10 meters of the original site location.
- Keep the boat steady as samples are being taken, this reduces drift and keeps any depth profile equipment lines vertical. If the current is too strong to keep the boat steady, an anchor may be placed to keep the boat at the correct location.
- Take all field measurements and grab samples from the upstream side of the boat to reduce contamination.
- Pour rinses on the downstream side of the boat.

WADING IN

- Always wade into the middle of the channel and then proceed a few steps upstream to allow the flow of water to push any disturbed sediment downstream of where you will be collecting the sample.
- Always pour rinses downstream of where you are standing or on the stream bank.
- If conditions are unsafe to enter the water, samples can be obtained from the streambank. Care should be taken to sample from an area that will most closely represent the entire stream. Typically, this will be the area of greatest flow and away from stagnant pools or eddies.

Sample Holding Times

When you collect a sample it must be processed and analyzed within a certain time window in order for it to be a valid sample. All samples should be kept cool in a cooler with ice or an ice pack, or in a refrigerator prior to processing. Use the following chart as a reference for the different holding times for each parameter.

Water Quality Parameter	Maximum Sample Holding Time
Alkalinity	24 hours
Bacteria (*E. coli*)	24 hours
Chlorophyll *a*	48 hours
Conductivity	28 days
Dissolved oxygen (Meter)	Immediately analyze
Dissolved oxygen (Winkler Titration)	Immediately acidify; Titrate within 8 hours
Enterococcus	24 hours
Nitrate-nitrogen	48 hours
Nitrite-nitrogen	48 hours
Total Nitrogen	48 hours
Orthophosphate	48 hours
Total Phosphorus	48 hours
pH	Immediately analyze
Salinity	28 days
Total dissolved solids	28 days*
Turbidity	24 hours
Water clarity	Immediately analyze
Water temperature	Immediately analyze

* Total dissolved solids are measured using a conductivity meter and are converted to total dissolved solids using a known conversion ratio factor, so sampling protocols for conductivity apply.

Data entry and management

As a CMC monitor you are required to electronically enter the water quality data that you collect to the Chesapeake Data Explorer. If you do not have access to a computer or the Internet and are unable to submit your data electronically, you may mail your datasheets to your monitoring coordinator for them to submit on your behalf.

Your monitoring coordinator needs to double check the data entered for any errors. We are all human and we make mistakes, so a strong part of the CMC is that we have incorporated a system of checks to make sure that the data made available on the CMC database is of the highest possible quality. By mailing your datasheets to your monitoring coordinator the CMC is able to check for data entry and potential equipment errors, as well as archive the sheets in a secure location.

Follow these steps to make sure your data are entered and checked so that you can share your data with the larger Chesapeake community:

1. Collect your water quality data and record it on your field datasheet. Be sure to fill out your field sheet in its entirety.
2. Enter your data on the Chesapeake Data Explorer (www.cmc.vims.edu). Your monitoring group will need to be registered and you will need to create an account to upload data.
3. Review your entered data to make sure it matches your field datasheet.
4. Submit your electronic data.
5. Mail your field data sheet to your monitoring coordinator for review and quality control check.
6. After your data has been quality checked it will be made available on the Data Explorer to the larger Chesapeake community.
7. Explore your data!

BACTERIA – COLISCAN EASYGEL

GATHERING MATERIALS AND EQUIPMENT LIST

- Coliscan Easygel Kit:
  - ✓ 30 mL sterile sample bottle
  - ✓ Coliscan Easygel media
  - ✓ Pretreated Coliscan petri dish
  - ✓ 1 mL pipette
- Bucket (if using)
- Sampling pole (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

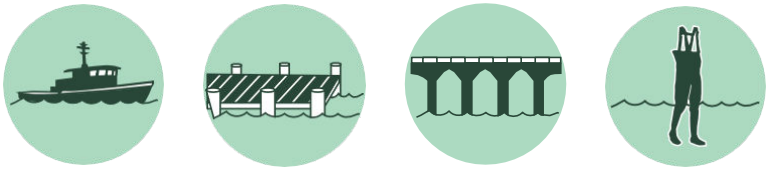
- Check to make sure your sample bottles have remained closed and uncontaminated.
- Prepare a cooler with ice or freezer packs to keep the samples cool during transport.
- Pre-label your sample bottles with your site ID, date, and replicate number (if applicable).

BACTERIA – COLISCAN EASYGEL

NOTE

Make sure you immediately place your samples on ice after collecting the sample. You can use a small cooler or insulated bag. Fill your cooler with regular ice, do not use frozen ice packs as they do not cool the sample fast enough. You can place the ice in a zip-lock bag if needed. Make sure the sample is not submerged under the ice and be careful to not freeze your sample.

A. SAMPLING METHOD: BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Un-cap the sterile and pre-labeled bottle without touching the inside of the lid or bottle.
2. Using a U motion, dip the bottle into the water down and away from yourself to the depth of about 0.3 m allowing the bottle to fill 3/4 full.
3. Cap the bottle and immediately place sample on ice in cooler (cooler temperature should be 1–4°C).

NOTE

If wading into the water to collect your sample, wade in first before un-capping your bottle.

II. Collecting using a bucket

1. Throw the bucket out as far as possible in the main channel and try not to disturb the bottom.
2. Rinse the bucket three times with sample water, pouring contents downstream of your sample location.
3. Fill the bucket with the sample water to ¾ full.
4. Un-cap the sterile and pre-labeled bottle without touching the inside of the lid or bottle.
5. Using a U motion dip the bottle into the bucket down and away from yourself allowing the bottle to fill ¾ full.
6. Cap the bottle and immediately place sample on ice in cooler (cooler temperature should be 1–4°C).

III. Collecting using a sampling pole

1. Secure your sterile pre-labeled bottle to the end of the pole.
2. Un-cap the bottle without touching the inside of the lid or bottle.
3. Extend the pole outward and dip at approximately 0.3 m below the surface, filling the bottle to ¾ full.
4. Cap the bottle and immediately place sample on ice in cooler (cooler temperature should be 1–4°C).

BACTERIA – COLISCAN EASYGEL

BACTERIA SAMPLE PLATING

Write the site designation, sample #, date, and time on the bottom of the Petri dish lid with a permanent marker. It is best to use small lettering on the outer rim of the dish.

1. Use proper technique to keep the pipette sterile: first, open the pipette packet bulb-side so that you do not contaminate the tip.
2. Gently mix the water sample in the sample bottle.
3. Pipette the desired volume (1.0–5.0 mL) of sample water directly into Coliscan media bottle and recap the bottle. Be careful not to let the bottle lid touch anything to prevent sample contamination.
4. Gently mix (do not shake) bottle of Coliscan media containing the sample water, and then pour the entire content into a Petri dish. Only open the Petri dish long enough to pour in the sample.
5. Gently swirl Petri dish so the Coliscan media covers the entire bottom.
6. Allow the media to solidify for approximately 60 minutes prior to incubation. (Amount of time will vary based on room temperature).
7. Put plates upside down (media on the top) in incubator and try to maintain at 37°C (98.6°F) for 24 hours.
8. If no incubator is available, place the dish in a safe, warm place out of direct sunlight, such as on top of a fridge or a water heater. Incubate for 48 hours.
9. Record the average incubator temperature on the datasheet as well as the number of hours that the plates were in the incubator or in ambient conditions.

NOTE

As soon as plates are removed from incubator, they must be scored.

BACTERIA SAMPLE PLATING

1. Place the Petri dishes on a white background or in natural sunlight. Count the number of dark blue (**NOT TEAL**) to purple (**NOT PINK**) colored colonies larger than pinprick size on each plate. Do not pay attention to halos around the dots, but only the center color.
2. Refer to the color guide on the following pages to help you identify colonies.
3. Record the number of colonies counted on your field datasheet.
4. Calculate the number of *E. coli* per 100 milliliters of water using the following equation:

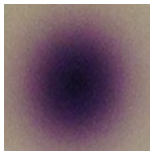
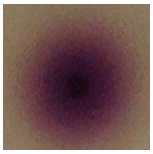
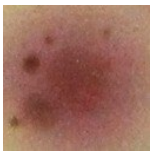
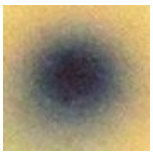
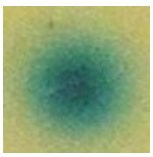
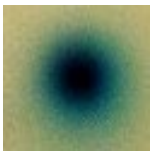
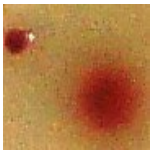
$$\textbf{Number of E. coli per 100 mL of water} = \frac{100}{\textbf{(mL of sample added)}} \times \textbf{Total number of colonies counted}$$

5. Record value on the datasheet. This is the value you will report in the Data Explorer.

EQUIPMENT CLEANING AND STORAGE

1. Throw used pipettes in the trash or recycling bin.
2. Rinse empty Coliscan bottles 2–3 times with tap water and dispose of in the trash can or recycling bin. (If media bottles are not rinsed, pathogens could grow in the remaining media.)
3. Place the plates in a zip-lock bag and add bleach or rubbing alcohol to each Petri dish to completely cover the solid media. Allow dishes to stand for at least 10 minutes to ensure all bacteria have been killed.
4. Place the plates and zip-lock bag in the trash.

BACTERIA – COLISCAN EASYGEL

E. coli		Not *E. coli*	
	Purple, with purple halo		White
	Purple, no halo		Pink, no halo
	Purple with pink halo		Pink with pink halo
	Blue with purple or pink halo		Pinpoints* (If after incubation period)
	Blue or dark blue, no halo		Teal green, no halo
	Dark blue with teal halo		Teal with teal halo
	Dark blue with blue halo		Red

*Do not count pinpoints if the plate is dominated by larger colonies. Pinpoints may be counted if they make up >50% of colonies. If possible, incubate a few additional hours to see if colonies will grow larger.

Courtesy of James Beckley, QA Coordinator of the Dept. of Environmental Quality, Richmond, VA

TEMPERATURE

GATHERING MATERIALS AND EQUIPMENT LIST

- Armored glass thermometer, digital thermometer, or probe
- Bucket (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

Check your thermometer or probe for optimal operation.

Traditional armored glass thermometer:

1. Check the column and confirm it is not separated.
2. Look for cracks or breaks in the glass.

Digital thermometer & probe:

1. Look for any bends in the metal or exposed wires.
2. Check the battery life.
3. Make sure all openings are tightly sealed.

Credit: Peter Bergstrom

CALIBRATION

You do not need to calibrate your thermometer before going into the field. But do not forget to have it checked once a year by your monitoring coordinator or CMC service provider.

TEMPERATURE

Air temperature

1. Locate a place near your site that is out of the direct sunlight.
2. Wait a few minutes to allow the thermometer to equilibrate (the value should not change in 10 seconds).
3. Record air temperature to the nearest 0.5°C for the armored thermometer or the readout listed on the digital thermometer or probe on your datasheet.

NOTE

Always measure air temperature before water temperature!

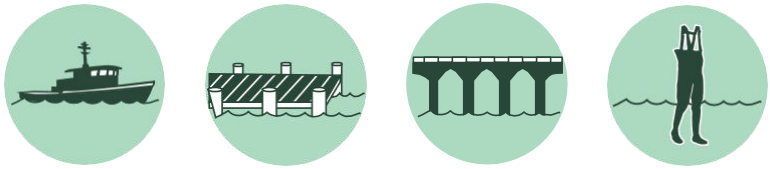
A wet thermometer can alter your air temperature readings.

NOTE

You can hang your thermometer in a shady place or have your partner hold the thermometer and let it equilibrate while taking your other samples.

Water temperature

SAMPLING METHOD: BOAT, DOCK, BRIDGE OR WADING



I. Measuring directly in the waterway

1. Place your thermometer 0.5 m beneath the surface of the water if sampling in Maryland or 1.0 m beneath the surface if sampling in Virginia. If you are unable to collect as these depths, due to equipment limitations, place the tip of the thermometer just below the surface of the water (approximately 0.3 m).
2. Wait for the thermometer to stabilize.
3. Record your temperature reading in Celcius and the depth at which it was measured.

II. Collecting using a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times with sample water collected downstream of your sample location.
3. Fill the bucket with sample water to ¾ full.
4. Hang or hold the thermometer in the bucket away from the sides or bottom of the bucket to minimize temperature drift.
5. Wait for the thermometer to stabilize.
6. Record your reading in Celcius and mark on your data sheet that the measurement was taken from a bucket.

POST-SAMPLE CHECK

You do not need to perform a post-sample check after sampling. Your thermometer should be checked annually against a standard NIST thermometer.

EQUIPMENT CLEANING AND STORAGE

1. Dry off all equipment.
2. Replace any protective caps.
3. Store armored glass thermometers upright to reduce column separation.
4. Store equipment in a cool dry place.

DISSOLVED OXYGEN - PROBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Various models of dissolved oxygen probes and meters (ex. Oakton, Extech, Hanna)
- Distilled or deionized (DI) water
- Bucket (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the probe for wear or damage.
- Make sure there is sufficient battery life for your field trip and check for battery leaks.
- Make sure all openings are sealed tight.
- Calibrate your meter within 24 hours of each sampling day.

CALIBRATION

The typical calibration is done using 100% saturation as the standard using clean DI water. Follow all the manufacturers specifications for calibrating your specific piece of equipment found in the users manual. Record all calibrations in logbooks for each instrument or directly on your field datasheet.

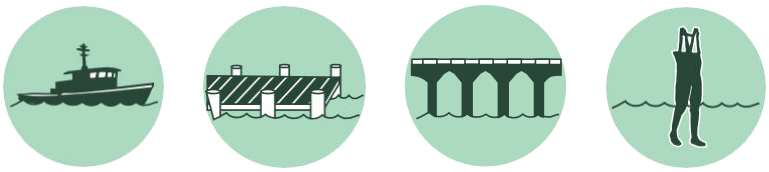
NOTE

Some probes may differ in displaying values. For DO probes, parts per million (ppm), and milligrams per liter (mg/L) are the same value. In addition, barometric pressure may be displayed in millibars (mBar) or in millimeters of mercury (mmHg).

Calibration readings should fall within +/- 0.50 mg/L of the calibration value or the meter should read "Calibration Successful". If the readings are outside the acceptable range, do not take field readings until the probe has been fixed and the calibration is successful.

DISSOLVED OXYGEN - PROBE

SAMPLING METHOD: BOAT, DOCK, BRIDGE OR WADING



I. Measuring directly in the waterway

1. Place your probe 0.5 m beneath the surface of the water if sampling in Maryland or 1.0 m beneath the surface if sampling in Virginia. If you are unable to collect at these depths, due to equipment limitations, place the tip of the probe just below the surface of the water (approximately 0.3 m).
2. Wait for the probe to stabilize.
3. Record your reading and the depth at which you recorded your reading.

II. Collecting using a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times with sample water collected downstream of your sampling location.
3. Fill the bucket with the sample water to ¾ full.
4. Place your probe in the bucket of water and gently swirl. Allow the reading to stabilize.

Credit: Peter Bergstrom

5. Record your reading on your datasheet. Mark on your data sheet that the measurement was taken from a bucket.

DISSOLVED OXYGEN - PROBE

POST-SAMPLE CHECK

After the sample run is complete, return the probe to the calibration station to perform a post-sample check. The post check consists of placing the probe in the DO calibration chamber and letting it equalize. This may take between 2–10 minutes depending on the condition of the probe. Calibrations after field sampling must be performed to check the response of each probe. Record calibration in logbooks for each instrument and/or sensor. The logbooks document all calibration, maintenance, and servicing information. Calibrations after field sampling should be performed indoors, but if performed outdoors, note that the dissolved oxygen value can be different than the pre-field calibration value. Follow all manufacturer specifications for calibration and maintenance.

EQUIPMENT CLEANING AND STORAGE

1. Follow manufacturer's instructions for cleaning and storing the probe.
2. Ensure the probe is cleaned and well maintained. After each sample run, rinse off the probe with distilled water. Use a soft cloth and gently dry the probe and sensor.
3. Store the probe tip in the cap provided by the manufacturer.
4. If the calibration or end of day check indicates there is a problem with the probe, and standard cleaning does not produce acceptable results, replacement of the sensor cap may be necessary. Contact a Project Team Member to get a replacement sensor cap.
5. Store the probe in a clean, cool, and dry space.

DISSOLVED OXYGEN - WINKLER

GATHERING MATERIALS AND EQUIPMENT LIST

- Sample bucket (if needed)
- LaMotte Dissolved Oxygen Test Kit
  - ✓ Water sampling bottles—60 mL glass (2)
  - ✓ Titration tubes with caps (2)
  - ✓ Titrator syringe
  - ✓ Manganous sulfate solution
  - ✓ Alkaline potassium iodide azide
  - ✓ Sulfuric acid 1:1
  - ✓ Sodium thiosulfate 0.025N
  - ✓ Starch indicator solution
  - ✓ Iodate iodide standard solution (10 mg/L DO equivalents)
  - ✓ Eye dropper

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

1. Check chemistry expiration dates, if chemicals are expired do not sample and contact your monitoring coordinator for replacements.
2. Check that your sample bottle, titration tube, and titrator syringe are clean, dry, and not showing cracks, wear, and tear.
3. Perform your sodium thiosulfate check (detailed below).

Credit: Alliance for the Chesapeake Bay

STANDARDIZATION

Sodium Thiosulfate Check

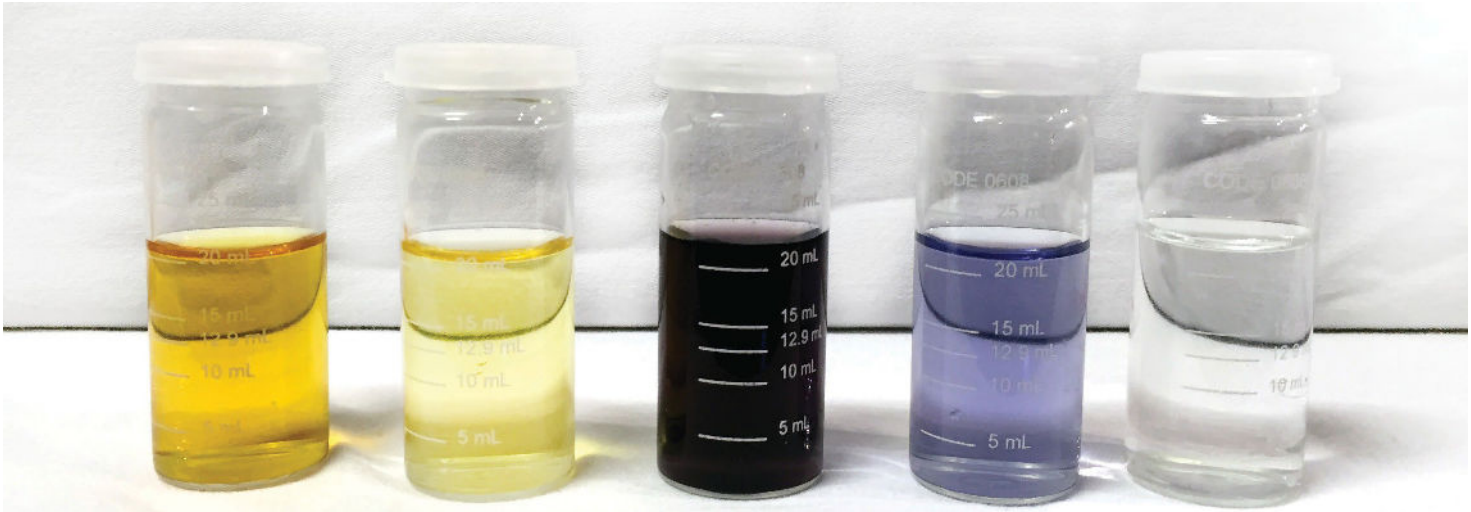
Prior to each sampling event (either the night before or the day of), you must run a test to make sure your sodium thiosulfate is still fresh and functional. sodium thiosulfate is fairly unstable and can very suddenly degrade, making it necessary to check it before each DO sampling. Perform this check at home before you go out. It is important to perform this check in a room temperature environment at 20°C.

1. Rinse the titrating tube (small glass vial with plastic lid that has a hole in it) with a small amount of Iodate-Iodide Standard Solution (in large amber bottle).
2. Pour into waste container and repeat step 1 two more times
3. Pour 20 mL of the Iodate-Iodide Standard Solution into the rinsed titrating tube. 20 mL is measured when the meniscus of the standard is right on top of the "20" line of the titrating tube. If excess solution is in the tube, remove it using the eyedropper and discard down the drain. Never insert the eye dropper or any other item into the amber bottle or discard excess solution back into the amber bottle as it will contaminate the solution, making it inaccurate.
4. Add 8 drops of 50% sulfuric acid (hold the bottle vertical to ensure equal drop size) to the 20 mL of solution and mix by swirling. Then place plastic cap (with hole in it) onto titrating tube.
5. Fill titrating syringe to the “0” mark with sodium thiosulfate.
6. Titrate using the sodium thiosulfate.
7. When solution turns a pale yellow color, but not clear:
    i. Remove cap, leaving syringe in cap.
    ii. Add 8 drops starch solution (white bottle). Swirl titration sample gently to mix to a uniform blue color. Recap glass tube and continue titration process.

Credit: Alliance for the Chesapeake Bay

Continued on next page...

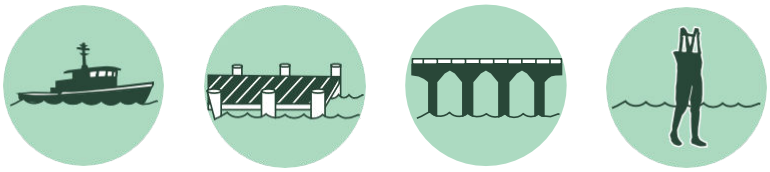
8. Continue slowly adding and mixing sodium thiosulfate until solution turns from blue to clear. When the solution starts to show clear water where the solution is being added, begin to add the sodium thiosulfate one drop at a time and mix well. The solution is nearing the endpoint and a very small amount of sodium thiosulfate will turn the water colorless
9. Place the titrating tube on or next to a white surface. Just as the solution turns completely clear with no trace of blue, stop the titration and remove the syringe. Read the results on the syringe.
10. Record your results on your field datasheet under the sodium thiosulfate check. If the result is within 9.4–10 mg/L, your sodium thiosulfate is good and you can collect your sample.
11. If results are less than 9.4 mg/L or greater than 10.0 mg/L, perform a 2nd test and record in the space on datasheet marked “2nd check”. If the second check is within the 9.4–10 range, do one final check. If the third check is within range, you record the two closest values and collect your sample.
12. If the second result is outside the 9.4–10 range, the sodium thiosulfate is bad and needs replacing. **Do not collect dissolved oxygen readings until fresh sodium thiosulfate is obtained and checked to be good.**
13. Dispose of solution in titrating tube and syringe by pouring it down the sink and flushing with additional tap water.



Credit: Alliance for the Chesapeake Bay

DISSOLVED OXYGEN - WINKLER

SAMPLE METHOD: BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Thoroughly rinse both water sampling bottles with the sample water, filling and dumping the waste water downstream three times before collecting your sample.

NOTE

Duplicate tests are run simultaneously on each sample to guard against error.

Do not forget to collect two samples with two sample bottles!

2. Using the first sample bottle, horizontally hold the bottle and submerge about ½ of the bottle opening allowing the water to gently flow into the bottle. Try to fill the bottle without causing a lot of bubbles.
3. As the bottle fills, gently lower the bottom of the bottle until the bottle is filled and fully submerged under water.
4. Turn the submerged bottle upright and tap the sides of the bottle to dislodge any air bubbles clinging to the inside of the bottle. Cap the bottle while it is still submerged.
5. Retrieve the bottle and turn it upside down to make sure that no air bubbles are trapped inside. If any air bubbles are present, empty the sample bottle downstream and refill. Fill the second sample bottle. Once two satisfactory samples have been collected, immediately proceed to steps to *FIX YOUR SAMPLE*.

II. Collecting using a bucket

1. Toss your bucket into the center of the waterbody. Be sure not to kick up any sediment or debris. Collect a sample of water, swish it in the bucket and toss it downstream.
2. Repeat step 1, two more times to thoroughly clean the bucket with sample water.
3. Thoroughly rinse both water sampling bottles with the sample water from the bucket, filling and dumping the waste water outside of the bucket three times before collecting your sample.
4. Using the first sample bottle, hold the bottle horizontal and submerge about ½ of the bottle opening allowing the water to gently flow into the bottle. Try to fill the bottle without causing a lot of bubbles.
5. As the bottle fills, gently lower the bottom of the bottle until the bottle is filled and fully submerged under water.
6. Turn the submerged bottle upright and tap the sides of the bottle to dislodge any air bubbles clinging to the inside of the bottle. Cap the bottle while it is still submerged.
7. Retrieve the bottle and turn it upside down to make sure that no air bubbles are trapped inside. If any air bubbles are present, empty the sample bottle downstream and refill. Fill the second sample bottle. Once two satisfactory samples have been collected, immediately proceed to steps to *FIX YOUR SAMPLE*.

NOTE

Duplicate tests are run simultaneously on each sample to guard against error.

Do not forget to collect two samples with two sample bottles!

DISSOLVED OXYGEN - WINKLER

FIX YOUR SAMPLE

1. Place both sample bottles on a flat surface and uncap. While holding the bottle vertical, add 8 drops of manganese sulfate solution (pink colored solution). Always add the manganese sulfate first.
2. Add 8 drops of alkaline potassium iodide solution (usually has a blue cap) to each sample bottle.
3. Cap each sample bottle and mix by inverting gently several times. A precipitate will form. Allow the precipitate to settle to the shoulder of the bottle.
4. Mix both bottles again and allow the precipitate to settle to the shoulder again.
5. Uncap the bottles and add 8 drops of the 50% sulfuric acid to both sample bottles.
6. Cap the bottles and gently shake using a waving motion ("making rainbows"), until both the reagent and the precipitate have dissolved. A clear yellow to brown orange color will develop. If brown flecks are present, keep mixing the samples until the flecks will not dissolve any further. Water that is below 10oC will may take considerably longer to fully dissolve the brown flakes.

NOTE

Following the completion of step 6, the samples have been "fixed," which means that dissolved oxygen cannot be added to the sample bottles. The titration procedure described in Titrate Your Sample may be performed at a later time (but must be performed within 8 hours of sample collection). This means that several samples can be collected and "fixed" in the field and then carried back to a testing station for the remaining steps.

Credit: Alliance for the Chesapeake Bay

DISSOLVED OXYGEN - WINKLER

TITRATE YOUR SAMPLE

1. Rinse the glass titration tube with about 5 mL of fixed solution twice to remove any residue from previous tests. Pour 20 mL of the fixed solution from one of the sample bottles into one of the glass titration tubes with its plastic cap removed. Fill to the white line so that the bottom of the meniscus (the curved surface of the liquid in the tube) rests on the top of the white line marked with at 20. The amount is critical so be sure to use the glass dropper to add or remove and discard excess sample solution from the tube. Do not place removed solution back into the sample bottle. Place cap on the tube.
2. Fill syringe (titrator) to the "0" mark with sodium thiosulfate solution. Be sure that there are no air bubbles in the syringe. Refer to kit manual for instructions on how to properly fill syringe.
3. To titrate the solution in the tube, insert the syringe into the cap of tube.
4. Add 3–4 drops of sodium thiosulfate to test tube and gently swirl the glass tube to mix.
5. Add another 3–4 drops of the sodium thiosulfate and swirl the tube. Continue this process until the yellow brown solution in the glass tube turns a pale yellow (lighter than the original yellow-brown solution but not clear). Once you reach this point, take the cap off while leaving the syringe in the cap.
6. Add 8 drops of starch solution to the glass titration tube. Gently swirl the tube to mix. The solution should turn from light yellow to dark blue.

Credit: Alliance for the Chesapeake Bay

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TITRATE YOUR SAMPLE

7. Recap the glass tube and continue the titration process with the sodium thiosulfate remaining in the syringe (as described in step 4 and 5). Once the solution turns light blue, start adding the sodium thiosulfate one drop at a time until until the test tube solution turns from blue to clear. This is the endpoint and can quickly occur, adding one drop at a time is crucial to get the accurate endpoint. If the solution turns blue again, ignore it. Do not add any more sodium thiosulfate than is necessary to produce this first color change.
8. Using the scale on the side of the syringe, read the total number of units of sodium thiosulfate used. Each line is 0.2 units. This number equals the number of parts per million (ppm) or milligrams per liter (mg/L) of dissolved oxygen in the water sample.
9. Carry out steps 1–8 on the second sample bottle and second glass tube.
10. Record the results of the two tests on the data sheet. If the difference between test 1 and test 2 is more than 0.6 mg/L, you should do a third test and record the two results which are within 0.6 mg/L.

Credit: Alliance for the Chesapeake Bay

NOTE

When the dissolved oxygen level is above 10 mg/L, the solution in the tube will still be blue when the plunger tip of the titrator reaches 10 units. If it reaches this 10 unit line, do not go beyond that line. Usually, this will only happen when the water temperature is cold. In this case, refill the syringe to the "0" line from the sodium thiosulfate bottle and continue adding a drop at a time and swirling until reaching the endpoint. Do not forget to add 10 mg/L to your final reading.

AFTER SAMPLE CALIBRATION CHECK

You do not need to perform a calibration check after sampling.

EQUIPMENT CLEANING AND STORAGE

1. Rinse your sample bottles, titration tubes, and caps with warm tap water three times and set out to dry. **DO NOT** use soap or any detergent products.
2. Dismantle your titrator syringe, rinse with water for 5 seconds and set to dry.
3. Store your chemicals in a cool dry place. They are sensitive to temperature fluxes and can expire early if not properly stored.

PH- PROBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Various models of individual pH probes and meters (ex. Hanna, LaMotte, Oakton, Extech)
- Distilled or deionized (DI) water
- Calibration solutions of pH 7, 4 and/or 10
- Bucket (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the probe for wear or damage.
- Make sure there is sufficient battery life for your field trip and check for battery leaks.
- Make sure all openings are sealed tight.
- Calibrate your meter using a 2 point calibration within 24 hrs of each sampling day.

CALIBRATION

This is done using pH 7 buffer solution and either pH 4 or 10 buffer solution depending on your typical field pH reading. The calibration buffers used should bracket your field pH reading. Record all calibrations in your calibration log or on your field datasheet.

NOTE

Most manufacturers specify calibrating first with pH 7.00 buffer solution however some may specify a different order of calibration. Refer to manufacture instructions for additional information. The below instructions assume calibrating with pH 7.00 buffer first.

Calibration values must be within +/- 0.20 from the standard buffer solution. If your calibration values fall outside of that range, do not take field readings until the probe is fixed and the calibrations are within range.

Use fresh buffer solution when you calibrate the probe, you can reuse these solutions for your end of the day check. Record the probe readings to the nearest hundredth unit place (Ex. pH 7.01) when performing the calibration.

PH- PROBE

1. If you are using premixed calibration solution, pour a small amount (~50 mL) of pH 7 solution and pH 4 or pH 10 solution in two separate, clean cups. If not, skip to step 2.
2. If you are using powder packets, pour 50 mL of DI water into a small beaker and empty the entire pH 7 packet (yellow) into the water. Use a clean stir stick to mix the solution. Repeat the steps with the pH 4 (red) or pH 10 (blue) powder.
3. Place the probe in the pH 7 buffer solution and gently swirl the probe in the buffer to obtain an accurate reading. Wait for the probe to stabilize and record the temperature of the probe in the solution.
4. Calibrate the probe in the pH 7 buffer according to the manufacterers instructions. This usually requires hitting the CAL (calibration) button and then HOLD/ENT, specifics vary by manufacturer. The probe should now read a value close to pH 7.00. Record this value. Most manufacturers of buffers provide a table showing the pH result that probes should display based on temperature. Check that the value displayed on the probe is close to this value.
5. Clean the probe with tap water and blot dry with a clean cloth or paper towel.
6. Immerse the probe in the pH 4 (or 10) buffer solution. The probe should change to indicate the buffer solution present.
7. Wait for the reading to stabilize and calibrate the probe. It should now read a value close to 4.01 (or 10.01) pH units. Record this value.

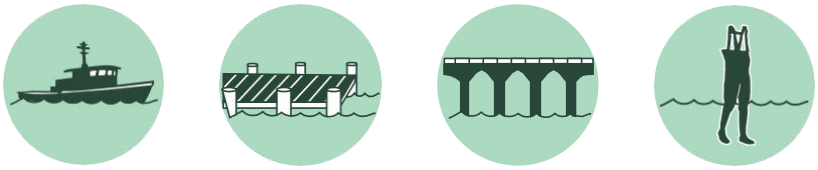
Credit: Alliance for the Chesapeake Bay

Continued on next page...

8. Repeat steps 5–7 if necessary for a third calibration with either pH 4 or 10 buffer.
9. Cover and set aside the calibration solutions for later use when you return from sampling.
10. After calibration, you may turn off the probe while you travel to your site. Follow manufacturer instructions regarding transporting of the probe into the field to prevent damage and drying out of the pH probe.

PH- PROBE

SAMPLING METHOD: BOAT, DOCK, BRIDGE, OR WADING



I. Measuring directly in the waterway

1. Place your meter 0.5 m beneath the surface of the water if sampling in Maryland or 1.0 m beneath the surface if sampling in Virginia. If you are unable to collect as these depths, due to equipment limitations, place the tip of the meter just below the surface of the water (approximately 0.3m).
2. Wait for the probe to stabilize.
3. Record your reading on your datasheet.

II. Collecting using a bucket

1. Throw the bucket out as far as possible in the main channel and try not to disturb the bottom.
2. Rinse the bucket three times with sample water, pouring contents downstream of your sample location.
3. Fill the bucket with the sample water to ¾ full.
4. Place your probe in the bucket of water and gently swirl. Allow the reading to stabilize.
5. Record your reading on your datasheet.

PH- PROBE

POST-SAMPLE CHECK

To ensure the probe has maintained proper calibration, it is important to verify no significant probe drift has occurred. The procedures listed below will verify the probe did not drift outside QA/QC specifications. **DO NOT CALIBRATE the probe during this check**. Doing so will invalidate the data collected during the sample run.

1. Rinse off the probe and probe tip with distilled water and wipe dry using a soft cloth.
2. Place the probe into a container of pH 7 buffer. You may use the same buffer used during the morning calibration as long as the buffer was covered and appears clean.
3. Allow the probe to stabilize and record the temperature and pH reading on your datasheet.
4. Rinse the probe and repeat steps 2–3 using the pH 4 or pH 10 buffer.

NOTE

If both calibration values and post-sample checks are within +/-0.20 pH units from the buffer values, the probe is within specifications. If the readings are greater than +/-0.20 pH units during calibraiton, do not take field readings until the probe is fixed and calibrated successfully. If the calibration values are within range, but the post-sample check are greater than +/-0.20 pH units, make a note in the comments section that the calibration is out of range on your field datasheet. Replace the electrode and recalibrate your meter prior to your next sampling day.

PH- PROBE

EQUIPMENT CLEANING AND STORAGE

1. Ensure the probe is cleaned and well maintained. After each sample run, rinse off the probe with distilled water. Use a soft cloth and gently dry the probe and glass sensor. Washing the probe will remove any material that may reduce probe life.
2. Store the probe tip in the cap provided by the manufacturer. Inside this cap, place a small cotton ball or piece of paper towel soaked with pH 4.00 buffer (or probe storage solution). This will keep the probe in working condition until the next field sampling event.
3. If you see any biological growth (mold, algae, etc.), use mild soap or warm (~30o C) pH 4.00 buffer to clean. Rinse with distilled water and dry.
4. If the calibration or post-sample check indicates there is a problem with the probe, and standard cleaning does not produce acceptable results, replacement of the electrode (or sensor cap) may be necessary. Contact your program coordinator for assistance.
5. Store the probe in a clean, cool, and dry space.

NOTE

When traveling to a sample station, keep the probe tip stored in the protective cap or submerged in pH 4.00 buffer, buffer storage solution, or if needed white vinegar. This will keep the glass sensor hydrated. Never store or transport the probe dry, or in distilled or deionized water, or pH 7 or 10 buffer. Doing so will result in permanent damage to the probe resulting in inaccurate readings.

PH - COLORIMETRIC KIT

GATHERING MATERIALS AND EQUIPMENT LIST

- LaMotte or Hach pH kit with reagents (wide and narrow range kits)
- Distilled or deionized (DI) water
- Bucket (if using)
- Sampling pole with bottle (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

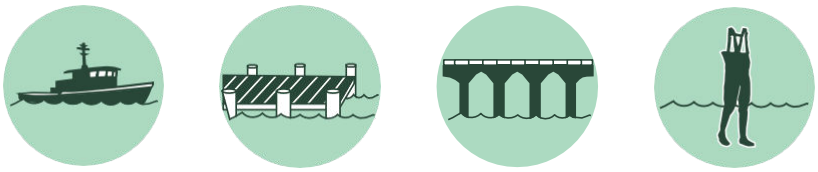
- Check your test tubes to make sure they are not broken and are clean.
- Check your chemical expiration dates. If chemicals are expired do not perform the test. Contact your monitoring coordinator for replacements and proper disposal instructions.

NOTE

Some of the chemicals used in pH colorimetric kits can be harmful if they come into contact with skin or eyes, or if swallowed. Be sure to read the material safety data sheet (MSDS) that accompanies your kit before using.

PH - COLORIMETRIC KIT

A. FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Rinse your sample test tube and cap three times with sample water.
2. Fill the sample test tube to the black line with water from 0.3 m beneath the surface. The bottom of the meniscus should be even with the line. Use a plastic eye dropper to add or remove water from test tube.
3. If you are using a wide-range pH kit, add 10 drops of the wide-range indicator to your sample test tube while holding the reagent bottle completely upside down.
4. If you are using a narrow-range kit, add 8 drops of the narrow-range indicator to your sample test tube while holding the reagent bottle completely upside down.
5. Cap the test tube and throughouly mix the sample.
6. Slide the tube in the comparator slot, hold it up to the sunlight, and record the pH value from the color in the comparator that most closely matches the sample tube color. When the color observed is between 2 colors on the comparator, the value is reported to the nearest 0.5 units for the wide-range kit or 0.1 units for other pH kits.
7. Record the value on your field datasheet.

II. Collecting using a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times with sample water collected downstream of your sampling location.
3. Fill the bucket with the sample water to ¾ full.
4. Rinse your sample test tube and cap three times with water from the bucket and toss downstream.
5. Fill the sample test tube to the black line with water from the bucket. The bottom of the meniscus should be even with the line. Use a plastic eye dropper to add or remove water from test tube.
6. If you are using a wide-range pH kit, add 10 drops of the wide-range indicator to your sample test tube while holding the reagent bottle completely upside down.
7. If you are using a narrow-range kit, add 8 drops of the narrow-range indicator to your sample test tube while holding the reagent bottle completely upside down.
8. Cap the test tube and thoroughly mix the sample.
9. Slide the tube in the comparator slot, hold it up to the sunlight, and record the pH value from the color in the comparator that most closely matches the sample tube color. When the color observed is between 2 colors on the comparator, the value is reported to the nearest 0.5 units for the wide-range kit or 0.1 units for other pH kits.
10. Record the value on your field datasheet and mark that the measurement was taken from a bucket.

III. Collecting using a sampling pole

1. Un-cap your bottle and secure it to the end of the pole.
2. Extend the pole outward and dip at approximately 0.3 m below the surface.
3. Rinse the sample bottle three times with sample water, pouring downstream.
4. Drain the bottle until it is empty, lower it about 0.3 meters. Wait for the bottle to fill, then return it to the surface and cap it.
5. Rinse your sample test tube and cap three times with water from the sample bottle and discard downstream.
6. Fill the sample test tube to the black line with water from the bottle. The bottom of the meniscus should be even with the line. Use a plastic eye dropper to add or remove water from test tube.
7. If you are using a wide-range pH kit, add 10 drops of the wide-range indicator to your sample test tube while holding the reagent bottle completely upside down.
8. If you are using a narrow-range kit, add 8 drops of the narrow-range indicator to your sample test tube while holding the reagent bottle completely upside down.
9. Cap the test tube and thoroughly mix the sample.
10. Slide the tube in the comparator slot, hold it up to the sunlight, and record the pH value from the color in the comparator that most closely matches the sample tube color. When the color observed is between 2 colors on the comparator, the value is reported to the nearest 0.5 units for the wide-range kit or 0.1 units for other pH kits.
11. Record value on your field datasheet.

POST-SAMPLE CHECK

You do not need to perform a calibration check after sampling.

EQUIPMENT CLEANING AND STORAGE

1. Thoroughly clean each test tube and allow to dry.
2. Store chemicals and equipment in a cool, dry place.

PH – TEST STRIPS

GATHERING MATERIALS AND EQUIPMENT LIST

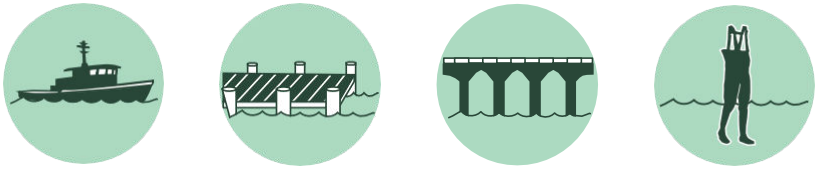
- ColorpHast pH strips (2–9)
- Sampling pole (if using)
- Bucket (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Check your strips to make sure that they are not discolored or have been previously dampened.

PH – TEST STRIPS

A. FROM A BOAT, DOCK, BRIDGE OR WADING



I. Collecting directly in the waterway

1. Carefully remove one strip from the box and close the box when not in use.
2. Dip the strip in the water and allow for colors to fully develop, about 1 to 2 minutes.
3. Compare your strip color to the provided chart.
4. Record your value to the nearest 0.5 pH units.
5. Properly dispose of your strip when you are finished.

I. Collecting using a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times with sample water collected downstream of your sampling location.
3. Fill the bucket with the sample water to ¾ full.
4. Carefully remove one strip from the box and close the box when not in use.
5. Dip the strip in the water and allow for colors to fully develop, about 1 to 2 minutes.
6. Compare your strip color to the provided chart.
7. Record your value to the nearest 0.5 pH units. Mark on your data sheet that the measurement was taken from a bucket.
8. Properly dispose of your strip when you are finished.

PH – TEST STRIPS

III. Collecting using a sampling pole

1. Un-cap your bottle and secure it to the end of the pole.
2. Extend the pole outward and dip at approximately 0.3 m below the surface.
3. Rinse the sample bottle three times with sample water.
4. Drain the bottle until it is empty, lower it about 0.3 meters. Wait for the bottle to fill, then return it to the surface and cap it. Mark on your data sheet the depth you collected your sample.
5. Carefully remove one strip from the box and close the box when not in use.
6. Dip the strip in the water and allow for colors to fully develop, about 1 to 2 minutes.
7. Compare your strip to the provided chart.
8. Record your value to the nearest 0.5 pH units.
9. Properly dispose of your strip when you are finished.

PH – TEST STRIPS

AFTER SAMPLE CALIBRATION CHECK

You do not need to perform a calibration check after sampling.

EQUIPMENT CLEANING AND STORAGE

1. Store your strips in a cool, dry place.

SALINITY/CONDUCTIVITY/TDS - PROBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Various models of individual conductivity probes and meters (ex. LaMotte, Extech, Hach, Hanna)
- Distilled or deionized (DI) water
- Bucket (if using)
- Sampling pole (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the probe for wear or damage.
- Make sure there is sufficient battery life for your field trip and check for battery leaks.
- Calibrate your meter within 24 hours of each sampling day.

CALIBRATION

Most probes that test for conductivity and TDS use a pre-made calibration solution with a specific conductivity value. The calibration solution used should be a concentration similar to what you may find in the field, typical solutions are: 1413 uS/cm in freshwater or 12.88 mS/cm in brackish and saltwater. Record calibration values in your calibration log or on your field datasheet.

Calibration readings should be within +/- 10% of the standard solution. If the calibration readings are outside of that range, do not take field readings until the probe is fixed and the calibrations are within range.

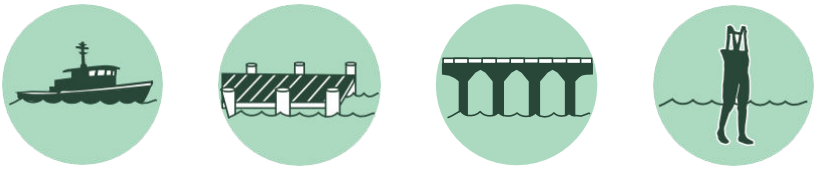
Continued on next page...

SALINITY/CONDUCTIVITY/TDS - PROBE

1. Record the temperature of the calibration solution read by the probe while you are calibrating the probe.
2. Write down the conductivity listed on the probe when you immerse the probe into the conductivity solution. Make sure to record the value prior to calibration.
3. Record the electrical conductivity value of the solution that you will use to calibrate the probe. The standard unit for these solutions is in microsiemens per centimeter (µS/cm) but probes may use different units such as millisiemens per centimeter (mS/cm).
4. Write down the conductivity reading after you have calibrated the probe in the solution. The probe should be very close to the calibrated buffer solution but may be off by a couple of units.

SALINITY/CONDUCTIVITY/TDS - PROBE

A. FROM A BOAT, DOCK, BRIDGE OR WADING



I. Measuring directly in the waterway

1. Select the appropriate mode and range on the meter, beginning with the highest range and working down. Some probes will auto-select the correct range.
2. Place your probe 0.5 m beneath the surface of the water if sampling in Maryland or 1.0 m beneath the surface if sampling in Virginia. If you are unable to collect at these depths, due to equipment limitations, place the tip of the probe just below the surface of the water (approximately 0.3 m).
3. Wait for probe to stabilize.
4. Record the salinity, conductivity, or TDS on your field datasheet.
5. Rinse the probe with distilled or deionized water between each sample and before the post-sampling calibration check. Replace the cap for storage and transport.

NOTE

If your probe does not automatically select the appropriate measurement range, and the reading is in the lower 10 percent of the range that you selected, switch to the next lower range. If the reading is above 10 percent on the scale, then record this number on your data sheet.

II. Collecting using a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times with sample water collected downstream of your sampling location.
3. Fill the bucket with the sample water to ¾ full.
4. Rinse the probe with deionized or distilled water.
5. Select the appropriate mode and range on the meter, beginning with the highest range and working down. Some probes will auto-select the correct range.

NOTE

If your probe does not automatically select the appropriate measurement range, and the reading is in the lower 10 percent of the range that you selected, switch to the next lower range. If the reading is above 10 percent on the scale, then record this number on your data sheet.

6. Place the probe into the bucket and wait for the reading to stabilize.
7. Record the salinity, conductivity, or TDS on your field datasheet.
8. Rinse the probe with distilled or deionized water between each sample and before the post sampling calibration check. Replace the cap for storage and transport.

SALINITY/CONDUCTIVITY/TDS - PROBE

POST-SAMPLE CHECK

1. Record the temperature of the probe at the end of the day when you are performing the calibration check.
2. Write down the conductivity listed on the probe when you immerse the probe into the conductivity solution. Make sure to record the value.
3. Calculate the difference between the pre- and post-sampling calibration values.
4. Standard rule of thumb is if the probe difference is less than 10.00%, you should be confident of the probe values. To calculate the relative percent difference use the formula:

$$\text{RPD\%} = \frac{\text{ABSOLUTE VALUE [SAMPLE 1 - SAMPLE 2]}}{\text{AVERAGE (SAMPLE 1 \& SAMPLE 2)}} \text{ X 100\%}$$

5. Initial the name of the person calibrating and using the probe for your records. This is good to know in case something happens to the probe that you may not be aware of due to someone else is using it.

EQUIPMENT CLEANING AND STORAGE

1. Rinse probe with DI water.
2. Clean according to manufacturer's instructions.
3. Store probe in its case according to manufacturer's instructions.

SALINITY - REFRACTOMETER

GATHERING MATERIALS AND EQUIPMENT LIST

- Refractometer (various models)
- Dropper
- Distilled or deionized (DI) water
- Tissue paper or soft cloth
- Bucket (if using)
- Sampling pole and bottle (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the refractometer wear or damage.
- Check the refractometer with distilled water. If it does not read 0 o/oo, you must calibrate the instrument.

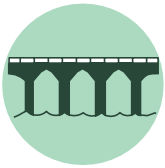
CALIBRATION

1. Check the refractometer with distilled water. If it does not read 0 o/oo, you must calibrate the instrument. **DO NOT PERFORM CALIBRATION IN THE FIELD**. Calibration must take place in controlled environment at approximately 20°C (room temperature) using distilled water of the same temperature.
2. Lift the cleat plate and add 1–2 drops of distilled water to the oval, blue prism. Hold the prism at a close-to-parallel angle so the water drops will not run off.
3. Gently close the plate. The water drops should spread and cover the entire prism. Repeat the process if there are any gaps or if the sample is only on one portion of the prism.
4. Look through the eyepiece. If the scale is not in focus, adjust it by turning the eyepiece either clockwise or counterclockwise.
5. The reading is taken at the point where the boundary line of the blue and white fields crosses the scale.
6. If the reading is not at “0” turn the calibration screw with the included screwdriver while looking through the eyepiece until the boundary line falls on “0.”
7. When the measurement is complete, the sample must be cleaned using tissue paper and distilled water.

SALINITY - REFRACTOMETER

A. FROM A BOAT, DOCK, BRIDGE OR WADING

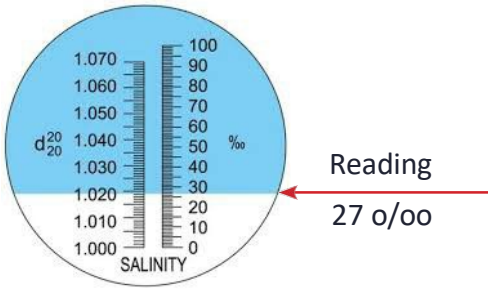





I. Collecting sample


Credit: UMCES

1. Rinse your dropper with sample water three times. You can collect water directly from the waterway or from your bucket.
2. Open the lid on the refractometer and using the dropper, rinse the refractometer sample surface with sample water.
3. Collect your sample in the dropper, apply the drops on the refractometer sample surface and close the lid.
4. Hold up to light to read salinity where the blue and white sections meet.
5. Record as parts per thousand (o/oo) using the scale located on the right hand side of refractometer view scope.



Credit: https://www.agriculturesolutions.com

SALINITY - REFRACTOMETER

POST-SAMPLE CHECK

You do not need to perform a calibration check after sampling.

EQUIPMENT CLEANING AND STORAGE

1. Rinse with DI or distilled water.
2. Wipe dry with a clean non-scratching cloth.
3. Store refractometer in the case.

WATER CLARITY – SECCHI DISK

GATHERING MATERIALS AND EQUIPMENT LIST

- 8” Secchi disk with attached line

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Secchi depth should be measured using a weighted line with decimeter (a tenth of a meter) markings.
- Examine the water-depth line for wear or damage.
- Measure the increments against a meter stick to ensure the line has not stretched.
- Ensure that the line is securely fastened to the Secchi disk.

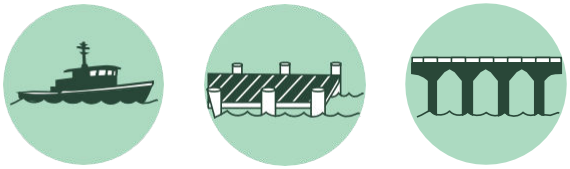
NOTE

- Make sure the line is securely fastened to Secchi disk.
- Make sure the line is securely held on the boat (do not let go of the line).
- Allow boat wakes and large waves to pass by before measuring Secchi depth.
- Lower the disk on the shady side of the boat.
- Take off sunglasses

Credit: Matt Rath / Chesapeake Bay Program

WATER CLARITY – SECCHI DISK

A. FROM A BOAT, DOCK, OR BRIDGE



I. Measuring directly in the waterway

1. Remove sunglasses if you are wearing them and stand with the sun to your back. Try to lower the disk into a shaded area.
2. Lower the disk into the water until the disk barely disappears from sight. Note the depth reading, in tenths of a meter, based on the length of line submerged.
3. Slowly raise the disk and note the depth at which it reappears (i.e. is barely perceptible).
4. It can be helpful to pinch the line exactly at the waterline before retrieving for measurement.
5. Average the two depth readings obtained above. The average of the two readings is considered to be the limit of visibility, or index of transparency. Record this average to the nearest tenth of a meter on your datasheet.

WATER CLARITY – SECCHI DISK

POST-SAMPLE CHECK

You do not need to perform a calibration check after sampling, however your secchi disk should be annually checked to make sure the markings are accurate.

EQUIPMENT CLEANING AND STORAGE

Rinse line and disk with water to clean off any mud or debris clinging to the line. Dry the line and disk before storing it in a cool, dry location. If algae begins to grow on the disk, wash with warm water and soap, and gently scrub with a sponge.

WATER CLARITY – TRANSPARENCY TUBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Transparency tube

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Check the transparency tube for wear or damage.
- Check that the Secchi disk is clearly visible at the bottom of the tube.
- Check that the drain tube stays closed until released.

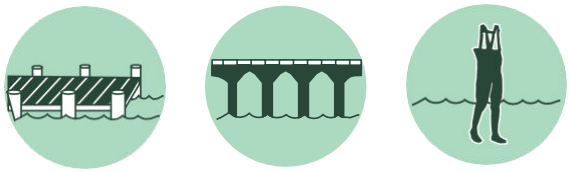
NOTE

- Transparency tubes are best for sampling sites where Secchi disks would be visible on the boat or where sites are shallow.
- If you are unsure of your measurement, take a second sample.
- Have a buddy help you out by controlling the water release crimp while you look down the tube.

Credit: UMCES

WATER CLARITY – TRANSPARENCY TUBE

A. FROM A DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Close the drain tube by squeezing the crimp. Enter the waterway downstream of the monitoring site and move to the center of the waterway.
2. Point the top of the tube in the upstream direction and collect water from the waterway, being careful not to disturb the stream bed.

NOTE

If you cannot fill your tube directly in the waterway, you may use your bucket to collect the sample and pour it into the turbidity tube.

3. Once the tube is full, lift out of the water and carefully exit the waterway.
4. Remove sunglasses if you are wearing them and move the tube to a shaded area or stand with the sun to your back.
5. Look down through the opening of the tube and look for the black and white pattern. If you can see the pattern with the tube full, record 120cm on your field datasheet and check the ">" box below the value.
6. If you cannot see the pattern, partially open the drain crimp and slowly draw off sample (controlling the flow by squeezing the crimp).
7. When the black and white pattern begins to appear, immediately tighten the crimp.
8. Record the level of water (in cm) remaining via the centimeter ruler on the side of tube.

WATER CLARITY – TRANSPARENCY TUBE

AFTER SAMPLE CALIBRATION CHECK

You do not need to perform a calibration check after sampling.

EQUIPMENT CLEANING AND STORAGE

Rinse tube with water to clean off any mud or debris remaining. Allow for the tube to dry before storing it in a cool, dry location.

TOTAL WATER DEPTH

GATHERING MATERIALS AND EQUIPMENT LIST

- Weighted line with decimeter (a tenth of a meter) markings. This line can be the Secchi disk line if you do not have an additional weighted measuring line or the turbidity tube.

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the water depth line for wear or damage.
- Measure the increments against a meter stick to ensure line has not stretched.
- Ensure that the line is securely fastened to the weight.

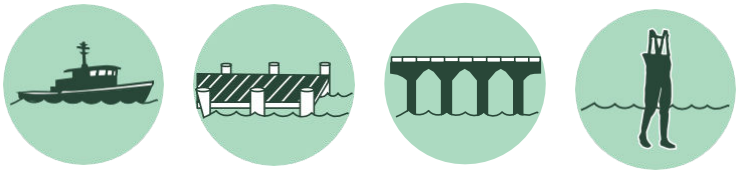
NOTE

- Make sure the line is securely fastened to the weight.
- Make sure the line is securely held on the boat (do not let go of the line).
- Allow boat wakes and large waves to pass by before measuring total depth.

Credit: UMCES

TOTAL WATER DEPTH

A. FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Measuring in directly in the waterway

1. At your sampling site, slowly lower the measuring line into the water until it is resting on the bottom and the line has just become slack. Record the depth reading, to the nearest tenth of a meter, based on the length of line submerged.

NOTE

You can also use your secchi disk, turbidity tube, YSI Sonde, or boat depth finder to measure total depth. Just be sure to always record the depth in meters!

TOTAL WATER DEPTH

AFTER SAMPLE CALIBRATION CHECK

You do not need to perform a calibration check after sampling.

EQUIPMENT CLEANING AND STORAGE

Rinse line with water to clean off any mud or debris remaining. Allow the line to dry before storing it in a cool dry location.

MULTIPROBE SONDE

Multiprobe sondes have a variety of manufacturers and parameters that can be monitored. The most common parameters include: conductivity, dissolved oxygen, pH, salinity, total dissolved solids, and water temperature. Depth profile samples should include at least dissolved oxygen, temperature and salinity.

GATHERING MATERIALS AND EQUIPMENT LIST

- Multiprobe sonde (ex. YSI, Hydrolab, etc)
- Distilled or deionized (DI) water
- Buffer and calibrating solutions

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the probe and individual sensors for wear or damage.
- Make sure there is sufficient battery life for your field trip and check for battery leaks.
- Calibrate your probe before each sampling event (at least 24 hours prior to sampling).

CALIBRATION

Calibration procedures vary between manufacturers. Follow all calibration procedures for the specific manufacturer and measured parameters.

Record calibration results in logbooks or field datasheet for each instrument and/or sensor and compare against the values in **Table 1** on the next page.

Credit: Peter Bergstrom

Continued on next page...

MULTIPROBE SONDE

Table 1: Calibration standards and ranges for parameters collected using a multiprobe sonde.

Parameter	Calibration Standard	Calibration Range
Dissolved Oxygen	100% Saturation	+/- 0.5 mg/L
pH	4.00, 7.00 and/or 10.00	+/- 0.20 SU
Conductivity	1413 uS/cm in freshwater areas and 12.88 mS/cm in brackish and saltwater areas.	+/- 10%
Turbidity	DI water	+/- 10%

If any of the calibrations for a given parameter fall outside of the acceptable range, do not take a field reading. The sensor must be fixed and perform a successful calibration before field readings can continue.

NOTE

Salinity (ppt) is a calculated value based on the temperature and conductivity readings. All salinity measuarements need to have a conductivity calibration performed in order to ensure accurate readings.

MULTIPROBE SONDE

A. FROM A BOAT, DOCK, OR BRIDGE

I. Surface Sampling

1. Place your probe 0.5 m beneath the surface of the water if you are sampling in Maryland and 1.0 m beneath the surface if you are sampling in Virginia.
2. Wait for the probe to stabilize.
3. Record your reading and the depth at which you took your reading.

II. Depth Profile Sampling (≤ 3 m)

1. Place your probe 1.0 m above the bottom. Be careful not to hit the bottom and disturb the sediment.
2. Allow the probe to stabilize and record your reading and the sample depth.

NOTE

The line should be vertical when taking depth profile samples. If the current is too strong to keep the line vertical, attach weights or a weighted probe guard to prevent displacement from the current.

3. Raise the probe to 0.5 m below the surface of the water if sampling in Maryland and 1.0 m below the surface if sampling in Virginia.
4. Allow the probe to stabilize and record your reading and the sample depth.

III. Depth Profile Sampling (> 3 m)

1. Place your probe 1.0 m above the bottom. Be careful not to hit the bottom and disturb the sediment.
2. Allow the probe to stabilize and record your readings and the sample depth.
3. Raise the probe to the nearest whole meter, allow probe to stabilize, and record readings and sample depth. (Example: At 3.4 m deep site, measure at 2.4 m, then raise it to 2.0 m)
4. Continue raising the probe in 1 meter intervals until you reach 1.0 m below the surface. If sampling in Maryland, take an additional reading at 0.5 m below the surface. (Example: At 3.4 m deep site, measure at 2.4 m, 2.0 m, and 1.0 m, take another reading at 0.5 m if in Maryland)

NOTE

The line should be vertical when taking depth profile samples. If the current is too strong to keep the line vertical, attach weights or a weighted probe guard to prevent displacement from the current.

Credit: Peter Bergstrom

POST-SAMPLE CHECK

After the sample run is complete, the post-sample check must be performed to check the drift of each probe and/or sensor. Return the probe to the calibration station to perform a post-sample check according the the procedures for the specific manufacturer and measured parameters. Record post-sample checks in the calibration logbooks or field datasheets for each instrument and/or sensor.

The post-sample check should be performed indoors, but if performed outdoors, note that the dissolved oxygen value can be different than the pre-field calibration value.

Post-sample check ranges follow the same calibration ranges found in **Table 1**.

NOTE

If the calibration or post-sample check indicates there is a problem with the probe, and standard cleaning does not produce acceptable results, replacement of the sensor may be necessary. Resolve any issues prior to sampling again.

EQUIPMENT CLEANING AND STORAGE

1. Follow manufacturer's instructions for cleaning and storing the probe.
2. Ensure the probe is cleaned and well maintained. After each sample run, rinse off the probe with distilled water. Use a soft cloth and gently dry the probe and sensor.
3. Store the probe tip in the cap provided by the manufacturer and with any storage solution recommended by the manufacturer.
4. Store the probe in a clean, cool, and dry space.

CHLOROPHYLL A - VACUUM PUMP

GATHERING MATERIALS AND EQUIPMENT LIST

- Distilled or dionized (DI) water
- Tissue paper
- Protective gloves (latex or nitrile)
- Sampling pole (if using)
- 500 mL polypropylene (PP) sample bottles
- Filter bodies with filter caps
- 25 mm 0.7 µm porosity GF/F filter membranes
- Handheld vacuum pump
- Opaque towels
- Aluminum foil
- Filter forceps

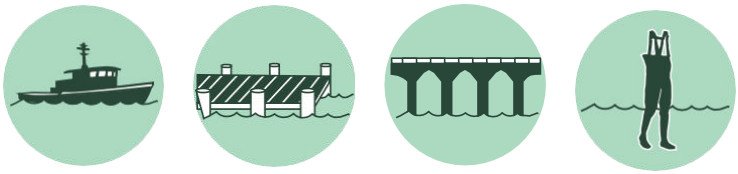
CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine your materials for ware and damage.
- Make sure your equipment is clean and prepared for going out into the field.

Credit: UMCES

CHLOROPHYLL A - VACUUM PUMP

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Keep your bottle capped.
2. Extend your bottle to 0.3 meters or 1 foot beneath the surface and remove the cap allowing the bottle to fill.

NOTE

If sampling from a dock or pier, go as far as possible to the end of the pier to collect your sample.

3. Recap the bottle beneath the surface.
4. Dump the sample downstream of your sampling location.
5. Repeat steps 1–4, three more times. On the third time collect the sample and keep for analysis.
6. Mark on your data sheet the depth you collected your sample.

II. Collecting using a sampling pole

1. Secure your pre-labeled bottle to the end of the pole and un-cap.
2. Extend the pole outward and dip at approximately 0.5 meters if sampling in Maryland and 1.0 meters if sampling in Virginia.
3. Bring the bottle back up to the surface and dump the sample downstream of your sampling location.

Continued on next page...

4. Repeat steps 1–3, three more times. On the third time collect the sample and keep for analysis. Mark on your data sheet the depth you collected your sample.
5. Mark on your data sheet the depth you collected your sample.

LABORATORY PREPARATION

1. Rinse the vacuum and filter holder three times with sample water.
2. Using forceps, place the filter in the filter holder and attached the funnel.
3. Pour the appropriate amount of sample into the funnel and use the vacuum pump to push water through the filter.
4. Prepare 2 or 4 inch square pieces of aluminum foil that is provided or recommended by the lab.
5. Fold in half, then unfold, creating a crease.
6. Create labels using labeling tape noting site number, date, and volume pressed through filter.
7. Place filter in aluminum foil with the center of the filter centered on the crease, with the side containing the chlorophyll up (should have slight color to it). Folding foil and gently assisting with forceps if necessary by pressing on filter, fold the filter in half.
8. Double over edges of fold, displacing air and create a little pocket in which the folded filter is located.
9. Repeat for all samples.
10. If using sticky backed labels, good practice is to attach the label where the foil is folded together to protect the sample and reduce the risk of water entering where the filter is located.

NOTE

Follow the recommended filtering procedure by the analytical laboratory where the samples will be analyzed. Color on the filter generally indicates a sufficient sample for analysis.

Continued on next page...

CHLOROPHYLL A - VACUUM PUMP

11. Place foil packets in locking plastic bag and then double bag with another locking plastic bag. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
12. Record the volume of water pushed through the filter on the data collection sheet.
13. Cap 500 mL bottle retaining sampled water and store in dark location to bring back to lab. This sample will serve as a back-up sample should there be a filter problem.

NOTE
It is critical that the chlorophyll water samples and foil packets remain dry. The samples in foil should be double bagged and packed with ice in portable coolers.

CHLOROPHYLL A - VACUUM PUMP

LABORATORY ANALYSIS

1. Samples should be transported to the analytical laboratory as soon as possible after sampling.
2. Fill out all appropriate Chain of Custody forms.

NOTE
If properly packaged and frozen (sampled filters should be stored frozen, at least -20˚C, in the dark), chlorophyll *a* samples can be stored for up to three and a half weeks. The package should also be marked to indicate “chlorophyll samples” as contents.

EQUIPMENT CLEANING AND STORAGE

1. Rinse equipment and bottles with DI or distilled water.
2. Allow equipment to air dry before storing.

CHLOROPHYLL A - SYRINGE

GATHERING MATERIALS AND EQUIPMENT LIST

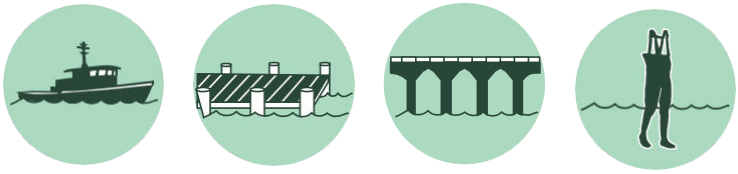
- Distilled or deionized (DI) water
- Tissue paper
- Protective gloves (latex or nitrile)
- Sampling pole (if using)
- 500 mL polypropylene (PP) sample bottles
- Filter bodies with filter caps
- 25 mm 0.7 µm porosity GF/F filter membranes
- 50 mL syringes
- Opaque towels
- Aluminum foil
- Filter forceps

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine your materials for ware and damage.
- Make sure your equipment is clean and prepared for going out into the field.

CHLOROPHYLL A - SYRINGE

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Keep your bottle capped.
2. Extend your bottle to 0.3 meters or 1 foot beneath the surface and remove the cap allowing the bottle to fill.

NOTE

If sampling from a dock or pier, go as far as possible to the end of the pier to collect your sample.

3. Recap the bottle beneath the surface.
4. Dump the sample downstream of your sampling location.
5. Repeat steps 1–4, three more times. On the third time collect the sample and keep for analysis.
6. Mark on your data sheet the depth you collected your sample.

II. Collecting using a sampling pole

1. Secure your pre-labeled bottle to the end of the pole and un-cap.
2. Extend the pole outward and dip at approximately 0.5 meters if sampling in Maryland and 1.0 meters if sampling in Virginia.
3. Bring the bottle back up to the surface and dump the sample downstream of your sampling location.
4. Repeat steps 1–3, three more times. On the third time collect the sample and keep for analysis.
5. Mark on your data sheet the depth you collected your sample.

CHLOROPHYLL A - SYRINGE

LABORATORY PREPARATION

1. Rinse the syringe and filter holder three times with sample water.
2. Using forceps, place the filter in the filter holder and close.
3. Fill the syringe with the appropriate amount of sample water, attach it to the filter holder and push water through the filter. Remove the filter holder from the syringe before withdrawing the plunger to add additional sample water.
4. Prepare 2 or 4 inch square pieces of aluminum foil that is provided or recommended by the lab.
5. Fold in half, then unfold, creating a crease.
6. Create labels using labeling tape noting site number, date, and volume pressed through filter.
7. Place filter in aluminum foil with the center of the filter centered on the crease, with side containing the chlorophyll up (should have slight color to it). Folding foil and gently assisting with forceps if necessary by pressing on filter fold the filter in half.
8. Double over edges of fold, displacing air and create a little pocket in which the folded filter is located.
9. Repeat for all samples.

NOTE

Follow the recommended filtering procedure by the analytical laboratory where the samples will be analyzed. Color on the filter generally indicates a sufficient sample for analysis.

Continued on next page...

CHLOROPHYLL A - SYRINGE

10. If using sticky backed labels, good practice is to attach the label where the foil is folded together to protect the sample and reduce the risk of water entering where the filter is located.
11. Place foil packets in a locking plastic bag and then double bag with another locking plastic bag. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
12. Record the volume of water pushed through the filter on the data collection sheet.
13. Cap 500 mL bottle retaining sampled water and store in dark location to bring back to the lab. This sample will serve as a back-up sample should there be a filter problem.

NOTE
It is critical that the chlorophyll water samples and foil packets remain dry. The samples in foil should be double bagged and packed with ice in portable coolers.

CHLOROPHYLL A - SYRINGE

LABORATORY ANALYSIS

1. Samples should be transported to the analytical laboratory as soon as possible after sampling.
2. Fill out all appropriate Chain of Custody forms.

NOTE
If properly packaged and frozen (sampled filters should be stored frozen, at least -20˚C, in the dark), chlorophyll *a* samples can be stored for up to three and a half weeks. The package should also be marked to indicate “chlorophyll samples” as contents.

EQUIPMENT CLEANING AND STORAGE

1. Rinse equipment and bottles with DI or distilled water.
2. Allow equipment to air dry before storing.

LAB GRAB SAMPLES

GATHERING MATERIALS AND EQUIPMENT LIST

- 500 mL polypropylene sample bottles or bottles provided by your lab
- Chain of custody form (COC)
- Labels for your sample bottles
- Permanent marker
- Cooler with ice or ice packs
- Sampling pole (if needed)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

1. Coordinate with your lab to pick up your sample bottles and ice from the lab.
2. Make sure you have the appropriate number and type of sample bottles.
3. Pre-label each bottle with the following:
    a. Station ID
    b. Date of sample collection (add time after collection)
    c. Collector's initials
    d. Sample depth in meters
    e. Parameter name and/or group code
    f. Container number
    g. Preservative used, if applicable
4. Sample containers should be inspected and any torn, punctured, or cracked sample containers should be discarded.

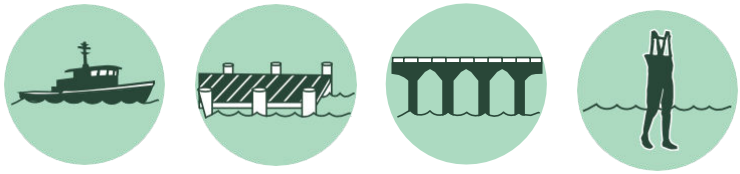
NOTE

Samples will not be analyzed if this information is missing. If more than one container is needed for a parameter (such as a duplicate sample), each container collected for that parameter must have a label with identical information, in addition to an indication of 1 of 3, 2 of 3, 3 of 3, etc., as required. Split samples should be designated as S1 and S2.

LAB GRAB SAMPLES

Bacteria and nutrient bottles with preservative

FROM A BOAT, DOCK, BRIDGE OR WADING



I. Collecting directly in the waterway

1. Uncap the bottle, keeping it upright until collecting your sample, be mindful of the acid or preservative in the bottle.
2. Facing upstream, swoop the bottle away from you collecting a sample that fills the bottle ¾ full or to the shoulder of the bottle. Do not overfill the bottle allowing sample to fall out (this could release acid into the environment). **DO NOT rinse the sample bottle.**
3. Cap your bottle and record the time of sample collection on the bottle.
4. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
5. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

NOTE

Nutrient sample bottles contain a small amount of sulfuric acid as a preservative. When sampling, it is important to fill the bottle to the needed level and not pour out the preservative or excess sample from the bottle.

II. Collecting using a sampling pole

1. Attach the sample bottle to the sampling pole, making sure that the clamp is tight.
2. Facing upstream, un-cap the sample bottle and extend the pole and bottle.

NOTE

If sampling from the bank, the sampling point in the waterway should have a low to medium flow and not be in eddies or stagnant water.

3. Dip the bottle into the water and fill the bottle up ¾ full or to the shoulder. Try to be careful to not overfill the bottle and release acid or preservative into the environment. **DO NOT rinse the sample bottle**.
4. Cap and label the bottle with the collection time.
5. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
6. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

III. Collecting using a bucket

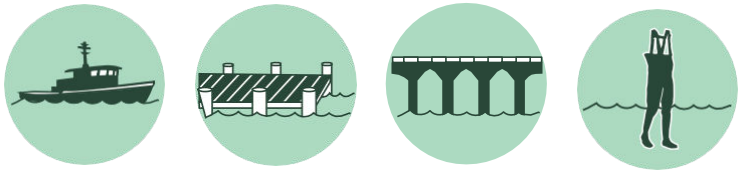
1. Lower the bottle into the bucket and allow to fill up to ¾ full or to the shoulder. Try to be careful to not overfill the bottle and release acid or preservative into the environment. **DO NOT rinse the sample bottle**.
2. Cap and label the bottle with the collection time.

Continued on next page...

3. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
4. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

Nutrient bottles without preservative

FROM A BOAT, DOCK, BRIDGE OR WADING



I. Collecting directly in the waterway

1. Facing upstream, submerge the bottle with the cap on to the depth of 0.3 m (length of about one forearm). Remove the cap and fill the bottle. Once filled, replace the cap. Toss the water sample downstream of you.
2. Repeat step 1, three more times. On the fourth collection cap the bottle and keep the sample.
3. Record the time of sample collection on the bottle.
4. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
5. On the field datasheet and Chain of Custody form, record the time, date, collection depth, and any other information about the water sampling event.

II. Collecting using a sampling pole

1. Attach the sample bottle to the sampling pole, making sure that the clamp is tight.
2. Facing upstream, uncap the sample bottle and extend the pole and bottle.

NOTE

If sampling from the bank, the sampling point in the waterway should have a low to medium flow and not be in eddies or stagnant water.

3. Dip the bottle into the water and rinse three times pouring out the water downstream of the sample location.
4. Take the sample on the fourth time from approximately 0.3 m, fill the bottle up ¾ full or to the shoulder.
5. Cap and label the bottle with the collection time.
6. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
7. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

III. Collecting using a bucket

1. Lower the bottle into the bucket and rinse three times pouring the water outside of the bucket.
2. On the fourth time, allow to fill up to ¾ full or to the shoulder.
3. Cap and label the bottle with the collection time.

Continued on next page...

4. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
5. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

LAB GRAB SAMPLES

AFTER SAMPLE PROCEDURES

1. After collecting the sample, make sure the lids are tightly secured to prevent contamination from water seepage in or out of the container.
2. It is essential that the actual sampling site match the labeling information. Always check the labeling information against the actual site. Samples not properly labeled may be rejected by the laboratory.
3. Sample containers and coolers should be stored with the tops securely fastened. Containers with loose fasteners should be replaced or taped to prevent loss of sample containers during transport.
4. If the laboratory provides temperature bottles that they use to determine sample temperature upon arrival at the lab, make sure that every cooler used to ship samples to the lab contains one of these bottles.
5. Double check your Chain of Custody form matches your sample bottles and is fully filled out.
6. Drop off your samples at the laboratory with your signed Chain of Custody form.

NITRATE - HACH KIT

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

- Sample bottle
- Sample bucket (if needed)
- Sample-collection pole (if needed)
- Cooler with ice or frozen freezer packs

Analysis:

- Hach NI-14 Nitrate Kit
  - ✓ Beaker
  - ✓ Dropper
  - ✓ Stoppers (4)
  - ✓ Syringe
  - ✓ Test tubes (4)
  - ✓ Timer
  - ✓ NitraVer 6
  - ✓ NitraVer 3
- Thermometer
- Scissors
- Cadmium waste bottle

Cleaning supplies:

- 5% Alconox soap
- Brush
- 10% HCl
- Distilled water

Safety gear:

- Goggles
- Latex or nitrile gloves

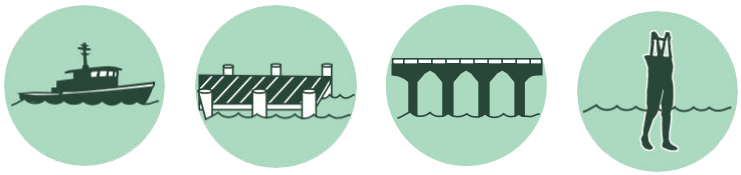
Credit: ALLARM

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the NitraVer 6 and NitriVer 3 reagents have not expired. The supplies and reagents recommended when using the Hach Nitrate Kit are included in the lists above.

If any materials are in poor condition, do not use them, and record which equipment needs replacement on your field data sheet. Return expired reagents to your monitoring coordinator so they can be properly disposed of, in accordance with federal, state, and local environmental-control regulations. For replacement reagents, contact your monitoring coordinator.

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Facing upstream, rinse the 500 mL sample bottle and cap with sample water three times, by lowering them into the waterway and pouring the rinse water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle.
4. Remove the sample bottle from the waterway and cap it.
5. Immediately analyze the nitrate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

II. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample-collection pole.
2. Use the pole to reach the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle and cap with sample water three times by lowering it into the waterway and pouring the water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
4. Prepare to fill the bottle by slightly tilting the mouth of the bottle downstream. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle or sample-collection pole.
5. Retrieve the sample bottle from the sample-collection pole and cap it.
6. Immediatley analyze the nitrate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

III. Collecting using a bucket

1. Rinse the sample bottle and cap with sample water three times by lowering them into the sample bucket and pouring the rinse water outside of the bucket. Do not touch the inside of the sample bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the bucket to fill.
4. Remove the sample bottle from the bucket and cap it.
5. Immediately analyze the nitrate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

AFTER SAMPLE PROCEDURES

NOTE

The NitraVer 6 Nitrate Reagent and NitriVer 3 Nitrite Reagent used in the Hach Nitrate Kit (NI 14) are considered hazardous, and extra caution should be taken when using the reagents. Avoid contact with your skin, eyes, nose, and mouth.

Safety Practices to Follow:

- Wear latex or nitrile gloves for extra protection.
- Keep all reagents out of the reach of children and pets.
- Do not dispose of reagents or waste on the ground or in the waterway. The waste produced from using the NitraVer 6 Nitrate Reagent must be collected and given to your monitoring coordinator for proper disposal.
- Always wash your hands when you finish testing your water sample.

First Aid: NitraVer 6 Nitrate Reagent

Contact	Effect	Precaution to Take	First Aid Measures
Spill			• Collect without creating dust. • Decontaminate area with a soap solution. • Pick up spill and dispose of in closed container.
Eye	May cause irritation.	Wear safety glasses.	• Immediately flush eyes with water for 15 minutes. • If wearing contacts, remove and continue rinsing. • Immediately call a physician.
Skin	May cause irritation.	Wear protective gloves and clothing.	• Wash with plenty of soap and water. • Remove contaminated clothing. • Call a physician if irritation develops.
Swallowed			• Immediately call physician. • Administer milk or beaten egg whites at frequent intervals. • Induce vomiting using syrup of ipecac or by sticking finger down throat.
Inhaled	Harmful if inhaled.	Do not breath dust.	• Seek fresh air. • Keep at rest in a position comfortable for breathing. • Give artificial respiration if necessary. • Call physician or poison center if unwell.

First Aid: NitriVer 3 Nitrite Reagent

Contact	Effect	Precaution to Take	First Aid Measures
Spill			• Scoop up spilled material into a large bottle and dissolve with water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Decontaminate the area of the spill with a soap solution. If regulations permit, flush down the drain with a large excess of water.
Eye	May cause irritation.	Wear safety glasses.	• Immediately flush eyes with water for 15 minutes. • If wearing contacts, remove and continue rinsing. • Call a physician if irritation develops.
Skin	May cause irritation.	Wear protective gloves and clothing.	• Wash with plenty of soap and water. • Remove contaminated clothing. • Call a physician if irritation develops.
Swallowed			• Wash with plenty of soap and water. • Remove contaminated clothing and wash before wearing again. • Call a physician if irritation develops.
Inhaled		Do not breath dust.	• Seek fresh air. • Give artificial respiration if necessary. • Call physician.

NITRATE - HACH KIT

WATER QUALITY ANALYSIS

1. Rinse test tubes and stoppers (2) with sample water three times. You can use water directly from your bucket or some other collection bottle. If your kit has a beaker or syringe to assist with sampling, rinse those three times.
2. Fill one sample tube to the 5 mL line using step A (low range) or B (high range):
   a. Nitrate = 0–1 mg/L
      1. Use the syringe to fill a test tube with 5.0 mL of sample water.

   b. Nitrate = 1–10 mg/L
      1. Use the syringe to fill a test tube with 4.5 mL of distilled water and add 0.5 mL of sample water to the test tube using the steps below.
         a. Fill the dropper with sample water to above the 0.5 mL line. Make sure there are no air bubbles trapped in the dropper.
         b. Squeeze the rubber bulb to release the excess water until you have exactly 0.5 mL of sample water in the dropper.
         c. Add the 0.5 mL of sample water to a test tube.

1. Add the NitraVer 6 Nitrate Reagent
   a. Open the NitraVer 6 Nitrate Reagent (with scissors) and empty the contents into the test tube with sample water.
   b. Place the stopper on the test tube, place your thumb over the stopper and vigorously shake for 30 seconds.
   c. Stop and wait 30 seconds for the cadmium particlaes to fall to the bottom of the tube.
   d. Pout the solution (without the particles) into the second test tube.
2. Add the NitraVer 3 Nitrate Reagent
   a. Open the NitriVer 3 Nitrite Reagent (with scissors) and empty the contents into the test tube with sample water.
   b. Place the stopper on the test tube, place your thumb over the stopper and vigorously shake the test tube for 30 seconds. A red color develops.

Continued on next page...

c. Wait for 10 minutes to read the results. Read the results within 20 mins.
d. Remove the stopper and insert the test tube in the color comparator—opening on right.

5. Prepare the blank
    a. During the 10 minute wait, pour out the remaining sample from the first test tube into the cadmium waste bottle.
    b. Rinse the test tube three times with distilled water and pour the waste water into the cadmium waste bottle.
    c. Fill the test tube with ~5 mL (at the line) with sample water and insert it in the color comparator—opening on left.
6. Measure the nitrate
    a. Hold the color comparator about one foot away from a white background and up to a light source. Rotate the color disc until the colors in both windows are the same.
    b. Read the value on the color disc through the window. If you followed step B (high range; 1–10 mg/L), multiply the value by 10.
    c. Record the final result on your data sheet in mg/L.
7. Replicates
    a. Repeat the test using the other two test tubes and stoppers. If you do not have extra supplies in your monitoring kit, see EQUIPMENT CLEANING AND STORAGE (next page) for instructions on how to clean them, and then proceed below.
    b. If the difference between the two replicates is > 0.1 mg/L (low range; 0–1 mg/L) or > 1.0 mg/L (high range; 1–10 mg/L), run additional replicates until two results are within the acceptable range of each other.
    c. Use those two replicate values to calculate and record the final (averaged) result.

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can significantly affect the results, which defeats the quality assurance measures built into the monitoring program. When cleaning your equipment, keep the following in mind:

- Wear latex or nitrile gloves.
- Equipment does not need to be dry before using, however allow the equipment to completely dry before placing it back into the kit or monitoring bin.
- When using the wash bottles (5% Alconox soap, 10% HCl solution, or distilled water), hold the bottle straight up and down (not at an angle) and gently squeeze. If a gentle squeeze does not work, the tip may be clogged. Do not fill the bottles past the fill line.

Handling 10% Hydrochloric Solution (HCl)

Hydrochloric acid is a strong acid that is used for a variety of purposes. Diluted HCl (10% HCl, 90% distilled water) can be used to clean and sterilize monitoring equipment. Although signifigantly diluted, precautionary measures need to be followed when using HCl, including:

- Avoid contact with eyes, skin, and clothing.
- Do not breathe the mist or vapor.
- Wear latex gloves when handling.
- Thoroughly wash hands afterwards.

First Aid: 10% Hydrochloric Solution (HCl)

Contact	First Aid Measures
Spill	• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	• Flush with water for 10 minutes.
Skin	• Flush with water for 10 minutes. • Remove contaminated clothing. • Immediately call a physician.
Swallowed	• Immediately call a physician.
Inhaled	• Move yourself to an area with fresh air.

Cleaning the Hach Nitrate Kit

1. Pour out all of the water from the beaker, test tubes, and sample bottle (if finished testing) into the sink while flushing with cold tap water. Rinse with tap water.
2. Thoroughly wash each item following these procedures:
    a. Sample bottle, beaker, test tubes, stoppers:
        i. Wash with 5% Alconox soap. Use a brush to remove any particles stuck to the equipment.
        ii. Rinse three times with cold tap water.
        iii. Rinse with 10% Hydrochloric acid solution (use a very small amount, ~2–5 mL) in the sink. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
    a. Syringe
        i. Separate the plunger from the body of the syringe and wash with 5% Alconox soap.
        ii. Rinse three times with cold tap water. Flush the syringe—reassemble and pull and push the plunger in and out of the body of the syringe.
        iii. Separate the plunger again and pour a small amount (~0.5 mL) of 10% HCl into the body. Carefully reattach the plunger and rotate the syringe so that all inside surfaces come in contact with the 10% HCl. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
    b. Dropper
        i. Remove the rubber bulb from the dropper tube and wash both with 5% Alconox soap.
        ii. Rinse three times with cold tap water. Flush the dropper—reassemble and squeeze the bulb.

Continued on next page...

iii. Separate the dropper again and pour a small amount (~0.5 mL) of 10% HCl into the tube. Carefully reattach the bulb and rotate the dropper so that all inside surfaces come in contact with the 10% HCl. Pour the used HCl solution down the sink while flushing with cold tap water.
iv. Rinse three times with distilled water.

3. Allow each item to completely dry before returning to the Hach Nitrate Kit or monitoring bin.

Storing

Always store your monitoring equipment and supplies in a cool, dry place out of direct sunlight and reach of children and pets, when not in use. Return your cadmium waste bottle to ALLARM when it is full to be appropriately processed.

NITRATE - LAMOTTE KIT

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

- Sample bottle
- Sample bucket (if needed)
- Sample-collection pole (if needed)
- Cooler with ice or frozen freezer packs

Analysis:

- LaMotte's Nitrate 3354 Kit
  - ✓ Nitrate #1 reagent
  - ✓ Nitrate #2 reagent
- Thermometer

Cleaning supplies:

- 5% Alconox soap
- Brush
- 10% HCl
- Distilled water

Safety gear:

- Goggles
- Latex or nitrile gloves

Credit: ALLARM

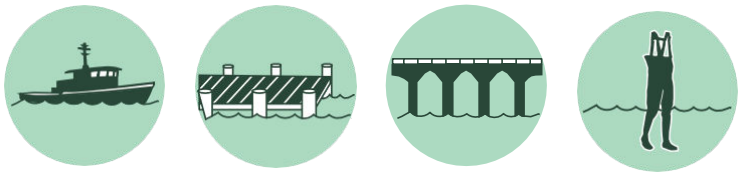
CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the Nitrate #1 and Nitrate #2 reagents have not expired. The supplies and reagents recommended when using the LaMotte Nitrate Kit are included in the lists above.

If any materials are in poor condition, do not use them, and record which equipment needs replacement on your field data sheet. Return expired reagents to your monitoring coordinator so they can be properly disposed of in accordance with federal, state, and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

NITRATE - LAMOTTE KIT

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Facing upstream, rinse the 500 mL sample bottle and cap with sample water three times, by lowering them into the waterway and pouring the rinse water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle.
4. Remove the sample bottle from the waterway and cap it.
5. Immediately analyze the nitrate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

II. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample-collection pole.
2. Use the pole to reach the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle and cap with sample water three times by lowering it into the waterway and pouring the water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
4. Prepare to fill the bottle by slightly tilting the mouth of the bottle downstream. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle or sample-collection pole.
5. Retrieve the sample bottle from the sample-collection pole and cap it.
6. Immediately analyze the nitrate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

III. Collecting using a bucket

1. Rinse the sample bottle and cap with sample water three times by lowering them into the sample bucket and pouring the rinse water outside of the bucket. Do not touch the inside of the sample bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the bucket to fill.
4. Remove the sample bottle from the bucket and cap it.
5. Immediately analyze the nitrate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

NITRATE - LAMOTTE KIT

AFTER SAMPLE PROCEDURES

NOTE

The Nitrate #1 and Nitrate #2 tablets used in the LaMotte Nitrate Kit (3354) are non-toxic and non-hazardous. However, you should still be careful using the reagents and avoid contact with your skin, eyes, nose, and mouth.

Safety Practices to Follow:

- Wear latex or nitrile gloves for extra protection.
- Keep all reagents out of the reach of children and pets.
- Do not dispose of reagents or waste on the ground or in the waterway. Pour the waste down your sink while flushing with cold tap water.
- Always wash your hands when you finish testing your water sample.

First Aid: Nitrate #1

Contact	Effect	Precaution to Take	First Aid Measures
Spill			• Avoid dust formation. Containerize spill material and hold for later disposal. If permitted, dissolve with a large volume of water, neutralize with alkaline material (sodium bicarbonate), then rinse down drain with extra water.
Eye	May cause irritation.	Wear safety glasses.	• Thoroughly rinse with plenty of water, also under the eyelids. • If irritation persists or develops, contact a physician.
Skin	May cause irritation.	Wear protective gloves and clothing.	• Wash off with warm water and soap. • If irritation persists, call a physician.
Swallowed	May cause gastrointestinal irritation, nausea, vomiting, and diarrhea.	Do not eat, drink, or smoke when using this product.	• Drink plenty of water. • If more than a few tablets have been swallowed, or if symptoms persist or develop, contact a physician.
Inhaled	May cause irritation of respiratory tract.	Do not breath dust.	• Seek fresh air. • If symptoms persist, call a physician.

First Aid: Nitrate #2

Contact	Effect	Precaution to Take	First Aid Measures
Spill			• Avoid dust formation. Containerize spill material and hold for later disposal. If permitted, dissolve with a large volume of water, neutralize with alkaline material (sodium bicarbonate), then rinse down drain with extra water.
Eye	May cause irritation.	Wear safety glasses.	• Thoroughly rinse with plenty of water, also under the eyelids. • If irritation persists or develops, contact a physician.
Skin	May cause irritation.	Wear protective gloves and clothing.	• Wash off with warm water and soap. • If irritation persists, call a physician.
Swallowed	May cause gastrointestinal irritation, nausea, vomiting, and diarrhea.	Do not eat, drink, or smoke when using this product.	• Drink plenty of water. • Clean mouth with water. • Consult a physician.
Inhaled	May cause irritation of respiratory tract.	Do not breath dust.	• Seek fresh air. • If breathing is difficult, give oxygen. • If not breathing, give artificial respiration and contact emergency personnel. • Immediately call a physician.

NITRATE - LAMOTTE KIT

WATER QUALITY ANALYSIS

1. Rinse test tubes and stoppers (2) with sample water three times. You can use water directly from your bucket or some other collection bottle. If your kit has a beaker or syringe to assist with sampling, rinse those three times.
2. Fill one test tube with 5 mL of sample water. You can use the syringe or fill directly from the bucket or waterway.
3. Add one Nitrate #1 Tablet to the test tube.
4. Place the stopper on the test tube and shake it until the tablet dissolves.
5. Addone Nitrate #2 Tablet to the test tube.
6. Place the stopper on the test tube and shake for two minutes until the tablet dissolves.
7. When the tablet has dissolved, set the timer for five minutes and wait.
8. Insert the test tube into the Octa-Slide 2 Viewer.
9. Match the color in the test tube to the color on the Octa-Slide 2 Bar. If the color appears to be in between two values, record the average of the two values. Example: between 4 and 6, record as 5 mg/L.
10. Record the value that looks most similar on your data sheet.
11. Replicates
    a. Repeat the test using the other clean test tube and stopper. If you do not have extra supplies in your monitoring kit, see *EQUIPMENT CLEANING AND STORAGE* for instructions on how to clean them, and then proceed below.
    b. If the difference between the two replicates is > 1 mg/L, run additional replicates until two results are within the acceptable range of each other.
    c. Use those two replicate values to calculate and record the final (averaged) result.

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can signifigantly affect the results, which defeats the quality assurance measures built into the monitoring program. When cleaning your equipment, keep the following in mind:

- Wear latex or nitrile gloves.
- Equipment does not need to be dry before using, however allow the equipment to completely dry before placing it back into the kit or monitoring bin.
- When using the wash bottles (5% Alconox soap, 10% HCl solution, or distilled water), hold the bottle straight up and down (not at an angle) and gently squeeze. If a gentle squeeze does not work, the tip may be clogged. Do not fill the bottles past the fill line.

Handling 10% Hydrochloric Solution (HCl)

Hydrochloric acid is a strong acid that is used for a variety of purposes. Diluted HCl (10% HCl, 90% distilled water) can be used to clean and sterilize monitoring equipment. Although signifigantly diluted, precautionary measures need to be followed when using HCl, including:

- Avoid contact with eyes, skin, and clothing.
- Do not breathe the mist or vapor.
- Wear latex gloves when handling.
- Thoroughly wash hands afterwards.

First Aid: 10% Hydrochloric Solution (HCl)

Contact	First Aid Measures
Spill	• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	• Flush with water for 10 minutes.
Skin	• Flush with water for 10 minutes. • Remove contaminated clothing. • Immediately call a physician.
Swallowed	• Immediately call a physician.
Inhaled	• Move yourself to an area with fresh air.

NITRATE - LAMOTTE KIT

Cleaning the LaMotte Nitrate Kit

1. Pour out all of the water from the beaker, test tubes, and sample bottle (if finished testing) into the sink while flushing with cold tap water. Rinse with tap water.
2. Thoroughly wash each item following these procedures:
    a. Sample bottle, beaker, test tubes, stoppers:
        i. Wash with 5% Alconox soap. Use a brush to remove any particles stuck to the equipment.
        ii. Rinse three times with cold tap water.
        iii. Rinse with 10% Hydrochloric acid solution (use a very small amount, ~2–5 mL) in the sink. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
    a. Syringe
        i. Separate the plunger from the body of the syringe and wash with 5% Alconox soap.
        ii. Rinse three times with cold tap water. Flush the syringe—reassemble and pull and push the plunger in and out of the body of the syringe.
        iii. Separate the plunger again and pour a small amount (~0.5 mL) of 10% HCl into the body. Carefully reattach the plunger and rotate the syringe so that all inside surfaces come in contact with the 10% HCl. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
1. Allow each item to completely dry before returning to the LaMotte Nitrate Kit or monitoring bin.

Storing

Always store your monitoring equipment and supplies in a cool, dry place out of direct sunlight and reach of children and pets, when not in use.

NITRITE – DIGITAL CHECKER

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

- Sample bottle
- Sample bucket (if needed)
- Sample-collection pole (if needed)
- Cooler with ice or frozen freezer packs

Analysis:

- Scissors
- Waste bottle
- Hanna Nitrite Checker Kit (HI707)
  - ✓ Beaker
  - ✓ Cuvette (2)
  - ✓ Syringe
  - ✓ Syringe
  - ✓ Cap or Stopper (2)
  - ✓ Timer
  - ✓ Nitrite Low Range Reagent

Cleaning supplies:

- 5% Alconox soap
- Brush
- 10% HCl
- Distilled water

Safety gear:

- Goggles
- Latex or nitrile gloves

Credit: ALLARM

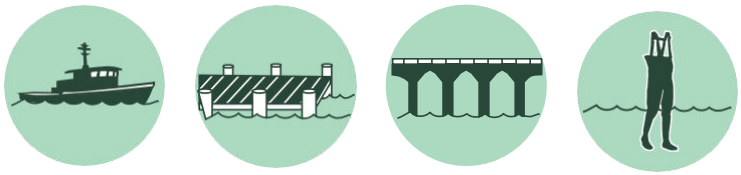
CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the Nitrite Low Range Reagent has not expired. The supplies and reagents recommended when using the Hanna Nitrite Kit are included in the table above.

If any materials are in poor condition, do not use them, and record which equipment needs replacement on your field data sheet. Return expired reagents to your monitoring coordinator so they can be properly disposed of in accordance with federal, state, and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

NITRITE – DIGITAL CHECKER

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Facing upstream, rinse the 500 mL sample bottle and cap with sample water three times, by lowering them into the waterway and pouring the rinse water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle.
4. Remove the sample bottle from the waterway and cap it.
5. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

II. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample-collection pole.
2. Use the pole to reach the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle and cap with sample water three times by lowering it into the waterway and pouring the water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
4. Prepare to fill the bottle by slightly tilting the mouth of the bottle downstream. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle or sample-collection pole.
5. Retrieve the sample bottle from the sample-collection pole and cap it.
6. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

III. Collecting using a bucket

1. Rinse the sample bottle and cap with sample water three times by lowering them into the sample bucket and pouring the rinse water outside of the bucket. Do not touch the inside of the sample bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the bucket to fill.
4. Remove the sample bottle from the bucket and cap it.
5. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

AFTER SAMPLE PROCEDURES

NOTE

The Nitrite Low Range Reagent used in the Hanna Ntirite Kit (HI 707) is considered hazardous, and extra caution should be taken when using the reagents. Avoid contact with your skin, eyes, nose, and mouth.

Safety Practices to Follow:

- Wear latex or nitrile gloves for extra protection.
- Keep all reagents out of the reach of children and pets.
- Do not dispose of reagents or waste on the ground or in the waterway. The waste produced from using the Phosphate Low Range Reagent must be collected and given to your monitoring coordinator for proper disposal.

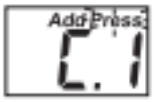
First Aid: Phosphate Low Range Reagent

Contact	Effect	Precaution to Take	First Aid Measures
Spill			• Collect May need more explanation
Eye	Causes severe eye damage.	Wear safety glasses.	• Flush with water for 15 minutes. • If pain persists, call a physician.
Skin	Causes severe skin burns.	Wear protective gloves and clothing.	• Wash skin with plenty of water. • Immediately remove contaminated clothing and safely dispose.
Swallowed	Nausea, vomiting, gastrointestinal and mouth pain, and/or diarrhea.		• Drink plenty of water and induce vomiting. • Call a physician if feeling unwell.
Inhaled	Causes burns.	Do not breath dust.	• Seek fresh air • Call a physician if breathing becomes difficult.

NITRITE – DIGITAL CHECKER

WATER QUALITY ANALYSIS

1. Rinse glass cuvettes and caps (2) with sample water three times. You can use water directly from your bucket or some other collection bottle.
2. Fill one cuvette with exactly 10 mL of sample water and secure the cap.
3. Prepare the Nitrite Checker.
   a. Press the black button on the Nitrite Checker to turn it on.
   b. When the display shows “Add,” “C.1,” and “Press” (blinking), the meter is ready.



   c. Clean the outside of the cuvette with the cloth to remove any fingerprints. Open the top of the Nitrite Checker and place the cuvette inside. Close the top.
   d. Press the black button. When “Add”, “C.2”, and “Press” (blinking) are displayed on the screen, the meter is ready.

4. Add the Nitrite Low Range Reagent.
   a. Remove the cuvette from the Phosphate Checker and unscrew the cap.
   b. Open the Phosphate Low Range Reagent (with scissors) and empty the contents into the cuvette.
   c. Replace the cap and gently shake the cuvette for 15 seconds until the powder is completely dissolved.
   d. If any bubbles form, gently swirl or tap the cuvette to remove them. Clean the outside of the cuvette with the cloth
5. Measure the Nitrite.
   a. Place the cuvette back inside the checker, press and hold the black button on the Phosphate Checker until the dislay shows a countdown timer (15 mins). The results will display after the 15 min timer has finished.
   b. Record the result on your data sheet in ppb. (Note: the Nitrite Checker will turn off after being idle for two minutes).

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6. Replicates.
    a. Repeat the test using the other clean cuvette. If you do not have extra cuvettes in your monitoring kit, see *EQUIPMENT CLEANING AND STORAGE* for instructions on how to clean them, and then proceed below.
    b. If the difference between the two replicates is ≥ 0.04 mg/L, run additional replicates until two results are within the acceptable range of each other.
    c. Use those two replicate values to calculate and record the final (averaged) result.

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can signifigantly affect the results, which defeats the quality assurance measures built into the monitoring program. When cleaning your equipment, keep the following in mind:

- Wear latex or nitrile gloves.
- Equipment does not need to be dry before using, however allow the equipment to completely dry before placing it back into the kit or monitoring bin.
- When using the wash bottles (5% Alconox soap, 10% HCl solution, or distilled water), hold the bottle straight up and down (not at an angle) and gently squeeze. If a gentle squeeze does not work, the tip may be clogged. Do not fill the bottles past the fill line.

Handling 10% Hydrochloric Solution (HCl)

Hydrochloric acid is a strong acid that is used for a variety of purposes. Diluted HCl (10% HCl, 90% distilled water) can be used to clean and sterilize monitoring equipment. Although signifigantly diluted, precautionary measures need to be followed when using HCl, including:

- Avoid contact with eyes, skin, and clothing.
- Do not breathe the mist or vapor.
- Wear latex gloves when handling.
- Thoroughly wash hands afterwards.

First Aid: 10% Hydrochloric Solution (HCl)

Contact	First Aid Measures
Spill	• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	• Flush with water for 10 minutes.
Skin	• Flush with water for 10 minutes. • Remove contaminated clothing. • Immediately call a physician.
Swallowed	• Immediately call a physician.
Inhaled	• Move yourself to an area with fresh air.

Cleaning the Hanna Phosphate Low Range Kit

1. Pour out all of the water from the beaker and sample bottle (if finished testing) into the sink while flushing with cold tap water. Rinse with tap water.
2. Pour out all of the water from the cuvettes into the Phosphate Waste Bottle. Rinse the cuvettes three times with distilled water and pour the waste water into the Phosphate Waste Bottle.
3. Thoroughly wash each item following these procedures:
    a. Sample bottle, beaker, cuvettes:
        i. Wash with 5% Alconox soap. Use a brush to remove any particles stuck to the equipment.
        ii. Rinse three times with cold tap water.
        iii. Rinse with 10% Hydrochloric acid solution (use a very small amount, ~2–5 mL) in the sink. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
    a. Syringe
        i. Separate the plunger from the body of the syringe and wash with 5% Alconox soap.
        ii. Rinse three times with cold tap water. Flush the syringe—reassemble and pull and push the plunger in and out of the body of the syringe.
        iii. Separate the plunger again and pour a small amount (~0.5 mL) of 10% HCl into the body. Carefully reattach the plunger and rotate the syringe so that all inside surfaces come in contact with the 10% HCl. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
4. Allow each item to completely dry before returning to the Hanna Phosphate Kit or monitoring bin.

Storing

Always store your monitoring equipment and supplies in a cool, dry place out of direct sunlight and reach of children and pets, when not in use. Return your phosphate waste bottle to your monitoring coordinator when it is full to be appropriately processed.

PHOSPHATE – DIGITAL CHECKER

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

- Sample bottle
- Sample bucket (if needed)
- Sample-collection pole (if needed)
- Cooler with ice or frozen freezer packs

Analysis:

- Scissors
- Phosphate waste bottle
- Hanna Phosphate Checker Kit (HI713)
  - ✓ Beaker
  - ✓ Cuvette (2)
  - ✓ Syringe
  - ✓ Timer
  - ✓ Cap or Stopper (2)
  - ✓ Phosphate Low Range Reagent

Cleaning supplies:

- 5% Alconox soap
- Brush
- 10% HCl
- Distilled water

Safety gear:

- Goggles
- Latex or nitrile gloves

Credit: ALLARM

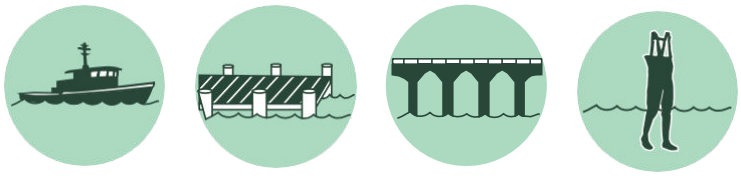
CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the Phosphate Low Range Reagent has not expired. The supplies and reagents recommended when using the Hanna Phosphate Kit are included in the table above.

If any materials are in poor condition, do not use them, and record which equipment needs replacement on your field data sheet. Return expired reagents to your monitoring coordinator so they can be properly disposed of in accordance with federal, state, and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

PHOSPHATE – DIGITAL CHECKER

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Facing upstream, rinse the 500 mL sample bottle and cap with sample water three times, by lowering them into the waterway and pouring the rinse water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle.
4. Remove the sample bottle from the waterway and cap it.
5. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

II. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample-collection pole.
2. Use the pole to reach the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle and cap with sample water three times by lowering it into the waterway and pouring the water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
4. Prepare to fill the bottle by slightly tilting the mouth of the bottle downstream. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle or sample-collection pole.
5. Retrieve the sample bottle from the sample-collection pole and cap it.
6. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

III. Collecting using a bucket

1. Rinse the sample bottle and cap with sample water three times by lowering them into the sample bucket and pouring the rinse water outside of the bucket. Do not touch the inside of the sample bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the bucket to fill.
4. Remove the sample bottle from the bucket and cap it.
5. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

AFTER SAMPLE PROCEDURES

NOTE

The Phosphate Low Range Reagent used in the Hanna Phosphate Kit (HI 713) is considered hazardous, and extra caution should be taken when using the reagents. Avoid contact with your skin, eyes, nose, and mouth.

Safety Practices to Follow:

- Wear latex or nitrile gloves for extra protection.
- Keep all reagents out of the reach of children and pets.
- Do not dispose of reagents or waste on the ground or in the waterway. The waste produced from using the Phosphate Low Range Reagent must be collected and given to your monitoring coordinator for proper disposal.

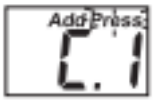
First Aid: Phosphate Low Range Reagent

Contact	Effect	Precaution to Take	First Aid Measures
Spill			• Collect May need more explanation
Eye	Causes severe eye damage.	Wear safety glasses.	• Flush with water for 15 minutes. • If pain persists, call a physician.
Skin	Causes severe skin burns.	Wear protective gloves and clothing.	• Wash skin with plenty of water. • Immediately remove contaminated clothing and safely dispose.
Swallowed	Nausea, vomiting, gastrointestinal and mouth pain, and/or diarrhea.		• Drink plenty of water and induce vomiting. • Call a physician if feeling unwell.
Inhaled	Causes burns.	Do not breath dust.	• Seek fresh air • Call a physician if breathing becomes difficult.

PHOSPHATE – DIGITAL CHECKER

WATER QUALITY ANALYSIS

1. Rinse glass cuvettes and caps (2) with sample water three times. You can use water directly from your bucket or some other collection bottle.
2. Fill one cuvette with exactly 10 mL of sample water and secure the cap.
3. Prepare the Phosphate Checker.
   a. Press the black button on the Phosphate Checker to turn it on.
   b. When the display shows “Add,” “C.1,” and “Press” (blinking), the meter is ready.



   c. Clean the outside of the cuvette with the cloth to remove any fingerprints. Open the top of the Phosphate Checker and place the cuvette inside. Close the top.
   d. Press the black button. When “Add”, “C.2”, and “Press” (blinking) are displayed on the screen, the meter is ready.

4. Add the Phosphate Low Range Reagent.
   a. Remove the cuvette from the Phosphate Checker and unscrew the cap.
   b. Open the Phosphate Low Range Reagent (with scissors) and empty the contents into the cuvette.
   c. Replace the cap and gently shake the cuvette for two minutes until the powder is completely dissolved.
   d. If any bubbles form, gently swirl or tap the cuvette to remove them. Clean the outside of the cuvette with the cloth and place it inside the Phosphate Checker.
5. Measure the orthophosphate.
   a. Place the cuvette back inside the checker, press and hold the black button on the Phosphate Checker until the dislay shows a countdown timer (3 mins). The results will display after the 3 min timer has finished.
   b. Record the result on your data sheet in ppm. (Note: the Phosphate Checker will turn off after being idle for two minutes).

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6. Replicates.
    a. Repeat the test using the other clean cuvette. If you do not have extra cuvettes in your monitoring kit, see *EQUIPMENT CLEANING AND STORAGE* for instructions on how to clean them, and then proceed below.
    b. If the difference between the two replicates is ≥ 0.04 mg/L, run additional replicates until two results are within the acceptable range of each other.
    c. Use those two replicate values to calculate and record the final (averaged) result.

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can signifigantly affect the results, which defeats the quality assurance measures built into the monitoring program. When cleaning your equipment, keep the following in mind:

- Wear latex or nitrile gloves.
- Equipment does not need to be dry before using, however allow the equipment to completely dry before placing it back into the kit or monitoring bin.
- When using the wash bottles (5% Alconox soap, 10% HCl solution, or distilled water), hold the bottle straight up and down (not at an angle) and gently squeeze. If a gentle squeeze does not work, the tip may be clogged. Do not fill the bottles past the fill line.

Handling 10% Hydrochloric Solution (HCl)

Hydrochloric acid is a strong acid that is used for a variety of purposes. Diluted HCl (10% HCl, 90% distilled water) can be used to clean and sterilize monitoring equipment. Although signifigantly diluted, precautionary measures need to be followed when using HCl, including:

- Avoid contact with eyes, skin, and clothing.
- Do not breathe the mist or vapor.
- Wear latex gloves when handling.
- Thoroughly wash hands afterwards.

First Aid: 10% Hydrochloric Solution (HCl)

Contact	First Aid Measures
Spill	• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	• Flush with water for 10 minutes.
Skin	• Flush with water for 10 minutes. • Remove contaminated clothing. • Immediately call a physician.
Swallowed	• Immediately call a physician.
Inhaled	• Move yourself to an area with fresh air.

Cleaning the Hanna Phosphate Low Range Kit

1. Pour out all of the water from the beaker and sample bottle (if finished testing) into the sink while flushing with cold tap water. Rinse with tap water.
2. Pour out all of the water from the cuvettes into the Phosphate Waste Bottle. Rinse the cuvettes three times with distilled water and pour the waste water into the Phosphate Waste Bottle.
3. Thoroughly wash each item following these procedures:
    a. Sample bottle, beaker, cuvettes:
        i. Wash with 5% Alconox soap. Use a brush to remove any particles stuck to the equipment.
        ii. Rinse three times with cold tap water.
        iii. Rinse with 10% Hydrochloric acid solution (use a very small amount, ~2–5 mL) in the sink. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
    a. Syringe
        i. Separate the plunger from the body of the syringe and wash with 5% Alconox soap.
        ii. Rinse three times with cold tap water. Flush the syringe—reassemble and pull and push the plunger in and out of the body of the syringe.
        iii. Separate the plunger again and pour a small amount (~0.5 mL) of 10% HCl into the body. Carefully reattach the plunger and rotate the syringe so that all inside surfaces come in contact with the 10% HCl. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
4. Allow each item to completely dry before returning to the Hanna Phosphate Kit or monitoring bin.

Storing

Always store your monitoring equipment and supplies in a cool, dry place out of direct sunlight and reach of children and pets, when not in use. Return your phosphate waste bottle to your monitoring coordinator when it is full to be appropriately processed.

PHOSPHATE – KIT

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

- Sample bottle
- Sample bucket (if needed)
- Sample-collection pole (if needed)
- Cooler with ice or frozen freezer packs

Analysis:

- Hach PO-19 Orthophosphate Kit
  - ✓ Beaker
  - ✓ Bottle
  - ✓ Syringe
  - ✓ Test tubes (3)
  - ✓ Timer
  - ✓ PhosVer3

Cleaning supplies:

- 5% Alconox soap
- Brush
- 10% HCl
- Distilled water

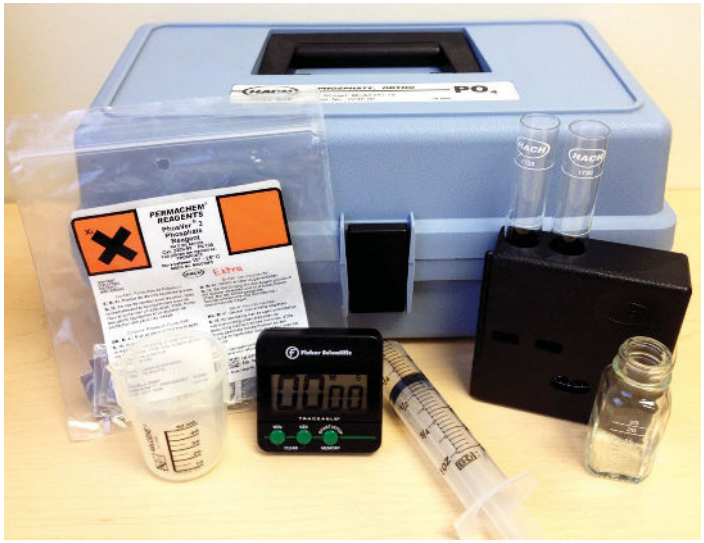
Safety gear:

- Goggles
- Latex or nitrile gloves

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

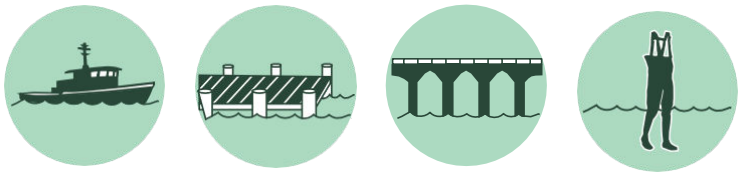
Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the PhosVer 3 Reagents have not expired. The supplies and reagents recommended when using the Hach Orthophosphate Kit are included in the lists above.

If any materials are in poor condition, do not use them, and record which equipment needs replacement on your field data sheet. Return expired reagents to your monitoring coordinator so they can be properly disposed of in accordance with federal, state, and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.



Credit: ALLARM

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Facing upstream, rinse the 500 mL sample bottle and cap with sample water three times, by lowering them into the waterway and pouring the rinse water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle.
4. Remove the sample bottle from the waterway and cap it.
5. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

II. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample-collection pole.
2. Use the pole to reach the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle and cap with sample water three times by lowering it into the waterway and pouring the water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
4. Prepare to fill the bottle by slightly tilting the mouth of the bottle downstream. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle or sample-collection pole.
5. Retrieve the sample bottle from the sample-collection pole and cap it.
6. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

III. Collecting using a bucket

1. Rinse the sample bottle and cap with sample water three times by lowering them into the sample bucket and pouring the rinse water outside of the bucket. Do not touch the inside of the sample bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the bucket to fill.
4. Remove the sample bottle from the bucket and cap it.
5. Immediately analyze the phosphate or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

AFTER SAMPLE PROCEDURES

NOTE

The PhosVer 3 Phosphate Reagent used in the Hach Orthophosphate Kit (PO 19) is considered hazardous, and extra caution should be taken when using the reagents. Avoid contact with your skin, eyes, nose, and mouth.

Safety Practices to Follow:

- Wear latex or nitrile gloves for extra protection.
- Keep all reagents out of the reach of children and pets.
- Do not dispose of reagents or waste on the ground or in the waterway. The waste produced from using the PhosVer 3 Phosphate Reagent must be collected and given to your monitoring coordinator for proper disposal.

First Aid: PhosVer 3 Phosphate Reagent

Contact	Effect	Precaution to Take	First Aid Measures
Spill			• Scoop up spilled material into a large bottle and dissolve with water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Decontaminate the area of the spill with a soap solution. If regulations permit, flush down the drain with a large excess of water.
Eye	Causes serious eye irritation and/or damage.	Wear safety glasses.	• Immediately flush eyes with water for 15 minutes. • If wearing contacts, remove and continue rinsing. • If irritation persists, call a physician.
Skin		Wear protective gloves and clothing.	• Wash skin with plenty of water.
Swallowed			• Immediately call physician. • Give 1–2 glasses of water. • Do not induce vomiting.
Inhaled		Do not breath dust.	• Seek fresh air. • Give artificial respiration if necessary. • Call physician.

PHOSPHATE – KIT

WATER QUALITY ANALYSIS

1. Prepare the equipment for analysis
    a. Beaker (1)
        i. Pour ~10 mL of sample water into the beaker.
        ii. Rotate the beaker so that water touches all sides of the beaker. Empty the rinse water into your sink.
        iii. Repeat three times.
        iv. Fill the beaker.
    b. Square Mixing Bottle (2)
        i. Pour ~5 mL of sample water into both square mixing bottles.
        ii. Rotate the bottles so that water touches all sides of the bottle. Empty the rinse water into your sink.
        iii. Repeat three times.
        iv. Fill the beaker.
    c. Test tubes (3)
        i. Fill the test tubes half way with water from the beaker.
        ii. Rotate the test tubes so that water touches all sides of the test tubes. Empty the rinse water into your sink.
        iii. Repeat three times.
    d. Syringe (1)
        i. Draw water from the beaker into the syringe.
        ii. Turn the syringe upside down and pull back the plunger to thoroughly rinse the inside of the syringe. Empty the rinse water into your sink.
        iii. Repeat three times.
    a. Thermometer (1)
        i. Rinse the thermometer with distilled water.
        ii. Repeat three times.
2. Prepare the water sample for analysis
    a. Shake the sample bottle.
    b. Empty the beaker and fill with new sample water.
    c. Measure the temperature of the water sample. The sample must be at room temperature (20–23°C) before testing it for orthophosphate.

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d. Use the syringe to fill the square mixing bottle with exactly 20 mL of sample water.

3. Add the PhosVer 3 Reagent
   a. Open the PhosVer 3 Phosphate Reagent (with scissors) and empty the contents into the square mixing bottle.
   b. Swirl the square mixing bottle for 15 seconds to mix the reagent. The reagent will not completely dissolve.
   c. Set the timer for eight minutes.
4. Prepare the blank
   a. Fill a test tube to the top line with sample water from the beaker.
   b. Insert the test tube into the color comparator—opening on left.
5. Transfer the sample to the test tube
   a. After eight minutes, fill a test tube to the top line with sample from the square mixing bottle.
   b. Insert the test tube into the color comparator—opening on right.
6. Measure the orthophosphate
   a. Hold the color comparator about one foot away from a white background and up to a light source.
   b. Rotate the color disc until the colors in both windows are the same.
   c. Read the value on the color disc through the window. Divide the value by 50.
   d. Record the final result on your data sheet.
7. Replicates
   a. Repeat the test using the other clean test tube (you can reuse the blank) and square mixing bottle. If you do not have extra supplies in your monitoring kit, see *EQUIPMENT CLEANING AND STORAGE* for instructions on how to clean them, and then proceed below.
   b. If the difference between the two replicates is > 0.04 mg/L, run additional replicates until two results are within the acceptable range of each other.
   c. Use those two replicate values to calculate and record the final (averaged) result.

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can signifigantly affect the results, which defeats the quality assurance measures built into the monitoring program. When cleaning your equipment, keep the following in mind:

- Wear latex or nitrile gloves.
- Equipment does not need to be dry before using, however allow the equipment to completely dry before placing it back into the kit or monitoring bin.
- When using the wash bottles (5% Alconox soap, 10% HCl solution, or distilled water), hold the bottle straight up and down (not at an angle) and gently squeeze. If a gentle squeeze does not work, the tip may be clogged. Do not fill the bottles past the fill line.

Handling 10% Hydrochloric Solution (HCl)

Hydrochloric acid is a strong acid that is used for a variety of purposes. Diluted HCl (10% HCl, 90% distilled water) can be used to clean and sterilize monitoring equipment. Although signifigantly diluted, precautionary measures need to be followed when using HCl, including:

- Avoid contact with eyes, skin, and clothing.
- Do not breathe the mist or vapor.
- Wear latex gloves when handling.
- Thoroughly wash hands afterwards.

First Aid: 10% Hydrochloric Solution (HCl)

Contact	First Aid Measures
Spill	• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	• Flush with water for 10 minutes.
Skin	• Flush with water for 10 minutes. • Remove contaminated clothing. • Immediately call a physician.
Swallowed	• Immediately call a physician.
Inhaled	• Remove yourself to an area with fresh air.

Cleaning the Hach Orthophosphate Kit

1. Pour out all of the water from the beaker, test tube (blank only), and sample bottle (if finished testing) into the sink while flushing with cold tap water. Rinse with tap water.
2. Pour out all of the water from the square mixing bottle and test tubes (with sample) into the sink while flushing with cold tap water. Rinse with tap water.
3. Thoroughly wash each item following these procedures:
    a. Sample bottle, beaker, square mixing bottle, test tubes:
        i. Wash with 5% Alconox soap. Use a brush to remove any particles stuck to the equipment.
        ii. Rinse three times with cold tap water.
        iii. Rinse with 10% Hydrochloric acid solution (use a very small amount, ~2–5 mL) in the sink. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
    a. Syringe
        i. Separate the plunger from the body of the syringe and wash with 5% Alconox soap.
        ii. Rinse three times with cold tap water. Flush the syringe—reassemble and pull and push the plunger in and out of the body of the syringe.
        iii. Separate the plunger again and pour a small amount (~0.5 mL) of 10% HCl into the body. Carefully reattach the plunger and rotate the syringe so that all inside surfaces come in contact with the 10% HCl. Pour the used HCl solution down the sink while flushing with cold tap water.
        iv. Rinse three times with distilled water.
4. Allow each item to completely dry before returning to the Hach Orthophosphate Kit or monitoring bin.

Storing

Always store your monitoring equipment and supplies in a cool, dry place out of direct sunlight and reach of children and pets, when not in use. Return your phosphate waste bottle to your monitoring coordinator when it is full to be appropriately processed.

TURBIDITY – KIT

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

- Sample bottle
- Sample bucket (if needed)
- Sample-collection pole (if needed)
- Cooler with ice or frozen freezer packs

Analysis:

- LaMotte Turbdidity Kit 7519
  - ✓ Column (2)
  - ✓ Standard Turbidity Reagent

Cleaning supplies:

- 5% Alconox soap
- Brush
- 10% HCl
- Distilled water

Safety gear:

- Goggles
- Latex or nitrile gloves

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

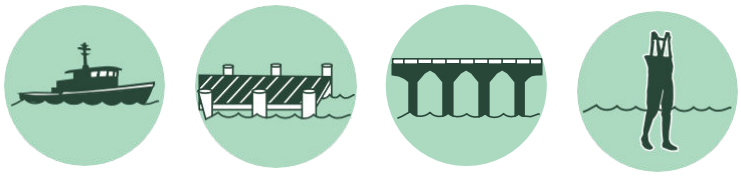
Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the Standard Turbidity Reagent has not expired. The supplies and reagents recommended when using the LaMotte Turbidity Kit are included in the lists above.

If any materials are in poor condition, do not use them, and record which equipment needs replacement on your field data sheet. Return expired reagents to your monitoring coordinator so they can be properly disposed of in accordance with federal, state, and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

Credit: ALLARM

TURBIDITY – KIT

FROM A BOAT, DOCK, BRIDGE, OR WADING



I. Collecting directly in the waterway

1. Facing upstream, rinse the 500 mL sample bottle and cap with sample water three times, by lowering it into the waterway and pouring the rinse water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth downstream.
3. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle.
4. Remove the sample bottle from the waterway and cap it.
5. Analyze the turbidity immediately or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

II. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample-collection pole.
2. Use the pole to reach the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle and cap with sample water three times by lowering it into the waterway and pouring the water out downstream from where you are standing. Do not touch the inside of the bottle or cap with your hands.
4. Prepare to fill the bottle by slightly tilting the mouth of the bottle downstream. Lower the bottle into the waterway, attempting to evenly sample the entire depth of the waterway, but do not touch the streambed with the sample bottle or sample-collection pole.
5. Retrieve the sample bottle from the sample-collection pole and cap it.
6. Analyze the turbidity immediately or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

III. Collecting using a bucket

1. Rinse the sample bottle and cap with sample water three times by lowering them into the sample bucket and pouring the rinse water outside of the bucket. Do not touch the inside of the sample bottle or cap with your hands.
2. Prepare to fill the bottle by slightly tilting the mouth towards you.
3. Lower the bottle into the bucket to fill.
4. Remove the sample bottle from the bucket and cap it.
5. Analyze the turbidity immediately or place the sample bottle in a cooler with ice. Samples need to remain cool (≤ 6°C) until they are analyzed (within 48 hours).

TURBIDITY – KIT

NOTE

The Standard Turbidity Reagent (7520) used in the LaMotte Turbidity Kit (7519) is non-toxic and non-hazardous. However, you should still be careful using the reagent and avoid contact with your skin, eyes, nose, and mouth.

Safety Practices to Follow:

- Wear latex or nitrile gloves for extra protection.
- Keep all reagents out of the reach of children and pets.
- Do not dispose of reagents or waste on the ground or in the waterway. Pour the waste down your sink while flushing with cold tap water.
- Always wash your hands when you finish testing your water sample.

WATER QUALITY ANALYSIS

1. Gently shake your sample bottle.
2. Rinse both Turbidity Columns with water from the sample bottle three times.
3. Fill the Turbidity Column #1 with sample water (sample) to the 50mL line.
4. Look straight down the Column.
    a. If you can see the black dot, continue to Step 5.
    b. If you cannot see the black dot, pour out the sample and fill the column to the 25mL line. If you can see the black dot, continue to Step 5.
    b. If you still cannot see the black dot, the turbidity is too high to measure using the LaMotte turbidity Kit. Record “over range” on your field data sheet and don’t continue.

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5. Fill the turbidity column #2 with distilled water (blank) to the same line as the turbidity column #1 (25 or 50mL line).
6. Look straight down both Turbidity Columns.
    a. If both black dots are equally clear, the turbidity is zero. Record the results on your field data sheet.
    b. If the black dot in Turbidity Column #1 (sample) is less clear than the black dot in Turbidity Column #2 (blank), continue to Step 7.
7. Vigorously shake the bottle of Standard Turbidity Reagent and add 0.5 mL using the dropper inside the reagent bottle to Turbidity Column #2 (blank).
    a. To ensure you add exactly 0.5 mL of reagent fill the dropper past the 0.5 mL line. Leave the tip of the dropper in the reagent bottle and gently squeeze the rubber bulb until the reagent touches the 0.5 mL line.
8. Use the stirring rod to vigorously stir the water in Turbidity Column #1 (sample). Rinse the stirring rod with distilled water. Repeat for Turbidity Column #2 (blank).
9. Look straight down both Turbidity Columns.
    a. If both black dots are equally clear, continue to step 10.
    b. If the black dot in Turbidity Column #1 (sample) is less clear than the black dot in Turbidity Column #2 (blank), continue adding the Standard Turbidity Reagent in 0.5 mL increments (repeating steps 7-9) until the clarity of the samples are equal.
10. Record the total number of measurements added and compare to the Turbidity Test Results chart (next page) to calculate the turbidity in JTU's. Record the final turbidity results on your field data sheet.

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Number of Additions	Volume of Additions	50 mL Result	25 mL Result
1	0.5	5 JTU	10 JTU
2	1.0	10 JTU	20 JTU
3	1.5	15 JTU	30 JTU
4	2.0	20 JTU	40 JTU
5	2.5	25 JTU	50 JTU
6	3.0	30 JTU	60 JTU
7	3.5	35 JTU	70 JTU
8	4.0	40 JTU	80 JTU
9	4.5	45 JTU	90 JTU
10	5.0	50 JTU	100 JTU
15	7.5	75 JTU	150 JTU
20	10.0	100 JTU	200 JTU

11. Repeat steps 1-10 for your replicate sample using clean Turbidity Columns. If you don't have two sets of columns, clean your columns by following the directions under EQUIPMENT CLEANING AND STORAGE (next page) before proceeding.
    a. If the difference between the two replicates is > 5 JTUs, run additional replicates until the two results are within 5 JTUs of each other.
    b. Use those two replicate values to calculate and record the final (averaged) result and record on your field data sheet.

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can signifigantly affect the results, which defeats the quality assurance measures built into the monitoring program. When cleaning your equipment, keep the following in mind:

- Wear latex or nitrile gloves.
- Equipment does not need to be dry before using, however allow the equipment to completely dry before placing it back into the kit or monitoring bin.
- When using the wash bottles (5% Alconox soap, 10% HCl solution, or distilled water), hold the bottle straight up and down (not at an angle) and gently squeeze. If a gentle squeeze does not work, the tip may be clogged. Do not fill the bottles past the fill line.

Handling 10% Hydrochloric Solution (HCl)

Hydrochloric acid is a strong acid that is used for a variety of purposes. Diluted HCl (10% HCl, 90% distilled water) can be used to clean and sterilize monitoring equipment. Although signifigantly diluted, precautionary measures need to be followed when using HCl, including:

- Avoid contact with eyes, skin, and clothing.
- Do not breathe the mist or vapor.
- Wear latex gloves when handling.
- Thoroughly wash hands afterwards.

First Aid: 10% Hydrochloric Solution (HCl)

Contact	First Aid Measures
Spill	• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	• Flush with water for 10 minutes.
Skin	• Flush with water for 10 minutes. • Remove contaminated clothing. • Immediately call a physician.
Swallowed	• Immediately call a physician.
Inhaled	• Move yourself to an area with fresh air.

Cleaning the LaMotte Turbidity Kit

1. Pour out all of the water from the Turbidity Columns and sample bottle (if finished testing) into the sink. Rinse with tap water.
2. Thoroughly wash each item with 5% Alconox soap. Use a brush to remove any particles stuck to the sides of equipment.
3. Rinse each item three times with cold tap water.
4. Rinse each item with 10% Hydrochloric acid solution (use a very small amount, ~2–5 mL) in the sink. Pour the used HCl solution down the sink while flushing with tap water.
5. Rinse each item three times with distilled water.
6. Allow each item to completely dry before returning to the LaMotte Turbidity Kit or monitoring bin.

Storing

Always store your monitoring equipment and supplies in a cool, dry place out of direct sunlight and reach of children and pets, when not in use.