

TIDAL METHODS MANUAL



University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Produced by the Chesapeake Monitoring Cooperative

Working together to understand the health of our waters

September 30, 2016

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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.

Photo Credits

Photos on the cover were taken by Will Parson of the 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 will provide technical, logistical, and outreach support for the integration of citizen-based and non-traditional 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, to inform policy management and water quality assessments, into a federal program. Not only will these data be available to the CBP through the development of a Chesapeake Monitoring Cooperative database, but will be accessible to the public, local governments, universities, and others. The contributions of data by volunteer and non-traditional 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 non-traditional and volunteer water quality monitoring community.
- Provide the infrastructure and support to make all water quality data of known quality available to the Chesapeake Watershed community and integrate data into the CBP partnership's monitoring database.
- 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

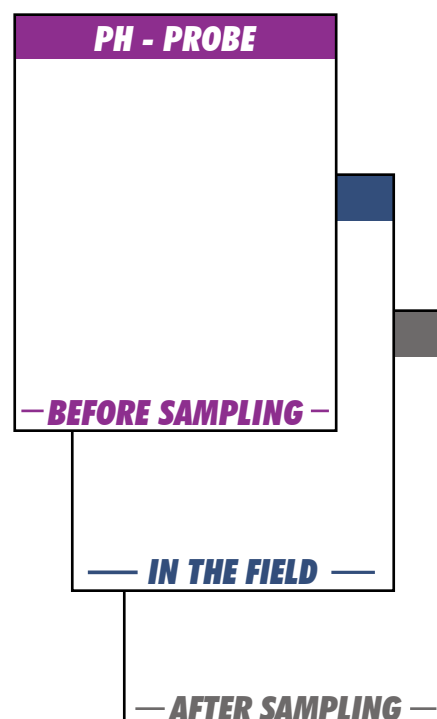
This manual was developed to support the wide variety of monitoring programs and research questions that communities have throughout the Chesapeake Bay watershed. The manual is intended to support the work of the Chesapeake Monitoring Cooperative and supplies methodology for a large number of popularly 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 in understanding their questions about water quality in their 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 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 purple, navy, and gray 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 yellow (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 which one works 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 tool that you will use to collect your sample, including directly in the waterway, a bucket, a probe, or with a sampling pole.

Purple hollow circles represent the platforms 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



Sampling pole



Bucket



Direct collection

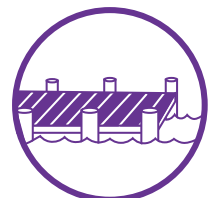


Secchi disk

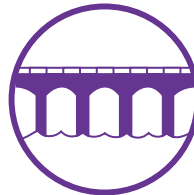
PLATFORMS



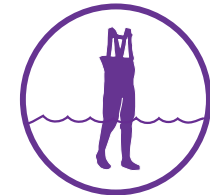
Boat



Dock



Bridge



Wade in

Best practices for monitoring

BEFORE GOING OUT INTO THE FIELD

- a. Choose a regular sampling day: Choose a convenient day of the week for sampling. Samples should be taken at regular weekly or monthly intervals. 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.
 - b. 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.
 - c. Perform your calibration and standardization checks before you go out into the field.
 - d. Get landowner permission: 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. See page ____ for a copy of a blank landowner permission form.
-

IN THE FIELD

- a. Sample with a buddy. It's always better to have an extra pair of hands and another person to help out in a hard or dangerous situation.
- b. Follow the safety guidelines outlined on page 1-10.
- c. Always sample from the same location. If you do move your site please let your monitoring coordinator know so that the site information can be updated.
- d. Always approach your sampling location from downstream. Try your best to not disturb the sediment on the stream bottom as this can affect your sampling results.
- e. Water samples should be collected from the middle of the waterway/tributary at a point where the water is the deepest and the flow is the fastest – do not sample stagnant water. The collection can be done by 1) wading into the waterway, 2) using a sample collection pole, 3) standing on a bridge or dock, or from a boat. If safety is an issue samples should be obtained from a bridge or a dock.
- f. Use the same method of sample collection each time you visit your site, which should be from the same exact location each time you monitor.

Continued on next page...

Best practices for monitoring

- g. When collecting your samples with a sample bottle, provided by your monitoring coordinator, always be sure that it is clean as well as rinsed three times with your sample water before collecting your sample. And don't forget to dump your rinse water downstream of your sample location.
- h. Collect your samples in the following order:
 - i. Air temperature
 - ii. Bacteria
 - iii. Water temperature & probe measurements
 - iv. Salinity
 - v. Water clarity
 - vi. Dissolved oxygen
 - vii. Chlorophyll a
 - viii. pH
 - ix. Lab or nutrient grab samples
- i. Record test your results: Record data on a data collection form provided by the Chesapeake Monitoring Cooperative. 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.
- j. Provide comments on your data sheet: The "Comments" section 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. The comments are very helpful to your monitoring coordinator when trouble shooting data anomalies.
- k. Keep your samples cool: Be sure to keep all samples that need to be kept cool are kept in a cooler with frozen ice packs or ice. Don't allow your samples to be submerged under icy water, this could allow dilution of your samples.

Continued on next page...

Best practices for monitoring

AT THE LAB OR AT HOME

- a. Process your samples in a timely manner. Follow the holding times chart on page 1-12 to know how long you have to process your sample after collecting.
 - b. When processing nutrient samples (nitrogen and phosphorus), water samples should be brought to room temperature before analyzing.
 - c. Shake your sample up before dispensing into your testing containers to make sure it is well mixed and representative of the sample you collected.
 - d. Use the test tube caps or stoppers, not your fingers, to cover test tubes during shaking or mixing.
 - e. When dispensing a reagent from a plastic squeeze bottle, hold the bottle vertically upside-down (not at an angle) and gently squeeze it (if a gentle squeeze does not suffice, the dispensing cap or plug may be clogged).
 - f. Wipe up any reagent spills, liquid or powder, as soon as they occur. Rinse area with a wet sponge, and then dry.
 - g. Thoroughly rinse test tubes before and after each test. Dry your hands and the outside of the tubes.
 - h. Tightly close all reagent containers immediately after use. Do not interchange caps from different containers.
 - i. 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.
 - j. Avoid prolonged exposure of equipment and reagents to direct sunlight. Protect them from extremely high temperatures. Protect them from freezing.
-

OVERALL

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

Field safety tips

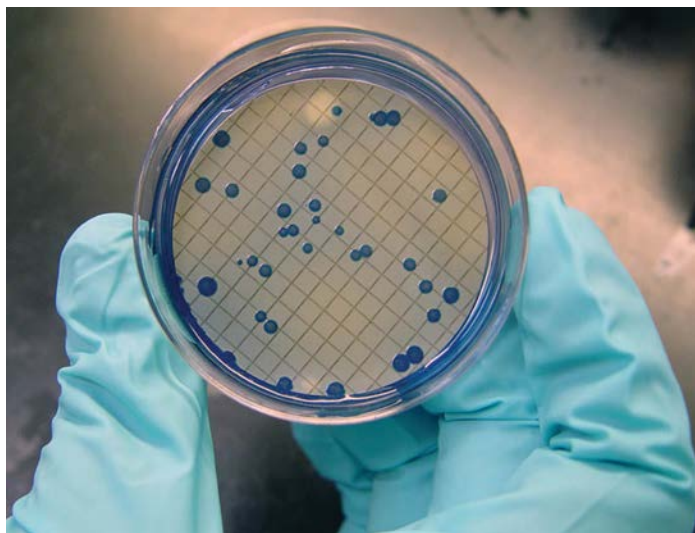
SAFETY CONSIDERATIONS WHEN VISITING YOUR MONITORING SITE

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/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 contact with all reagents and your skin, eyes, nose, and mouth.
- Wear safety glasses and latex/nitrile gloves for extra protection.
- Do not breathe in any dust, mist, or vapors.
- Wash your hands immediately 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 affect the results significantly, which defeats the quality assurance measures built into the monitoring program. When cleaning your equipment with lab-grade soap and a 10% Hydrochloric Acid Solution, keep the following in mind:

- Avoid contact with your skin, eyes, nose, and mouth.
- Wear safety glasses and latex/nitrile gloves for extra protection.
- Do not breathe in any dust, mist, or vapors.
- Wash your hands immediately 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.
- Keep reagent containers tightly closed.



Credit: Will Parson / Chesapeake Bay Program



Credit: UMCES

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	24 hours
Conductivity	28 days
Dissolved oxygen (Meter)	Analyze immediately
Dissolved oxygen (Winkler Titration)	Acidify immediately; Titrate within 8 hours
Nitrate-nitrogen	48 hours
Orthophosphate	48 hours
pH	24 hours
Salinity	28 days
Total dissolved solids	28 days*
Turbidity	24 hours
Water clarity	Analyze immediately
Water temperature	Analyze immediately

* 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.

PROPERTY OWNER PERMISSION AND LIABILITY RELEASE AGREEMENT

_____ is participating in a program to monitor the condition of local rivers and streams, to collect baseline data and ensure that water quality is properly maintained. As part of the survey, trained local volunteers collect water samples and scientific baseline data on a weekly basis at consistent specific sites. This monthly monitoring will last approximately 30 minutes to an hour per site. This agreement is intended to grant permission to volunteers to access private property for site-specific data collection in the watershed, as well as to release and hold harmless the property owner from liability arising from that access.

I, _____ the property owner, hereby grant permission to _____ (name of organization), its volunteers, and necessary project partners, to enter my property located at _____, beginning on _____ (date) until _____ (date or until program completion), for the sole purpose of site-access and water monitoring that takes place on or near my property to accomplish weekly baseline data collection.

I agree that my permission is granted on a voluntary basis and I have neither received or expect to receive any form of compensation in exchange for my permission.

I agree to hold the organization listed above, its volunteers, and necessary project partners, harmless from and forever discharge them from any and all liability for damages, injury, or loss which may be sustained as a result of their entry into the private property described in this agreement.

In addition, the organization listed above hold harmless and forever discharge me, the property owner, from any and all liability for any damage, injury, or loss which may be sustained as a result of their entry into the private property described in this agreement.

Property Owner _____ Date: _____

Organization _____ Date: _____

VOLUNTEER LIABILITY WAIVER

LIABILITY

The Alliance for the Chesapeake Bay, hereafter ACB, intends that volunteers participating in this program are not acting on behalf of the ACB Board of Directors or any ACB partner in any official capacity. As such, it is the intent of ACB that volunteers are not authorized to be considered agents, employees, or authorized representatives of the ACB or any partner for any purpose, and that volunteers are not entitled to the same benefits received by employees of the ACB.

Volunteers must recognize the potential for injury to themselves and their real and personal property which may result from volunteer activities conducted with the ACB's volunteer monitoring program. The ACB and all ACB partners intend that volunteers expressly assume all risks and liability for any injuries to, or caused by, volunteers under this program.

LIABILITY RELEASE

In consideration of the foregoing, I, for myself, my heirs, and executors, do hereby release and discharge all Alliance for the Chesapeake and supporting organizations for all claims, damages, demands, actions and whatever in any manner arising or growing out of my participation in said monitoring program.

Signed: _____

Date: _____

First and last name : _____

Phone: _____

Address: _____

Data entry and management

As a CMC monitor you are required to electronically enter the water quality data that you collect to the CMC database. If you do not have access to a computer or the Internet and are unable to submit your data electronically, you may mail your data sheets 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 data sheets 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 data sheet. Be sure to fill out your field sheet in its entirety.
2. Enter your data to the CMC database (available Fall 2017).
3. Upload a scanned .jpg or .pdf of your field sheet.
4. Review your entered data to make sure it matches your field data sheet.
5. Submit your electronic data.
6. Mail your field data sheet to your monitoring coordinator for review and quality control check. If you uploaded an image of your field sheet to the database you can bundle your field sheets and mail them to your monitoring coordinator each quarter. If you didn't upload your data sheet, mail it in as soon as you can so your data can be checked out by your monitoring coordinator.

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C/O CMC Coordinator
612 Hull St. Suite 101C
Richmond, VA 23223

Dickinson College/ALLARM
C/O CMC Coordinator
P.O. Box 1773
Carlisle, PA 17013

Izaak Walton League of America
C/O CMC Coordinator
707 Conservation Lane
Gaithersburg, MD 20878

7. After your data has been quality checked it will be made available on the database to the larger Chesapeake community.
8. Explore your data!

TEMPERATURE

GATHERING MATERIALS AND EQUIPMENT LIST

- Armored glass thermometer, digital thermistor, or probe
 - Tape measurer with weight at end (for depth profile sampling only)
-

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 sealed tight.



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.

BEFORE SAMPLING

TEMPERATURE

Air temperature

1. Locate a place near your site out of the direct sun.
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 thermistor or probe on your data sheet.

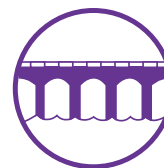
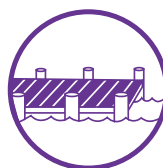
NOTE

Always measure air temperature before water temperature!

A wet thermometer can alter your air temperature readings.

Water temperature

A. FROM A BOAT, DOCK, OR BRIDGE



I. Surface sampling with a probe, armored glass thermometer, or digital thermistor

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.
2. Wait for the probe to stabilize.
3. Record your temperature reading and the depth at which it was measured.

TEMPERATURE



II. If using a bucket to collect your sample

1. Hang or hold the thermometer in the bucket away from the sides or bottom of the bucket to minimize temperature drift.
 2. Wait for the probe or thermometer to stabilize.
 3. Record your reading. Mark on your data sheet that the measurement was taken from a bucket.
-



III. Depth profile sampling (water depth >3 m) with a probe

1. Measure temperature 0.5 m above the bottom, then 1 meter intervals to 0.5 m below the surface if sampling in Maryland or 1.0 m below the surface if sampling in Virginia. *Example: At a 3.4 m deep site, measure at 2.9, 3.0, 2.0, 1.0, and 0.5 m if sampling in Maryland.*
 2. At each iteration allow the probe to stabilize before recording your temperature reading at the corresponding depth.
 3. Measure salinity and DO at each depth as well.
 4. Record depth, DO, temperature, and salinity on your data sheet for each depth.
-



IV. Depth profile sampling (water depth <3 m) with a probe

1. Measure 0.5 m above the bottom, allow the probe to stabilize and record your result.
2. Measure temperature 0.5 m above the bottom, then 1 meter intervals to 0.5 m below the surface if sampling in Maryland or 1.0 m below the surface if sampling in Virginia. Allow the probe to stabilize and record your result and the depth at which your temperature was recorded.

TEMPERATURE

B. WADING



I. Surface sampling with a probe, armored glass thermometer, or digital thermistor

1. Walk up creek to the sample location in the center of the creek. Be sure not to kick up any sediment or debris in front of you.
2. Place your probe or thermometer 0.3 m beneath the surface of the water.
3. Wait for the probe or thermometer to stabilize.
4. Record your reading and the depth at which you recorded your sample.

IN THE FIELD

TEMPERATURE

AFTER SAMPLE CALIBRATION CHECK

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

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.

———— ***AFTER SAMPLING*** ————

BACTERIA - COLISCAN EASYGEL

GATHERING MATERIALS AND EQUIPMENT LIST

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

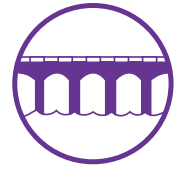
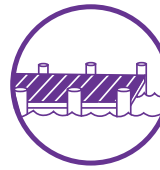
CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- 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).

———— **BEFORE SAMPLING** ————

BACTERIA - COLISCAN EASYGEL

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting directly in the waterway

1. Un-cap the sterile and pre-labeled bottle without touching the inside of the lid
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 $\frac{3}{4}$ full.
3. Cap the bottle and place sample on ice in cooler immediately (cooler temperature should be 1°C to 4°C.
4. Record the depth you collected your sample.

NOTE

Be careful to not freeze your sample!



II. Collecting with a bucket

1. Make sure not to touch inside of bucket with your hands.
2. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
3. Rinse the bucket three times with sample water collected downstream of your sampling location.
4. Fill the bucket with the sample water to $\frac{1}{2}$ full.
5. Un-cap the sterile and pre-labeled bottle without touching the inside of the lid
6. Using a U motion dip the bottle into the water down and away from yourself allowing the bottle to fill $\frac{3}{4}$ full.
7. Cap the bottle and place sample on ice in cooler immediately (cooler temperature should be 1°C to 4°C. Do not freeze your sample.

IN THE FIELD

BACTERIA - COLISCAN EASYGEL



III. Collecting with a sampling pole

1. Un-cap your sterile and pre-labeled 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 filling the bottle to 3/4 full.
3. Cap the bottle and place sample on ice in cooler immediately (cooler temperature should be 1°C to 4°C.
4. Record the depth you collected your sample.

NOTE

Be careful to not freeze your sample!

B. WADING



I. Collecting directly in the waterway

1. Wade into the main flow of the waterway.
2. Take a few steps (~5 feet) upstream with minimal disturbance. Sampling point should be where the main flow of the water is.
3. Un-cap the sterile and pre-labeled bottle without touching the inside of the lid.
4. 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 $\frac{3}{4}$ full. Avoid any sediment plumes from walking to the sample point.
5. Exit the waterway carefully.
6. Cap the bottle and place sample on ice in cooler immediately (cooler temperature should be 1°C to 4°C. Do not freeze your sample.
7. Record the depth you collected your sample.

IN THE FIELD

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 pipette sterile: open pipette packet bulb-side first so that you do not contaminate the tip.
2. Gently mix the water sample in the bottle.
3. Pipette the desired volume (1.0 – 5.0 milliliters) of sample water directly into Coliscan media bottle and recap the bottle. It is best to dispense 2-ml in two separate allotments for a total of 4 ml while using a 3 ml disposable pipette. 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 contents 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 in incubator upside down (media on the top) 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.

AFTER SAMPLING

BACTERIA - COLISCAN EASYGEL

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 in the column labeled “Total # of purple or dark blue colonies on plate” on the data form.
 4. Calculate the number of E. coli per 100 milliliters of water by following the instructions on the datasheet and record.
 5. Calculate the average number of E. coli per plate and record on the datasheet. This is the value you will report in the on-line database. Refer to the identification guide on the next page.
-

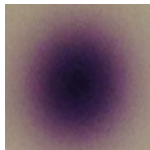
EQUIPMENT CLEANING AND STORAGE

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. 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 in a zip-lock bag and dispose of in the trash.

———— **AFTER SAMPLING** ————

BACTERIA - COLISCAN EASYGEL

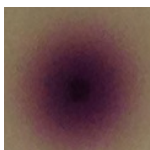
E. coli



Purple, with purple halo



Purple, no halo



Purple with pink halo



Blue with purple or pink halo



Blue or dark blue, no halo



Dark blue with teal halo



Dark blue with blue halo

Not *E. coli*



White



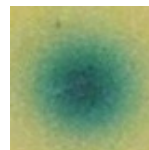
Pink, no halo



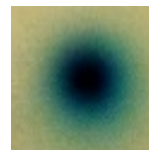
Pink with pink halo



Pinpoints*
(If after incubation period)



Teal green, no halo



Teal with teal 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

AFTER SAMPLING

PH - PROBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Various models of conductivity probes and meters
- Distilled or DI water
- Bucket (if using)
- Calibration solutions 7 and 4.01 or 10

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 before each sampling day.

CALIBRATION

Calibration must be done each day you perform samples. Most meters allow calibrating the pH probe using two different buffers. In most cases the use the 7.00 and 4.00 pH buffer solutions is suitable. If your waterway usually measures above pH values of 7.00, you should calibrate using 7.00 and 10.00 buffer.

NOTE

Most manufacturers specify calibrating first with 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 7.00 buffer first.

Use fresh buffer solution when you calibrate the probe and check the readings at the end of the day. Please record the probe readings to the nearest hundredth unit place (Ex. 7.01) when performing the calibration.

1. If you are using premixed calibration solution, pour a small amount (~50mL) of solution 7 and solution 4 or 10 in two separate clean cups. If not, skip to step 2.

BEFORE SAMPLING

PH - PROBE

2. If you are using powder packets, pour 50 mL of water into a small beaker and empty the entire pH 7 packet into the water. Use a clean stir stick to mix the solution. Repeat the steps with the pH 4 or pH 10 powder.
3. Record the temperature of the probe in the solution during calibration.
4. Place the probe in the 7.00 buffer solution. Gently swirl the buffer or the probe and wait for the reading to stabilize. Press the CAL button. The bottom number will change to indicate the buffer solution present.
5. Wait for the reading to stabilize and press HOLD/ENT, the probe should now read a value close to 7.00 pH units. Record the calibrated value on your field datasheet.
6. Clean the probe with distilled or deionized water and blot dry with a clean cloth or Kimwipe.
7. Immerse the probe in the 4.00 (or 10.00) buffer solution and wait for reading to stabilize.
8. Calibrate the probe (press HOLD/ENT) and it should now read a value close to 4 (or 10) pH units. Record the calibrated value.
9. Repeat steps 6-8 if necessary for the third check with 4.00 or 10.00 buffer.
10. Cover and set aside the calibration solutions for use when you return from sampling.
11. After calibration, you may turn off the probe if the manufacturer says so. If not, the probe should be kept on at all times while going out into the field and prior to the post check. Follow manufacturer instructions regarding transporting of the probe into the field to prevent damage and drying out of the pH probe.



Credit: Alliance for the Chesapeake Bay

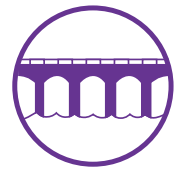
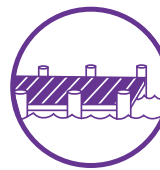
BEFORE SAMPLING

PH - PROBE

NOTE

When traveling to a sample station, keep the probe tip stored in the protective cap or submerged in pH 4.00 buffer, household vinegar, or if needed tap or sample water. 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 the probe resulting in inaccurate readings.

A. FROM A BOAT, DOCK, OR BRIDGE



I. Surface sampling with a probe

1. If you are sampling with a probe that has a cord, place your probe 0.5 m beneath the surface of the water if sampling in Maryland and 1.0 m beneath the surface if sampling in Virginia. If not proceed to step 2.
2. If you are sampling with a pocket probe, place your probe 0.3 m beneath the surface of the water.
3. Wait for the probe to stabilize.
4. Record your reading on your data sheet and the measurement depth.

NOTE

Replicate tests are taken to guard against error. Don't forget to measure twice!

PH - PROBE



II. Depth profile sampling (water depth >3 m) with a probe

1. Measure pH 0.5 m above the bottom, then 1 meter intervals to 0.5 m below the surface if sampling in Maryland or 1.0 m below the surface if sampling in Virginia. *Example: At a 3.4 m deep site, measure at 2.9, 3.0, 2.0, 1.0, and 0.5 m if sampling in Maryland.*
2. At each iteration allow the probe to stabilize before recording your pH reading at the corresponding depth.
3. Measure temperature, salinity and DO at each depth as well.
4. Record depth, DO, temperature, and salinity on your data sheet for each depth.



III. Depth profile sampling (water depth <3 m) with a probe

1. Measure 0.5 m above the bottom, allow the probe to stabilize and record your result.
2. Measure pH 0.5 m above the bottom, then 1 meter intervals to 0.5 m below the surface if sampling in Maryland or 1.0 m below the surface if sampling in Virginia. Allow the probe to stabilize and record your result and the depth at which your pH was recorded.



Credit: UMCES

IN THE FIELD

PH - PROBE



IV. Collecting with 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 3/4 full.
 4. Place your probe in the bucket of water and swirl gently. Allow the reading to stabilize.
 5. Record your reading on your data sheet. Mark on your data sheet that the measurement was taken from a bucket.
-

B. WADING



I. Collecting directly in the waterway

1. Always proceed upstream to allow the flow of the water to push any disturbed sediment downstream of where you will be collecting the sample.
2. Be sure any sediment or debris disturbed from your movement in the streambed is not present where you will collect the sample.
3. Place your probe 0.3 m beneath the surface of the water.
4. Wait for the probe to stabilize and record your reading on your data sheet.
5. Turn off your probe and replace the protective cap.
6. Record your reading on your data sheet and the measurement depth.

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.
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 (~30° C) pH 4.00 buffer to clean. Rinse with distilled water and dry.
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.

———— ***AFTER SAMPLING*** ————

PH - PROBE

AFTER SAMPLE CALIBRATION 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. Washing the probe will remove any material that may reduce probe life.
2. Place the probe into a container of pH 7.00 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 in the end of day temperature °C and the end of day pH 7 check columns on your data sheet.
4. Rinse the probe and repeat the end of day check process using the 4.00 or 10.00 buffer.

NOTE

If both buffer checks are within 0.20 units from the calibration values, the probe is within specifications. If the readings are greater than 0.20 units, flag all pH data collected during the sample run by selecting the pH probe flag in the problems section when entering data into the on-line database. Also note “pH probe flag” at the top of the hard copy datasheet. This is because sometime during the sample run, the probe exceeded QA/QC specifications.

———— ***AFTER SAMPLING*** ————

DISSOLVED OXYGEN - PROBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Various models of dissolved oxygen probes and meters
 - Distilled or 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 before each sampling day.
-

CALIBRATION

With practice and proper care for the dissolved oxygen probe, users can complete the entire DO probe calibration process within 5-10 minutes.

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).



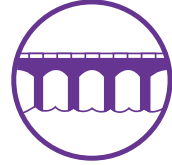
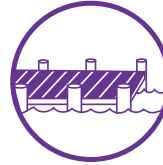
Credit: Peter Bergstrom

Calibrations before field sampling must be performed to standardize 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 before field sampling should be performed indoors. Allow the probes to stabilize to room temperature. Follow all manufacturer specifications for calibration and maintenance.

BEFORE SAMPLING

DISSOLVED OXYGEN - PROBE

A. FROM A BOAT, DOCK, OR BRIDGE



1. Collecting directly in the waterway - Depth Profile Sampling (>3m)

If you are measuring with a multi probe and have a long enough cord, you are encouraged to do depth profiles.

NOTE

Replicate tests are taken to guard against error. Don't forget to measure twice!

1. Place your probe 0.5 m above the bottom of the water.
2. Measure 0.5 m, then at 1 meter intervals 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. (Example: At 3.4 m deep site in Maryland, measure at 2.9, 2.0, 1.0, and 0.5 m)
3. At each iteration allow the probe to stabilize before recording your DO reading at the corresponding depth
4. Measure salinity and temperature at each depth as well
5. Record depth, DO, temperature, and salinity on your data sheet for each depth



Credit: Peter Bergstrom

Continued on next page...

IN THE FIELD

DISSOLVED OXYGEN - PROBE



II. Collecting directly in the waterway - Depth Profile Sampling ($\leq 3\text{m}$)

1. Measure 0.5 m above the bottom, allow the probe to stabilize and record your result
 2. Measure 0.5 m below the surface of the water if sampling in Maryland and 1.0 m below the surface if sampling in Virginia. Allow the probe to stabilize and record your result.
 3. Measure salinity and temperature at each depth as well
-



III. 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, and then record your reading and the depth at which you recorded your reading.
-



IV. Collecting with 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 3/4 full.
4. Place your probe in the bucket of water and swirl gently. Allow the reading to stabilize.
5. Record your reading on your data sheet. Mark on your data sheet that the measurement was taken from a bucket.

DISSOLVED OXYGEN - PROBE

B. WADING



1. Collecting directly in the waterway

1. Always proceed upstream to allow the flow of the water to push any disturbed sediment downstream of where you will be collecting the sample.
2. Be sure any sediment or debris disturbed from your movement in the streambed is not present where you will collect the sample.
3. 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.
4. Wait for the probe to stabilize and record your reading on your data sheet.
5. Turn off your probe and replace the protective cap.
6. Record your reading on your data sheet and the measurement depth.

IN THE FIELD

DISSOLVED OXYGEN - PROBE

AFTER SAMPLE CALIBRATION CHECK

After the sample run is complete, return the probe to the calibration station to perform a quick post check. The post check consists of placing the probe in the DO calibration chamber and letting it equalize. This may take between 2 to 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.

———— ***AFTER SAMPLING*** ————

SALINITY/CONDUCTIVITY/TDS - PROBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Various models of conductivity probes and meters
 - Distilled or DI water
 - Bucket (if using)
 - Sampling pole (if using)
 - Sample bottles
-

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.
-

CALIBRATION

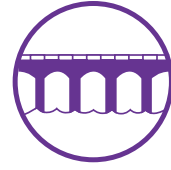
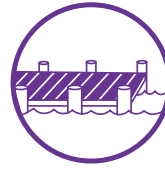
Most probes that test for conductivity and TDS use a pre-made calibration solution with a specific conductivity value. The probe is immersed in the solution and calibrated to the value of the solution. It is good to use a calibration solution concentration similar to what you may find in the field to ensure accuracy.

1. Record the date of calibration. Calibration must be done each day you perform samples.
2. Record the temperature of the water read by the probe while you are calibrating the probe.
3. Write down the conductivity listed on the probe when you immerse the probe into the conductivity solution and record the value prior to calibration.
4. 4. Record the conductivity solution that you will use to calibrate the probe. The standard unit for these solutions is in microsiemens per centimeter (uS/cm) but probes may use different units such is millisiemens per centimeter (mS/cm).
5. 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.

———— ***BEFORE SAMPLING*** ————

SALINITY/CONDUCTIVITY/TDS - PROBE

A. FROM A BOAT, DOCK, OR BRIDGE



I. Surface sampling with a probe

1. If you only are taking surface measurements, place your probe 0.5 m beneath the surface of the water if sampling in Maryland and 1.0 m beneath the surface if sampling in Virginia, wait for the probe to stabilize, and then record your reading.
2. If the meter is not equipped with a pressure gauge for depth estimation and the current is strong enough to pull the meter so that the cable is at an angle noticeably different than vertical, estimation of depth will have to be corrected. Weighted probe guards may help prevent displacement by current.
3. Rinse the probe with deionized or distilled water.
4. 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.
5. Place the probe into the sample water, and read the salinity, conductivity or TDS of the water sample on the meter's scale.
6. Rinse the probe with distilled or deionized water between each sample and before post sampling calibration check. Replace the cap for storage and transport.

NOTE

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

Continued on next page...

IN THE FIELD

SALINITY/CONDUCTIVITY/TDS - PROBE



II. Depth profile sampling (water depth >3 m) with a probe

1. Measure your parameter 0.5 m above the bottom, then 1 meter intervals to 0.5 m below the surface if sampling in Maryland or 1.0 m below the surface if sampling in Virginia. *Example: At a 3.4 m deep site, measure at 2.9, 3.0, 2.0, 1.0, and 0.5 m if sampling in Maryland.*
2. At each iteration allow the probe to stabilize before recording your reading at the corresponding depth.
3. Measure temperature, pH, and DO at each depth as well.
4. Record depth, DO, temperature, pH, and salinityconductivity/TDS on your data sheet for each depth.



III. Depth profile sampling (water depth <3 m) with a probe

1. Measure 0.5 m above the bottom, allow the probe to stabilize and record your result.
2. Measure your parameter 0.5 m above the bottom, then 1 meter intervals to 0.5 m below the surface if sampling in Maryland or 1.0 m below the surface if sampling in Virginia. Allow the probe to stabilize and record your result and the depth at which your reading was recorded.



Credit: UMCES

IN THE FIELD

SALINITY/CONDUCTIVITY/TDS - PROBE



IV. Collecting with a sampling pole

1. Uncap your pre-labeled bottle and secure it to the end of the pole.
2. Extend the pole outward and dip at approximately 0.5 m below the surface if sampling in Maryland and 1.0 m below the surface if sampling in Virginia.
3. Cap the bottle.
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. See note at top of page.
6. Place the probe into the sample water, and read the salinity, conductivity or TDS of the water sample on the meter's scale.

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.

7. Rinse the probe with distilled or deionized water between each sample and before post sampling calibration check. Replace the cap for storage and transport.



Credit: Alliance for the Chesapeake Bay

IN THE FIELD

SALINITY/CONDUCTIVITY/TDS - PROBE



V. Collecting with 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 3/4 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.
6. Place the probe into the sample water, and read the salinity, conductivity or TDS of the water sample on the meter's scale.

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.

7. Rinse the probe with distilled or deionized water between each sample and before post sampling calibration check. Replace the cap for storage and transport.

SALINITY/CONDUCTIVITY/TDS - PROBE

B. WADING



1. Collecting directly in the waterway

1. When wading to the sample site, always proceed upstream to allow the flow of the water to push any disturbed sediment downstream of where you will be collecting the sample.
2. Be sure any sediment or debris disturbed from your movement in the streambed is not present where you will collect the sample.
3. Rinse the probe with deionized or distilled water.
4. 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.



Credit: ALLARM

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.

5. Place the probe into the sample water, and read the salinity, conductivity or TDS of the water sample on the meter's scale.
6. Exit the waterway carefully.
7. Rinse the probe with distilled or deionized water between each sample and before post sampling calibration check. Replace the cap for storage and transport.

IN THE FIELD

SALINITY/CONDUCTIVITY/TDS - PROBE

AFTER SAMPLE CALIBRATION 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 and 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:

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

5. Initial 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 with DI water.
2. Clean according to manufacturers instructions.
3. Store in case according to manufacturers instructions.

———— ***AFTER SAMPLING*** ————

SALINITY - REFRACTOMETER

GATHERING MATERIALS AND EQUIPMENT LIST

- Salinity refractometer
 - DI or distilled water
 - Tissue paper or soft cloth
 - Bucket (if using)
 - Sampling pole (if using)
 - Sample bottles
 - Dropper
-

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.
-

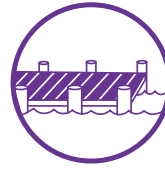
CALIBRATION

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 an angle close to parallel so the water drops will not run off.
3. Close the plate gently. 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.

BEFORE SAMPLING

SALINITY - REFRACTOMETER

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting directly in the waterway

1. Uncap your pre-labeled bottle and collect a water sample from approximately 0.3 m below the surface.
 2. Cap the bottle and place the sample in a cooler with ice or ice-packs.
-



II. Collecting with 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 3/4 full.
 4. Collect your sample water using your dropper to test on site or collect using a pre-labeled sample bottle for later analysis.
-



III. Collecting with a sampling pole

1. Un-cap your pre-labeled 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. Cap the bottle and place the sample in a cooler with ice or ice-packs.

IN THE FIELD

SALINITY - REFRACTOMETER

B. WADING



I. Collecting directly in the waterway

1. Uncap your pre-labeled bottle and collect a water sample from approximately 0.3 m below the surface.
2. Cap the bottle and place the sample in a cooler with ice or ice-packs.

IN THE FIELD

SALINITY - REFRACTOMETER

WATER QUALITY ANALYSIS

Determining Salinity

1. Rinse your dropper with sample water three times.
2. Using the dropper, rinse the refractometer with water sample.
3. Then apply drops from water sample on refractometer and hold up to light to read salinity (right side of circle).
4. Record as parts per thousand (o/oo) using the scale located on the right hand side of refractometer view scope.



Credit: UMCES

AFTER SAMPLE CALIBRATION 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 in case.

AFTER SAMPLING

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 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 held securely 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

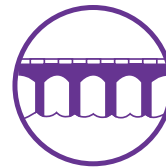
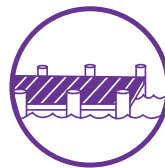


Credit: Matt Rath / Chesapeake Bay Program

BEFORE SAMPLING

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 record 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 data form.
-

B. WADING



I. Measuring directly in the waterway

1. Enter the waterway downstream of the monitoring site to avoid disturbing the stream bed. Move to the center of the waterway, if possible, and face upstream.
2. Perform steps 1 through 5 in section A-I.
3. Carefully exit the stream.

IN THE FIELD

WATER CLARITY - SECCHI DISK

AFTER SAMPLE CALIBRATION CHECK

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

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 scrub gently with a sponge.

———— ***AFTER SAMPLING*** ————

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.

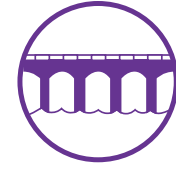
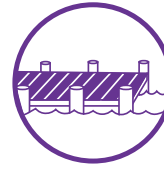


Credit: UMCES

BEFORE SAMPLING

WATER CLARITY - TRANSPARENCY TUBE

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting directly in the waterway

1. If the transparency tube has a drain, close the drain tube by squeezing the crimp.
 2. To collect water directly from the waterway, point the top of the tube in the upstream direction and collect water from the waterway, being careful not to disturb the stream bed.
 3. While looking down through the opening of the tube, partially open drain crimp, slowly draw off sample (Control flow by squeezing the crimp).
 4. When the black and white pattern begins to appear, immediately tighten the crimp.
 5. Record the level of water remaining via the centimeter ruler on the side of tube.
-



I. Collecting with a bucket

1. If the transparency tube has a drain, close the drain tube by squeezing the crimp.
2. Toss your bucket out and collect a water sample.
3. Pour sample water directly into the transparency tube.
4. While looking down through the opening of the tube, partially open drain crimp, slowly draw off sample (Control flow by squeezing the crimp).
5. When the black and white pattern begins to appear, immediately tighten the crimp.
6. Record the level of water remaining via the centimeter ruler on the side of tube.

IN THE FIELD

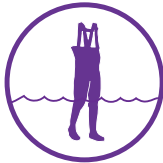
WATER CLARITY - TRANSPARENCY TUBE



I. Collecting with a sampling pole

1. Use your sampling pole to collect a water sample. You may need more than one bottle of water to fill the transparency tube until the Secchi disk disappears
 2. Pour sample water directly into the transparency tube with drain crimp closed.
 3. While looking down through the opening of the tube, partially open drain crimp, slowly draw off sample (Control flow by squeezing the crimp).
 4. When the black and white pattern begins to appear, immediately tighten the crimp.
 5. Record the level of water remaining via the centimeter ruler on the side of tube.
-

B. WADING



I. Collecting directly in the waterway

1. Enter the waterway downstream of the monitoring site to avoid disturbing the stream bed. Move to the center of the waterway, if possible, and face upstream.
2. To collect water directly from the waterway, point the top of the tube in the upstream direction and collect water from the waterway, being careful not to disturb the stream bed.
3. Carefully exit the waterway.
4. While looking down through the opening of the tube, partially open drain crimp, slowly draw off sample (Control flow by squeezing the crimp).
5. When the black and white pattern begins to appear, immediately tighten the crimp.
6. Record the level of water remaining via the centimeter ruler on the side of tube.

IN THE FIELD

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.

———— ***AFTER SAMPLING*** ————

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 don't have an additional weighted measuring line.

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 weight.
- Make sure the line is held securely 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

BEFORE SAMPLING

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.

IN THE FIELD

TOTAL WATER DEPTH

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.

———— ***AFTER SAMPLING*** ————

DISSOLVED OXYGEN - WINKLER

GATHERING MATERIALS AND EQUIPMENT LIST

LaMotte Dissolved Oxygen Test Kit

- (2) Water sampling bottles – 60 mL glass
- (2) Titration tubes w/ caps
- 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
- Sample bucket (if needed)

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 your sample bottle, titration tube, and titrator syringe are clean, dry, and not showing cracks and wear and tear
3. Perform your sodium thiosulfate check (detailed below)



Credit: Alliance for the Chesapeake Bay

BEFORE SAMPLING

DISSOLVED OXYGEN - WINKLER

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 degrade very suddenly, 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. Here is how you do the check...

1. Rinse the titrating tube (small glass vial with plastic lid with hole in it) with a small amount of Iodate-Iodide Standard Solution (in large amber bottle).
2. Pour into waste container.
3. Repeat step 1 and 2 two more times
4. Pour 20 ml of the Iodate-Iodide Standard Solution into the rinsed titrating tube. 20 ml is 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.
5. 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.
6. Fill titrating syringe to the “0” mark with Sodium Thiosulfate.
7. Titrate using the Sodium Thiosulfate.
8. 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

———— **BEFORE SAMPLING** ————

DISSOLVED OXYGEN - WINKLER

9. 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
10. Just as the solution turns completely clear with no trace of blue by placing the titrating tube on or next to a white surface, stop titration and remove the syringe. Read the results on syringe - Record your results under the Dissolved Oxygen portion on your field datasheet.
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 also outside the 9.4 to 10 range, do one final check. Take the average of the two closest readings to average the result.
12. If the result is outside the 9.4 to 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 down sink and flushing with additional tap water.
14. Keep the amber bottle solution at home stored in a dark and cool place like a closet. Do not take the amber bottle out into the field.

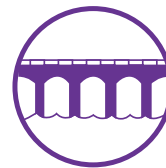
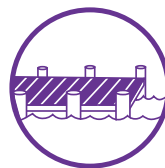


Credit: Alliance for the Chesapeake Bay

BEFORE SAMPLING

DISSOLVED OXYGEN - WINKLER

A. FROM A BOAT, DOCK, OR BRIDGE



1. Using a bucket to collect your sample

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 downstream three times before collecting your sample.
4. Using the first sample bottle, submerge about 1/2 of the bottle opening allowing the water to gently flow into the bottle. Try to fill the bottle without causing a lot of bubbles. Submerge the filled bottle.
5. 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.
6. 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, proceed immediately to Steps for *Fix Your Sample*.
7. Mark on your data sheet that you collected your sample using a bucket.

NOTE

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

Don't forget to collect two samples with two sample bottles!

IN THE FIELD

DISSOLVED OXYGEN - WINKLER



II. Collecting directly in the waterway

1. Collect your sample upstream of the boat or dock.
2. Using the first sample bottle, submerge about 1/2 of the bottle opening allowing the water to gently flow into the bottle. Try to fill the bottle without causing a lot of bubbles. Submerge the filled bottle.
3. 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.
4. 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, proceed immediately to Steps for *Fix Your Sample*.

NOTE

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

Don't forget to collect two samples with two sample bottles!

DISSOLVED OXYGEN - WINKLER

B. WADING



I. Collecting directly in the waterway

1. Walk up creek to the sample location. Be sure not to kick up any sediment or debris in front of you. If sampling from a platform (boat, dock, or bridge), sample upstream of the platform.
2. Thoroughly rinse both water sampling bottles with the sample water, filling and dumping the waste water downstream three times before collecting your sample.
3. Using the first sample bottle, submerge about 1/2 of the bottle opening allowing the water to gently flow into the bottle. Try to fill the bottle without causing a lot of bubbles. Submerge the filled bottle.
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, proceed immediately to Steps for *Fix Your Sample*.



Credit: Alliance for the Chesapeake Bay

IN THE FIELD

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 10 °C 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

IN THE FIELD

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 1 drop of Sodium Thiosulfate to test tube and gently swirl the glass tube to mix.
5. Add another drop of the Sodium Thiosulfate and swirl the tube. Continue this process one drop at a time 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. Swirl the tube gently to mix. The solution should turn from light yellow to dark blue.
7. Recap the glass tube and continue the titration process with the Sodium Thiosulfate remaining in the syringe (adding one drop at a time and swirling as described in Step 5). Be sure to gently swirl the test tube after each drop. Add one drop at a time until the test tube solution turns from blue to clear. This is the endpoint and can occur quickly, 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.



Credit: Alliance for the Chesapeake Bay

AFTER SAMPLING

DISSOLVED OXYGEN - WINKLER

TITRATE YOUR SAMPLE

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.

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.

9. Carry out Steps 1 to 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.

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 tap water three times and set out to dry.
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.

AFTER SAMPLING

CHLOROPHYLL A - VACUUM PUMP

GATHERING MATERIALS AND EQUIPMENT LIST

- Distilled or 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- μ m porosity GF/F filter membranes
- Hand-held vacuum pump
- Opaque towels
- Aluminum foil
- Filter forceps

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

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

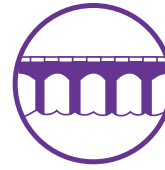
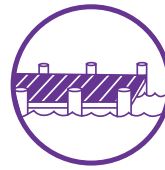


Credit: UMCES

BEFORE SAMPLING

CHLOROPHYLL A - VACUUM PUMP

A. FROM A BOAT, DOCK, OR BRIDGE



1. Collecting directly in the waterway

1. Keep your bottle capped.
2. Extend your bottle to 0.3 meters beneath the surface and remove the cap allowing the bottle to fill.
3. Recap the bottle beneath the surface.
4. Dump the sample downstream of your sampling location.
5. Repeat steps 1 to 4, 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.
6. Rinse the filter holder and vacuum pump three times with sample water.
7. 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.
8. Use the vacuum to push water through the filter.
9. Record the volume of water pushed through the filter on the data collection sheet.
10. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
11. 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

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

IN THE FIELD

CHLOROPHYLL A - VACUUM PUMP



II. Collecting with a sampling pole

1. Un-cap your pre-labeled bottle and secure it to the end of the pole.
2. Extend the pole outward and dip at approximately 0.5 m below the surface.
3. Rinse the sample bottles, vacuum, and filter holder three times with sample water.
4. Drain the bottle until it is empty, lower it about 0.5 meters if sampling in Maryland and 1.0 meters if sampling in Virginia. 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. 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.
6. Use the vacuum to push water through the filter.
7. Record the volume of water pushed through the filter on the data collection sheet.
8. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
9. 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

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

CHLOROPHYLL A - VACUUM PUMP

B. WADING



1. Collecting directly in the waterway

1. Always proceed upstream to allow the flow of the water to push any disturbed sediment downstream of where you will be collecting the sample.
2. Be sure any sediment or debris disturbed from your movement in the streambed is not present where you will collect the sample.
3. Lower the capped sample bottle 0.3 m or 1 foot beneath the surface and uncap the bottle to fill.
4. Rinse the sample bottle, vacuum, and filter holder three times with sample water.
5. Drain the bottle until it is empty, put the cap on, lower under water about 0.3 meters, then remove the cap. Wait for the bottle to fill, then cap it and return it to the surface.
6. 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.
7. Use the vacuum to push water through the filter.
8. Record the volume of water pushed through the filter on the data collection sheet.
9. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
10. 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.

IN THE FIELD

CHLOROPHYLL A - VACUUM PUMP

LABORATORY PREPARATION

1. Prepare 2 or 4 inch square pieces of aluminum foil that is provided or recommended by the lab.
2. Fold in half again, then unfold, creating a crease.
3. Create labels using labeling tape noting site number, date, and volume pressed through filter.
4. Place filter in aluminum foil with the center of the filter centered on the crease, with side containing the intercept 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.
5. Double over edges of fold, displacing air and create a little pocket in which the folded filter is located.
6. Repeat for all samples.
7. 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.
8. Place foil packets in locking plastic bag and then double bag with another locking plastic bag.
9. Place in freezer to await shipment to the analytical laboratory.

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 Styrofoam transport coolers with surrounding cardboard box. Samples should be mailed overnight to arrive at the analytical laboratory as soon as possible. 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.

AFTER SAMPLING

CHLOROPHYLL A - SYRINGE

GATHERING MATERIALS AND EQUIPMENT LIST

- Distilled or 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- μ m porosity GF/F filter membranes
 - 50-mL syringes
 - Opaque towels
 - Aluminum foil
 - Filter forceps
-

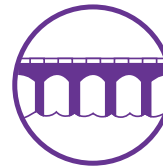
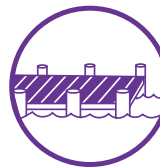
CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

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

BEFORE SAMPLING

CHLOROPHYLL A - SYRINGE

A. FROM A BOAT, DOCK, OR BRIDGE



1. Collecting directly in the waterway

1. Keep your bottle capped.
2. Extend your bottle to 0.3 meters beneath the surface and remove the cap allowing the bottle to fill.
3. Recap the bottle beneath the surface.
4. Dump the sample downstream of your sampling location.
5. Repeat steps 1 to 4, 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.
6. Rinse the syringe three times with sample water.
7. 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.
8. Use the syringe to push water through the filter. Remove the filter holder from the syringe before withdrawing the plunger to add additional sample water.
9. Record the volume of water pushed through the filter on the data collection sheet.
10. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
11. 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

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

IN THE FIELD

CHLOROPHYLL A - SYRINGE



II. Collecting with a sampling pole

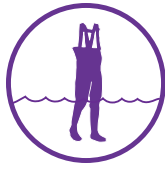
1. Un-cap your pre-labeled bottle and secure it to the end of the pole.
2. Extend the pole outward and dip at approximately 0.5 m below the surface.
3. Rinse the sample bottles and syringe three times with sample water.
4. Drain the bottle until it is empty, lower it about 0.5 meters if sampling in Maryland and 1.0 meters if sampling in Virginia. 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. 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.
6. Use the syringe to push water through the filter. Remove the filter holder from the syringe before withdrawing the plunger to add additional sample water.
7. Record the volume of water pushed through the filter on the data collection sheet.
8. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
9. 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

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

CHLOROPHYLL A - SYRINGE

B. WADING



1. Collecting directly in the waterway

1. Always proceed upstream to allow the flow of the water to push any disturbed sediment downstream of where you will be collecting the sample.
2. Be sure any sediment or debris disturbed from your movement in the streambed is not present where you will collect the sample.
3. Lower the capped sample bottle 0.3 m or 1 foot beneath the surface and uncap the bottle to fill.
4. Rinse the sample bottle and syringe three times with sample water.
5. Drain the bottle until it is empty, put the cap on, lower under water about 0.3 meters, then remove the cap. Wait for the bottle to fill, then cap it and return it to the surface.
6. 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.
7. Use the syringe to push water through the filter. Remove the filter holder from the syringe before withdrawing the plunger to add additional sample water.
8. Record the volume of water pushed through the filter on the data collection sheet.
9. Store samples in cooler. Samples must be kept cool and out of sunlight for the duration of field sampling.
10. 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.

IN THE FIELD

CHLOROPHYLL A - SYRINGE

LABORATORY PREPARATION

1. Prepare pieces of aluminum foil.
2. Fold in half again, then unfold, creating a crease.
3. Create labels using labeling tape noting site number, date, and volume pressed through filter.
4. Place filter in aluminum foil with the center of the filter centered on the crease, with side containing the intercept 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.
5. Double over edges of fold, displacing air and create a little pocket in which the folded filter is located.
6. Repeat for all samples.
7. Label foil packets.
8. Place foil packets in locking plastic bag and then double bag with another locking plastic bag.
9. Place in freezer to await shipment to the analytical laboratory.

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 Styrofoam transport coolers with surrounding cardboard box. Samples should be mailed overnight to arrive at the analytical laboratory as soon as possible. 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.

AFTER SAMPLING

PH - COLORIMETRIC KIT

GATHERING MATERIALS AND EQUIPMENT LIST

- LaMotte or Hach pH kit with reagents
 - Distilled or 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.

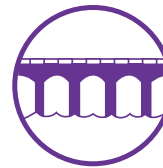
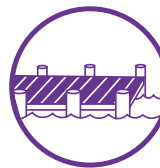
NOTE

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.

BEFORE SAMPLING

PH - COLORIMETRIC KIT

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting directly in the waterway

1. Rinse your sample test tube and cap three times with water from the waterway.
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 indicator to your sample test tube while holding the reagent bottle completely upside down.
5. Cap the test tube and mix the sample thoroughly.
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 unit (for wide range kit) or 0.1 unit for other pH kits.
7. Record on your data sheet the sampling depth.

IN THE FIELD

PH - COLORIMETRIC KIT



II. Collecting with 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 3/4 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 indicator to your sample test tube while holding the reagent bottle completely upside down.
8. Cap the test tube and mix the sample thoroughly.
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 unit (for wide range kit) or 0.1 unit for other pH kits.
10. Mark on your data sheet that the measurement was taken from a bucket.

PH - COLORIMETRIC KIT



III. Collecting with 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. Rinse your sample test tube and cap three times with water from the sample bottle and toss downstream.
6. 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.
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 indicator to your sample test tube while holding the reagent bottle completely upside down.
9. Cap the test tube and mix the sample thoroughly.
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 unit (for wide range kit) or 0.1 unit for other pH kits.

PH - COLORIMETRIC KIT

B. WADING



1. Collecting directly in the waterway

1. Always proceed upstream to allow the flow of the water to push any disturbed sediment downstream of where you will be collecting the sample.
2. Be sure any sediment or debris disturbed from your movement in the streambed is not present where you will collect the sample.
3. 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.
4. 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.
5. If you are using a narrow range kit, add 8 drops of the indicator to your sample test tube while holding the reagent bottle completely upside down.
6. Cap the test tube and mix the sample thoroughly.
7. 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 unit (for wide range kit) or 0.1 unit for other pH kits.

PH - COLORIMETRIC KIT

AFTER SAMPLE CALIBRATION CHECK

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

EQUIPMENT CLEANING AND STORAGE

1. Clean each test tube thoroughly and allow to dry.
2. Store chemicals and equipment in a cool dry place.

———— ***AFTER SAMPLING*** ————

PH - TEST STRIPS

GATHERING MATERIALS AND EQUIPMENT LIST

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

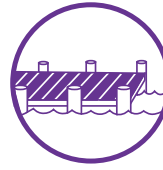
CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

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

BEFORE SAMPLING

PH - TEST STRIPS

A. FROM A BOAT, DOCK, OR BRIDGE



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 until fully moistened.
 3. Allow for colors to fully develop about 1 to 2 minutes.
 4. Compare your strip to the chart provided.
 5. Record your value to the nearest 0.5 units.
 6. Properly dispose of your strip when you are finished.
-



II. Collecting with 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 3/4 full.
4. Carefully remove one strip from the box and close the box when not in use.
5. Dip the strip in the water until fully moistened.
6. Allow for colors to fully develop about 1 to 2 minutes.
7. Compare your strip to the chart provided.
8. Record your value to the nearest 0.5 units.
9. Properly dispose of your strip when you are finished.
10. Mark on your data sheet that the measurement was taken from a bucket.

IN THE FIELD

PH - TEST STRIPS



III. Collecting with 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 until fully moistened.
7. Allow for colors to fully develop about 1 to 2 minutes.
8. Compare your strip to the chart provided.
9. Record your value to the nearest 0.5 units.
10. Properly dispose of your strip when you are finished.

PH - TEST STRIPS

B. WADING



I. Collecting directly in the waterway

1. Always proceed upstream to allow the flow of the water to push any disturbed sediment downstream of where you will be collecting the sample.
2. Be sure any sediment or debris disturbed from your movement in the streambed is not present where you will collect the sample.
3. Carefully remove one strip from the box and close the box when not in use.
4. Dip the strip in the water until fully moistened.
5. Allow for colors to fully develop about 1 to 2 minutes.
6. Compare your strip to the chart provided.
7. Record your value to the nearest 0.5 units.
8. Properly dispose of your strip when you are finished.

IN THE FIELD

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 dark place.

———— ***AFTER SAMPLING*** ————

LAB GRAB SAMPLES

GATHERING MATERIALS AND EQUIPMENT LIST

- Sampling pole (if needed)
- 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

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 discarded.

NOTE

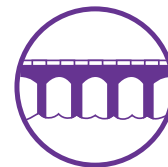
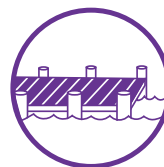
Samples will not be analyzed if this information is missing. If more than one container is needed for a parameter (such as a duplicate sample), each container collected for that parameter must have a label with identical information in addition to an indication of 1 of 3, 2 of 3, 3 of 3, etc., as required.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

BEFORE SAMPLING

LAB GRAB SAMPLES

Nutrients and bacteria

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting in 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. If the boat used a propeller to get to the site, collect the sample from the bow or amidships so well away from the propeller wash. Facing upstream, swoop the bottle away from you collecting a sample that fills the bottle 3/4 full or to the shoulder of the bottle. Do not over fill the bottle allowing sample to fall out (this could release acid into the environment).
3. Cap your bottle and record the time of sample collection on the bottle and COC sheet.
4. After samples are taken, 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 data sheet, 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.

LAB GRAB SAMPLES



I. Collecting using a sampling pole

1. Attach the sample bottle to the sampling pole, making sure that the clamp is tight.
 2. The sampling point in the the waterway or river should have a low to medium flow and not be in eddies or stagnant water.
 3. Facing upstream, extend the pole and bottle.
 4. Fill the bottle up 3/4 full or to the shoulder, careful to not overfill the bottle and release acid or preservative into the environment.
 5. Cap and label the bottle with the collection time and complete the COC form.
 6. 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.
-

B. WADING



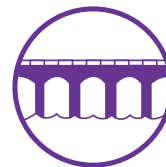
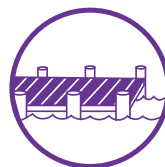
I. Collecting directly in the waterway

1. Wade into the main flow of the the waterway.
2. Take a few steps (~ 5 ft.) upstream with care not to disturb the sediment.
3. Lower the bottle into the water and allow to fill to the shoulder. If the bottle contains an acid preservative either carefully fill the bottle to allow the contents to exit or use a clean separate bottle to pour the contents into the preserved bottle.
4. Cap and label the bottle with the sample time and fill in your COC sheet.
5. After samples are taken, 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.

LAB GRAB SAMPLES

Chlorophyll & bottles without preservatives

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting in directly in the waterway

1. Facing upstream, submerge the bottle with the cap on to the depth of 0.3 m. 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 and COC sheet.
4. After samples are taken, 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 data sheet, record the time, date, collection depth, and any other information about the water sampling event.

B. WADING



II. Collecting in directly in the waterway

1. Wade into the main flow of the the waterway.
2. Take a few steps upstream with care not to disturb the sediment.
3. Follow steps 1 through 5 above in section A-I

IN THE FIELD

LAB GRAB SAMPLES

AFTER SAMPLE CALIBRATION CHECK

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

AFTER SAMPLE PROCEDURES

1. After collecting the sample, make sure the lids are secured tightly 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 labeled properly 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.
-

EQUIPMENT CLEANING AND STORAGE

1. Rinse your sample bottles, titration tubes, and caps with tap water three times and set out to dry.
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.

———— **AFTER SAMPLING** ————

NITRATE - HACH NI-14

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

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

Cleaning supplies:

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

Analysis:

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

Safety gear:

- Goggles
- Latex/nitrile gloves



Credit: ALLARM

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

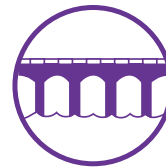
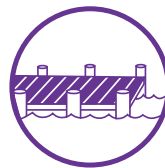
Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the NitraVer 6 and NitriVer 3 Reagents have not expired. The supplies and reagents recommended when using the Hach Nitrate Kit are included in the lists above.

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 disposed of properly in accordance with federal, state and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

BEFORE SAMPLING

NITRATE - HACH NI-14

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting in directly in the waterway

1. Rinse the 500 mL sample bottle and cap with sample water, 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. Repeat three times.
3. Prepare to fill the bottle by slightly tilting the mouth towards you.
4. 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.
5. Remove the sample bottle from the waterway and cap it.
6. b. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.



II. Collecting using a bucket

1. Stand on the bridge at the mid-point of the waterway (or where the water is flowing swiftly), preferably on the upstream side, and lower the sample bucket (securely attached to a rope) over the side of the bridge to collect a water sample. Do not touch the stream bed with the sample bucket.
2. Raise the bucket back up to the bridge and swirl the water around inside so that it rinses the bucket on all sides.
3. Pour the rinse water out, preferably on the downstream side of the bridge. Do not empty the water from the location you collected it.

Continued on next page...

IN THE FIELD

NITRATE - HACH NI-14

4. Repeat three times. During the final rinse, rinse the sample bottle and cap with sample water three times. Do not touch the inside of the sample bottle or cap with your hands.
 5. Lower the sample bucket into the waterway again to collect the water sample, attempting to evenly sample the entire depth of the waterway. Do not touch the streambed with the bucket.
 6. Fill the sample bottle with water from the bucket and cap it.
 7. Pour the water remaining in the bucket out.
 8. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed (within 48 hours).
-



III. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample collection pole.
2. Reach the pole to the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle with sample water 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.
4. Repeat step 3 three times. During the final rinse, rinse the bottle cap with sample water from the bottle three times. Do not touch the inside of the cap with your hands.
5. 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.
6. Retrieve the sample bottle from the sample collection pole and cap it.
7. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

NITRATE - HACH NI-14

B. WADING



I. Collecting in directly in the waterway

1. Enter the waterway downstream of the monitoring site to avoid disturbing the streambed.
2. Move to the center of the waterway, if possible, and face upstream.
3. Rinse the 500 mL sample bottle and cap with sample water, 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.
4. Repeat step 3 three times.
5. Prepare to fill the bottle by slightly tilting the mouth towards you.
6. 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.
7. Remove the sample bottle from the waterway and cap it.
8. Carefully exit the waterway.
9. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

NITRATE - HACH NI-14

AFTER SAMPLE PROCEDURES

NOTE

The NitraVer 6 Nitrate Reagent and NitraVer 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			<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• Immediately flush eyes with water for 15 minutes.• If wearing contacts, remove and continue rinsing.• Call a physician immediately.
Skin	May cause irritation.	Wear protective gloves and clothing.	<ul style="list-style-type: none">• Wash with plenty of soap and water.• Remove contaminated clothing.• Call a physician if irritation develops.
Swallowed			<ul style="list-style-type: none">• Call physician immediately.• 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.	<ul style="list-style-type: none">• Seek fresh air.• Keep at rest in a position comfortable for breathing.• Give artificial respiration if necessary.• Call physician or poison center if unwell.

———— **AFTER SAMPLING** ————

NITRATE - HACH NI-14

First Aid: NitriVer 3 Nitrite Reagent

Contact	Effect	Precaution to Take	First Aid Measures
Spill			<ul style="list-style-type: none">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.	<ul style="list-style-type: none">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.	<ul style="list-style-type: none">Wash with plenty of soap and water.Remove contaminated clothing.Call a physician if irritation develops.
Swallowed			<ul style="list-style-type: none">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.	<ul style="list-style-type: none">Seek fresh air.Give artificial respiration if necessary.Call physician.

———— **AFTER SAMPLING** ————

NITRATE - HACH NI-14

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. Test tubes and stoppers (4)
 - i. Fill the test tubes half way with water from the beaker.
 - ii. Place the stoppers on the test tubes and shake vigorously to thoroughly rinse the inside of the test tubes and stoppers. Empty the rinse water into your sink.
 - iii. Repeat three times.
- c. Dropper (1)
 - i. Place the tip of the dropper under the water in the beaker and squeeze/release the bulb to thoroughly rinse the inside of the dropper.
 - ii. 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.
- e. 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.

Continued on next page...

———— **AFTER SAMPLING** ————

NITRATE - HACH NI-14

- c. Measure the temperature of the water sample. The sample must be at room temperature (20 – 23 °C) before testing it for nitrate.
- d. Fill one test tube with water 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.
 - a. Add 0.5 mL of sample water to the test tube.
 - b. Fill the dropper with sample water to above the 0.5 mL line. Make sure there are no air bubbles trapped in the dropper.
 - c. Squeeze the rubber bulb to release the excess water until you have exactly 0.5 mL of sample water in the dropper.
 - d. Add the 0.5 mL of water to a test tube.

3. Add the NitraVer 6 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 and set the timer for three minutes.
- c. Place your thumb over the stopper and vigorously shake the test tube for three minutes.
- d. After three minutes, place the test tube on a flat surface and wait 30 seconds.

4. Isolate the cadmium particles

- a. Very carefully pour the sample into the empty test tube without transferring any of the cadmium particles – the gray, specs found on the bottom and surface of the test tube. You may leave ~0.5 mL of the sample in the first test tube.
- b. If you accidentally transfer some of the cadmium particles into the empty test tube, discard the sample in the cadmium waste bottle, and restart the process using a clean test tube. Otherwise, the cadmium will interfere with the test, and your results will not be accurate.

Continued on next page...

AFTER SAMPLING

NITRATE - HACH NI-14

5. Add the NitriVer 3 Reagent

- a. Open the NitriVer 3 Reagent (with scissors) and empty the contents into the test tube with sample water.
- b. Place the stopper on the test tube and set the timer for 30 seconds.
- c. Place your thumb over the stopper and vigorously shake the test tube for 30 seconds.
- d. Remove the stopper and insert the test tube in the color comparator – opening on right.
- e. Set the timer for 10 minutes.

6. 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.

7. Measure the nitrate

- 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 color in both windows are the same.
- c. 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.
- d. Record the final result on your data sheet.

8. 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 “Post Testing Procedures” 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.

———— **AFTER SAMPLING** ————

NITRATE - HACH NI-14

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can affect the results significantly, 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 dry completely before placing it back into the kit/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 squeeze gently. 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 diluted significantly, precautionary measures need to be followed when using, including:

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

First Aid: 10% Hydrochloric Solution (HCl)	
Contact	First Aid Measures
Spill	<ul style="list-style-type: none">• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	<ul style="list-style-type: none">• Flush with water for 10 minutes.
Skin	<ul style="list-style-type: none">• Flush with water for 10 minutes.• Remove contaminated clothing.• Call a physician immediately.
Swallowed	<ul style="list-style-type: none">• Call a physician immediately.
Inhaled	<ul style="list-style-type: none">• Remove yourself to an area with fresh air.

AFTER SAMPLING

NITRATE - HACH NI-14

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.
 - b. 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/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.
 - c. 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.
 - 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 dry completely before returning to the Hach Nitrate Kit/monitoring bin.

AFTER SAMPLING

NITRATE - HACH NI-14

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 processed appropriately.

———— ***AFTER SAMPLING*** ————

NITRATE - LAMOTTE 3354

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

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

Cleaning supplies:

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

Analysis:

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

Safety gear:

- Goggles
- Latex/nitrile gloves



Credit: ALLARM

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

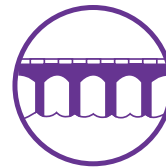
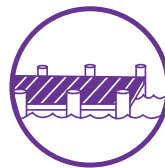
Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the Nitrate #1 and Nitrate #2 Reagents have not expired. The supplies and reagents recommended when using the LaMotte Nitrate Kit are included in the lists above.

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 disposed of properly in accordance with federal, state and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

BEFORE SAMPLING

NITRATE - LAMOTTE 3354

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting in directly in the waterway

1. Rinse the 500 mL sample bottle and cap with sample water, 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. Repeat three times.
3. Prepare to fill the bottle by slightly tilting the mouth towards you.
4. 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.
5. Remove the sample bottle from the waterway and cap it.
6. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.



II. Collecting using a bucket

1. Stand on the bridge at the mid-point of the waterway (or where the water is flowing swiftly), preferably on the upstream side, and lower the sample bucket (securely attached to a rope) over the side of the bridge to collect a water sample. Do not touch the stream bed with the sample bucket.
2. Raise the bucket back up to the bridge and swirl the water around inside so that it rinses the bucket on all sides.
3. Pour the rinse water out, preferably on the downstream side of the bridge. Do not empty the water from the location you collected it.

Continued on next page...

IN THE FIELD

NITRATE - LAMOTTE 3354

4. Repeat three times. During the final rinse, rinse the sample bottle and cap with sample water three times. Do not touch the inside of the sample bottle or cap with your hands.
 5. Lower the sample bucket into the waterway again to collect the water sample, attempting to evenly sample the entire depth of the waterway. Do not touch the streambed with the bucket.
 6. Fill the sample bottle with water from the bucket and cap it.
 7. Pour the water remaining in the bucket out.
 8. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed (within 48 hours).
-



III. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample collection pole.
2. Reach the pole to the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle with sample water 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.
4. Repeat step 3 three times. During the final rinse, rinse the bottle cap with sample water from the bottle three times. Do not touch the inside of the cap with your hands.
5. 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.
6. Retrieve the sample bottle from the sample collection pole and cap it.
7. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

NITRATE - LAMOTTE 3354

B. WADING



I. Collecting in directly in the waterway

1. Enter the waterway downstream of the monitoring site to avoid disturbing the streambed.
2. Move to the center of the waterway, if possible, and face upstream.
3. Rinse the 500 mL sample bottle and cap with sample water, 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.
4. Repeat step 3 three times.
5. Prepare to fill the bottle by slightly tilting the mouth towards you.
6. 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.
7. Remove the sample bottle from the waterway and cap it.
8. Carefully exit the waterway.
9. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

IN THE FIELD

NITRATE - LAMOTTE 3354

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			<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• Rinse thoroughly 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.	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• Seek fresh air.• If symptoms persist, call a physician.

———— **AFTER SAMPLING** ————

NITRATE - LAMOTTE 3354

First Aid: Nitrate #2

Contact	Effect	Precaution to Take	First Aid Measures
Spill			<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Rinse thoroughly 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Drink plenty of water. Clean mouth with water. Consult a physician.
Inhaled	May cause irritation of respiratory tract.	Do not breath dust.	<ul style="list-style-type: none"> Seek fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration and contact emergency personnel. Call a physician immediately.

AFTER SAMPLING

NITRATE - LAMOTTE 3354

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. Test tubes and stoppers (2)
 - i. Fill the test tubes half way with water from the beaker.
 - ii. Place the stoppers on the test tubes and shake vigorously to thoroughly rinse the inside of the test tubes and stoppers. Empty the rinse water into your sink.
 - iii. Repeat three times.
- c. 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.
- d. 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 nitrate.
- d. Fill one test tube with 5 mL of sample water using the syringe.

Continued on next page...

———— **AFTER SAMPLING** ————

NITRATE - LAMOTTE 3354

3. Add the Nitrate #1 Tablet
 - a. Add one Nitrate #1 Tablet to the test tube.
 - b. Place the stopper on the test tube and shake it until the tablet dissolves.
4. Add the Nitrate #2 Tablet
 - a. Add one Nitrate #2 Tablet to the test tube.
 - b. Place the stopper on the test tube and shake it until the tablet dissolves.
 - c. When the tablet has dissolved, set the timer for five minutes and wait.
5. Measure the nitrate
 - a. After waiting five minutes, insert the test tube into the Octa-Slide 2 Viewer.
 - b. 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.
 - c. Record the value that looks most similar on your data sheet.
6. 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 “Post Testing Procedures” 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.

———— **AFTER SAMPLING** ————

NITRATE - LAMOTTE 3354

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can affect the results significantly, 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 dry completely before placing it back into the kit/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 squeeze gently. 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 diluted significantly, precautionary measures need to be followed when using, including:

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

First Aid: 10% Hydrochloric Solution (HCl)	
Contact	First Aid Measures
Spill	<ul style="list-style-type: none">• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	<ul style="list-style-type: none">• Flush with water for 10 minutes.
Skin	<ul style="list-style-type: none">• Flush with water for 10 minutes.• Remove contaminated clothing.• Call a physician immediately.
Swallowed	<ul style="list-style-type: none">• Call a physician immediately.
Inhaled	<ul style="list-style-type: none">• Remove yourself to an area with fresh air.

AFTER SAMPLING

NITRATE - LAMOTTE 3354

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.
 - b. 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/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.
 3. Allow each item to dry completely before returning to the LaMotte Nitrate Kit/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.

———— **AFTER SAMPLING** ————

PHOSPHATE - HANNA HI 713

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

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

Cleaning supplies:

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

Analysis:

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

Safety gear:

- Goggles
- Latex/nitrile gloves



Credit: ALLARM

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

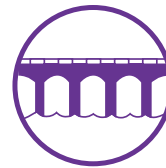
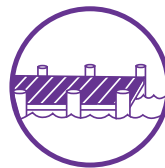
Once you have collected your monitoring equipment, check to make sure all of the materials are clean, in good condition, and that the Phosphate Low Range Reagent has not expired. The supplies and reagents recommended when using the Hanna Phosphate Kit are included in the table above.

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 disposed of properly in accordance with federal, state and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

BEFORE SAMPLING

PHOSPHATE - HANNA HI 713

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting in directly in the waterway

1. Rinse the 500 mL sample bottle and cap with sample water, 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. Repeat three times.
3. Prepare to fill the bottle by slightly tilting the mouth towards you.
4. 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.
5. Remove the sample bottle from the waterway and cap it.
6. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6\text{ }^{\circ}\text{C}$) until they are analyzed.



II. Collecting using a bucket

1. Stand on the bridge at the mid-point of the waterway (or where the water is flowing swiftly), preferably on the upstream side, and lower the sample bucket (securely attached to a rope) over the side of the bridge to collect a water sample. Do not touch the stream bed with the sample bucket.
2. Raise the bucket back up to the bridge and swirl the water around inside so that it rinses the bucket on all sides.
3. Pour the rinse water out, preferably on the downstream side of the bridge. Do not empty the water from the location you collected it.

Continued on next page...

IN THE FIELD

PHOSPHATE - HANNA HI 713

4. Repeat three times. During the final rinse, rinse the sample bottle and cap with sample water three times. Do not touch the inside of the sample bottle or cap with your hands.
5. Lower the sample bucket into the waterway again to collect the water sample, attempting to evenly sample the entire depth of the waterway. Do not touch the streambed with the bucket.
6. Fill the sample bottle with water from the bucket and cap it.
7. Pour the water remaining in the bucket out.
8. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed (within 48 hours).



III. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample collection pole.
2. Reach the pole to the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle with sample water 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.
4. Repeat step 3 three times. During the final rinse, rinse the bottle cap with sample water from the bottle three times. Do not touch the inside of the cap with your hands.
5. 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.
6. Retrieve the sample bottle from the sample collection pole and cap it.
7. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

PHOSPHATE - HANNA HI 713

B. WADING



I. Collecting in directly in the waterway

1. Enter the waterway downstream of the monitoring site to avoid disturbing the streambed.
2. Move to the center of the waterway, if possible, and face upstream.
3. Rinse the 500 mL sample bottle and cap with stream water, 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.
4. Repeat step 3 three times.
5. Prepare to fill the bottle by slightly tilting the mouth towards you.
6. 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.
7. Remove the sample bottle from the waterway and cap it.
8. Carefully exit the waterway.
9. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

PHOSPHATE - HANNA HI 713

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			<ul style="list-style-type: none">• Collect
Eye	Causes severe eye damage	Wear safety glasses	<ul style="list-style-type: none">• Flush with water for 15 minutes.• If pain persists, call a physician.
Skin	Causes severe skin burns.	Wear protective gloves and clothing.	<ul style="list-style-type: none">• Wash skin with plenty of water.• Remove contaminated clothing immediately and dispose of safely.
Swallowed	Nausea, vomiting, gastrointestinal and mouth pain, and or diarrhea.		<ul style="list-style-type: none">• Drink plenty of water and induce vomiting.• Call a physician if feeling unwell.
Inhaled	Causes burns.	Do not breath dust.	<ul style="list-style-type: none">• Seek fresh air• Call a physician if breathing becomes difficult.

———— **AFTER SAMPLING** ————

PHOSPHATE - HANNA HI 713

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 with sample water.
 - b. Cuvette (2)
 - i. Fill the cuvettes half way with water from the beaker.
 - ii. Place the cap on the cuvettes and shake vigorously to thoroughly rinse the inside of the cuvettes and caps. Empty the rinse water into your sink.
 - iii. Repeat three times.
 - c. 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.
 - d. 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.
 - d. Use the syringe to fill one cuvette with exactly 10 mL of sample water. Secure the cap.



Credit: ALLARM

Continued on next page...

AFTER SAMPLING

PHOSPHATE - HANNA HI 713

3. Prepare the Phosphate Checker.
 - a. Press the black button on the Phosphate Checker to turn it on.
 - b. When “Add”, “C.1”, and “Press” (blinking) is displayed on the screen, 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.1”, and “Press” (blinking) is 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 set a timer for two minutes. Shake the cuvette gently for two minutes until the powder is completely dissolved.
 - d. Set the timer for three minutes. 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. After waiting three minutes, press the black button on the Phosphate Checker to display the orthophosphate reading.
 - b. Record the result on your data sheet. (Note: the Phosphate Checker will turn off after being idle for two minutes).
6. Replicates.
 - a. Repeat the test using the other clean cuvette. If you do not have extra cuvettes in your monitoring kit, see “Post Testing Procedures” 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.

AFTER SAMPLING

PHOSPHATE - HANNA HI 713

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can affect the results significantly, 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 dry completely before placing it back into the kit/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 squeeze gently. 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 diluted significantly, precautionary measures need to be followed when using, including:

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

First Aid: 10% Hydrochloric Solution (HCl)	
Contact	First Aid Measures
Spill	<ul style="list-style-type: none">• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	<ul style="list-style-type: none">• Flush with water for 10 minutes.
Skin	<ul style="list-style-type: none">• Flush with water for 10 minutes.• Remove contaminated clothing.• Call a physician immediately.
Swallowed	<ul style="list-style-type: none">• Call a physician immediately.
Inhaled	<ul style="list-style-type: none">• Remove yourself to an area with fresh air.

AFTER SAMPLING

PHOSPHATE - HANNA HI 713

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.
 - b. 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/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 dry completely before returning to the Hanna Phosphate Kit/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 processed appropriately.

AFTER SAMPLING

PHOSPHATE - HACH PO-19

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

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

Cleaning supplies:

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

Analysis:

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

Safety gear:

- Goggles
- Latex/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 disposed of properly in accordance with federal, state and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

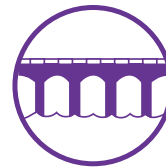
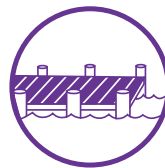


Credit: ALLARM

BEFORE SAMPLING

PHOSPHATE - HACH PO-19

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting in directly in the waterway

1. Rinse the 500 mL sample bottle and cap with sample water, 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. Repeat three times.
3. Prepare to fill the bottle by slightly tilting the mouth towards you.
4. 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.
5. Remove the sample bottle from the waterway and cap it.
6. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.



II. Collecting using a bucket

1. Stand on the bridge at the mid-point of the waterway (or where the water is flowing swiftly), preferably on the upstream side, and lower the sample bucket (securely attached to a rope) over the side of the bridge to collect a water sample. Do not touch the stream bed with the sample bucket.
2. Raise the bucket back up to the bridge and swirl the water around inside so that it rinses the bucket on all sides.
3. Pour the rinse water out, preferably on the downstream side of the bridge. Do not empty the water from the location you collected it.

Continued on next page...

IN THE FIELD

PHOSPHATE - HACH PO-19

4. Repeat three times. During the final rinse, rinse the sample bottle and cap with sample water three times. Do not touch the inside of the sample bottle or cap with your hands.
5. Lower the sample bucket into the waterway again to collect the water sample, attempting to evenly sample the entire depth of the waterway. Do not touch the streambed with the bucket.
6. Fill the sample bottle with water from the bucket and cap it.
7. Pour the water remaining in the bucket out.
8. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed (within 48 hours).



III. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample collection pole.
2. Reach the pole to the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle with sample water 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.
4. Repeat step 3 three times. During the final rinse, rinse the bottle cap with sample water from the bottle three times. Do not touch the inside of the cap with your hands.
5. 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.
6. Retrieve the sample bottle from the sample collection pole and cap it.
7. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

PHOSPHATE - HACH PO-19

B. WADING



I. Collecting in directly in the waterway

1. Enter the waterway downstream of the monitoring site to avoid disturbing the streambed.
2. Move to the center of the waterway, if possible, and face upstream.
3. Rinse the 500 mL sample bottle and cap with sample water, 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.
4. Repeat step 3 three times.
5. Prepare to fill the bottle by slightly tilting the mouth towards you.
6. 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.
7. Remove the sample bottle from the waterway and cap it.
8. Carefully exit the waterway.
9. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

IN THE FIELD

PHOSPHATE - HACH PO-19

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			<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• Wash skin with plenty of water.
Swallowed			<ul style="list-style-type: none">• Call physician immediately.• Give 1-2 glasses of water.• Do not induce vomiting.
Inhaled		Do not breath dust.	<ul style="list-style-type: none">• Seek fresh air.• Give artificial respiration if necessary.• Call physician.

AFTER SAMPLING

PHOSPHATE - HACH PO-19

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

———— **AFTER SAMPLING** ————

PHOSPHATE - HACH PO-19

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 dissolve completely.
 - 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 color 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 “Post Testing Procedures” 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.

AFTER SAMPLING

PHOSPHATE - HACH PO-19

EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can affect the results significantly, 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 dry completely before placing it back into the kit/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 squeeze gently. 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 diluted significantly, precautionary measures need to be followed when using, including:

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

First Aid: 10% Hydrochloric Solution (HCl)	
Contact	First Aid Measures
Spill	<ul style="list-style-type: none">• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	<ul style="list-style-type: none">• Flush with water for 10 minutes.
Skin	<ul style="list-style-type: none">• Flush with water for 10 minutes.• Remove contaminated clothing.• Call a physician immediately.
Swallowed	<ul style="list-style-type: none">• Call a physician immediately.
Inhaled	<ul style="list-style-type: none">• Remove yourself to an area with fresh air.

AFTER SAMPLING

PHOSPHATE - HACH PO-19

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.
 - b. 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/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 dry completely before returning to the Hach Orthophosphate Kit/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 processed appropriately.

———— **AFTER SAMPLING** ————

TURBIDITY - LAMOTTE 7519

GATHERING MATERIALS AND EQUIPMENT LIST

Collection:

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

Cleaning supplies:

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

Analysis:

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

Safety gear:

- Goggles
- Latex/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 disposed of properly in accordance with federal, state and local environmental control regulations. For replacement reagents, contact your monitoring coordinator.

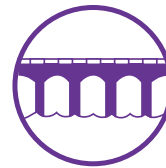
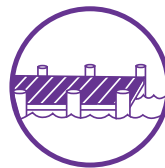


Credit: ALLARM

BEFORE SAMPLING

TURBIDITY - LAMOTTE 7519

A. FROM A BOAT, DOCK, OR BRIDGE



I. Collecting in directly in the waterway

1. Rinse the 500 mL sample bottle and cap with sample water, 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. Repeat three times.
3. Prepare to fill the bottle by slightly tilting the mouth towards you.
4. 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.
5. Remove the sample bottle from the waterway and cap it.
6. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.



II. Collecting using a bucket

1. Stand on the bridge at the mid-point of the waterway (or where the water is flowing swiftly), preferably on the upstream side, and lower the sample bucket (securely attached to a rope) over the side of the bridge to collect a water sample. Do not touch the stream bed with the sample bucket.
2. Raise the bucket back up to the bridge and swirl the water around inside so that it rinses the bucket on all sides.
3. Pour the rinse water out, preferably on the downstream side of the bridge. Do not empty the water from the location you collected it.

Continued on next page...

IN THE FIELD

TURBIDITY - LAMOTTE 7519

4. Repeat three times. During the final rinse, rinse the sample bottle and cap with sample water three times. Do not touch the inside of the sample bottle or cap with your hands.
 5. Lower the sample bucket into the waterway again to collect the water sample, attempting to evenly sample the entire depth of the waterway. Do not touch the streambed with the bucket.
 6. Fill the sample bottle with water from the bucket and cap it.
 7. Pour the water remaining in the bucket out.
 8. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed (within 48 hours).
-



III. Collecting using a sampling pole

1. Secure the uncapped sample bottle to the sample collection pole.
2. Reach the pole to the center of the waterway, if possible.
3. Rinse the 500 mL sample bottle with sample water 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.
4. Repeat step 3 three times. During the final rinse, rinse the bottle cap with sample water from the bottle three times. Do not touch the inside of the cap with your hands.
5. 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.
6. Retrieve the sample bottle from the sample collection pole and cap it.
7. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

TURBIDITY - LAMOTTE 7519

B. WADING



I. Collecting in directly in the waterway

1. Enter the waterway downstream of the monitoring site to avoid disturbing the streambed.
2. Move to the center of the waterway, if possible, and face upstream.
3. Rinse the 500 mL sample bottle and cap with sample water, 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.
4. Repeat step 3 three times.
5. Prepare to fill the bottle by slightly tilting the mouth towards you.
6. 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.
7. Remove the sample bottle from the waterway and cap it.
8. Carefully exit the waterway.
9. Measure the nitrate immediately or place the sample bottle in a cooler with ice. Samples need to remain cool ($\leq 6^{\circ}\text{C}$) until they are analyzed.

TURBIDITY - LAMOTTE 7519

AFTER SAMPLE PROCEDURES

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.

First Aid: Standard Turbidity Reagent (7520)			
Contact	Effect	Precaution to Take	First Aid Measures
Spill			<ul style="list-style-type: none">• Mop up with paper towels
Eye			<ul style="list-style-type: none">• Flush with water for 15 minutes.
Skin			<ul style="list-style-type: none">• Wash skin with water, then wash with soap and water.
Swallowed			<ul style="list-style-type: none">• Drink plenty of water.• If a large amount has been swallowed, contact a physician.
Inhaled			

———— **AFTER SAMPLING** ————

TURBIDITY - LAMOTTE 7519

WATER QUALITY ANALYSIS

1. 1. Prepare the equipment for analysis
 - a. Rinse both turbidity tubes with water from the sample bottle three times.
2. Prepare the water sample for analysis
 - a. Shake the sample bottle.
 - b. Fill the Turbidity Column #1 with sample water to the 50 mL line.
 - c. Look straight down into the column.
 - i. If you can see the black dot, continue to “d”.
 - ii. If you cannot see the black dot, pour out the sample. Repeat “a – c” using 25 mL of water.
 - iii. If you can now see the black dot, continue to “d”.
 - iv. If you still cannot see the black dot, the turbidity is too high to measure using the LaMotte Turbidity Kit (7519). Record “over range” on your data sheet, and continue to step 8.
3. Prepare the blank
 - a. Fill the Turbidity Column #2 with distilled water to the same line as Turbidity Column #1 (25 or 50 mL line).
4. Compare the water samples.
 - a. Look straight down into both Turbidity Columns.
 - i. If both black dots are equally clear, the turbidity is zero. Record your results on your data sheet and continue to step X
 - ii. If the black dot in Turbidity Column #1 (sample water) is less clear than the black dot in Turbidity Column #2 (distilled water), continue to step 5.

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5. Add the reagent
 - a. Vigorously shake the bottle of Standard Turbidity Reagent.
 - b. Add 0.5 mL of Standard Turbidity Reagent (dropper is inside reagent bottle) to Turbidity Column #2 (distilled water). To ensure you add exactly 0.5 mL of Standard Turbidity Reagent:
 - i. Fill the dropper past the 0.5 mL line.
 - ii. 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.
6. Compare the Turbidity Columns
 - a. Use the stirring rod to vigorously stir the water in Turbidity Column #1. Rinse the stirring rod with distilled water. Repeat for Turbidity Column #2. This will suspend any turbid mater in the column.
 - b. Look straight down into both Turbidity Columns.
 - i. If both black dots are equally clear, the test is complete. Continue to step 7.
 - ii. If the black dot in Turbidity Column #1 (sample water) is less clear than the black dot in Turbidity Column #2 (distilled water), continue adding Standard Turbidity Reagent in 0.5 mL increments (and stirring) until the relatively clarity of both black dots is equal.

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7. Measure the turbidity

- a. Use the table below to determine the final turbidity result of the water sample.

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

- b. Record your result on your data sheet.

8. Replicates

- a. Repeat the test using clean Turbidity Columns. If you do not have extra Turbidity Columns in your monitoring kit, see “Post Testing Procedures” for instructions on how to clean them, and then proceed below.
- b. If the difference between the two replicates is > 5 JTU, run additional replicates until two results are within 5 JTU of each other.
- c. Use those two replicate values to calculate and record the final (averaged) result.

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EQUIPMENT CLEANING AND STORAGE

Cleaning

Cleaning your equipment after each use is very important. Dirty glassware can affect the results significantly, 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 dry completely before placing it back into the kit/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 squeeze gently. 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 diluted significantly, precautionary measures need to be followed when using, including:

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

First Aid: 10% Hydrochloric Solution (HCl)	
Contact	First Aid Measures
Spill	<ul style="list-style-type: none">• Mop up with paper towels while wearing latex or nitrile gloves.
Eye	<ul style="list-style-type: none">• Flush with water for 10 minutes.
Skin	<ul style="list-style-type: none">• Flush with water for 10 minutes.• Remove contaminated clothing.• Call a physician immediately.
Swallowed	<ul style="list-style-type: none">• Call a physician immediately.
Inhaled	<ul style="list-style-type: none">• Remove yourself to an area with fresh air.

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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 dry completely before returning to the LaMotte Turbidity Kit/monitoring bin.
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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.

———— ***AFTER SAMPLING*** ————