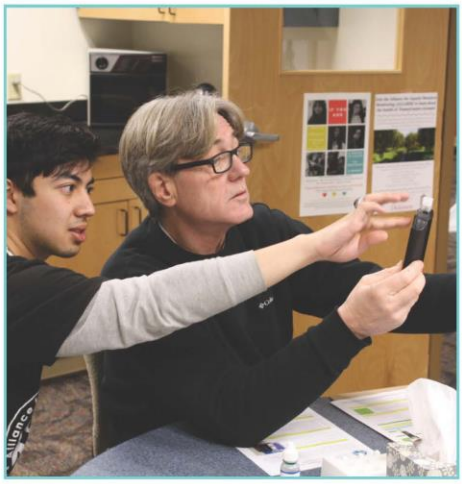
Stream Team Water Quality Monitoring Manual

November 2018
Version 1.1





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CMC Chesapeake Monitoring Cooperative

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WATER QUALITY MONITORING MANUAL

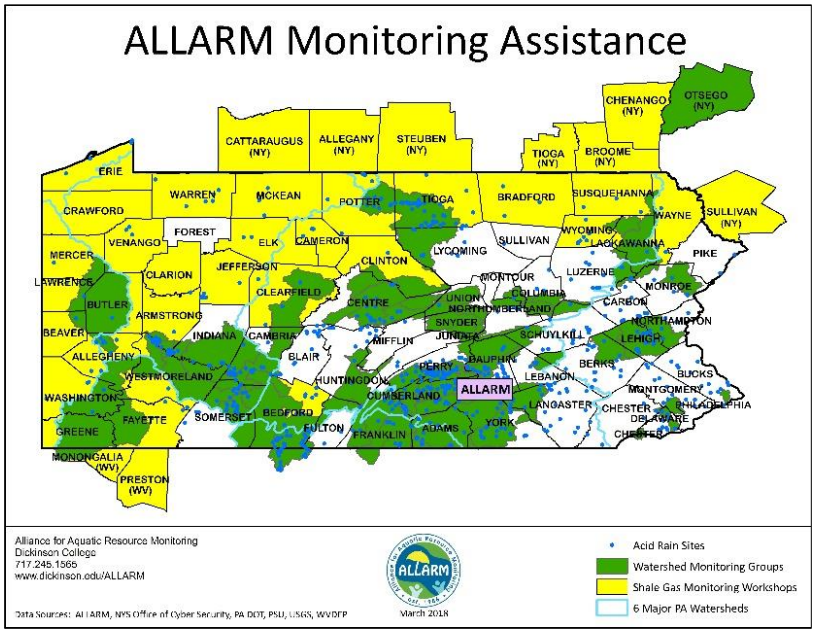
This Water Quality Monitoring Manual outlines the ALLARM Stream Team volunteer monitoring program and contains directions specific to the program and to monitors trained by the Alliance for Aquatic Resource Monitoring (ALLARM) at Dickinson College. The purpose of this manual is to ensure that water samples are collected and tested for water temperature, conductivity, nitrate-nitrogen, and pH in a standard way. The methods described in detail in this manual serve as a quality control mechanism for collecting stream data of known quality.

ALLIANCE FOR AQUATIC RESOURCE MONITORING

The Alliance for Aquatic Resource Monitoring (ALLARM) is a nationally-recognized technical and programmatic support center for community organizations interested in watershed assessment, protection, and restoration. ALLARM was founded in 1986 and is a project of Dickinson College in Carlisle, PA. ALLARM's mission is to empower communities with scientific tools to understand the health of their streams and participate in local decision-making.

ALLARM provides customized assistance to community groups through skill-building workshops, trainings, and outreach on topics such as:

- Study design
- Water quality
- Macroinvertebrate monitoring
- Visual assessment
- Shale gas monitoring
- Quality assurance/quality control
- Data analysis and interpretation
- Communication strategies
- Strategic planning
- Volunteer recruitment



Through the work of four full-time staff, a science advisor, and 12-16 Dickinson College students, ALLARM offers comprehensive services to enable groups to use critical scientific tools that can enhance the quality of their local environment and allow them to fully participate in community decision-making. For more information on ALLARM, please visit: www.dickinson.edu/ALLARM.

SUSQUEHANNA STREAM TEAM

The Susquehanna River is the largest tributary to the Chesapeake Bay, providing 50% of fresh water and draining close to 28,000 mi^2 of land. Improving the health of the Susquehanna River watershed is key to Pennsylvania and New York achieving their Bay pollution reduction goals. Stream monitoring is a vital tool in assessing the health of the Susquehanna watershed and determining whether the Bay pollution blueprint is working. To this end, ALLARM developed a standardized protocol for chemical and biological stream monitoring, with the goal of engaging volunteer teams throughout the Susquehanna tributaries

to collect scientific data of known quality that can inform local approaches to achieving improved watershed health. The ALLARM Stream Team volunteer monitoring program is currently funded through the Chesapeake Monitoring Cooperative, a cooperative agreement with the EPA Chesapeake Bay Program; ACB CB96334901 – Citizen and Non-traditional Monitoring.

1a. Monthly Chemical Monitoring ● Conductivity ● Nitrate-nitrogen ● pH ● Water temperature ● Visual site characteristics assessment	1b. Annual Macroinvertebrate Monitoring (spring or fall) ● EPA Volunteer Monitoring Macroinvertebrate Protocol
1c. Data Management: Volunteers will record data in data sheets and upload data to the Chesapeake Data Explorer.	
1d. Data Interpretation (after 12 months) ● Teach teams how to interpret results and find the story in their data. ● Develop written water quality reports that communicate the volunteers' findings.	
2. Additional Monitoring Parameters (if the baseline data indicate further analysis): ● Dissolved oxygen ● Orthophosphate	
Note: All volunteers will be trained in accordance with federally approved Quality Assurance Project Plans.	

QUALITY ASSURANCE & QUALITY CONTROL

Quality assurance and quality control (QA/QC) are the backbone of any successful stream monitoring program. The ALLARM Stream Team volunteer monitoring program implements a variety of QA/QC practices to ensure that the data collected are of known quality. A summary of these practices are listed in the table below:

Practice	Component(s)
Training requirements	Attend ALLARM training workshops and follow-up meetings.
Documented procedures	Follow procedures in the Stream Team Monitoring Manual.
Equipment care	Care for equipment following the guidelines outlined in the this manual, including: • calibrate and use equipment according to manufacturer's directions • inspect, clean, and store equipment properly • contact ALLARM with questions
Internal QA/QC	Measure parameters in replicate.
External QA/QC	Duplicate sample analysis, run by ALLARM.

PART 1: PRE-STREAM

Quick Overview

- Gather the equipment and supplies you will need for the pre-stream monitoring section.
- Calibrate LaMotte Tracer PockeTester meter for conductivity testing.

Pre-Stream Equipment Checklist:

- ☐ LaMotte Tracer PockeTester
- ☐ 84 µS/cm conductivity standard
- ☐ 84 µS/cm calibration vial
- ☐ 1,413 µS/cm conductivity standard
- ☐ 1,413 µS/cm calibration vial
- ☐ Distilled water wash bottle
- ☐ Waste container

Note! Calibrate the LaMotte Tracer PockeTester before every sampling event to ensure the best data quality.

Calibrate the LaMotte Tracer PockeTester

Step #1: Gather and prepare the equipment

1. Gather the following supplies:
    a. LaMotte Tracer PockeTester
    b. 84 µS/cm conductivity standard
    c. 84 µS/cm calibration vial
    d. 1,413 µS/cm conductivity standard
    e. 1,413 µS/cm calibration vial
    f. Distilled water wash bottle
    g. Waste container
2. Turn the meter on by pressing the **ON/OFF** button, and remove the cap covering the electrode.
3. Confirm that the meter is in conductivity mode – **µS** will be displayed above the reading (see diagram on right for symbols).

*Note! To change modes, press and hold the **MODE** button for ~3 seconds to cycle through the other two modes (total dissolved solids and salinity) until **µS** displays. **CON** will also display at the bottom of the screen when it is conductivity mode.*

Step #2: Calibrate the meter with 84 µS/cm calibration solution

1. Invert the bottle of 84 µS/cm conductivity standard and rinse the 84 µS/cm calibration vial three times with the standard solution. Pour ~20 mL of conductivity standard into the vial (about halfway).
2. Place the electrode into the solution (do not let the meter rest on the bottom), and allow the reading to stabilize. This may take up to 2 minutes. Once the reading is stable, press and hold the **CAL** button for ~2 seconds, until **CAL** appears on the bottom of the screen and **84** flashes. When the meter is finished calibrating, **SA** and **End** will briefly flash and the meter will return to the conductivity measurement mode.

Note! SA will not flash if the calibration fails. Repeat and try again. See meter troubleshooting section if the issue persists (page 19).

3. Rinse the electrode with distilled water over the waste container and shake dry.

Step #3: Calibrate the meter with 1,413 µS/cm calibration solution

1. Repeat step #2 using the 1,413 µS/cm conductivity standard and vial.

Step #4: Clean Up

1. When you have finished calibrating your meter, rinse it again before putting the cap back on, turn it off, and note on your data sheet that you calibrated your meter.
2. Pour the 84 and 1,413 µS/cm conductivity standards into your waste container or sink.

End of Part 1: Pre-Stream Section.

PART 2: AT-STREAM

Quick Overview

- Gather the equipment and supplies you will need for the at-stream monitoring section.
- Fill out your data sheet.
- Collect a water sample for conductivity, nitrate-nitrogen, and pH testing.
- Measure water temperature in the stream.

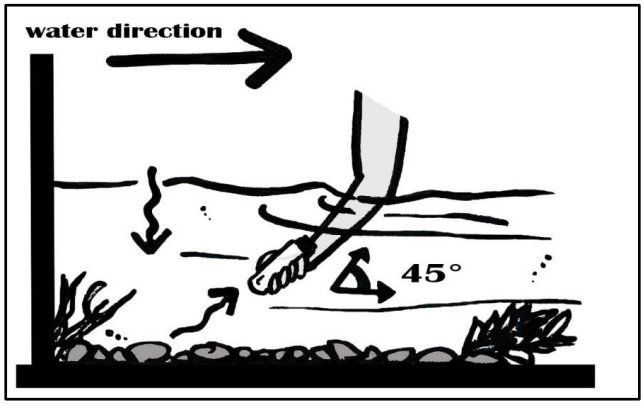
At-Stream Equipment Checklist:

- ☐ Sample bottle (1)
- ☐ LaMotte Tracer PockeTester (1749)
- ☐ Distilled water wash bottle
- ☐ Optional: sample collection pole, sampling bucket and rope
- ☐ Monitoring Manual (with data sheet)
- ☐ Waders or closed-toe shoes suitable for entering the stream
- ☐ Cooler with ice/freezer packs
- ☐ Pen
- ☐ Cell phone

Collecting a Water Sample

- Each time you visit your monitoring site, collect a water sample from the same location using the same collection method. Record on your data sheet if you change locations.
- Samples should be collected from the middle of the stream where the water is flowing steadily, using a clean sample bottle. Do not touch the inside of the bottle or cap with your hands.

Method #1: Wade into the stream:



1. Enter the stream.
   a. Enter the stream **downstream** of your monitoring site to avoid disturbing the streambed.
   b. Move to the center of the stream, if possible, and face upstream.
2. Rinse the sample bottle and cap.
   a. Fill the sample bottle with stream water and cap it. Shake the bottle and pour the rinse water out downstream from where you are standing.
   b. Repeat two more times.
3. Collect a water sample.
   a. Tilt the mouth of the bottle downstream and lower it into the stream. Sample the entire depth of the stream, but do not let the bottle touch the streambed.
   b. When the bottle is full, remove it from the stream and cap it.
   c. Exit the stream and store your sample for post-stream testing.

Note! If stream level is >6 inches, follow the above instructions. If stream level is <6 inches, tilt the bottle upstream, and collect as much water as possible without disturbing the streambed.

Method #2: Use a sample collection pole:

1. Rinse the sample bottle and cap.
    a. Stand along the stream bank or at a bridge at your monitoring site and secure the sample bottle to the sample collection pole. Remove the cap from the bottle.
    b. Fill the sample bottle with stream water. Swirl the water in the bottle, then pour out the rinse water downstream from where you are standing.
    c. Repeat two more times. During the final rinse, rinse the cap with stream water three times.
2. Collect a water sample.
    a. Extend the collection pole to the middle of the stream (or as close to the middle as possible). Tilt the mouth of the bottle downstream and lower it into the stream. Sample the entire depth of the stream, but do not let the bottle touch the streambed.
    b. When the bottle is full, remove it from the stream and cap it.

Method #3: Use a sampling bucket:

If you choose to sample from a bridge, there needs to be enough room on the shoulder of the road to stand and move safely without worrying about traffic. Also, be aware that a bucket full of water can be heavy and difficult to lift to the top of a bridge.

1. Rinse the sampling bucket, sample bottle, and cap.
    a. Stand on the bridge at the mid-point of the stream (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 and into the stream. Do not touch the streambed with the sample bucket.
    b. Raise the bucket back up to the bridge. Swirl the water in the bucket, then pour out the rinse water downstream from where you are standing.
    c. Repeat two more times. During the final rinse, rinse the sample bottle and cap with stream water three times.
2. Collect a water sample.
    a. Lower the sample bucket into the stream again. Sample the entire depth of the stream, but do not let the bucket touch the streambed.
    b. Raise the bucket back up to the bridge. Fill the sample bottle with water and cap it.
    c. Pour out the remaining water in the bucket.

At-Stream Safety Tips!

- Monitor with a partner, or make sure others know you are going monitoring
- Do NOT monitor if:
    - You feel ill
    - Weather is bad (especially snowy or icy conditions)
    - High flow stream conditions (it rained a lot the night before, is above your knees)
- Be careful entering/exiting the stream (could be slippery)
- Make sure you have public access to the stream
- Do not put yourself in a situation that could cause harm

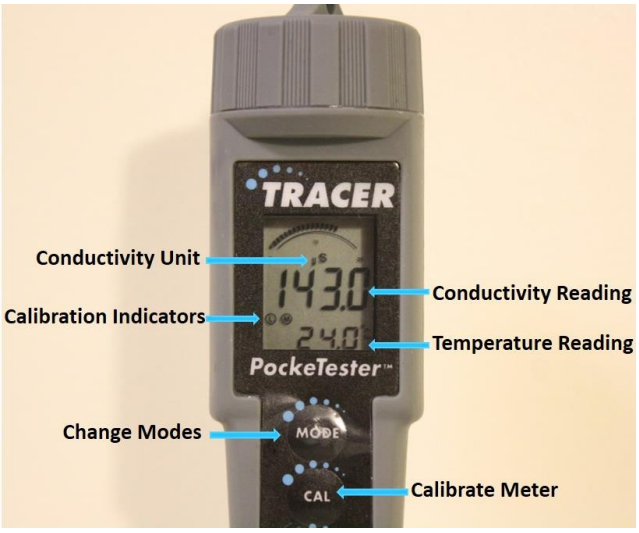
WATER TEMPERATURE: LaMotte PockeTester (1749)

The LaMotte Tracer PockeTester measures water temperature, the amount of heat present in water. The temperature will be recorded in degrees Celsius (°C). The meter must be calibrated using 84 and 1,413 µS/cm solution before every sampling occasion.

Step #1: Measure the water temperature

1. Remove the electrode cap and turn the meter on – press the **ON/OFF** button.
2. Place the electrode in the stream and allow the water temperature readings to stabilize. The temperature reading is the smaller number on the bottom. The larger number is the conductivity reading, which will be measured during the post-stream section.
3. Record the measurements on your data sheet as __°C.

Note! If your meter is reading in °F, follow the instructions on page 19 to change the unit.



Step #2: Measure the replicate(s)

1. Remove the electrode from the stream and repeat step #1.
2. The values of the two replicates must be within the acceptable precision range of ± 0.5 °C for water temperature. If the values are outside of the range, measure additional replicates until two values are within the range.
3. Use the two replicate values within the acceptable range to calculate the average value. Record the final result on your data sheet.

EXAMPLE

Replicate #1	Replicate #2	Final Result
13.1 °C	13.3 °C	13.2 °C

Step #3: Clean Up

1. Exit the stream.
2. Turn the meter off. Rinse the electrode with distilled water and shake dry.
3. Replace the electrode cap.

The equipment directions have been modified by ALLARM for this specific audience. The manufacturer's directions can be found at: http://www.lamotte.com/en/browse/1749.html.

End of Part 2: At-Stream Section.

PART 3: POST-STREAM

Quick Overview

- Gather the equipment and supplies you will need for the post-stream monitoring section.
- Measure conductivity, nitrate-nitrogen, and pH.
- Clean your monitoring equipment.
- Record your results.

Post-Stream Equipment Checklist:

- ☐ LaMotte Nitrate Nitrogen Tablet Kit (3354)
- ☐ LaMotte LaMotte Precision pH Kit (5858)
- ☐ Distilled water
- ☐ 5% Alconox soap
- ☐ Brush
- ☐ 10% Hydrochloric acid solution
- ☐ Waste container
- ☐ Latex/nitrile gloves
- ☐ Beaker

Conductivity, nitrate-nitrogen, and pH may be measured at home using the water you collected in the sample bottle within the maximum holding time (see table below). Measure each parameter a minimum of two times (**replicates**), or until two values fall within the acceptable precision range, which is based on the precision and sensitivity of the equipment.

Parameter	Equipment	Acceptable Precision Range	Maximum Holding Time
Conductivity	LaMotte Tracer PockeTester	± 10 µS/cm	N/A
Nitrate-nitrogen	LaMotte Nitrate Nitrogen Tablet Kit	0 – 2 mg/L = ± 1 mg/L 2 – 10 mg/L = ± 2 mg/L 10 – 15 mg/L = ± 5 mg/L	48 hours
pH	LaMotte Precision pH Kit	± 1 pH unit	24 hours

Prepare the Sample Water

Before testing any of the post-stream parameters, rinse the beaker three times with sample water. Pour rinse water into the waste container. Then fill the beaker with the sample water for conductivity testing. You will need to empty the beaker into the waste container after testing conductivity, then rinse the beaker again and fill it with water to use for the remaining tests. Then rinse the syringe three times with sample water to use for nitrate-nitrogen and pH testing.

CONDUCTIVITY: LaMotte PockeTester (1749)

The LaMotte Tracer PockeTester measures conductivity, the ability of water to pass an electrical current due to the presence of ions (cations & anions) dissolved in water. The conductivity value (measured in "microSiemens per centimeter"; µS/cm) displayed on the meter will fluctuate until it stabilizes. The meter must be calibrated using 84 and 1,413 µS/cm solution before every sampling occasion.

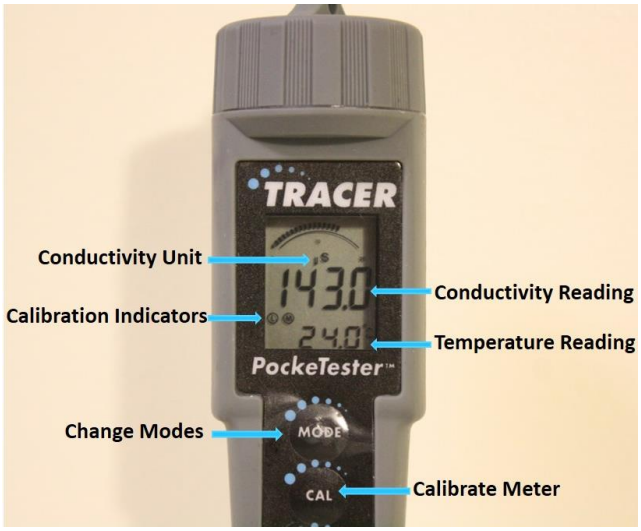
Step #1: Gather and prepare the equipment

1. Gather the following supplies:
    a. Beaker of sample water
    b. LaMotte Tracer PockeTester
    c. Distilled water

Step #1: Measure the conductivity

1. Remove the electrode cap and turn the meter on – press the **ON/OFF** button.
2. Make sure that the meter is in the correct mode and **µS/cm** is displayed.
3. Place the electrode in beaker and allow the conductivity reading to stabilize.
4. Record the value on your data sheet as ____µS/cm.

Note! Conductivity values ≥ 200 µS/cm will be displayed as a whole number (no decimal point). See Appendix B for equipment tips (page 19).



Step #2: Measure the replicate(s)

1. Repeat Step #1.
2. The values of the two replicates must be within the acceptable precision range of ± 10 µS/cm. If the values are outside of the range, measure additional replicates until two values are within the range.
3. Use the two replicate values within the acceptable range to calculate the average value. Record the final result on your data sheet.

EXAMPLE

Replicate #1	Replicate #2	Final Result
414 µS/cm	419 µS/cm	417 µS/cm

Step #3: Clean Up

1. Turn the meter off. Rinse the electrode with distilled water and shake dry.
2. Replace the electrode cap.
3. Pour the sample water from the beaker into the waste container and refill for nitrate-nitrogen and pH testing.

The equipment directions have been modified by ALLARM for this specific audience. The manufacturer's directions can be found at: http://www.lamotte.com/en/browse/1749.html.

NITRATE: LaMotte Nitrate Nitrogen Tablet Kit (3354)

Nitrogen is an essential plant nutrient, but excess amounts can cause problems, such as reduced oxygen levels, overabundance of aquatic plants, and eutrophication. The LaMotte Nitrate Nitrogen Tablet Kit measures the concentration of nitrate-nitrogen (NO_3-N) dissolved in water. Nitrate-nitrogen is measured in "milligrams per liter" or mg/L.

Step #1: Gather and prepare the equipment

1. Gather the following supplies:
    a. Beaker of sample water
    b. LaMotte Tracer PockeTester
    c. (2) Test tube and cap
    d. Nitrate #1 Tablet (red text on foil packet)
    e. Nitrate #2 Tablet (purple text on foil packet)
    f. Timer
    g. Octa-Slide 2 Viewer
    h. Octa-Slide 2 Bar
    i. Syringe
2. Protective Sleeve (if testing outside)
3. Rinse the (2) test tubes, test tube caps, and syringe with sample water from the beaker 3 times.

Step #2: Prepare the water sample

1. Use the LaMotte Tracer PockeTester (1749) to measure the temperature of the water sample. **The sample must be at room temperature** (20 – 23 °C) before testing it for nitrate.
2. Use the syringe to fill both test tubes with 5 mL of sample water. Set one test tube aside to test as replicate #2.

Tip! Draw a little more than 5 mL of water into the syringe, point the tip into the waste container, and slowly depress the plunger until the bottom of the black cone is level with the 5 mL line.

Step #3: Add Nitrate #1 Tablet to the test tube

1. Add one Nitrate #1 Tablet to the test tube and cap it. Shake the test tube until the tablet dissolves.

Step #4: Add Nitrate #2 Tablet to the test tube

1. Add one Nitrate #2 Tablet to the test tube and cap it. If testing outside, insert the test tube into the Protective Sleeve to shield the sample from UV light.
2. Set the timer for **two minutes** and shake the test tube to dissolve the tablet.
3. Set the timer for **five minutes** and wait.

Step #5: Measure the nitrate

1. After waiting for five minutes, insert the test tube into the Octa-Slide 2 Viewer. If testing outside, remove the test tube from the Protective Sleeve.
2. Hold the Viewer ~1 foot in front of a white-colored background (i.e. paper, wall, etc.) so indirect light can enter through the back of the Viewer. Match the color in the test tube to the color most similar on the Octa-Slide 2 Bar and record the result on your data sheet as _____ mg/L NO_3-N. If the color is between two values, record the average of the two values.

Step #6: Measure the replicate(s)

1. Repeat steps #2 – 5 using the second tube and cap. If you do not have a clean test tube available, see cleaning instructions below.
2. The values of the two replicates must be within the acceptable precision range (see table). If the values are outside of the range, run additional replicates until two values are within the range.
3. Use the two replicate values within the acceptable range to calculate the average value. Record the final result on your data sheet.

Nitrate Value	Acceptable Precision Range
0 – 2 mg/L	± 1 mg/L
2 – 10 mg/L	± 2 mg/L
10 – 15 mg/L	± 5 mg/L

Tip! If measuring both replicates at the same time, hold and shake both test tubes in the same hand.

EXAMPLE

Replicate #1	Replicate #2	Final Result
2 mg/L	4 mg/L	3 mg/L

Step #7: Clean Up

1. Pour the sample from both test tubes into your waste container.

The equipment directions have been modified by ALLARM for this specific audience. The manufacturer's directions can be found at: http://www.lamotte.com/en/browse/3354-01.html.

pH: LaMotte Precision pH Kit (5858)

The LaMotte Precision pH Kit measures how acidic or basic water is, or the amount of hydrogen (H+) and hydroxide (OH-) ions, which make up water (H_2O). pH is measured on a scale that ranges from 0 to 14 (0 is the most acidic, 14 is the most basic). The difference of one pH unit is equal to a 10-fold increase in acidity – a water sample with a pH of 4 is ten times more acidic than a sample with a pH of 5.

Step #1: Prepare the water sample

1. Gather the following supplies:
    a. Beaker of sample water
    b. (2) Test tube and cap
    c. Wide Range pH Indicator
    d. Octa-Slide 2 Viewer
    e. (2) Octa-Slide 2 Bar
    f. Syringe
2. Rinse the (2) test tubes and caps with sample water from your beaker 3 times.
3. Use the syringe to fill both test tubes with 10 mL of sample water from the beaker. Set one test tube aside to test as replicate #2.

Tip! Draw a little more than 10 mL of water into the syringe, point the tip into the waste container, and slowly depress the plunger until the bottom of the black cone is level with the 10 mL line.

Step #2: Add Wide Range pH Indicator

1. Invert the bottle of Wide Range pH Indicator 3 times.
2. Remove the cap, **hold the bottle vertically**, and add 10 drops to the test tube.
3. Cap the test tube and invert it 3 times.

Step #3: Measure the pH

1. Insert the test tube and one Octa-Slide 2 Bar into the Octa-Slide 2 Viewer. If the color range on the Octa-Slide 2 Bar does not match the color in the test tube, insert the other Octa-Slide 2 Bar.
2. Hold the Viewer ~1 foot in front of a white-colored background (i.e. paper, wall, etc.) so indirect light can enter through the back of the Viewer. Match the color in the test tube to the color most similar on the Octa-Slide 2 Bar and record the result on your data sheet as _____ pH units. If the color is between two values, record the average of the two values.

Step #4: Measure the replicate(s)

1. Repeat steps #2 – 3 using the second test tube and cap.
2. The values of the two replicates must be within the acceptable precision range of ± 1 pH unit. If the values are outside of the range, test additional replicates until two values are within the range.
3. Record the final result on your data sheet.

EXAMPLE

Replicate #1	Replicate #2	Final Result
7 pH units	6 pH units	6.5 pH units

Step #5: Clean Up

1. Pour the sample from both test tubes into your waste container.

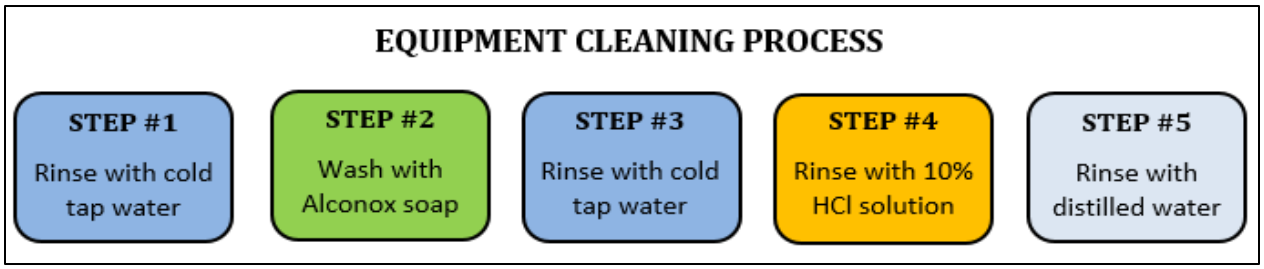
POST-STREAM EQUIPMENT CLEAN UP

Cleaning your equipment **after each use** is very important. Using dirty equipment can affect the results significantly, which defeats the quality assurance measures built into your monitoring program and can question the credibility of your data. Equipment should cleaned at a sink using a combination of tap water, Alconox soap (5%, phosphate-free detergent), Hydrochloric Acid (10%, HCl), and distilled water, using the following methods:

1. Pour the wastewater from your waste container into your sink while flushing with cold tap water. Rinse the waste container with tap water three times.
2. Clean your syringe:
    a. Separate the plunger from the body of the syringe and rinse both parts with tap water.
    b. Wash both parts with a small amount of 5% Alconox soap.
    c. Rinse 3 times with cold tap water.
    d. Pour a very small amount of 10% Hydrochloric acid solution into the body of the syringe. Carefully reattach the plunger and rotate the syringe so that all inside surfaces come in contact with the 10% HCl. Depress the plunger to empty the used HCl solution down the sink while flushing with cold tap water.
    e. Separate the plunger again and rinse both parts 3 times with distilled water.
3. Clean your remaining supplies.
    a. Rinse with tap water.
    b. Wash with a small amount of 5% Alconox soap. Use a brush to remove any particles.
    c. Rinse 3 times with cold tap water.
    d. Rinse with a small amount of 10% Hydrochloric acid solution. Pour the used HCl solution down the sink while flushing with cold tap water.
    e. Rinse 3 times with distilled water.

BEWARE!

10% HCl can stain your stainless steel sink!



When your equipment is completely dry, return it to your monitoring bin. Use the following best practices to store your monitoring equipment and supplies:

- Keep reagent containers tightly closed.
- Store in a dry, cool, well-ventilated place away from combustible materials.
- Keep out of reach from children and pets.

DATA MANAGEMENT

Review your data sheet and confirm that you have completed all of the tests and filled it out completely. Note the time it took to complete all sections of the monitoring process on the bottom of your data sheet. Add results to a data management system like an Excel file and send data sheets to the coordinator. The data will be regularly integrated into the Chesapeake Data Explorer.

End of Part 3: Post-Stream Section.

APPENDIX A: EFFECTS, PRECAUTIONS, FIRST AID, CLEAN-UP

Some of the reagents and cleaning solutions included in your monitoring bin are slightly hazardous materials. Use caution and follow these safety practices:

- Avoid contact with your skin, eyes, nose, and mouth.
- Wear safety glasses and latex/nitrile gloves for extra protection.
- Wash your hands immediately after testing your water sample and cleaning your equipment.

Nitrate #1 Tablet

Contact	Effect	Precautions to Take	First Aid Measures
Eye	May cause irritation.	Wear safety glasses.	• 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.	• Wash off with warm water and soap. • If irritation persists, call a physician.
Swallowed	May cause gastrointestinal irritation, nausea, vomiting, and diarrhea.	Do not eat, drink, or smoke when using this product.	• Drink plenty of water. • If more than a few tablets have been swallowed, or if symptoms persist or develop, contact a physician.
Inhaled	May cause irritation of respiratory tract.		• Seek fresh air. • If symptoms persist, call a physician.
Spill Clean-up Procedure: 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.			

Nitrate #2 Tablet

Contact	Effect	Precautions to Take	First Aid Measures
Eye	May cause irritation.		• Rinse thoroughly with plenty of water, also under the eyelids. • If irritation persists or develops, contact a physician.
Skin	May cause irritation.		• Wash off with warm water and soap. • If irritation persists, call a physician.
Swallowed	May cause gastrointestinal discomfort if consumed in large amounts.	Do not eat, drink, or smoke when using this product.	• Drink plenty of water. • Clean mouth with water. • Consult a physician.
Inhaled	May cause irritation of		• Seek fresh air. • If breathing is difficult, give oxygen.

	respiratory tract.		• If not breathing, give artificial respiration and contact emergency personnel. • Call a physician immediately.
Spill Clean-up Procedure: 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.			

10% Hydrochloric Acid (HCl)

Contact	Effect	Precautions to Take	First Aid Measures
Eye	Irritation and may include inflammation, redness, watering, itching, and possible burns.	Wear safety glasses.	• Call a physician immediately. • Remove contact lenses. • Flush with water for at least 15 minutes.
Skin	Irritation and may include inflammation, itching, scaling, reddening, or occasionally produce blistering or burns.	Wear protective gloves and clothing.	• Call a physician immediately. • Flush with plenty of water for at least 15 minutes, while removing contaminated clothing and shoes. • If serious, wash with a disinfectant soap and cover with an anti-bacterial cream. • Cover the irritated skin with an emollient. • Washing clothing and shoes before wearing again.
Swallowed	Irritation to gastrointestinal tract and may include nausea, vomiting, abdominal cramps, and diarrhea.		• DO NOT INDUCE VOMITTING unless directly by emergency personnel. • If large quantities are swallowed, call a physician immediately. • Never give anything by mouth to an unconscious person. • Loosen tight clothing.
Inhaled	Severe irritation of respiratory tract and may include coughing, choking, sneezing, hoarseness, or shortness of breath.	Use in a well-ventilated area.	• Call a physician immediately. • Seek fresh air. • If not breathing, give artificial respiration. • If breathing is difficult, give oxygen. • If serious, loosen tight clothing (collar, tie, belt, waistband, etc.).
Other Effects: May be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, and teeth. May cause adverse reproductive effects and affect genetic material and behavior. Repeated or prolonged exposure can produce target organs damage. Repeated or prolonged exposure to spray mist may produce chronic eye irritation, severe skin irritation, and respiratory tract irritation leading to frequent attacks of bronchial infection.			

Spill Clean-up Procedure: Dilute the liquid with water and mop up, or absorb with an inert dry material and place in an appropriate waste container.

84 and 1,413 µS/cm Calibration Solution

Contact	Effect	Precautions to Take	First Aid Measures
Eye	N/A	Wear safety glasses.	• Rinse/flush gently with water for 15-20 minutes. • Remove contact lenses if present and easy to do. Continue rinsing.
Skin	N/A	Wear protective gloves and clothing.	• Rinse affected area with water and soap. • If irritation persists, call a physician.
Swallowed	N/A	Do not eat, drink, or smoke when using this product.	• Rinse mouth and drink plenty of water. • Do not induce vomiting. • If symptoms develop, call a physician.
Inhaled	N/A		• Seek fresh air. • If symptoms develop, call a physician.
Spill Clean-up Procedure: Absorb with non-combustible, liquid-binding material.			

Wide Range pH Indicator

Contact	Effect	Precautions to Take	First Aid Measures
Eye	May cause irritation.	Wear safety glasses.	• Flush thoroughly with water for 15 minutes, lifting lower and upper eyelids. • If irritation develops, call a physician.
Skin	Irritation.	Wear protective gloves and clothing.	• Flush with water for 15 minutes. • If irritation develops, call a physician.
Swallowed	May cause drowsiness and dizziness. May be fatal or cause blindness if swallowed. May cause central nervous system depression.		• Drink two glasses of water. • Do not induce vomiting without first consulting a physician. • Call a physician immediately.
Inhaled	May cause irritation of respiratory tract. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination.	Use in an area with adequate ventilation.	• Seek fresh air. • If breathing is difficult, give oxygen. • If not breathing, give artificial respiration and contact emergency personnel. • Call a physician immediately.
Spill Clean-up Procedure: Absorb spill with inert material and place in a chemical waste container. After cleaning, flush away tracer with water.			

B: EQUIPMENT TROUBLESHOOTING & TIPS

LaMotte Tracer PockeTester (1749)

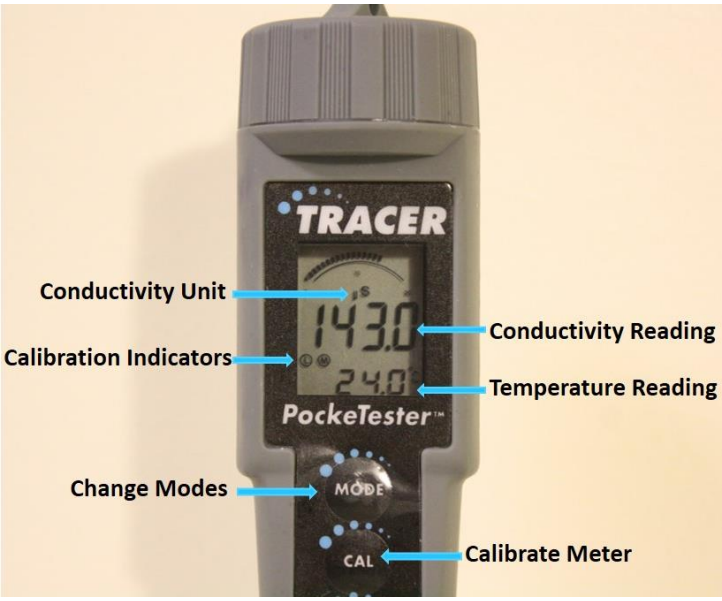
If you have trouble calibrating or using your meter, try the following options:

Remove the batteries	Replace the batteries	Reset the meter
Removing the batteries temporarily can be a way of "resetting" the meter. 1. Twist off the battery compartment cap. 2. Hold the battery housing in place with one finger. Remove the battery carrier by pulling on the small tabs. 3. Remove the four CR2032 batteries. 4. Insert the same four batteries (observe polarity). 5. Replace the battery compartment cap.	The batteries in the PockeTester will need to be replaced every 2-5 years, depending on use. There is a low battery indicator on the meter that displays "BAT" when the batteries become weak. You can find replacement batteries (CR2032) at any local box/grocery/home improvement store or online. Four new batteries cost ~$2. Replace the batteries following the instructions above.	1. Turn the meter off. 2. Simultaneously press the ON/OFF, CAL, and MODE buttons momentarily. "dFlt" will be displayed on the screen.

To change temperature measurement from °F to °C and vice versa:

1. Turn the meter off.
2. Simultaneously press the ON/OFF and CAL buttons momentarily.
3. SELF CAL will flash on the screen and the meter will turn back on with the newly changed unit of measurement.

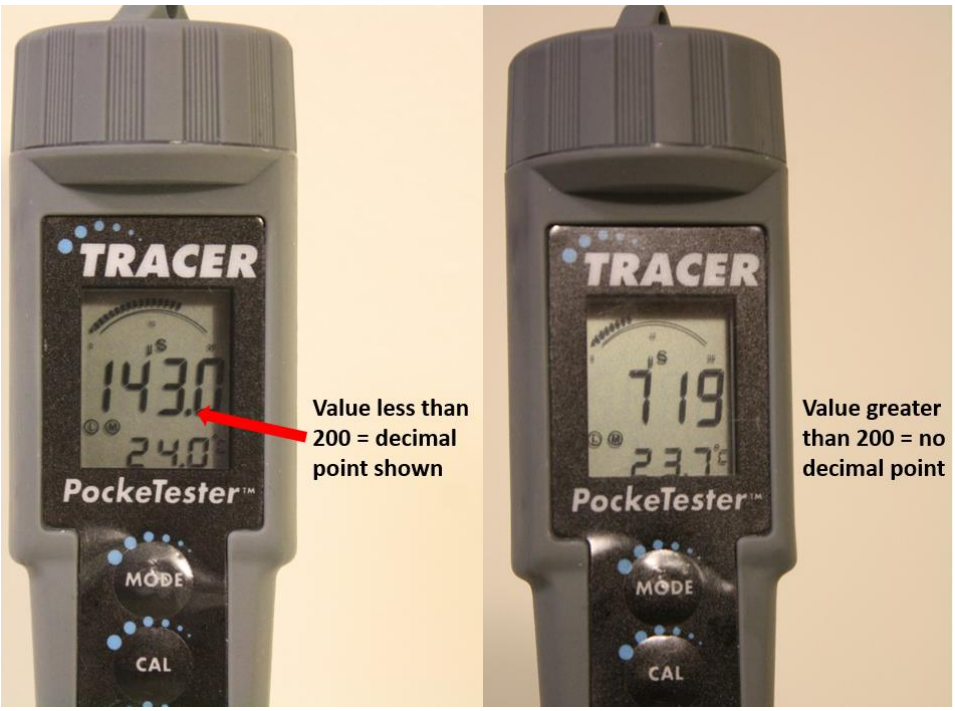
If you have trouble reading the screen, use the following pictures to help familiarize yourself with the symbols.



Tips!

When you are in the stream or outside in general, there could be glare from the sun on the screen. Slightly tip the meter up and down to make sure the glare is not showing a decimal point or any other symbol that should not be there. If you are inside, poor lighting could also make it harder to see the screen. The trick is finding the balance where you can read all the numbers clearly and know that you are recording the right values!

It can be tricky to spot the decimal point on the conductivity value. A value **less than 200 µS/cm** will show a **decimal point** in the tenths column. A value of 200 µS/cm or greater will not show a decimal point, and you will typically only see three numbers on your screen. See the picture below.



For additional help troubleshooting your meter, please contact ALLARM.

C: MONITORING FORMS

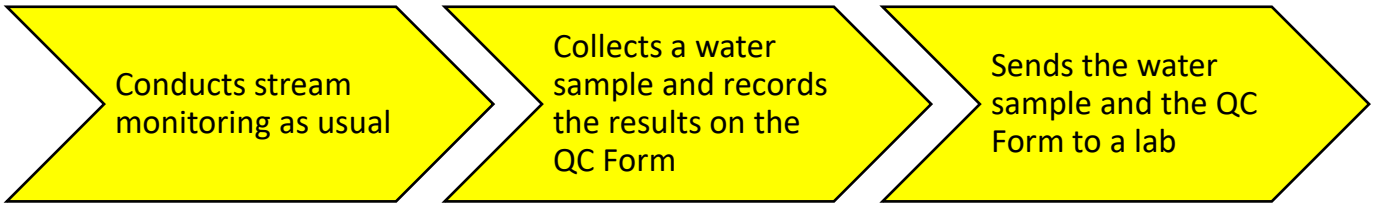
QUALITY CONTROL INSTRUCTIONS: Collecting a duplicate sample

Alliance for Aquatic Resource Monitoring (ALLARM) is to provide quality control (QC) assistance to Stream Team Volunteer Monitors.

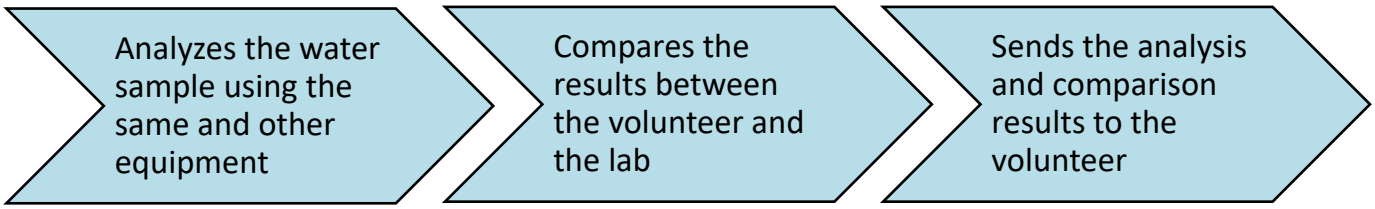
Quality assurance and quality control (QA/QC) procedures are an important part of a stream monitoring program and should be followed consistently to help ensure the credibility and quality of the data being collected.

Here is how the ALLARM Quality Control Program works:

Volunteer:



ALLARM:



For specific directions, please see the Quality Control Form on the back of this page. Remember to:

- Label the QC bottle with your name, site name, and the collection date.
- Fill the QC bottle completely with stream water and close the lid tightly to avoid leaks.

If you have questions, please contact: Jinnie Monismith, ALLARM Assistant Director
monismij@dickinson.edu
717.245.1021

ALLARM will notify you with the analysis and comparison results within one month of processing your water sample. Thank you for collecting information about the health of streams in the Chesapeake Bay Watershed and participating in the ALLARM Quality Control Program!

For more information on ALLARM, please visit www.dickinson.edu/ALLARM.

STREAM TEAM QUALITY CONTROL FORM

1. Fill out the label on your QC bottle. Record your bottle # here: _____

2. Enter the stream and face upstream. Rinse your QC bottle and cap ***three*** times by filling the bottle with stream water, then pour the rinse water out downstream. Next, fill your QC bottle completely with stream water and close it tightly with the cap.

3. Record your results in the boxes below.

Parameter	Units	Equipment	Result
Conductivity	µS/cm	LaMotte Tracer PockeTester (1749)	
Nitrate-nitrogen	mg/L	LaMotte Nitrate Tablet Kit (3354)	
pH	pH units	LaMotte Precision pH Kit (5858)	

4. Fill out the information in the boxes below.

Volunteer Information		Sample Information	
Name		Site Name	
Mailing Address		Stream Name	
		Latitude Coordinate	
Email Address		Longitude Coordinate	
County Monitored		Collection Date	
Group Affiliation		Collection Time	

5. The samples and data sheets will be picked up from your location. Otherwise, pack a small cooler with your QC bottle and this QC Form and send it to ALLARM at Dickinson College:

Dickinson College/ALLARM
28 North College Street
PO Box 1773
Carlisle, PA 17013-2896

STREAM TEAM FIELD DATA SHEET

1. Check that equipment is prepared and calibrated:

☑	**Equipment Prep**
	Equipment gathered, inspected, and ready to use
	LaMotte Tracer PockeTester calibrated with 84 & 1,413 µS/cm calibration solution

2. Record the sampling and site information in the boxes below:

Sampling Information		**Site Information**	
Monitor Name		Stream Name	
Sample Collection Date		Site ID	
Sample Collection Time			

3. Record general observations in the boxes below:

Air Temperature (°C)	
Rainfall Today (mm)	
Rainfall Within 48 Hours (mm)	
Stream Flow (circle one)	Negligible Low Normal High
Water Color (circle one)	Normal Abnormal
Water Color Description (circle one)	Clear Brown Green
Weather Conditions Today (circle one)	Sun Partial Cloud Overcast Fog Drizzle Rain Snow
Weather Conditions Yesterday (circle one)	Sun Partial Cloud Overcast Fog Drizzle Rain Snow
Observations/Notes:	

4. Record all parameter measurements in the boxes below:

Parameter	Order	Acceptable Range	Rep #1	Rep #2	Rep #3*	Average
Water Temperature (°C)	At-Stream	± 0.5 °C				
Conductivity (µS/cm)	Post-Stream	± 10 µS/cm				
Nitrate-nitrogen (mg/L)	Post-Stream	0 – 2 mg/L = ± 1 mg/L 2 – 10 mg/L = ± 2 mg/L 10 – 15 mg/L = ± 5 mg/L				
pH (SU)	Post-Stream	± 1 pH unit				
Observations/Notes:						

*If the second replicate value falls outside the acceptable range listed in the chart, test the sample again. Record the average of the two values that are within the acceptable range in the final column. Ex. Nitrate Rep #1 = 2.4 mg/L; Rep #2 = 4.8 mg/L; Rep #3 = 3.0 mg/L, then record 2.7 mg/L average.

5. Was the water sample tested within the maximum holding time?

Parameter	Maximum Holding Time	☑ YES	☑ NO
Nitrate-nitrogen	48 hours		
pH	24 hours		

6. Record the amount of time spent monitoring, including:

a. Preparing monitoring equipment
b. Driving to/from collection site
c. Collecting a water sample and measuring all parameters
d. Cleaning monitoring equipment
e. Recording data

_____ hours