



STANDARD OPERATING PROCEDURE

MAINE VOLUNTEER RIVER MONITORING PROGRAM

METHODS FOR USING THE OAKTON WATERPROOF ECTestr 11+ (PLUS) FOR MEASURING SPECIFIC CONDUCTANCE IN RIVERS AND STREAMS



Note: The mention of brand names does not constitute recommendation of a specific company.



Volunteer River Monitoring Program
Standard Operating Procedure
Methods for using the Oakton Waterproof ECTestr 11+ (PLUS)
for Measuring Specific Conductance
in Rivers and Streams

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1. Applicability. This standard operating procedure (SOP) is used by the Volunteer River Monitoring Program (VRMP) of the Maine Department of Environmental Protection's Division of Watershed Management. It applies to the collection of specific conductance using an Oakton ECTestr 11+ (PLUS) by volunteers from rivers and streams in Maine. (*Note:* This meter is also capable of measuring water temperature. However, since this meter requires periodic calibration of the temperature-measurement device, volunteers are asked to not use the temperature values obtained by this device but rather from their dissolved oxygen meter or thermometer instead.)

2. Purpose. The purpose of this SOP is to provide standardized methods for volunteer groups to determine specific conductance of rivers and streams as an instantaneous reading using the Oakton hand-held ECTests 11+ (PLUS) meter.

3. Definitions.

A. Oakton. Manufacturer of water quality monitoring meters.

B. Electrode. Sensing device located at the end of a cable that is attached to the meter.

C. Specific Conductance. A measure of the ability of a water solution to conduct an electrical current. Specific conductance is electrical conductivity (EC) that is being expressed in microsiemens per centimeter ($\mu\text{s}/\text{cm}$) at a normalized temperature of 25 °C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in mg/L) is about 65% of the specific conductance (in microsiemens). (*Note:* This relation is not constant from stream to stream, and it may vary in the same stream with changes in the composition of the water.)



4. Responsibilities.

A. *Volunteer Monitors & Volunteer Groups*

- **Certification.** It is the responsibility of the individual obtaining this data to maintain current certification for the parameter(s) they collect if they wish their data to be entered into the VRMP database. Training will be provided to volunteers on an annual basis by VRMP/DEP staff, and certification will last for one year from the date of training.
- **Data recording.** It is the responsibility of the individual obtaining this data to record the results and additional qualifying information on current field sheets obtained from their affiliated watershed association or through the VRMP program of the DEP.
- **Data Quality Checks and Data Submission.** The data manager for the volunteer group will collect and enter volunteer field sheet data onto the appropriate computer file, perform quality assurance checks (refer to Section 5.10 of the Quality Assurance Program Plan), and submit data to the VRMP following protocols outlined in the volunteer group's latest sampling and analysis plan (SAP) that has been approved by the VRMP.

B. *Volunteer River Monitoring Program (VRMP) Staff*

- **Oversight of Volunteer Groups and Volunteers.** VRMP staff will oversee volunteer groups and volunteers through a variety of ways including maintaining an up-to-date VRMP quality assurance project plan (QAPP); reviewing sampling and analysis plans (SAPs) of the volunteer groups; providing annual training/certification sessions for volunteers; conducting quality assurance checks on data submitted by volunteer groups and laboratories; and uploading data into the DEP's EGAD database. These tasks are described in greater detail in the VRMP's latest QAPP.

5. Guidelines and Procedures.

A. *Oakton ECTestr 11+(PLUS) Meter Preparation.*

- **First time use.** Follow manufacturer's instructions for preparing meter for first time use. (Refer to Appendix A; sections "Before You Begin" through "HOLD Function").
- **Beginning of field season.** Before each field season, volunteer monitoring groups should conduct a full inspection of the meter. Follow manufacturer's instructions for first-time use (see above). New batteries shall be installed at the start of the sampling season and additionally, as needed. In addition, follow manufacturer's instructions for maintenance (Refer to Appendix A; section "Electrode Maintenance"). Each meter "setup" should be equipped with the following items:



- Extra batteries
- Field data sheet
- Pencil with eraser

- **Prior to field sampling.** Before each field sample collection, the volunteer shall inspect the meter, including the condition of its electrode and batteries.
- **Calibration.** The Oakton ECTestr 11+ (PLUS) meter shall be calibrated at the beginning of the field season. When calibrating the Oakton ECTestr 11+ (PLUS), use the “Auto Calibration” and “1-point Calibration” modes, which are the factory-default modes. (Refer to Appendix A, sections “About Calibration” *through* “Auto Calibration”.)

B. EC Measurements.

- **Sampling period and location.** Sampling period and site location information will be documented in volunteer groups’ SAPs (that require approval by the VRMP) which are submitted by the volunteer groups prior to the beginning of a sampling season. (Detailed information regarding how volunteer groups are to obtain and document site location information can be found in VRMP SOP-02 [Documenting Site Location].)
- **Familiarize Yourself With the Meter.** Volunteers shall familiarize themselves with the basic operation, keypad, and readouts of the meter (Appendix A; sections “Before You Begin” *through* “HOLD Function”).
- **Range Selection.** Volunteers shall ensure that Oakton EC 11+ (PLUS) Testr is set to “AUTO”- the default setting. (Refer to Appendix A, section “Range Selection”).
- **General Sampling Protocol.** (Refer to Appendix A, section “Measurement”).
 - (1) Record site location on data sheet.
 - (2) Remove electrode cap. Switch unit on.
 - (3) Dip electrode directly into stream or into a clean sample bottle/cup of the test solution. (“Clean” means that the sample container has been rinsed 3 times with stream water at your site.) Make sure sensor is fully covered by water.
 - (4) Wait for reading to stabilize (Automatic Temperature Compensation corrects for temperature changes.) Record reading.
 - (5) Replace electrode cap.
- **Quality Control**
 - (1) At the beginning of each field season, all VRMP staff and VRMP volunteers who will collect specific conductance data will have a training/refresher session to (re)familiarize themselves with the contents of this SOP.



(2) For every volunteer, a field duplicate shall be obtained for all parameters for at least 10% of their own sampling efforts. A field duplicate will be collected for every 10 samples monitored.

(3) Refer to the VRMP quality assurance project plan (QAPP) for more QA/QC details.

6. Equipment Care.

A. *Start of field season.*

1. Follow manufacturer's directions for preparation of a new electrode at the start of the field season.
2. Use new batteries at start of each sampling season. An extra set of appropriate size batteries (4 1.5V alkaline batteries) should be included in the meter carrying case.
3. Each meter "setup" should include the following items:
 - a. Field datasheet
 - b. Pencil with eraser
 - c. Extra batteries

B. *Field Season.*

1. Always keep the sensor electrodes clean. Rinse the electrode with de-ionized water and wipe it dry with a clean cloth before storing with protective cap.
2. Ideally the meter should be in water-resistant case with padding to protect it from damage.
3. Allow the case and contents to air-dry at end of each day. This may be accomplished by simply propping lid open. When contents are very wet, remove the contents and spread out to facilitate drying.
4. Keep meter from freezing.
5. Never scratch electrodes with a hard substrate.
6. Replace all batteries if low battery indicator starts blinking, or if readings are faint or unstable.

C. *End of field season (also see Appendix A, section "Electrode Maintenance").*

1. Completely dry meter, case, and all items in the case before storing.
2. Remove batteries.
3. Soak electrode in alcohol for a 10-15 minutes to remove oils.
4. Cover top of electrode with electrode cap to keep dust and dirt out for winter.
5. Keep meter dry and at room temperature to prevent corrosion of electronic parts.
6. Record winterization date and equipment repairs in Equipment Log.
7. Label the meter and case as 'WINTERIZED' in an obvious manner (so users will know the current status of the unit).

D. *Miscellaneous.* Refer to Appendix A, "Electrode Replacement", if Testr fails to calibrate or gives fluctuating readings in calibration standards.



7. Specifications

Range	Range	Accuracy	Resolution
PU	0 - 200 μ S/cm	\pm 1% full scale	0.1 μ S/cm
LO	0 – 2000 μ S/cm	\pm 1% full scale	1 μ S/cm
HI	0 to 1990 μ S	\pm 1% full scale	0.1 mS/cm

8. Appendix.

A. Conductivity owner's manual:

Oakton®. 2006. Instruction Manual: Oakton® EC/TDS/SALT Testr: ECTestr 11+.
Oakton Instruments, Illinois.

9. References.

A. DEP Standard Operating Procedures:

- Document number #:DEPLW-0890: Dissolved Oxygen and Temperature, Instantaneous Measurement using Electronic Meters
- Document number#: DEPLW-0636: Protocols for using Hanna Dissolved Oxygen and Specific Conductance/Temperature/pH Meters

B. Maine VRMP QAPP:

- Maine Department of Environmental Protection (MDEP). 2009. Maine Volunteer River Monitoring Program (VRMP) Quality Assurance Program Plan (QAPP). Portland, ME. DEPLW-0984.