



STANDARD OPERATING PROCEDURE

VOLUNTEER RIVER MONITORING PROGRAM (VRMP)

METHODS FOR USING THE LAMOTTE DISSOLVED OXYGEN KIT (MODEL 5856) & EASY READ® POCKET THERMOMETERS (range: -5 to 50°C; divisions: 0.5°C; accuracy: 0.5°) 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 LaMotte (Model 5856) Dissolved Oxygen Kit
& Easy Read® Pocket Thermometers
(range: -5 to 50°C; divisions: 0.5°C; accuracy: 0.5°)

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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 dissolved oxygen (DO) from rivers and stream in Maine using LaMotte dissolved oxygen water quality monitoring kits (Model 5856) and Easy Read® Pocket Thermometers (range: -5 to 50°C; divisions: 0.5°C; accuracy: 0.5°). Water temperature shall be measured at the same time as dissolved oxygen because it is critical towards helping calculate the percent saturation of dissolved oxygen in a sample.

2. Purpose. The purpose of this SOP is to provide standardized methods for volunteer groups to determine temperature and dissolved oxygen (DO) of rivers and streams as an instantaneous reading using LaMotte dissolved oxygen water quality monitoring kits (Model 5856) and Easy Read® Pocket Thermometers (range: -5 to 50°C; divisions: 0.5°C; accuracy: 0.5°; *hereafter* referred to solely as “thermometer”).

3. Definitions

A. MSDS. Material Safety Data Sheet. Dated summary of a substance's characteristics including product identification, hazardous and non-hazardous ingredients, physical, fire, explosion, and reactivity data, health hazards, emergency first aid, spill and disposal procedures, precautionary measures, and special precautions.



B. Hazardous Substance. A substance that has ignitability, corrosivity, reactivity and/or toxicity characteristics requiring that special precautions be taken when working with it.

C. LaMotte. Manufacturer of water quality monitoring test kits including dissolved oxygen test kits.



D. Easy Read®. Brand of pocket thermometer.

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 VRMP 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 into 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 program 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. *Safety.*

- Several reagents used in dissolved oxygen test kit are considered hazardous substances. These reagents include: Manganous Sulfate, Alkaline Potassium Iodine Azide, and Sulfuric Acid – all come with a Material Safety Data Sheet (MSDS). Please review the MSDS and the directions found in each kit carefully before using. The use of safety glasses is highly recommended.
- Do not dispose fixed samples or reagents into the waterbody. Use up all reagents at



the end of their ‘shelf life’, even if this means testing tap water. Each batch of fixed samples and titrant should be collected in a disposable gallon milk jug, diluted with tap water and scattered over the ground away from any wells. DO NOT dispose of any samples or reagents down your sink; explosive gases could form.

B1. LaMotte Test Kit Preparation.

- **First time use, beginning of field season, and prior to field sampling.** Conduct a full inspection of the kit to ensure completeness and valid chemical expiration dates. If any problems are detected, contact your group’s coordinator or the VRMP for recommendations on how to resolve them.

B2. Thermometer Preparation.

- **First time use, beginning of field season, and prior to field sampling.** Inspect the thermometer for bubbles or gaps in the thermometer liquid that would hinder accurate temperature measurement. If bubbles or gaps are detected, contact the VRMP for recommendations on how to repair the thermometer.

C1. Dissolved Oxygen Measurements.

- **Sampling Period and Location.** Sampling period and site location information will be documented in SAPs (that require approval by the VRMP) that 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].
- **Sample Timing.** Dissolved oxygen data collected between dawn and 8 am are important for assessment of attainment of DO criteria within Maine’s Water Quality Standards. But, except as naturally occurs, DO concentrations below the applicable DO criteria at any time of day signal non-attainment. If there are no DO concentrations below the criteria after 8 am, then data between dawn and 8 am must be collected to assess attainment of the criteria
- **Dissolved Oxygen Measurements.**
 - (1) Record site location on data sheet.
 - (2) Follow manufacturer’s instructions for proper DO sample analysis techniques (Appendix A, sections, “COLLECTION & TREATMENT OF THE WATER SAMPLE”, “DIRECT READING TITRATOR INSTRUCTIONS”, and “TEST PROCEDURE”).

C2. Temperature Measurements.

- **Sampling Period and Location.** See section C1.
- **Temperature Measurements.**
 - (1) Record site location on data sheet, if not done so already.



- (2) Place the thermometer close to where the DO sample was taken and hold there for at least 1 minute.
- (3) Record the temperature value on the data sheet.

D. *Quality Control.*

- (1) At the beginning of each field season, all VRMP staff and VRMP volunteers who will collect dissolved oxygen 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.
- (4) Prior to measuring dissolved oxygen, the sodium thiosulfate shall be standardized once a month. Follow manufacturer's instructions for standardization technique (Refer to Appendix B, section, "DISSOLVED OXYGEN CHECK STANDARD PROCEDURE"). Record date and time of standardization on field data sheet.

E. *Computation of % Saturation of Dissolved Oxygen.*

- (1) The VRMP will compute (using the DEP EGAD database) the % saturation of dissolved oxygen values for volunteer groups based upon the dissolved oxygen concentration and temperature data that the volunteers submit.
- (2) The specific conductance of freshwaters sampled by VRMP groups will be assumed to be less than 1000 $\mu\text{S}/\text{cm}$ in most cases, unless available data suggest otherwise, since it affects the % saturation of DO. If brackish tidal stream waters are to be sampled, conductivity data may need to be collected.
- (3) For volunteers interested in learning about this computation process and percent saturation tables, they can read more in Lewis (2006).

6. Equipment Care

A. *Start of field season.*

- (1) A full inspection and inventory of the kit including expiration dates of chemicals.

B. *During field season.*

- (1) Keep kit out of direct sunlight as much as possible.
- (2) Store kit indoors in a cool, dry place out of direct sun. Keep out of the reach of children and pets.
- (3) Keep close track of chemical expiration dates and replace expired chemicals as necessary.
- (4) Remove plunger from titrator (syringe). Lightly coat rubber sides of plunger with lubricant (Vaseline or mineral oil will work) to keep rubber from drying, cracking or sticking. Refer to manufacturer's instructions (Appendix 1).
- (5) Rinse sampling bottle after sampling and return to kit with cap loosened or removed to allow for excess water to evaporate from bottle.



C. End of field season.

- (1) Store kit indoors in a cool, dry place out of direct sun. Keep out of the reach of children and pets.
- (2) Remove plunger from titrator (syringe). Lightly coat rubber sides of plunger with lubricant (Vaseline or mineral oil will work) to keep rubber from drying, cracking or sticking. Refer to manufacturer's instructions (Appendix 1).

7. References

Lewis, M. E. 2006. Chapter 6.2 Dissolved Oxygen *IN* U.S. Geological Survey, (variously dated), National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A9, available online at <http://pubs.water.usgs.gov/twri9A>.

8. Appendices

A. LaMotte. 2007. Dissolved Oxygen Instruction Manual (Code 5856) Water Quality Test Kit. Chestertown, Maryland.

B. D.O. Kit Reagent Shelf Lives. The shelf life is based on the date of manufacture. The date of manufacture can be determined from the first 3 digits of the lot number on the lower left side of the label. The first two digits denote the week and the third number is a 1-digit code for year. For example, a lot number starting with 247 was made in the 24th week, which would be the first week in June, in the year 2007. If the chemical had a 2-year shelf life, it should be viable until the first week of June 2009. Keep in mind that shelf life is based on optimum storage conditions: 65-75 F, away from heat/freezing, high humidity, etc. Exposure to these conditions will decrease the shelf life. Below are the shelf lives for chemicals in LaMotte kit # 5860.

<u>Chemical</u>	<u>Shelf Life</u>
Sodium Thiosulfate (# 4169)	1 year
Starch Indicator (# 4170)	1.5 years
Mang. Sulf. (# 4167)	3 years
Alk. Pot. Iodide Azide (# 7166)	3 years
Sulfuric Acid (# 6141)	3 years

The following table provides the estimated week number for the first week of each month.

<u>Week</u>	<u>Month</u>	<u>Week</u>	<u>Month</u>	<u>Week</u>	<u>Month</u>
1	Jan	17	April/May	35	Aug/Sept
5	Jan/Feb	21	May/Jun	40	Oct
8	Feb/Mar	26	July	44	Oct/Nov
13	April	30	July/Aug	48	Nov

