

5.2 PROTOCOL FOR CONVENTIONAL FIELD MEASUREMENTS

Overview

In situ measurements of parameters such as pH, dissolved oxygen, temperature, conductivity, turbidity, and redox potential are routinely taken at the time of sampling. These measurements are taken *in situ* in the water body just below the surface, at mid-depth or at discrete depths depending on the sampling objective and the depth of the sampling site, using electronic single or multi-probe meters.

The proper maintenance and calibration of instruments is a very important part of any water quality program. The instruments must be in good working condition in order to get accurate results. Field personnel must understand the calibration and use of any instrument they are using in the field. Maintenance and calibration log books should be kept up to date to track the performance of the meter. The meter probes should be calibrated daily under field conditions and temperatures, and periodically throughout the day if required (e.g., dissolved oxygen at sites of different altitudes or every five samples if water quality changes dramatically from site to site). The exceptions are: temperature (check in laboratory monthly with a certified mercury thermometer), conductivity and turbidity (calibrate at the beginning of the sampling trip), and redox potential (calibrate once every six months).

Review the water quality data on-site during sample collection to prevent the measurement and/or recording of false measurements. Re-measure and double check any dubious readings before leaving the site. It may also be worthwhile doing verifications at the end of the day for some key parameters (not re-calibrations) to check if the meter has drifted or is malfunctioning. Meter readings should be checked in standard solutions and recorded in the log/field book. This ensures that the meter has been working properly throughout the day.

Sources

Environment Canada and B.C. WLAP (2005 c), Alberta Environment (2006 a), EMAN-N (2005)

At a glance

1 If taking field temperature measurements with a thermometer, remove the cover and place it in the shade, out of the wind, preferably about 1 metre above the ground to minimize the heat influence from anything other than ambient air temperature. Leave the thermometer for five to ten minutes or for the time it takes to collect the water samples. Record the air temperature to the nearest 0.5 degrees Celsius. Temperature measurements of the water must be taken in the field

immediately upon obtaining a sample or preferably *in-situ*, by means of automated temperature probes.

calibration

2 Calibrate the multi-probe/meter prior to daily sampling for pH and DO. Conductivity and turbidity can be calibrated at the beginning of the sampling trip and redox potential should be calibrated every six months. Temperature should be calibrated every month with a certified thermometer.

3 *In situ* measurements at sites <2m deep should be taken just below the surface of the water (0.1 m depth).

4 *In situ* measurements at sites >4m deep, should be taken just below the surface of the water (0.1 m depth) and at 1 m intervals down to 1 m above the lake bottom. At sites ≤ 2 m deep, one set of measurements at mid-depth might be considered appropriate. At sites between 2 and 4 m deep, two measurements can be taken 0.25 m below the surface and 0.25 m above the lake bottom. It is preferred to take field water quality readings from the body of water itself (*in situ*) but on some occasions it may be necessary to take the measurements from a sub-sample of water. In this case take separate water samples for these field measurements and never take field water quality measurements from samples to be submitted to the laboratory for analysis.

let the instrument stabilize at each depth

5 Let the instrument stabilize at each depth (usually 1-2 minutes) and record the readings in a field sheet/book. Also, if possible store readings at each depth in a datalogger. On deep profiles and where approved by the project manager, it may be acceptable to proceed at 5 m intervals if there is little change in readings at 1 m intervals. When change is detected (thermocline, chemocline, etc.), then define the area of change at 1 m intervals.

6 Bring the probe/sonde back up to 1 m, allow to stabilize and record readings at that depth. (Note: redox will probably not stabilize quickly at the surface.) This acts as a field check on the instrument and verifies the accuracy of the first reading.

7 New **conductivity** meters may use different types of probes. Follow the manufacturer's instructions for use. Conductivity meters are also available for "pure water" (i.e., conductivity from 0 – 100 $\mu\text{S}/\text{cm}$) and for high conductivity waters (100 – 1000 $\mu\text{S}/\text{cm}$). The sampling circumstances may need both ranges.

8 **pH** should be measured after the conductivity measurement using a pH meter. Adjust the temperature reading (if needed) to the temperature of the field sample. Shake the sample and rinse the electrode with sample. Place the electrode in the sample. Select pH measurement mode. Swirl the sample and measure the pH. Allow sufficient time for the meter to stabilize. Be sure to rinse the electrode with de-ionized water before storage. Store the electrode in a potassium chloride (KCl) storage (long-term) solution according to the manufacturer's instructions. pH

electrode sensors should be kept wet with sample water or tap water, and not in a standard solution, at all times during sampling.

9 Dissolved oxygen can be measured using multi-meter DO sensors that have appropriate membranes and are properly calibrated. The meters measure the level of dissolved oxygen in both milligrams per litre and percent of oxygen saturation. Follow the manufacturer's instructions for measuring DO, calibrating the meter and keeping the probe clean. One water sample taken at one profile depth per water body can be subjected to a Winkler analysis as a further check of the accuracy of the DO meter measurement, preferably at a depth where oxygen appears stable. A meter DO measurement within ± 0.5 mg/L of the Winkler DO measurement is generally considered acceptable, however USGS (2005) recommended that meter and Winkler DO measurements should be within ± 0.05 mg/L DO.

10 Turbidity is measured as follows. Fill a *cuvette* with shaken field sample to the line marked on the cuvette. Dry the cuvette with a clean, lint-free, laboratory-grade paper towel. Place the cuvette with the orientation mark facing forward in the chamber. Note: Handle the cuvette with care and do not touch the area of the cuvette below the line. Keep the cuvettes absolutely clean. Measure the turbidity of the sample. Rinse the cuvette with de-ionized water before storage.

Other sources

ISO (2008 a) , B.C. WLAP2003, ISO 2003 (a), Ministère de l'Environnement, Gouvernement du Québec (2000), Environment Canada Undated (a), Environment Canada (2008 draft), Ontario Ministry of the Environment (2006), Newfoundland and Labrador Environment and Conservation (1999), Prince Edward Island Undated, Environment Canada (1999) draft, New Brunswick 2000, Saskatchewan (Undated), Environment Canada (2009), Nova Scotia Environment and Labour 1996, Environment Canada (2003 a), Environment Canada 2003 (f), Environment Canada 1998, Environment Canada 2003(e)