
WATER QUALITY PROGRAMS DIVISION

Standard Operating Procedure for the Recording of
Physical/Chemical Parameters Using a Multiparameter
Instrument in Streams

Revised and Adopted November 2005

Draft Copy



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STANDARD OPERATING PROCEDURE FOR THE RECORDING OF PHYSICAL/CHEMICAL PARAMETERS USING A MULTIPARAMETER INSTRUMENT IN STREAMS

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1.0 General Information

A Hydrolab® or Y.S.I. ® sonde is used to collect and store information for some of the physical/chemical parameters of the stream being studied. Parameters measured by these sondes include water temperature, dissolved oxygen (D.O.), dissolved oxygen % saturation, pH, specific conductivity, salinity, depth, oxidation-reduction potential (redox), and total dissolved solids. There are many similarities in operating both types of sondes. Some instructions on operating the Hydrolab® are provided in this document but specific training on the operation of each sonde will be provided by the supervising F.T.E. The important thing to remember is to always use the same type of sonde (even the same serial number sonde, when possible) throughout a particular study so that data collected is comparable.

2.0 Definitions/Terms

- Team Leader—crew member of team who provides support, expertise, and opinions; gives instruction and has final say on how work will be done
- Team Member—crew member of team who provides support, expertise, and opinions; follows the instructions of the team leader
- Multiparameter Instrument—instrument used in the field for grab sample collection of measured data *in-situ*

3.0 Safety

Upon reaching the sampling location, site safety determinations should be made before proceeding. These will be different for wadeable and bridge sites. Please refer to the OWRB safety manual for instructions on how to sample both kinds of sites. When regulating the flow of traffic is necessary, please refer to the portion of the safety manual outlining "Traffic Safety Protocols".

4.0 Quality of the Measurement

Principle investigators for the OWRB are required to have degrees and/or experience with biological or other applicable sciences. Principle investigators are defined as crew leaders, and this designation may be made upon the leader of a multi- or a one person crew. Training is required for all SOPs dealing with water quality and quantity collections and measurements as well as habitat assessments and biological collections. In-house training will be conducted for the use of all meters and digital titrators used for water quality or quantity measurements. Investigators must be familiar with OWRB SOP document and all training will follow the methods outlined in that document. Extra training will be provided when new SOPs are developed. Training of

field crews will be done through dry run exercises in the laboratory to familiarize field crews with sample collection, sample preservation, instrument operation, calibration, and maintenance. In addition, when new personnel are hired or new methods developed, qualified staff will train on sample collection, measurement, and field analysis methods through side-by-side field trips. These trips will familiarize staff with SOP requirements. When training is considered adequate, a qualified staff member will check field staff for adherence to SOPs.

When sampling for all programs, Quality Assurance/Quality Control (QA/QC) samples will be routinely collected to assure that environmental samples meet the Data Quality Objectives (DQO's) that are outlined in the controlling Quality Assurance Project Plan (QAPP). QA/QC sampling is designed to control each step of the sampling process. Known standards for each parameter should be routinely measured. Protocols for these calibrations are listed in Section 5.12 of this document

5.0 Personnel and Equipment

In most instances, the collection of water quality samples requires only one field person. However, depending on the safety requirements of a particular station, additional crew members may be necessary to ensure a safe work zone. Equipment used to collect the turbidity sample are described in the document "Standard Operating Procedure for the Collection of Water Quality Samples".

5.1 Hydrolab® Datasonde, Minisonde, and Surveyors

Check calibration and maintenance logs before leaving office to ensure that the pre-trip calibration has occurred. If calibration has not occurred, perform the pre-trip calibrations (a supervising F.T.E. will demonstrate calibration techniques and the unit's operations manual can be consulted for calibration techniques). **ALL CALIBRATIONS AND MAINTENANCE MUST BE RECORDED IN THE UNIT'S LOGBOOK.**

5.11 Maintenance

When not in use, the hydrolab units should be kept in their carrying case. The instrument should be kept dry and clean both inside and out. After each measurement, the probes should be rinsed twice with tap water and stored in the storage cap in tap water. Instruments should never be stored in temperatures below freezing in extremely hot temperatures. Surveyor stored data should be recorded and deleted on a weekly schedule. Failure to do so may result in shortening the life of the internal lithium battery and/or the loss of valuable field data.

Specific pre-trip and in field maintenance should occur for the sonde as follows

- **Sonde casing.** Check the sonde casing periodically for cracks or looseness of connections. Connections may need to be tightened or re-siliconed periodically (only after the approval of a supervisor or senior staff member).
- **Bulkhead.** Periodically check the bulkhead connection for bent pins or looseness.

- **Dissolved Oxygen Probe.** Check the probe membrane for any cracks, bubbles, or other abnormalities, and change membrane if necessary.
- **PH Probe.** Check the probe bulb for cracks, dirt, scum, or other abnormalities, and change or clean probe if necessary (only after the approval of a supervisor or senior staff member). Clean with warm soapy water and Q-tip.
- **Specific Conductance(SpC) Probe.** Check the probe bulb for cracks, dirt, scum, or other abnormalities, and change or clean probe if necessary (only after the approval of a supervisor or senior staff member). Clean with warm soapy water and Q-tip.
- **Stirrer.** Periodically take the stirrer end off and clean out embedded sediment.

5.12 Pre-trip Calibration

Specific weekly pre-trip calibrations should occur for each probe as follows:

- **Dissolved Oxygen Percent Saturation.** Perform an “air” calibration with tap water using the barometric pressure (BP) of the laboratory. The lab and field barometers give BP in units of “inHg”, and the unit can only accept BP in units of “mmHg”. A conversion chart is provided in the laboratory and in each field notebook (the conversion is ‘inHg x 25.4 = mmHg’).
- **PH Probe.** Determine the expected range of pH by consulting the station data, and perform a two-point calibration based on the pH values. For example, if the ranges on the trip are from 7.5 to 8.1, perform a 7-10 pH calibration, or if the ranges are from 6.6 to 7.1, perform a 7-4 pH calibration. If values vary from station to station, always calibrate to the first station on the trip.
- **Specific Conductance(SpC) Probe.** Determine the expected range of SpC by consulting the station data, and perform a two-point calibration based on the SpC values. For example, if the ranges on the trip are low range (< 700), perform a 0-500 SpC calibration, or if the ranges are high range (> 700), perform a 0-1413 SpC calibration. If values vary from station to station, always calibrate to the first station on the trip.
- **Oxidation/Reduction Potential (ORP):** Should be performed once per month. Consult unit logbook to determine if needed.

5.13 Site Specific Calibrations or Checks

The following in-field calibrations and checks should occur as follows:

- **Depth:** Depth (meters) should be calibrated to 0.1 at each station.
- **Dissolved Oxygen Percent Saturation (D.O.):** At each station, check the probe membrane for any cracks, bubbles, or other abnormalities, and change membrane if necessary. Dissolved oxygen percent saturation should also be calibrated when BP change is greater than 0.5 inHg in comparison to the previous calibration, when the reading is below the screening, or when the reading is outside the norm for a particular station (refer to the description of lab calibration). Local BP can be obtained from the SHERPA® weather watch or a comparable instrument (an FTE will demonstrate appropriate use and calibration of the watch). Also, the tap water used for calibrating should be changed each time calibration is done. Fresh tap water should be collected in the morning and

at least once during the day and should always be kept in the cab of the truck to avoid freezing or over-heating.

- **pH:** At each station, check the probe bulb for cracks, dirt, scum, or other abnormalities, and change or clean probe if necessary (only change probe after consulting with supervisor). Clean with warm soapy water and Q-tip. Determine the expected range of pH by consulting the station data. Refer to the description of lab calibration. If the initial reading at a site is outside the range of current calibration, the instrument needs to be calibrated to the correct two point calibration. If the reading is outside the OWQS standard of 6.5 to 9.0 s.u.'s, then the instrument needs to be calibrated at the appropriate range to ensure that the reading is accurate.
- **Specific Conductance(SpC):** Check the probe bulb for cracks, dirt, scum, or other abnormalities, and change or clean probe if necessary (only change probe after consulting with supervisor). Clean with warm soapy water and Q-tip. Determine the expected range of SpC by consulting the station data. Refer to the description of lab calibration. If the initial reading at a site is outside the range of current calibration, the instrument needs to be calibrated to the correct two point calibration.
- **Oxidation/Reduction Potential (ORP):** Do not perform in field.

5.14 Post-Trip Checks

All units should undergo a post-trip check. After each trip (normally before pre-trip calibration for the following week), the unit should be checked against known standards to ensure that probes are reading correctly. If a probe is not reading correctly, the information should be recorded in the log book and on the field sheet of comments of the previous trip.

6.0 Measurement of *in-situ* Parameters Using Multiparameter Instruments

No matter which sonde is used, similar techniques are used to collect data. At each site, data is collected at the thalweg (the major channel). The collection method will be different for bridge sites and wadeable sites. For bridge sites, the sonde unit will be connected to the data logger using the 150-foot cable. It is important to ensure that sonde unit is in the water, and depending upon flow, different sized weights may be necessary. If the flow is so high that an accurate reading can not be obtained, the reading may be taken outside of the thalweg in an area of lesser flow (note in the "sampler's comments" portion of the laboratory log-in sheet). After lowering the sonde into the water, allow the unit to equilibrate. Equilibration should take no more than 1 to 2 minutes. The key is to allow all the parameter readings to stabilize before storing the information. Because streams and rivers have a constant mixing zone, the sonde readings can be taken from just below the surface of the water to the midpoint of the water column (sampling near the stream bed may bias certain parameters). The supervising F.T.E. will instruct you on how to operate and store data in the logger unit and also how to extract data from the surveyor unit for recording on the field sheet. Use a 5-meter cord for wadeable streams.

6.1 Hydrolab

6.11 Creation of Manual File

Each trip requires a different manual file be created. Only needs to be done at the beginning of the trip. Create the file by doing the following:

- sequence: I/O → File → Create → Enter file name → Done → select parameters to be measured → Done.
- File names should be written in the following sequence: trip number, trip type, month, year. For example, permanent station trip number 7 taken during November of the year 2000 would be written as "07AT1100".
- Parameters to be measured should already be entered and be in the correct order. If they need to be entered, do so in the following order: "date(MMDDYY)/time(HHMMSS)", "depth(meters)", "water temp(°C)", "dissolved oxygen(mg/L)", "dissolved oxygen(%sat.)", "pH(units)", "specific conductivity(æS/cm)", "salinity(ppt)", "oxidation/reduction potential(mV)", "total dissolved solids(g/L)", "circulator(status)", "IB volts(volts)", "IB percentage(%left)".

6.12 Connecting the Sonde to the Surveyor

- The surveyor is connected to the cable at the serial port on the back of the unit. Ensure that pins are fully aligned before tightening screws. Do not force or over-tighten screws.
- The sonde is connected to the cable at the bulkhead. Ensure that the sonde pins are aligned with the bulkhead by matching the raised knot on the bulkhead to the large pin on the sonde. Snap the two ends together and screw the sleeve tight. (**NOTE:** If pins are bent and do not completely connect, the unit will not work properly.)
- Use 150-meter cable when working from bridge and 5-meter cable when wading.
- **BEFORE PROCEEDING, ENSURE THAT ALL CONNECTIONS BETWEEN SONDE /CABLE/SURVEYOR ARE SECURED.**

6.13 Measuring and Recording Readings

- Each site will be measured at or near the thalweg at a depth of 0.1 to 0.5 meters.
- Lower the sonde unit to the desired depth and wait for the Hydrolab to equilibrate (especially D.O., temp., and specific conductivity readings) before selecting the STORE key to save the displayed information.
- When the readings are stabilized, press **Store**. Now the reading for that site is stored into the manual file of the Hydrolab and is safe from human error. **Before pressing store be sure to read the file that you are storing to. The surveyor unit may bring up another file that is in the unit.**
- After storing the information, data will need to be recorded to the multiprobe field data sheet. This can be accomplished by using the **Review** option under the **File** menu for the surveyor 4. It is best to record data on site.

7.0 Forms

Multiparameter data are maintained on the station field form. They are data and should be treated as such. Therefore, they should be written, legible, and complete. To avoid confusion and loss of data, a new sheet should be used at each new project site. Field

notes should be initialed and dated by the collecting personnel and data entry personnel. Both sonde and surveyor serial numbers should be recorded on the field notes. For guidance on proper procedure to complete the field notes, refer to your supervisor and or FTE. Field notes can be found at S:\Monitoring\STREAMS\forms\Field Notes.doc.

8.0 Data Storage

All completed paper copies of forms and data sheets should be maintained with the appropriate station notebook. The data from the field notes and laboratory data sheets should be either entered into or uploaded to the Water Quality Database. Each sample should be maintained electronically in the database under a unique sample number.

9.0 References