Standard Operating Procedure – Sonde Profile

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1 POINT OF CONTACT

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2 OBJECTIVE

Determine the sample depth (m), temperature (°C), salinity (ppt), dissolved oxygen concentration (mg/L = ppm), and dissolved oxygen percent (% sat.) in the surface (0.5 m below surface) and bottom water (0.5 m above bottom) at the station. When total water depth is greater than 10 m, parameters at mid-depth will also be determined. Multiparameter sondes may also include probes for turbidity (NTU) and chlorophyll a (RFU, µg/L). Frequency of sampling and daily order of events are specified in the “UWS Sampling Plan SOP.”
3 DEFINITIONS AND ABBREVIATIONS

Embayment: A recess in a coastline or an indentation off a shoreline which forms a bay. In Long Island Sound, the names of embayments often include the words Harbor (27%), River (23%), Cove (19%), Bay (10%), Creek (10%), and Pond (7%); with a few including the names Brook, Gut, Inlet, or Lake.

Field Team: Person or group of people working together to sample a station.

Monitoring Group: The group conducting the field work.

Salinity: A measure of all the salts dissolved in water. Salinity is usually measured in parts per thousand (ppt or ‰). The average open ocean salinity is 35 ppt and the average river water salinity is <0.5 ppt. This equates to 35 grams of salt in every kilogram (1000 grams) of seawater.

Section: The reporting regions for the embayment report card. Each section must include a minimum of three stations. Sections will be assigned a unique name by the UWS; examples are included below.

<table>
<thead>
<tr>
<th>Number of Sections</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Sections</td>
<td>whole</td>
<td>inner outer</td>
<td>inner middle outer</td>
</tr>
<tr>
<td>Abbreviations for Sections</td>
<td>W</td>
<td>I O</td>
<td>I M O</td>
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</tbody>
</table>

Site: The whole embayment, as defined by the UWS list. Each site has a unique three letter code assigned by the UWS; for example, Little neck Bay, NY is “LNE”.

Sonde: An instrument probe that automatically transmits information about its surroundings underground, under water, in the atmosphere, etc.

SOP: Standard operating procedure; this document is a SOP.

Station: The location where samples are collected, identified by a GPS location.

UWS: Unified Water Study

UWS Coordinator: The person designated as the point of contact for the UWS.

UWS Scientific Advisor: Estuarine or water quality scientists designated as advisors to the UWS.

4 OVERVIEW

Determine the sample depth (m), temperature (°C), salinity (ppt), dissolved oxygen concentration (mg/L = ppm), and dissolved oxygen percent (% sat.) in the surface (0.5 m below surface) and bottom water (0.5 m above bottom) at the station. When total water depth is greater than 10 m, parameters at mid-depth will also be determined. Multiparameter sondes may also include probes for turbidity (NTU) and chlorophyll a (RFU, µg/L). Frequency of sampling and daily order of events are specified in the “UWS Sampling Plan SOP.”

At one station per day per embayment (typically the last station), do two replicate profiles – do one complete profile, then do a second. This allows for the precision of the sonde to be assessed.

5 SOURCES

These procedures are based on the EPA Volunteer Estuary Monitoring Manual (EPA, 2007) and follows methods used in the EPA National Coastal Assessment (EPA, 2001). The EPA Volunteer Estuary
Monitoring Manual (EPA, 2007) provides a wealth of specific data for monitoring groups. All groups should refer to the EPA manual for specific guidance.

6 MATERIALS AND EQUIPMENT

MULTIPARAMETER SONDE

→ If turbidity and chlorophyll $a$ are sampled, each field team receives a multiparameter sonde equipped with the following probes:

- depth
- temperature
- salinity
- dissolved oxygen
- chlorophyll $a$
- turbidity

Examples of instruments include:

- YSI EXO 1 with EXO Handheld Display
- Eureka Sub 3+ with Amphibian 2 Data Display

→ If turbidity and chlorophyll $a$ are not sampled, each team receives a Multiparameter sonde equipped with the following probes:

- depth
- temperature
- salinity
- dissolved oxygen

Examples of instruments include:

- YSI EXO 1 with EXO Handheld Display
- Eureka Sub 2 with Amphibian 2 Data Display
- YSI Pro Plus

OTHER MATERIALS AND EQUIPMENT

- bucket

- See “UWS Filtered Chlorophyll SOP.” For each sonde, the field team will need all equipment and material listed for chlorophyll. Filter two samples per field day for verification of sonde readings.

STANDARDS

- ASTM type I (ultrapure) water or equivalent for 0 NTU turbidity standard solution and 0 RFU (and 0 µg/L) for chlorophyll $a$ calibration, $76 / 20$L (FisherSci catalog #9150-5)
ASTM type III (distilled or deionized) water (ASTM Type II or I are also acceptable), for 0 ppt salinity standard solution, $38 / 10L (FisherSci catalog #NC0467154)

YSI turbidity standard (124 NTU) (YSI SKU: 607300), $340 / 1 gallon – Sharing of this standard among groups is recommended, it is reusable (does not need to be disposed after each calibration). Contact the UWS coordinator for more information.

salinity standard between 20 and 32 ppt; or a conductivity standard between 30 and 50 mS/cm (30,000 to 50,000 µS/cm). Examples:

- Sodium Chloride, 0.5078N, Conductivity = 47,600µS/cm, APHA for Salinity, Ricca Chemical (FisherSci catalog #7225-16 or #7225-32; Ricca #722516 or #722532), $35 / 500 mL - $55 / 1L
- YSI Conductivity Calibrator Solution, 3169: 50,000 µS/cm (YSI SKU: 060660), $124 / eight 1-pint bottles

7 METHODS

7.1 Preparation

- Check the battery power. Pack extra batteries in the field tool kit.
- Calibrate the sonde the afternoon before each field day. Follow the manufacturer’s instructions for calibration.
  - Salinity – Conduct a two-point calibration using the 0 ppt (ASTM type III (distilled or deionized) water (ASTM Type II or I are also acceptable), and salinity standard solution.
  - Dissolved Oxygen – Conduct an air calibration, using water saturated air for calibrating 100% saturation.
  - Chlorophyll a - Conduct a one-point calibration using the 0 NTU (ASTM type I (ultrapure) water).
  - Turbidity - Conduct a two-point calibration using the 0 NTU (ASTM type I (ultrapure) water) and 124 NTU standard solutions.
  - Depth – Calibrate the depth following manufacturer’s guidelines.
  - The instrument should be factory calibrated at the manufacturer’s recommended interval.
- After calibrating, use the sonde to take a verification reading in each of the standard solutions.
- Record calibration information in a calibration log book. The following information should be entered into the UWS data entry template:
  - dissolved oxygen - post calibration reading in 100% saturated air
  - salinity standard for sonde - manufacturer and value (ppt)
  - salinity standard for sonde - lot number
  - salinity standard for sonde - expiration date
  - salinity on sonde - post calibration reading in standard (ppt)
  - fluorescence on sonde - post calibration reading
  - turbidity standard - manufacturer and value (NTU)
Field Collection and Processing

7.2.1 Sampling at a Station

- Turn on the sonde and allow it to warm up per manufacturer’s guidelines (typically 10 minutes).
- If sampling from a boat, anchor the boat.
- Determine sampling depths as described in the “UWS Sampling Plan SOP.”
- If wading in to sample, take extra precaution to not stir up sediment. Samples should be taken from an area that is not disturbed from the sampler’s approach.
- Lower sonde to sample depth. Be sure that the probe ends are at the desired depth, versus other sections of the sonde. Be careful not to let the probe contact the sediments as this could foul the probes and give inaccurate readings.
- Allow the sonde to equilibrate. Watch the salinity first. Once salinity is steady, watch the dissolved oxygen. The value may fluctuate in response to real variability in the water column. You are waiting for the readings to hover around a value, versus consistently rising or falling. This will typically take about one minute, but may take longer. Do not wait for turbidity or chlorophyll $a$ to stabilize, these probes respond quickly to real variability in the water column.
- Record readings on the field data sheet.
- At one station per day per embayment (typically the last station), do two replicate profiles – do one complete profile, then do a second. This allows for the precision of the sonde to be assessed.

7.2.2 Verification of Water Quality Parameters and Sonde Depth

- Take and record sonde values in standards at the start and end of a sampling day (salinity, oxygen in 100% water saturated air, and turbidity).
- Verify sonde depth by lowering sonde to a known depth following the procedures listed in “UWS Depth SOP”.

7.2.3 Verification of Chlorophyll $a$ – Bucket Sample

If a chlorophyll $a$ probe is on the sonde, verify the chlorophyll $a$ readings from the sonde once per day and send to an analytical lab for analysis. This may be conducted at a dock; it does not need to happen at a station.

- Rinse the bucket three times with surface water.
- Fill the bucket with surface water.
- Place the sonde in the bucket, allow to equilibrate, record chlorophyll $a$ reading.
Filter two samples from the bucket following the procedures indicated in the “UWS Filtered Chlorophyll SOP.” Prior to withdrawing a sample from the bucket, be sure to stir the water in the bucket, using the 60 mL syringe.

7.3 Sample Storage

Not applicable for the sonde. Follow instructions in the “UWS Filtered Chlorophyll SOP” for filtered chlorophyll a samples.

7.4 Laboratory Analysis

Not applicable for the sonde. Follow instructions in the “UWS Filtered Chlorophyll SOP” for filtered chlorophyll a samples.

8 TROUBLESHOOTING / HINTS

- Always make sure to wait until readings have stabilized before calibrating or logging a reading.
- If the probe does not appear to be operating or calibrating properly, contact the project manager to make a decision on whether to use a backup sampling protocol or to make a decision on proceeding with the sampling event.

9 DATA PROCESSING AND STORAGE

The UWS coordinator will be the custodian of the finalized data files. The UWS coordinator will maintain a database which includes the unique site codes, section codes, and station codes for the embayment. Each unique station code will be affiliated with the corresponding GPS for the station.

The monitoring group is responsible for obtaining data, entering data into the UWS data template, and delivering the data to the UWS coordinator.

The monitoring group is responsible for assuring that the correct unique station ID assigned by the UWS is properly matched with the local organizations station ID codes. Both codes (monitoring group’s station code and UWS unique station ID) will be entered into the data template, along with the GPS coordinates.

10 REFERENCES


11 Quick Sheet – Sonde Water Quality Profile

**Preparation**
- Check the battery power. Pack extra batteries in the field tool kit.
- Calibrate the sonde the afternoon before each field day. Follow the manufacturer’s instructions for calibration.
- After calibrating, use the sonde to take a verification reading in each of the standard solutions.
- Record calibration information in a calibration log book.

**Field Collection and Processing**
- Turn on the sonde and allow it to warm up per manufacturer’s guidelines (typically 10 minutes).
- If sampling from a boat, anchor the boat.
- Determine sampling depths as described in the “UWS Sampling Plan SOP.”
- If wading in to sample, take extra precaution to not stir up sediment. Sample should be taken from an area that is not disturbed from the sampler’s approach.
- Lower sonde to sample depth. Be sure that the probe ends are at the desired depth, versus other sections of the sonde. Be careful not to let the probe contact the sediments as this could foul the probes and give inaccurate readings.
- Allow the sonde to equilibrate.
  - Watch the salinity first.
  - Once salinity is steady, watch the dissolved oxygen.
  - The value may fluctuate in response to real variability in the water column. You are waiting for the readings to hover around a value, versus consistently rising or falling. This will typically take about one minute, but may take longer. Do not wait for turbidity or chlorophyll a to stabilize, these probes respond quickly to real variability in the water column.
- Record readings on the field data sheet.
- At one station per day per embayment (typically the last station), do two replicate profiles – do one complete profile, then do a second. This allows for the precision of the sonde to be assessed.

**Verification of Water Quality Parameters and Sonde Depth**
- Take and record sonde values in standards at the start and end of a sampling day (salinity, oxygen in 100% water saturated air, and turbidity).
- Verify sonde depth by lowering sonde to a known depth following the procedures listed in “UWS Depth SOP”.

**Verify chlorophyll a by sampling in a bucket, if a chlorophyll a probe is used on the sonde.**
Verify the chlorophyll a readings from the sonde once per day and send to an analytical lab for analysis. This may be conducted at a dock; it does not need to happen at a station.
- Rinse the bucket three times with surface water, fill the bucket with surface water.
- Place the sonde in the bucket, allow to equilibrate, record chlorophyll a reading.
- Filter two samples from the bucket following the procedures indicated in the “UWS Filtered Chlorophyll SOP.” Prior to withdrawing a sample from the bucket, be sure to stir the water in the bucket, using the 60 mL syringe.