Region 4 U.S. Environmental Protection Agency Laboratory Services and Applied Science Division Athens, Georgia	
OPERATING PROCEDURE	
Title: Field Specific Conductance Measurement	**ID: FSBPROC-101-R8**
Issuing Authority: Field Services Branch Supervisor	
Effective Date: February 5, 2025	**Next Review Due Date: February 5, 2029**
Method Reference: N/A	**SOP Author: John Davis**

Purpose

This document describes procedures, methods and considerations to be used and observed when conducting field specific conductance measurements in aqueous phase environmental media, including groundwater, surface water and certain wastewaters.

Scope/Application

The procedures contained in this document are to be used by field investigators when measuring the specific conductance of aqueous phase environmental media in the field. On the occasion that LSASD field investigators determine that any of the procedures described in this section cannot be used to obtain specific conductance measurements of the media being sampled, and that another method must be used to obtain said measurements, the variant instrument and/or measurement procedure will be documented in the field logbook, along with a description of the circumstances requiring its use. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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1 General Information

1.1 Documentation/Verification

This procedure was prepared by persons deemed technically competent by LSASD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the LSASD local area network (LAN). The Document Control Coordinator is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.2 General Precautions

1.2.1 Health and Safety

Proper safety precautions must be observed when conducting field specific conductance measurements. Refer to the LSASD Safety, Health and Environmental Management Program Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.2.2 Procedural Precautions

All field specific conductance measurements pertinent to the sampling event, including a unique, traceable identifier for the instrument, such as a property number or serial number, should be recorded in the field logbook for the event. All records should be entered according to the procedures outlined in the Field Services Branch Operating Procedure for Project Data and Reporting (FSBPROC-003, most recent version), LSASD Operating Procedure for Control of Records (LSASDPROC-1001, most recent version), and LSASD Operating Procedure for Logbooks (LSASDPROC-1002, most recent version).

Conductivity standards are easily diluted and contaminated; therefore, extra care must be taken to avoid contaminating standards and samples. Prior to their use, verify expiration dates and lot numbers of all standards and record them in the logbook. All meters should be calibrated, operated and maintained according to manufacturer’s specifications.

2 Quality Control

All specific conductance meters will be maintained and operated in accordance with the manufacturer's instructions and the LSASD Operating Procedure for Equipment Inventory and Management (LSASDPROC-1009, most recent version). Before a meter is taken to the field, it will be properly calibrated or verified, according to Section 3.2 of this procedure, to ensure it is operating properly. These calibration and verification checks, including the expiration dates of any calibration standards used, will be documented and maintained in a logbook.

The ambient temperature in the immediate vicinity of the meter should be measured and recorded in the field logbook to ensure the instrument is operated within the manufacturer's specified range of operating temperatures. For instruments that are deployed for in-situ measurements, the temperature of the medium being monitored should be measured and recorded in the logbook prior to deployment. In-situ monitoring equipment may be utilized in unattended deployments where autonomous logging may preclude temperature measurement prior to deployment. Because in-situ instrumentation generally has a wide range of operating temperatures, the field investigator may utilize professional judgment in determining if the operating environment is suitable for unattended deployment.

If at any time during a field investigation it appears that the environmental conditions could jeopardize the quality of the measurement results, the measurements will be stopped. This will be documented in the field logbook.

3 Field Specific Conductance Measurement Procedures

3.1 General

Specific conductance is a measure of the ability of an aqueous solution to conduct an electric current and is customarily reported in microsiemens per centimeter (µS/cm) or micromhos per centimeter (µmhos/cm) at 25°C. If the specific conductance measurements are for NPDES (National Pollutant Discharge Elimination System) reporting purposes, the meter and conductivity cell should be verified by comparing against a laboratory meter with a platinum-electrode type conductivity cell.

3.2 Instrument Calibration and Verification

Many brands of instruments are commercially available for the measurement of specific conductance, incorporating a wide variety of technologies. The manufacturer's instruction manual should be consulted for specific procedures regarding their calibration, maintenance and use. Calibration of any measurement instrument must be conducted and/or verified prior to each use or on a daily basis, whichever is most appropriate. Calibration and verification readings should not be recorded until the sensor has stabilized.

Conductivity is affected by temperature; therefore, for instruments that do not automatically compensate for temperature, the user should first document temperature so that appropriate adjustments can be made in accordance with the manufacturer's instructions and/or method. The following are basic guidelines for calibration/verification and are provided as an example:

1. Verify the meter's internal temperature sensor (thermistor) against a National Institute of Standards and Technology (NIST) traceable thermometer and note any differences between the thermistor and the NIST-traceable thermometer in the logbook. If temperatures do not agree within ± 4°C, the unit must be repaired or replaced. Alternatively, if the meter can be used in a manual temperature compensation mode, the NIST-traceable thermometer may be used for temperature readings and the necessary corrections applied. Check and record temperatures of the standards and samples.

2. Rinse the probe with de-ionized water and blot dry before conducting the following calibration and verification checks.

   Note: To avoid dilution and fouling of calibration standards, it is important to blot the sensor dry before it is immersed in any standard.

3. Fresh standards should be used for each calibration. Immerse the probe in the first standard solution, record a pre-calibration reading, and then calibrate or verify the meter against that solution. After the initial standard, calibrate and/or verify the meter using additional standards, as appropriate. Rinse the probe with de-ionized water and blot dry or otherwise remove excess rinse water between the different standards. In the logbook, record the standard values and temperatures used to calibrate or verify the meter.

   Note: Some instruments require that calibration standards reflect the anticipated specific conductance of the media being measured.

4. Some meters will auto-recognize standards during calibration. For example, the Thermo Star Series meter will auto-recognize standards 1413 µS/cm, 100 µS/cm and 12.9 mS/cm. If the meter is calibrated in a manner where it does not auto-recognize the standard, and the meter is not accurate to ± 10% of the standard solution(s) known values, the meter or probe should be repaired or replaced. If this condition can be corrected by adjusting the cell constant of the probe, refer to the instruction manual and make the adjustment.

   Note: For best results, Thermo Star A325 units used for groundwater investigations should be set to the nLFn temperature correction mode (i.e., nonlinear natural water function).

5. After calibration is complete, place the probe back into the calibration standard used and record a post-calibration reading. Use the logbook to record a post-calibration reading for each standard used. If the meter is not accurate to within ± 10% of the standard solution(s) known values, it should be recalibrated. If it is still outside of the acceptable accuracy range after the second calibration, the probe and/or meter should be replaced.

6. Once the meter has been properly calibrated and verified (steps 1-5 above), it is ready for use. Rinse the probe with de-ionized water and store it in the manufacturer's recommended storage solution. Certain meters may require that the instrument be left on until all sample measurements are performed and the results are recorded. When collecting measurements from grab samples, certain instrument manufacturers recommend that an intermediate check(s) be performed by periodically checking the meter against the known calibration standards if used for extended periods (> 4 hrs).

3.3 Sample Measurement Procedures

The following procedures should be followed when conducting field specific conductance measurements of grab samples:

1. Collect the sample, check and record its temperature.

2. Correct the instrument's temperature adjustment to the temperature of the sample (if required).

3. Immerse the probe in the sample keeping it away from the sides and bottom of the container. It is important that the center portion of the probe be wetted by the sample.

4. Allow meter to stabilize. Record the measurements in a logbook.

5. Rinse probe with de-ionized water.

The following procedures should be followed when conducting in-situ field specific conductivity measurements:

1. Place the probe into the media to be measured and allow the specific conductivity and temperature readings to stabilize. Once the readings have stabilized, record the measurements in the logbook.

2. When deploying meters for extended periods of time, ensure the measurement location is representative of average media conditions.

3.4 Operational Checks

Although it is not necessary to re-calibrate conductivity meters at regular intervals during the day, it may be appropriate to periodically perform operational checks to determine if site conditions, such as an extreme temperature change, have impacted the meter's performance. The appropriateness of these additional checks will depend on the instrument and the operational environment. If an operational check is warranted, the following procedures should be followed to ensure that the performance of the meter has not changed.

1. Check the conductivity meter with fresh conductivity standard. Rinse the conductivity probe with deionized water, blot dry or otherwise remove excess rinse water and immerse it into the appropriate conductivity standard.

2. If the measured conductivity value is not within ± 10% of the standard, the probe should be re-calibrated. If the probe is still not within ± 10% of the standard, the probe should be repaired or replaced. These measurements must be recorded in the field logbook.

A post-operation instrument verification check will be performed using the appropriate standard(s) at the end of the day or after all measurements have been taken for a particular period of operation. These measurements must be recorded in the field logbook.

References

FSB Operating Procedure for Project Data and Reporting, FSBPROC-003, Most Recent Version

LSASD Operating Procedure for Control of Records, LSASDPROC-1001, Most Recent Version

LSASD Operating Procedure for Logbooks, LSASDPROC-1002, Most Recent Version

LSASD Operating Procedure for Equipment Inventory and Management, LSASDPROC-1009, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 LSASD, Athens, GA, Most Recent Version (https://usepa.sharepoint.com/sites/r4-safety-occup-health)

Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the LSASD Document Control Coordinator on the LSASD local area network (LAN).

History	Section Supervisors Initials	Date
FSBPROC-101-R8, *Field Specific Conductance Measurement*, replaces LSASDPROC-101-R7 **General:** Corrected typographical, grammatical, and formatting errors. Removed outdated SOP references and replaced with current versions. **Section 3:** Provided clarification on documenting readings in logbooks and avoiding contamination of calibration standards. **Revision History:** Added Section Supervisors Initials	MR	December 4, 2024
LSASDPROC-101-R7 *Field Specific Conductance Measurement*, replaces SESDPROC-101-R6 **General:** Corrected any typographical, grammatical, and/or editorial errors. Changed references to Division Name to match current organization **Cover Page:** Changed Names of Division and approving officials to reflect current organization. Section 3.2 added a reference to the appropriate temperature compensation setting for the Thermo Star A325.		May 5, 2020
SESDPROC-101-R6, *Field Specific Conductance Measurement*, replaces SESDPROC-101-R5 **General:** Corrected any typographical, grammatical, and/or editorial errors. Throughout the document mention of quality system or SESD quality system was replaced with Field Branches Quality System or FBQS. **Cover Page:** Omitted Hunter Johnson as an author. Updated cover page to represent SESD reorganization. John Deatrick was not listed as the Chief of the Field Services Branch.		July 13, 2016

SESDPROC-101-R5, *Field Specific Conductance Measurement*, replaces SESDPROC-101-R4		August 30, 2012
SESDPROC-101-R4, *Field Specific Conductance Measurement*, replaces SESDPROC-101-R3		January 13, 2012
SESDPROC-101-R3, *Field Specific Conductance Measurement*, replaces SESDPROC-101-R2		August 12, 2011
SESDPROC-101-R2, *Field Specific Conductance Measurement*, replaces SESDPROC-101-R1		June 13, 2008
SESDPROC-101-R1, *Field Specific Conductance Measurement*, replaces SESDPROC-101-R0		November 1, 2007
SESDPROC-101-R0, *Field Specific Conductance Measurement*, Original Issue		February 05, 2007