

Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

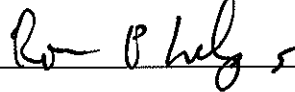
Title: Field Turbidity Measurement

Effective Date: June 13, 2008

Number: SESDPROC-103-R2

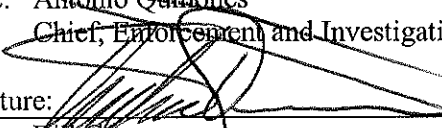
Authors

Name: Ron Phelps
Title: Environmental Scientist

Signature:  Date: 6-2-08

Approvals

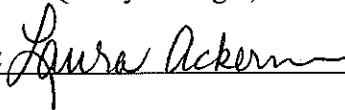
Name: ~~Antonio Quiñones~~
Title: ~~Chief, Enforcement and Investigations Branch~~

Signature:  Date: 6/3/08

Name: Bill Cosgrove
Title: Chief, Ecological Assessment Branch

Signature:  Date: 6/2/08

Name: Laura Ackerman
Title: Field Quality Manager, Science and Ecosystem Support Division

Signature:  Date: 06/02/08

Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the SESD Document Control Coordinator.

History	Effective Date
<p>SESDPROC-103-R2, <i>Field Turbidity Measurement</i>, Replaces SESDPROC-103-R1</p> <p>Cover Page: Author was changed from Marty Allen to Ron Phelps.</p> <p>Revision History Changed Field Quality Manager to Document Control Coordinator.</p> <p>Section 1.3 Changed Field Quality Manager to Document Control Coordinator.</p>	<p>June 13, 2008</p>
<p>SESDPROC-103-R1, <i>Field Turbidity Measurement</i>, Replaces SESDPROC-103-R0</p> <p>General Deleted all references to SOSA.</p> <p>Updated referenced procedures due to changes in title names and/or to reflect most recent version.</p> <p>Title Page Changed title for Antonio Quinones from Environmental Investigations Branch to Enforcement and Investigations Branch. Changed Bill Cosgrove's title from Acting Chief to Chief.</p> <p>Section 1.3 Updated information to reflect that procedure is located on the H: drive of the LAN.</p> <p>Section 1.4 Alphabetized and revised the referencing style for consistency.</p> <p>Section 2 Added last paragraph regarding stopping measurements due to environmental conditions.</p>	<p>November 1, 2007</p>

Section 3.5 Re-phrased operational check 2 for clarity.	
SESDPROC-103-R0, Field Turbidity Measurement, Original Issue	February 05, 2007

TABLE OF CONTENTS

1	General Information.....	5
1.1	Purpose.....	5
1.2	Scope/Application	5
1.3	Documentation/Verification.....	5
1.4	References.....	5
1.5	General Precautions.....	6
1.5.1	<i>Safety</i>	6
1.5.2	<i>Procedural Precautions</i>	6
2	Quality Control	7
3	Field Turbidity Measurement Procedures	8
3.1	General.....	8
3.2	Meter Calibration and Verification	8
3.3	Probe Calibration and Verification.....	8
3.4	Sample Measurement Procedures	9
3.5	Operational check	10
3.6	Units	10

1 General Information

1.1 Purpose

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

1.2 Scope/Application

The procedures contained in this document are to be used by field personnel when measuring turbidity of various, aqueous phase environmental media in the field. On the occasion that SESD field personnel determine that any of the procedures described in this section cannot be used to obtain turbidity measurements of the media being sampled, and that another method or turbidity measurement instrument must be used to obtain said measurements, the variant instrument and measurement procedure will be documented in the field log book, along with a description of the circumstances requiring it's use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD 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 H: drive of the SESD local area network. The Document Control Coordinator is responsible for ensuring the most recent version of the procedure is placed on the H: drive and for maintaining records of review conducted prior to its issuance.

1.4 References

SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-108, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

United States Environmental Protection Agency (US EPA). 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (SESD), Athens, GA

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when conducting field turbidity measurements. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) 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. When using this procedure, minimize exposure to potential health hazards through the use of protective clothing, eye wear and gloves. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.5.2 Procedural Precautions

All field turbidity measurements pertinent to the sampling event should be recorded in the field log book for the event. All records should be entered according to the procedures outlined in the SESD Operating Procedure for Logbooks (SESDPROC-010).

2 Quality Control

All turbidity meters and probes shall be maintained and operated in accordance with the manufacturer's instructions and the SESD Operating Procedure for Equipment Inventory and Management (SESDPROC-108). Before a meter or probe is taken to the field, it shall be properly calibrated and verified, according to Sections 3.2 and 3.3 of this procedure, to ensure it is operating properly. These calibration and verification checks shall 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 insure 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 temperature, 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 Turbidity Measurement Procedures

3.1 General

Turbidity is caused by suspended and colloidal matter such as clay, silt, organic and inorganic matter and microscopic organisms. Many methods are available for the measurement of turbidity including turbidimeters and optical probes. Turbidity is measured by determining the amount of scatter when a light is passed through a sample.

3.2 Meter Calibration and Verification

1. The turbidimeter is calibrated or verified in accordance with the manufacturer's instructions prior to use in the field. If the instrument readings do not agree within $\pm 10\%$ of the calibration standards, the unit must be recalibrated, repaired or replaced. These verifications should be documented in the field investigator's logbook.
2. Turn the meter "ON".
3. Rinse the sample cell three times with organic-free or de-ionized water.
4. Fill the cell to the fill line with organic-free or de-ionized water and then cap the cell.
5. Use a non-abrasive, lint-free paper or cloth (preferably lens paper) to wipe off excess water and streaks.
6. Open the cover and insert the cell (arrow to the front) into the unit and close the cover.
7. Press "READ" and wait for the value to be displayed.
8. Using the verification standards, repeat steps 4, 5, and 6. Record all measurements.

3.3 Probe Calibration and Verification

1. The probe is calibrated in accordance with the manufacturer's instructions prior to use in the field. If the instrument readings do not agree within $\pm 10\%$ of the calibration standards, the unit must be recalibrated, repaired or replaced. These calibrations should be documented in the field investigator's logbook.
2. Turn the meter "ON" and allow it to stabilize.

3. Immerse the probe in the first standard solution and calibrate the probe against the solution.
4. Rinse the probe with de-ionized water, remove excess rinse water and calibrate the probe using additional standards as appropriate.
5. Record the standard values used to calibrate the meter.

3.4 Sample Measurement Procedures

These procedures should be followed when conducting turbidity measurements of grab samples:

1. Collect a representative sample and pour off enough to fill the cell to the fill line (about 15 mL) and replace the cap on the cell.
2. Wipe off excess water and any streaks with a soft, lint-free cloth (lens paper).
3. Press I/O and the instrument will turn on. Place the meter on a flat, sturdy surface. Do not hold the instrument while making measurements.
4. Insert the sample cell in the instrument so the diamond or orientation mark aligns with the raised orientation mark in the front of the cell compartment. Close the lid.
5. Select manual or automatic range selection by pressing the range key.
6. Select signal averaging mode by pressing the Signal Average key. Use signal average mode if the sample causes a noisy signal (display changes constantly).
7. Press Read. The display will show ---- NTU. Then the turbidity is displayed in NTU. Record the result after the lamp symbol turns off.
8. Rinse the cell with de-ionized water.

These procedures should be followed when conducting in-situ turbidity measurements:

1. Place the probe into the media to be measured and allow the turbidity reading to stabilize. Once the reading has stabilized, record the measurement in the logbook.
2. When deploying meters for extended periods of time, insure the measurement location is representative of average media conditions.

3.5 Operational check

1. If possible, periodically check the turbidity meter during the day by using the appropriate turbidity standards.
2. A post-operation instrument verification check should be performed using the appropriate standards 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 log book.

3.6 Units

Turbidity measurements are reported in nephelometric turbidity units (NTUs). It is important to note that if the turbidity measurements are for NPDES reporting purposes, all values above 40 NTU must be diluted with turbidity free water and calculated by multiplying by a dilution factor.