STANDARD OPERATING PROCEDURE APPROVAL AND CHANGE FORM

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STANDARD OPERATING PROCEDURE
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The top row of this table shows the most recent changes to the controlled document. For previous revision history information, archived versions of this document are maintained by the SERAS QA/QC Officer on the SERAS local area network (LAN).

History	Effective Date
Editorial changes	07/31/16
Added UFP QAPP preparation language to Section 1.0; training records for documenting competency to Section 9.0; data verification text to Section 10.0	07/31/16
Rewrite of Section 3.0	07/31/16
Added text discussing selection of samplers based on composition; and the impact of floating debris on dip samplers and of currents when using Kemmerer bottles, to Section 4.0	07/31/16
Added field rinsing discussion to Section 7.1	07/31/16
Rewrite of Section 7.2	07/31/16
Deleted discussion of Van Doren and Bacon Bomb samplers from SOP	07/31/16
Rewrite of sections 7.3.2 Dip Sampler and 7.3.3 Direct Method	07/31/16

SURFACE WATER SAMPLING

CONTENTS

SUPERSEDES: SOP #2013; Revision 0.0; 02/15/02; U.S. EPA Contract 68-C99-223

SURFACE WATER SAMPLING

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) is applicable to the collection of representative surface water samples from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface.

A Quality Assurance Project Plan (QAPP) in Uniform Federal Policy (UFP) format describing the project objectives must be prepared prior to deploying for a sampling event. The sampler needs to ensure that the methods used are adequate to satisfy the data quality objectives listed in the QAPP for a particular site.

The procedures in this SOP may be varied or changed as required, dependent on site conditions, equipment limitations or other procedural limitations. In all instances, the procedures employed must be documented on a Field Change Form and attached to the QAPP. These changes must be documented in the final deliverable

2.0 METHOD SUMMARY

Sampling situations vary widely due to varying water depths, velocity, sampling intervals, etc.; therefore, no universal sampling procedure can be recommended. However, surface water sampling is generally accomplished through the use of one of the following samplers or techniques:

- Kemmerer bottle
- Dip sampler
- Direct method (collecting water samples directly into the sample container)

These samplers and sampling techniques will result in the collection of representative samples from the majority of surface waters and impoundments encountered.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample collected, along with the proper sample container type (i.e. glass, plastic), chemical preservation, and storage requirements are dependent upon the matrix sampled and analysis performed. For further information, refer to the Scientific Engineering Response and Analytical Services (SERAS) SOP #2003, *Sample Storage, Preservation and Handling*.

Whenever possible, dedicated sampling devices should be used. However, if sampling with re-usable (non-dedicated) equipment, equipment will need to be decontaminated. Refer to SERAS SOP #2006, *Sampling Equipment Decontamination*, for proper procedures.

Once samples have been collected, the following procedures should be followed:

1. Transfer the sample(s) into suitable, labeled sample containers specific for the analyses to be performed.
2. If appropriate, preserve the sample, or use pre-preserved sample bottles. Do not overfill bottles if they are pre-preserved.
3. Cap the container securely, place in a resealable plastic bag, and cool to less than or equal to (≤) 6 degrees Centigrade (°C).
4. Record all pertinent data in the site logbook and/or on field data sheets.
5. Complete the Chain of Custody (COC) record.

6. Attach custody seals to cooler prior to shipment.
7. Decontaminate all non-dedicated sampling equipment prior to the collection of additional samples.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Cross contamination problems can be eliminated or minimized through the use of dedicated or disposable sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to SERAS SOP #2006, *Sampling Equipment Decontamination*, for proper procedures.

The appropriate sampling device must be of a proper composition. Selection of samplers constructed of glass, stainless steel, polyvinyl chloride (PVC) or polytetrafluoroethylene (PTFE) commonly referred to as Teflon®, should be based upon the suspected contaminants and the analyses to be performed

Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed or non-representative area.

Following proper decontamination procedures, minimizing disturbance of the sample site, and careful selection of sampling locations will eliminate these problems. Proper timing for the collection of samples must be taken into consideration due to tidal influences and low or fast-flowing streams or rivers.

Dip samplers may collect floating debris which may skew sample results.

Collection at a non-representative depth may result when using a Kemmerer bottle in a current, due to inaccurate depth measurements.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection, preservation and handling of surface water samples may include (depending on technique chosen):

- Kemmerer bottles
- Line and messengers
- Dip sampler
- Peristalic pump
- Tygon tubing
- Polyethylene (PE) or PTFE tubing
- 0.45 micron (µm) filters
- Sample bottles
- Preservation reagents
- pH paper
- Resealable plastic bags
- Ice
- Coolers
- Inert packing material
- Sample labels
- Printer
- Chain of Custody records
- Custody seals

- Field data sheets
- Decontamination equipment/supplies
- Maps/plot plan
- Personal protective equipment (PPE)
- Compass
- Tape measure
- Survey stakes, flags, or buoys and anchors
- Vessel
- Global Positioning System (GPS) unit
- Camera
- Logbook/waterproof pen
- Paper towels
- Water quality meter

6.0 REAGENTS

Reagents are utilized for preservation of samples and for decontamination of sampling equipment. The preservatives depend on the analysis to be performed and are summarized in SERAS SOP #2003, *Sample Storage, Preservation and Handling.* Decontamination solutions are specified in SERAS SOP #2006, *Sampling Equipment Decontamination.*

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the type and amount of equipment and supplies needed.
2. Obtain the necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Use stakes, flags, or buoys to identify and mark all sampling locations identified by GPS data. If required, the proposed locations may be adjusted based on site access, property boundaries, and obstructions.
6. Field Rinsing - Once field work has begun, and before samples are collected, the sample-wetted portions of most of the collection and processing equipment require a field rinse with native water. Field rinsing helps to condition, or equilibrate, sampling equipment to the sample environment. Rinsing also serves to ensure that all cleaning-solution residues have been removed. **Note –** Do not field rinse pre-preserved bottles or when collecting volatile organic compounds (VOCs).

7.2 Representative Sampling Considerations

In order to collect a representative sample, the hydrology and characteristics of a stream, river, pond, lake or impoundment should be determined prior to sampling. This will aid in determining the presence of separate phases or layers in lagoons or impoundments, flow patterns in streams, and appropriate sample locations and depths. Location of sampling will depend on project goals and conditions. For example, in a stream or river the sample should be collected at a location where the velocity is sufficient to prevent deposition of solids and should have relatively uniform flow. In

moving water, the sampler must always stand downstream of the collected sample. Care must be taken to avoid introducing re-suspended sediment into the sample, particularly in small stagnant ponds. Recent storm events may dilute contamination or bring contaminants from upstream sources and should be taken into consideration when collecting samples. In addition, present or recent storm events will alter water quality data. Storm event data should be recorded in logbooks to help evaluate the data.

7.2.1 Water Quality Data

Water quality data, including pH, conductivity, oxygen reductions potential (ORP), and dissolved oxygen (DO) may be collected in ponds, lakes and impoundments to determine if stratification is present. Measurement intervals will depend on many factors (i.e. total depth, location access, site conditions, etc). A determination will be made prior to collecting any water quality data as to depth(s) and frequency of measurements. These measurement intervals should be as consistent as possible throughout the sampling event. Depth intervals should be documented in the QAPP, any changes should be documented in a field logbook. Refer to SERAS SOP # 2041, *Operation of the Water Quality Multi-Parameter Meters,* for more information on how to collect the necessary water quality data.

7.2.2 Sampling Methods

Factors that contribute to the selection of a sampling method are:

- Width, depth, flow and accessibility of the location being sampled
- Whether the sample will be collected onshore or offshore

Kemmerer bottles (Figure 1, Appendix A) may be used in most situations where site access is from a boat or structure, such as a bridge or pier, and where samples at specific depths are required.

Dip samplers (Figure 2, Appendix A) are useful in situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access to the sample point is not feasible.

The direct method may be utilized to collect water samples from streams, rivers, lakes, and other surface waters directly into the sample container(s).

7.3 Sample Collection

7.3.1 Kemmerer Bottle

Sampling procedures for a Kemmerer Bottle are as follows:

1. Use a properly decontaminated Kemmerer bottle. Set the sampling device so that the upper and lower stoppers are pulled away from the body, allowing the surface water to enter tube.
2. Lower the pre-set sampling device to the predetermined depth. Avoid disturbance of the bottom.
3. When the Kemmerer bottle is at the required depth, send the weighted messenger

down the suspension line to close the sampling device.

4. Retrieve the sampler and discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. Fill sample containers for VOC samples first as these samples should not be composited. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

7.3.2 Dip Sampler

Sampling procedures for a Dip Sampler are as follows:

1. If necessary, assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample by dipping the sampler into the water.
3. Retrieve the sampler and transfer the sample to the appropriate sample container(s).

7.3.3 Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples directly into the sample container(s). Health and safety considerations must be addressed when sampling lagoons or other impoundments where specific conditions may exist that warrant the use of additional safety equipment. These issues must be addressed in the site-specific Health and Safety Plan (HASP).

Using adequate protective clothing for wading or boats, access the sampling station from a downstream location, walking upstream so as to not disturb sediments and suspending them into the water column. Collect water quality information for the sampling location and record in the site log book or field data sheets. For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream; the container must be upstream of the collector. Avoid disturbing the substrate. For lakes and other impoundments, collect the sample under the water surface while avoiding surface debris and boat wake. Pre-preserved sample bottles cannot be used for this sampling method.

Surface water samples may also be collected directly by using a peristaltic pump with PE or PTFE lined tubing. This method is also used when collecting filtered samples.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

1. All data must be documented on field data sheets or in site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Calibration of equipment must occur prior to sampling/operation and must be documented in the site log book or field data sheets.
3. To avoid the incidental inclusion of disturbed sediment in the sample, multiple surface water samples should be collected from a downstream to upstream direction and upstream of any activity that may disturb the sediment (i.e., wading).
4. While collecting surface water using the direct method, the sample container should be opened below the surface to avoid the collection of floating debris.
5. Water quality data (pH, specific conductivity, ORP, temperature, and DO) may be collected to detect the presence of stratified layers or other site-specific characteristics that would affect the sample.
6. The competency of field personnel must be demonstrated and documented.

Additional Quality Assurance/Quality Control (QA/QC) Samples should be collected as outlined in the QAPP for each specific site. Further information on QA/QC Samples can be located in SERAS SOP #2005, *Quality Assurance/Quality Control Samples*.

10.0 DATA VALIDATION

Data verification/completeness checks must be conducted to ensure project-specific quality objectives have been met as defined in the corresponding UFP-QAPP. The SERAS Task Leader is responsible for completing the UFP-QAPP verification checklist for each project.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, Occupational Health and Safety Administration (OSHA) and/or corporate health and safety procedures.

When sampling lagoons or surface impoundments containing known or suspected hazardous substances, adequate health and safety and boating precautions must be taken to ensure the safety of sampling personnel. Refer to SERAS SOP #3023, *Boat Safety* and SERAS SOP #3016, *Personal Protective Equipment Program.*

12.0 REFERENCES

Wilde, F.D., D.B. Radtke, J. Gibs and R.T. Iwatsubo. 1998. National Field Manual for the Collection of Water-Quality Data - Selection of Equipment for Water Sampling. U.S. Geological Survey Techniques of Water - Resources Investigations, Book 9, Chap. A2, variously paged.

U.S. Environmental Protection Agency. 1984. Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA/600/4-84-076.

13.0 APPENDICES

A - Figures

APPENDIX A
Figures
SOP #2013
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FIGURE 1. Kemmerer Bottle

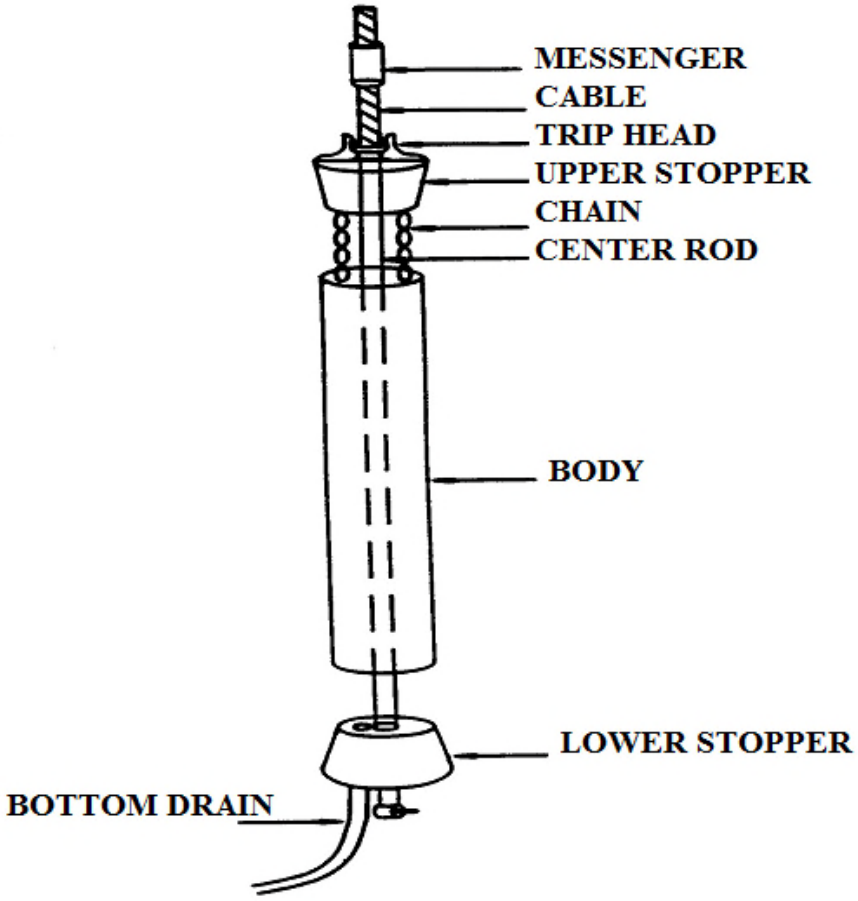

FIGURE 2. Dip Sampler