

STANDARD OPERATING PROCEDURE
FOR THE COLLECTION OF LOW LEVEL METALS AMBIENT WATER SAMPLES

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1.0 Scope & Application:

This Standard Operating Procedure is applicable to the collection of representative chemical and biological samples from lakes, ponds and streams.

2.0 Summary of Method:

This SOP describes the procedure for the collection of representative water samples from: a boat, using waders, or from shore. This method assumes that the sampling parameters (pollutants) are uniformly distributed in the water column. This SOP includes sample parameters for specific methods used in ambient metals collection. It does not address flow proportioned sampling.

3.0 Definitions:

- 3.1 **Bottle Blank:** Analyte-free water is collected into a sample container, of the same lot number as the containers used for the environmental samples. This sample evaluates contamination introduced from the sample container(s) from a common lot.
- 3.2 **Field Blank:** In the field, analyte-free water is collected into a sample container with preservatives. The sample containers are the same lot used for the environmental samples. This evaluates contamination introduced from the sample container(s) with applicable preservatives. Field blanks are not used for volatile samples.
- 3.3 **Filter Blank:** In the field, analyte-free water is passed through a filter and collected into in the appropriate sample container. The filter blank is then preserved. This procedure is identical to the sample collection.
- 3.4 **Trip Blanks:** A sample collected at the laboratory using analyte free water in the appropriate sample container with the proper preservative, taken out to the field, and returned to the laboratory for analysis without being opened. Trip blanks are generally for volatile organic compounds, low level metals, and gasoline range hydrocarbon samples. Trip blanks are used to assess contamination introduced during sample transport.
- 3.5 **Field Replicates/Duplicates:** Two or more samples collected at the same sampling location. Field replicates should be samples collected side by side or by collecting one sample and immediately collecting the second sample. Field replicates represent the precision of the whole method, site heterogeneity, field sampling and the laboratory analysis.

3.6 Field Split Samples: Two or more representative sub-samples taken from one environmental sample in the field. Prior to splitting, the environmental sample is homogenized to correct for sample heterogeneity that would adversely impact data comparability. Field split samples are usually analyzed by different laboratories (intra-laboratory comparison) or by the same laboratory (intra-laboratory comparison). Field splits are used to assess sample handling procedures from field to laboratory and laboratory's comparability.

4.0 Health and Safety Warnings:

4.1 All proper personal protection clothing and equipment must be worn.

4.2 All sampling involving hazardous material or hazardous conditions (i.e sampling material, sample preservatives) must be performed with at least two people.

4.3 When working with potentially hazardous materials or situations, follow EPA, OSHA, and site specific health or safety procedures. If a site has a known hazardous chemical is present on site, review all chemical data including exposure guidelines and Material Data Safety Sheets (MSDS) before visiting the site.

4.4 When sampling lagoons or surface impoundments, the sampling team member(s) collecting the sample should not get too close of the edge of the impoundment, where bank failure may cause them to lose their balance.

4.5 Follow the OEME Boat Safety SOP (see reference) when conducting sampling from a boat.

4.6 When preserving samples all proper personal protection clothing and equipment is to be worn. At a minimum, this will include closed toed shoes, safety glasses and impervious gloves. Clean water and baking soda should be available for rinsing and neutralizing acids.

4.7 When working with potential hazardous chemicals or biological agents, avoid inhalation, skin contact, eye contact or ingestion. If skin contact occurs remove contaminated clothing immediately. Wash the affected areas thoroughly with large amounts of water and soap and water. If available consult the Material Data Safety Sheets (MSDS) for prompt action, and in all cases seek medical attention immediately. If inhalation, eye contact or ingestion occurs, consult the Material Data Safety Sheets (MSDS) for prompt

action, and in all cases seek medical attention immediately.

4.8 When sample handling is complete, wash your hands thoroughly.

5.0 Interferences:

5.1 Interference may result from using contaminated equipment, solvents, reagents, preservatives, sample containers, gloves, or sampling in a disturbed area.

5.2 Cross contamination problems can be eliminated or minimized by meticulously following the specified procedure.

5.3 All sampling equipment must be routinely demonstrated to be free from contaminants under the conditions of the analysis by running filter blanks and bottle blanks.

6.0 Personnel Qualifications:

6.1 All field samplers working at Superfund sites are required to take a 40 hour health and safety training course and the required annual refresher course prior to engaging in any field activities.

6.2 The field samplers should be pre-trained in all sampling equipment and procedures by an experienced sampler before initiating the sampling procedure.

6.3 All personnel shall be responsible for complying with all quality assurance/quality control requirements that pertain to their organizational/technical function.

7.0 Equipment and Supplies:

7.1 One sampling kit per site and blank to be sampled and an extra kit or two as backup. They will be assembled in the lab ahead of time by a handler wearing gloves. Each kit will consist of the following items placed inside two sealed plastic Zip-Lock bags, one inside the other.

7.1.1 One 500 ml pre-cleaned bottle per site (a 1000 ml bottle for the filter blank) that has been demonstrated to be free of contaminants.(Bottles are purchased from Eagle Pitcher; part number C50-500/NM/LP. They have been washed with dilute acid and rinsed in a clean room with hot distilled water. Bottles are delivered capped in a sealed plastic bag.)

7.1.2 One pair of “powder free” shoulder length polyethylene gloves which have been stored in their commercial packaging or in a sealed Zip-Lock plastic bag.

7.1.3 One clean filter, syringe, and adaptor in their original packaging.

You will also need:

7.2 A box of regular powder-free gloves.

7.3 Ultrex-grade nitric acid and clean, packaged pipettes.

7.4 pH paper, preferably measuring a range of pH from 0 to 2.5.

7.5 General equipment: Site logbooks, indelible marker, waterproof pen, field data sheets, chain of custody forms.

7.5 Chest waders with belt, hip boots

7.6 Boat

8.0 Pre-sample Collection:

8.1 Determine the number of samples (including QC samples) specified in QAPP. Refer to section 3.0 for QC sample definitions. At a minimum, a filter/equipment blank must be conducted for each sampling event or for each day.

8.2 Determine the sample locations, analytical sampling parameters, the sampling methods to be employed, and which equipment and supplies are needed.

8.3 Prepare a schedule and coordinate with the staff, clients, laboratory and regulatory agencies.

8.4 If possible, perform a general site survey prior to the site entry in accordance with the health and safety plan and QAPP.

8.5 Use GPS, topographic maps, stakes, flags, or buoys to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access,

property boundaries, and surface obstructions.

9.0 Sample Collection

When collecting samples, the field location should be recorded using Global Positioning System (GPS). The date and time of sample collection, field measurements and ambient conditions must be recorded. Water chemistry measurements should be made by a separate team, after sample collection is complete, unless the measurements can be made in a way that will not contaminate or influence the samples (i.e, if there is a strong flow). Refer to the YSI Sondes SOP (see reference) for measuring water chemistry in the field.

9.1.0 Collection from a Boat

- 9.1.1 Use only a fiber-glass boat for sampling.
- 9.1.2 Approach the sampling point from a downstream or down-wind position and then motor slowly toward the sampling point. The motor should be turned off prior to reaching the sampling location and the boat allowed to coast a short distance to the anchoring point to prevent sampling of water affected by motor exhaust.
- 9.1.3 Allow the boat to come to a complete stop and lower the anchor slowly to prevent bottom sediments from being disturbed. Do not drop or toss the anchor overboard. If there is no wind or current you may not need to anchor.
- 9.1.4 Allow the boat to drift into anchored position before beginning sampling.

9.2.0 Sample Collection From Shore or Using Waders

- 9.2.1 Don waders with belt
- 9.2.2 Where there is flow or current, always approach the sampling location slowly from the downstream. Once you have reached the sampling location allow the water to return to a pre-disturbed condition. Avoid contacting the syringe with the bottom or adjacent rocks and stream debris. If the water depth is less than 0.2 meters, record this condition and sample the water at mid depth.

9.3 Collection Procedure

- 9.3.1 Sampling is done in teams of two. The person taking the sample is designated the “clean hands” person (CHP), and the assistant is designated the “dirty hands” person (DHP). The CHP is not to touch anything except the syringe, filter, and adaptor until sampling is complete.
- 9.3.2 Immediately before collecting the sample, the DHP dons regular powder-free gloves. They then opens the sample kit, extracts the bag containing the shoulder-length gloves and opens it, allowing the CHP to take them out and put them on.
- 9.3.2 Next, the DHP takes out and opens the filter package. The CHP then removes the filter.
- 9.3.3 The CHP next removes the adaptor from the kit and connects it to the filter (Note the flow arrow on the filter and hook the adaptor up to the inlet).
- 9.3.5 Next, the DHP removes the syringe package from the kit and opens it.
- 9.3.6 The CHP now takes the syringe out of the package, fills it up with water from about 0.2 meters below the surface, places the tip of it into the adaptor and empties it into the filter. (If necessary, rather than holding the filter while drawing the sample, the CHP may place the filter and adaptor on the opened syringe packaging or pass the filter to the DHP while filling the syringe. Do not, however, allow the filter to contact any unclean surfaces such as a stream bank or the boat.)
- 9.3.7 The CHP now draws another syringe of water (always from about 0.2 meters below the surface), places the tip of it into the adaptor, and empties it into the filter, purging the water out of the filter downstream from the sampling site.
- 9.3.8 Next the DHP takes the sample bottle from the kit and opens it with out touching the inside. The cap is held in one hand (without touching the inside) or may be placed in the open syringe packaging.
- 9.3.9 The CHP places the filter and adaptor onto the bottle allowing the DHP to hold it in place.
- 9.3.10 The CHP draws a syringe of sample from the water and empties it into the filter. They continue to do this until the bottle is nearly full, leaving enough room for

about 1 ml of preservative to be added.

9.3.12 The DHP then removes the filter and caps the sample bottle.

10.0 Sample Handling, Preservation, and Storage

Preservation should be done immediately after sampling, continuing with the “dirty hands/clean hands” technique.

- 10.1 The CHP dons safety glasses, shoulder-length gloves and any other necessary safety equipment. Have a neutralizing agent (such as baking soda) and rinse water readily available.
- 10.2 The DHP opens the pipette package and the CHP removes the pipette.
- 10.4 Next, the DHP opens the bottle containing Ultrex-grade nitric acid and the sample bottle.
- 10.5 The CHP draws about 1 ml of acid per 500 ml sample and adds it to the bottle. The pipette may be placed back in its original wrapper.
- 10.6 The DHP caps the sample bottle and shakes it gently to mix the preservative with the sample.
- 10.7 The CHP takes out a piece of pH paper and the DHP pours a drop of the sample onto it. To avoid contamination, do not dip the pH paper in the sample bottle.
- 10.9 If the pH does not register ≤ 2.0 , add a drop more acid, to the sample, cap and shake the bot, and retest the pH using the above protocols until the correct acidity is achieved (no glove changes needed).
- 10.6 Once the sample has been preserved properly, the DHP caps the sample bottle (using a custody seal if the sample is for enforcement), places it in a Zip-lock plastic bag (optional), and places the bottle in a cooler of ice, ensuring that the bottle is in the ice but not totally immersed in water.
- 10.8 Record all pertinent data in the site logbook and on the field data sheet. At a minimum this includes date, time, station number, sampling number and sampling conditions.

11.0 Chain of Custody

- 11.1 Follow the Sample Control Procedures, chain-of-custody Standard Operating Procedures.
- 11.2 At a minimum enter the following information on the Chain of Custody form: sampling date, sampling time, station number, sample numbers, project name, number of containers per station/sample number, type of analyses, type of sample (composite or grab), and samplers signatures.
- 11.3 Chain of custody forms should stay with the samples at all times. When samples are not in custody of the sampler or designated person (who signs the form) they should be maintained under lock and key.
- 11.3 Attach the custody seals to the cooler prior to shipment if for investigation or shipment to another laboratory.

12.0 Data and Records Management:

- 12.1 All data and information shall be recorded in a hardbound book or on a data sheet. Follow the Field Data Management SOP.
- 12.2 The chain of custody form is signed over to the laboratory. A copy is kept with the sampling records.
- 12.3 The sampling data is stored at US EPA - NE, 11 Technology Dr, North Chelmsford, MA for at least 5 years.

13.0 Quality Control/Quality Assurance and Decontamination:

- 13.1 Representative samples are required. The sampler will evaluate the site specific conditions to assure the sample will be representative.
- 13.2 All sampling equipment must be completely decontaminated prior to and after use.
- 13.3 Between each stations sampling equipment (i.e buckets, depth sampler and depth integrated sampler) shall be washed with a phosphate free soap and rinsed three times with distilled water. If sampling vertical profiles at the same station, sampling equipment will not be washed unless deemed necessary by the project data quality objectives.

- 13.4 All field QC sample requirements in the QAPP must be followed. These may involve trip blanks, equipment blanks, field duplicates and the collection of extra samples for the laboratory's quality control.

14.0 Waste Management and Pollution Prevention:

- 14.1 During field sampling and analysis events there may be hazardous waste produced from the sample collection. The waste must be handled and disposed of in accordance with federal, state, and municipal regulations. Dispose of the site specific hazardous waste produced where the work was performed, if the operating site has proper disposal available. If there is no disposal that meets regulatory requirements, the waste must be transported back to EPA-NE and transferred to the hazardous waste manager for disposal. The sample volume should be minimized to reduce unnecessary waste.

15.0 References:

- 15.1 U.S. EPA, Office of Environmental Measurement and Evaluation, January 1998, Revision 2. Safe Boating Standard Operating Procedures. EPA-RG 1-OEME/BOAT
- 15.2 U.S. EPA, Office of Environmental Measurement and Evaluation, 4/23/02, Revision 0. Standard Operating Procedures for calibration and field measurement procedures for the YSI model 6- series Sondes (Including: temperature, pH, specific conductance, turbidity, and dissolved oxygen. YSI Sondes
- 15.3 U.S. EPA, Office of Environmental Measurement and Evaluation, August 1996, Revision 1. Sample Control Procedures, chain-of-custody.
- 15.4 U.S. EPA 40 CFR Part 136.3 (e) Table II