

Standard Operating Procedure for:
Water Sample Collection with Nalgene 1100 Samplers
(Water Sampling with Nalgene 1100 Sampler.doc)

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and
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1 Identification of the method

Water sample collection using Nalgene 1100 sampler.

2 Scope of the method

This standard operating procedure provides Missouri State University (MSU) field and laboratory personnel with guidance on the procedure for collecting water samples using the Nalgene 1100 sampler.

3 Summary of method

Water samples are collected in bottles appropriate for each analyte. Sampling personnel should be aware that collecting water samples can be hazardous and that following these procedures should minimize personal risks. Samplers are installed in a ditch, storm grate, or stream channel to collect a full one liter first flush grab sample into a 1000ml NALGENE® HDPE sample bottle within the first 30 minutes of storm water outfall flow. A floating ball valve automatically closes off the sample port after the bottle is full to prevent contamination and mixing from later run-off. Preservative is added to the bottle if needed; the bottle is sealed and placed into a cooler with ice. Information about the sample (for example, collection time, temperature, preservative, etc.) is recorded on the sample collection form and bottle label.

4 Definitions

- 4.1 Deionized water: is water that does not contain cations (Na, Ca, Fe, Cu) or anions (Cl and Br).
- 4.2 Chain of Custody (COC): used to describe the written record of the collection, possession and handling of samples. Chain of custody forms should be completed as described in the Chain of Custody SOP # 1030R01. Chain of custody (COC) forms are located on a board in Temple Hall 125.
- 4.3 Field Duplicate (FD): two separate samples collected during the same site visit, from the same location in the stream, and within <5 minutes of one another. Both samples are treated identically throughout field and laboratory procedures. Analyses of field duplicates indicate the effects of natural variations in actual water quality parameters; variations in sample collection procedures, preservation, and storage; and are used to analyze the precision of instantaneous sample collection.
- 4.4 Field Blank (FB): an aliquot of deionized water added to an empty sample container while at a sampling site and then treated as a regular sample in all aspects, including exposure to a sample bottle holding time, preservatives, and all pre-analysis treatments. The purpose is to determine if the field or sample transporting procedures and environments have contaminated the sample.
- 4.5 Natural water flush: water at the sampling site that is used to rinse the sample bottle three times before sample collection.

- 4.6 Grab sampling: water samples collected by hand where the bottle is dipped into the current with the mouth of the bottle upstream. The sample should be collected within the thalweg of the channel and the bottle should be allowed to fill near the middle of the water column. Field technicians should avoid skimming the water surface or the disturbing sediment in the channel bed during collection.
- 4.7 Depth integrated sampling: water samples are collected with a DH-48 or a DH-76 sampler using one continuous vertical motion throughout the entire water column without pausing when the channel bed is reached. The channel width, depth, and flow rate as well as the volume of the sample container will dictate which size of nozzle to use. If only one sample is collected, the sample should be collected within the thalweg of the channel and the sampler should be raised and lowered until the bottle is full which occurs when bubbles are no longer escaping from the bottle.
- 4.8 Cross-channel depth-integrated sampling: water samples are collected using depth integrated sampling techniques at equal width increments across the entire surface width of the channel. Cross sections are measured at a straight-sided wade-able section of stream, with reasonably smooth, laminar flow. One continuous vertical motion should be used to collect water throughout the entire water column at the midpoint of each increment without pausing when the channel bed is reached. Samples taken at each increment can be analyzed separately or can be combined to produce a composite sample for the site.
- 4.9 Composite sampling: a technique whereby water samples regardless of collection type are combined, thoroughly homogenized, and treated as a single sample.
- 4.10 Sample preservation: samples are acidified to $\text{pH} < 2$, put on ice during transport, and are stored in a refrigerator at the laboratory to retard biological action, retard hydrolysis of chemical compounds and complexes, reduce volatility of constituents, and reduce absorption effects. Sample preservation is determined by the water quality parameters of interest. If the samples are collected for nutrient analyses, then H_2SO_4 should be used to acidify those samples. Nitric acid is used to acidify samples collected for metal analyses. Samples collected to determine suspended solid or dissolved fraction parameters do not require acidification.
- 4.11 Thalweg: the deepest point of the channel.

5 Health and safety

- 5.1 When wading in streams where water depths may be 1 meter deep or more, wear a life preserver and/or remove hip boots or chest waders. Currents can force wading field workers into deep water and water-filled boots can make swimming difficult.

- 5.2 When walking through densely vegetated areas along streams, be sure to look for and avoid toxic plants like poison ivy. Be sure to wear appropriate insect repellent and protective clothing for protection from mosquitoes, chiggers, and ticks. In addition, probe areas in your path with a walking stick to warn and disperse poisonous snakes like the cotton mouth and copperhead which may inhabit riparian areas.
- 5.3 Field staff should protect themselves from water borne illness by wearing disposable gloves, and avoid touching eyes, nose and mouth. Be sure to clean up with bacteria disinfectant soap and water after wading in streams. This is particularly important for streams that drain livestock areas, sewage treatment plant effluents, and other obvious pollution sources. Under no circumstances should you drink the water from any stream.
- 5.4 Concentrated sulfuric acid and concentrated nitric acid are highly corrosive. Use protective gloves during handling. Review the MSDS for additional information and safety concerns regarding the acid used to preserve the samples based on the analyte of concern.

6 Personnel qualifications

Water samples will be collected by Missouri State University (MSU) field and laboratory personnel who have received appropriate training from experienced personnel, prior coursework, and field experience regarding the collection of grab samples, and who are familiar with all of MSU's sample handling and labeling procedures and appropriate SOPs.

7 Equipment and supplies

- 7.1 Field Notebook, Pen, and Permanent Marker: for recording sample site information and to complete the sample bottle labels.
- 7.2 Global Positioning System (GPS): to locate sample sites
- 7.3 Cooler with ice and bottle rack: for storage and transport of samples from the field to the lab.
- 7.4 Fresh Concentrated Sulfuric Acid (H_2SO_4) in a precise volume dispenser: for preservation of nutrient samples. Fresh concentrated sulfuric acid will be delivered to a clean precise volume dispenser for each sampling event. Arrangements should be made with the laboratory manager **prior** to field activities for this action to take place. Any sulfuric acid not used in the field will be disposed of properly by the laboratory manager. (Caution: highly corrosive. Handle with gloves)
- 7.5 Fresh Concentrated Nitric Acid (HNO_3) in a precise volume dispenser: for preservation of metals samples. Fresh concentrated nitric acid will be delivered to a clean precise volume dispenser for each sampling event. Arrangements should be made with the laboratory manager **prior** to field activities for this action to take place. Any nitric acid not used in the field will be disposed of properly by the laboratory manager. (Caution: highly corrosive. Handle with gloves)

- 7.6 Protective Gloves: for protection against chemicals and from water borne contaminants.
- 7.7 Sample Containers: appropriate for the analytes of concern and that have been *visually checked for cleanliness* by both the laboratory manager during the release of the containers from the laboratory *as well as the field technician before taking the containers into the field*. Always take an additional sample container into the field. Always keep sample containers capped after inspection to prevent contamination. Containers used most often have a capacity of 500 ml and are made of HPDE plastic. The project supervisor will determine the appropriate size and type of sample containers to use for the project.
- 7.8 DI Water: for the field blank (FB). Rinse two clean sample containers three times each with DI water in the laboratory. Fill one of the containers with DI water and cap. Transfer this DI water to the other pre-rinsed container in the field for the field blank. Most project managers prefer that the location of the field blank preparation be noted in the field notes or on the chain of custody (COC) as well.
- 7.9 Nalgene 1100 sampler: high density polyethylene, EPDM gasket, polypropylene ball valve and closure. Meets EPA NPDES MSGP (Fed. Reg. FRL-6880-5 10/20/00). Nalgene cat. number: 1100-1000).
- 7.10 Storm Water Mounting Kit: Nalgene cat. number: 1160-1000.
- 7.11 Chain of Custody Forms: used to describe the written record of the collection, possession and handling of samples. Chain of custody (COC) forms are located on a board in Temple Hall 125. Chain of custody forms should be completed as described in the Chain of Custody SOP # 1030R01.

8 Procedure

- 8.1 Sample bottle labeling: Every sample container must have a sample label (see below for an example). Complete the label using indelible ink before placing the bottle in the stream (i.e., it is easier to write on a dry label than a wet one).

Date: _____ **Time:** _____
Site: _____ **Project:** _____
Analyze for: _____
Collected by: _____
Missouri State University
Ozarks Environmental and Water Resources Institute

- 8.2 Sample collection documentation: For each sample record the date, site ID, sample type, matrix, container type, preservative, time collected and the sample collector's initials on the chain of custody form (see 1030R01 Chain of Custody for explanation of how to complete the chain of custody form). For each sample record the date, site ID, time collected, and any other information required in the field notebook.
- 8.3 Record ambient hydrologic conditions such as stream flow and precipitation in a field notebook as dictated by the specific project QAPP.

- 8.4 Sampler Installation:
- a. Samplers installed within a stream channel or within a storm water ditch will be positioned to draw water near the one year reoccurrence interval (Q1) stage estimated by the slope-area method or below Q1, but above the probable mean annual flow depth to obtain samples during “first flush” flow in the channel. The polypropylene ball valve will seat with the EPDM gasket and close the bottle to prevent mixing with additional runoff.
 - b. Concrete anchors will be used to install samplers within a storm grate or curb inlet box to hold samplers in place and will be positioned within the inlet to receive initial runoff from the storm event and then close prior to mixing with additional runoff.
- 8.5 Field Blank Preparation: rinse two clean sample containers three times each with DI water in the laboratory. Fill one of the containers with DI water and cap. Transfer this DI water to the other pre-rinsed container in the field for the field blank. Use only containers that were specifically rinsed with DI water 3 times prior to field activities. Label appropriately and include the site abbreviation where the field blank was prepared if required by the project manager.
- 8.6 Sample Collection: samples will be retrieved from samplers within 24 hours of sample collection. Bottles are removed from the sampler and sealed with a regular cap for transport.
- 8.7 Sample Preservation: add preserving acid to each sample, duplicate, and field blank immediately after collection or preparation. Do not acidify samples collected specifically for total suspended solid or dissolved fraction analyses. Total suspended solid samples do not require acidification and dissolved fraction samples are acidified after filtration.
- 8.7a Fresh concentrated sulfuric acid (H_2SO_4) is used to preserve samples collected for nutrient analyses. Fresh concentrated nitric acid (HNO_3) is used to preserve samples collected for metal analyses. Fresh acid will be delivered to a clean precise volume dispenser for each sampling event. Arrangements should be made with the laboratory manager **prior** to field activities for this action to take place. Any sulfuric acid not used in the field will be disposed of properly by the laboratory manager. (Caution: highly corrosive. Handle with gloves)
- 8.7b Use the precise volume dispenser to deliver 2 ml of acid into the samples, duplicates, and field blanks by squeezing the dispenser once to fill the inner chamber with acid and then tipping and squeezing a final time to deliver acid to the sample container. There is no need to check the pH of the samples; 2 ml will make the sample pH <2 which is adequate to preserve surface water samples collected in the Ozarks.

- 8.8 Sample Transportation: sample containers are capped and placed on ice in a cooler for transport to the laboratory. The samples will be kept in the possession of Missouri State University personnel who collected the samples until the samples are transferred to a laboratory refrigerator with the appropriate chain of custody forms.
- 8.9 Sample Storage: the samples are placed in a refrigerator in the laboratory located in Temple Hall 125.
- 8.10 Documentation: chain of custody (COC) forms should be completed as described in the Chain of Custody SOP # 1030R01. Field notebooks and copies of the COC forms should be stored by the project manager in a file dedicated to the project for which samples are collected. The original COC will be stored in a file and kept in the quality control manager's office.

9 Computer hardware and software

- 9.1 Microsoft Word: this document is prepared using Word.
- 9.2 The Word document file name for this SOP is: Water Sampling with Nalgene 1100 Sampler.doc

10 References

- 10.1 Nalgene Storm Water Sampler Ordering Information, www.Stormwatersampler.com, Rochester, NY, 2007.

11 Tables, diagrams and flowcharts

There are no tables, diagrams, or flowcharts for this method.