Montana Department of Environmental Quality

Field Equipment Decontamination Standard Operating Procedure

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Approvals:

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REVISION HISTORY

Revision No.	Date	Modified By	Sections Modified	Description of Changes

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ACRONYMS

DEQ	Department of Environmental Quality (Montana)
DI	Deionized
MSDS	Material Safety Data Sheet
PPE	Personal Protective Equipment
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure

1.0 INTRODUCTION

Montana Department of Environmental Quality (DEQ) collects various types of samples for water quality investigations. In order to obtain representative samples, quality assurance measures, which include decontamination of sampling equipment, should be implemented to prevent cross-contamination by sampling equipment. Decontamination consists of physically removing contaminants from equipment. Decontamination should occur when non-disposable field sampling equipment or instruments are used to collect environmental samples from media such as soil, sediment, surface water or groundwater. Examples of soil, sediment, surface water, and groundwater collection equipment that would require decontamination includes dredges, pumps, bailers, tubing, scoops, and other related equipment.

1.1 SCOPE AND APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to establish consistent methods to reduce or eliminate cross-contamination of environmental samples from sampling equipment and improve data quality and reliability. This SOP describes the procedures needed to clean typical sampling equipment that will be used by DEQ personnel conducting water quality investigations to determine the concentration of toxic chemicals, including metals and organics.

These procedures are general and may be modified to meet specific projects based on the contaminants being investigated. The site and project specific procedures will be defined and cited in the project Sampling and Analysis Plan (SAP).

This is applicable to sites where equipment is being used to collect soil, sediment, surface water or groundwater that is coming in contact with known or expected chemical (inorganic or organic) contaminants. This is applicable for highly contaminated sites as well as sites where low-level contaminants are a concern.

2.0 PERSONNEL QUALIFICATIONS

Monitoring staff are trained and experienced in proper sampling and field analysis as described in the DEQ Field Procedures Manual (Montana Department of Environmental Quality, 2012) and associated SOPs. Before data collection, field personnel should be experienced in the use of the field equipment and instruments. Initial training for field procedures is performed by experienced monitoring staff. Experienced field staff accompanies new field staff during monitoring activities until the new staff member exhibits proficiency in the field.

The project manager, or designee, will have the responsibility of ensuring that decontamination procedures are followed in accordance with the SAP. The field personnel will be responsible for applying the decontamination procedures in accordance with the SAP.

3.0 GENERAL PRECAUTIONS/SAFETY

Proper safety precautions must be observed when field cleaning or decontaminating sampling equipment. Field staff should always read and be familiar with the Material Safety Data Sheet (MSDS)

for any acid or solvent use. The MSDS will provide information about a chemical's properties along with health and safety data. The containers used for the acids and solvents used in the decontamination process should be labeled appropriately.

Field personnel will be responsible for using the appropriate Personal Protective Equipment (PPE) when working with corrosive and oxidizing solutions as well as solvents. Always use a fume hood or adequate ventilation when solvent rinsing equipment.

4.0 EQUIPMENT, REAGENTS, AND SUPPLIES

- Appropriate PPE
- Appropriate containers for collecting used acids and/or solvents
- Cleaning brushes
- Dispensing bottles
- Portable water (tap or site water) and container
- Deionized (DI) water and container
- Liqui-Nox® biodegradable, phosphate-free, concentrated soap (use a 1% solution made with tap water for scrubbing equipment)
- 5% Nitric or Hydrochloric Acid (dilute reagent grade nitric or hydrochloric acid with DI water)
- High purity solvents: Hexane (Certified ACS HPLC Grade), Methanol (Certified ACS Reagent Grade), or Acetone (Certified ACS HPLC Grade)
- MSDS sheets for the acids and/or solvents used for decontamination
- Heavy-duty aluminum foil, reclosable plastic bags, or sampling equipment storage container (if necessary)
- Plastic sheeting (if necessary)

5.0 PROCEDURE

5.1 SELECTING THE METHOD

There are several factors to consider when selecting a decontamination procedure. A project manager must consider the objectives of the study, target analytes, anticipated concentration of analytes, data quality objectives, media to be sampled, composition of sampling equipment, and safety of cleaning procedures. For some sampling applications, cleaning the equipment by washing with a detergent solution and rinsing with water may be sufficient. However, if multiple stations will be sampled, decontamination procedures are recommended to minimize cross-contamination of samples among stations. More rigorous equipment decontamination might be necessary if highly contaminated sites are sampled or if low level contaminants are a concern.

The target analytes will be an important factor in selecting the appropriate decontamination method. Whether the contaminants being sampled are inorganic (metals) or organic will determine the acid or solvent used for decontamination. For metals, dilute nitric or hydrochloric acid is used to decontaminate equipment. The type of acid is dependent on whether nitrogen species will be collected for analysis in addition to metals. Nitric acid may be used only if there are no nitrogen samples being collected, while

hydrochloric acid should be used if nitrogen samples will be collected. For organics, organic solvents such as hexane, isopropyl alcohol, acetone, or methanol are used to decontaminate the equipment. See **Figure 4-1** for a flow chart of recommended decontamination procedures.

If it is known that the samples have high concentrations of the contaminant being sampled, then it will take more time and effort to decontaminate the sampling equipment effectively. Begin sampling in the areas where contaminant concentrations are expected to be the least and progress towards more contaminated areas to reduce cross-contamination of samples. To minimize cross-contamination of samples and to reduce the amount of equipment decontamination required, it might be prudent to sample reference sites (i.e., relatively clean sites) first, followed by test stations.

The media to be sampled will also determine the amount of effort to clean equipment. Equipment used to sample oily media or sediments will require more physical cleaning than equipment used to sample water.

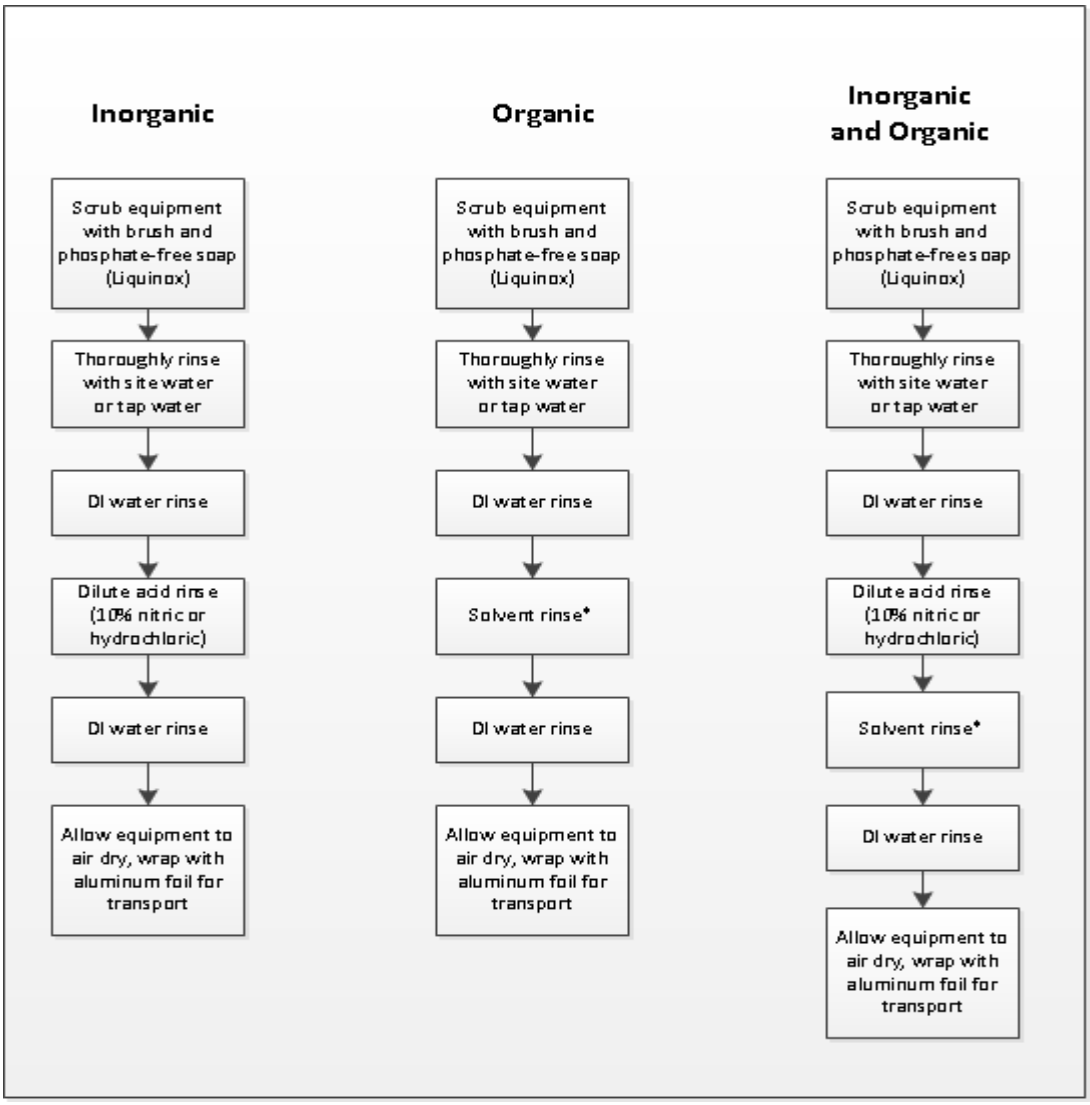

Figure 4-1. General procedures for decontaminating equipment for inorganic and organic contaminants

Table 4-1 shows the recommended acids or solvents for decontaminating equipment for some analytes of interest. Some materials may not be compatible with acids and solvents used for cleaning, so it is important to that the materials used in the decontamination and the materials of the sampling equipment be known so that they can be evaluated for compatibility. For example, hexane has poor compatibility with Tygon, so Tygon tubing used for pumps may be damaged if hexane is circulated through the tubing.

Table 4-1. Recommended Acids/Solvents for Analytes of Interest

5% Nitric Acid	5% Hydrochloric Acid[1]	Hexane	Methanol	Acetone
Metals	Metals and Nutrients	Polycyclic Aromatic Hydrocarbons (PAHs)	Volatile Organic Compounds	Semi-Volatile Organic Compounds
		Polychlorinated Biphenyls (PCBs)		Pharmaceuticals
		Non-Polar Pesticides (Organochlorine Pesticides, DDT, Dieldrin, Toxaphene, etc.)		Polar Pesticides (Many herbicides, Some Organophosphate Pesticides)
		Dioxins/Furans		Many Emerging Contaminants

[1]Hydrocholoric should be used if samples will be analyzed for nitrogen species in addition to metals

5.2 STEP-BY-STEP PROCEDURE

In general, sample contacting equipment should be washed with a detergent solution followed by a series of control water, desorbing agents and deionized water rinses. This general procedure can be done before, between, and after sampling. The following decontamination procedure will be applied to the surfaces of sampling equipment:

- Wash with detergent solution, using a brush made of inert material to remove any particles or surface film.
    - For equipment that cannot be cleaned with a brush (e.g., tubing), circulate the decontamination solutions through the equipment
- Rinse thoroughly with site or tap water. Visually inspect for cleanliness, and repeat scrubbing and rinsing if necessary.
- Rinse thoroughly with DI water.
- If sampling for inorganics, rinse with a dilute acid (10% reagent grade Nitric or Hydrochloric Acid)
- Rinse thoroughly with DI water.
- If sampling organic compounds, rinse with appropriate solvent identified from **Table 4-1**.
- Rinse thoroughly with DI water.
- Let air dry as much as possible.
- Keep the cleaned, decontaminated equipment separate from dirty equipment and samples. In some cases, the equipment should be wrapped in aluminum foil, sealed in

reclosable plastic bags, or kept in a storage container with lid for transport to prevent cross-contamination depending on the sampling application.

The decontamination procedure will generate rinsates and wastewaters and all washing and rinsing solutions should be captured in a container for proper disposal. Some of the organic rinsates volatilize quickly and are difficult to capture, but sampling staff should employ their best efforts to capture as much as possible.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Evaluating and documenting the effectiveness of decontamination is essential to obtaining reliable data. Equipment rinse blanks are a tool to evaluate the effectiveness of the decontamination procedures. These samples are collected by pouring over or running DI water through the sample collection equipment after decontamination. The sample is collected in the appropriate sample container with the proper preservative, identical to the samples, and analyzed for the same parameter suite as the samples.

The frequency of sampling of equipment rinse blanks to demonstrate the completeness of equipment decontamination is dependent upon objectives of the project as they relate to quality assurance/quality control. At a minimum it is recommended to do at least one equipment rinse blank per sampling event.

If contaminants of concern are detected in the equipment rinse blank, further investigation will be required to determine the source of contamination and treatment of the associated data.

REFERENCES

ASTM International. 2008. Standard Practice for Decontamination of Field Equipment Used at Waste Sites. Active Standard ASTM D5088-02.

Montana Department of Environmental Quality. 2012. Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring, Version 3.0. Helena, MT: Montana Department of Environmental Quality.

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