COVER SHEET
STANDARD OPERATING PROCEDURE

Operation Title: **PROTOCOL FOR COLLECTING SAMPLES FROM CONTAINERS**

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1.0 APPLICABILITY

This Standard Operating Procedure (SOP) applies to all programs in the Maine Department of Environmental Protection's (MEDEP) Division of Remediation (DR). It is also applicable to all parties that may submit data that will be used by the MEDEP/DR.

This SOP is not a rule and is not intended to have the force of law, nor does it create or affect any legal rights of any individual, all of which are determined by applicable statutes and law. This SOP does not supersede statutes or rules.

2.0 PURPOSE

The purpose of this document is to describe the MEDEP/DR procedure for the handling and sampling of containers containing unknown and known hazardous chemicals and petroleum products. This includes drums of all sizes, tanks of all sizes, buckets, cans and any other type of vessel that may contain chemicals (in all phases) as well as petroleum.

3.0 RESPONSIBILITIES

All MEDEP/DR Staff must follow this procedure when performing this task. All Managers and Supervisors are responsible for ensuring that their staff are familiar with and adhere to this procedure. MEDEP/DR staff reviewing data by outside parties are responsible for assuring that the procedure (or an equivalent) was utilized appropriately.

4.0 GUIDELINES AND PROCEDURES

4.1 INTRODUCTION

The situations in which containers of chemicals are discovered and require sampling for characterization is wide and varied. Situations can include a few containers of unknown material in an abandoned residential garage, a cache of drums located in the basement of a mill, or mass burial of drums and tanks in a field. Each of these situations provides its own hazards, constraints, and sampling requirements. Therefore, this SOP will outline the items that need to be considered for planning and implementing container sampling.

4.2 PLANNING/SITE RECONNAISSANCE

Planning and preparation is the key to a safe and productive container sampling event. Prior to conducting any type of container sampling, a sampling and analysis plan (SAP) and a health and safety plan (HASP) must be developed. Protocol for the development of a Sampling and Analysis Plan can be found in MEDEP/DR SOP# RWM-DR-014 – Development of a Sampling and Analysis Plan. However, container sampling does have additional needs. A full reconnaissance of the site should be conducted prior to actual opening and sampling of containers. All containers should be identified, inventoried, and conditions noted prior to the

actual sampling event. Additionally, all staging, sampling and storage areas should be inspected to assure the areas are of suitable size, provide stable conditions, and adequately protect staff and containers during sampling and storage until disposal is arranged. It is better to make additional reconnaissance trips to assure that all needed information is obtained, rather than be surprised during sampling when containers will be open, and chemicals exposed.

The SAP should address all of the following items:

1) Purpose of sampling. Is sampling to determine what material is, or for disposal purposes? What analysis will be run? How much material is needed for each sample? What are the data quality objectives?

2) Location and Access of containers. Where are the containers on the site located? Are they buried? Is it safe to excavate them? If located in a structure, is it safe for access? Will the structure require shoring? If the containers are not sealed or are leaking, have they created a hazardous situation where they are located?

3) Number of Containers to be sampled. How many containers are there? Have they all been identified, or will more be located? Is each one to be sampled? Can they be grouped together?

4) Type and Size of Containers to be sampled. Are all containers of the same type and size, or are they different? Will you need different size/ type of opening devices for containers?

5) Condition of Containers. Are containers intact, or will they fall apart if moved?

6) Moving of containers. Can containers be sampled where they are currently located, or must they be moved? How will they be moved? Do containers with non-compatible materials exist near each other?

7) Opening of containers. How will containers be opened? Does the access port work, or are they rusted shut? Will we need to puncture containers to access contents?

8) Material within containers. What most likely is the material to be sampled? Are there markings? From what industry did the material come from? Is it a solid, liquid, or gas? Might it be multiphase, and layered? Which layers should be sampled? Are the contents unused chemicals in their original containers, or a waste chemical in a reused container?

9) Health risks posed by material. How toxic is the material? Will it explode? Will it release toxic gases once open? Do samplers have the correct personal protective equipment?

10) Security of containers after sampling. Can the containers be closed after opening? Will containers be safe from weather and people accessing site?

11) Surrounding area. Is it residential, urban, industrial, or commercial? If containers leak or explode, will neighbors be affected? Can vandals break into the site and disturb containers after sampling?

12) Shipping of material to lab. Are there any rules or regulations that apply to shipping the material that has been sampled? Any special manifests or tamper proofing required? Is material safe to transport via standard shipping? What if a container breaks?

13) Decontamination. Certain chemicals may require additional decontamination procedures. Will the site be able to support required decontamination? Will a water supply or electricity be required that isn't currently available at the Site location?

14) Documentation. What level of documentation is required? Will documentation be needed to meet disposal requirements, or will documentation be used in an enforcement action? Will specialized forms be used?

15) Exposure to material. What will happen to staff if exposed, and can local hospitals decontaminate accident victims if necessary?

The SAP should also include a map or description of the activities area showing staging areas, egress routes, hot/cold zones, decontamination areas, container storage areas, and any other areas of activity or hazard.

It should be noted that container sampling situations exist that may require use of PPE that require specialized training and health monitoring. Personnel are not to conduct work in scope that is beyond their training, job classification, and health monitoring.

4.3 EQUIPMENT

Equipment for a container sampling event can be varied depending on the containers to be sampled, condition, and location, as well as the sampling objective. Generally, equipment required will be:

- Personal protective equipment (PPE);
- Environmental monitoring equipment,
- Container staging equipment;
- Container opening equipment;
- Sampling equipment;
- Sampling containers; and
- Decontamination equipment.

4.3.1 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Container sampling provides additional health and safety risks than standard environmental sampling. Chemicals will be encountered in a non-diluted form, as a solid, liquid, or gas, and may pose additional dermal and respiratory risks. Additionally, physical hazards with accessing

and opening containers, such as sharp edges, may also be present. Therefore, in addition to standard field PPE (steel toed/shank boots, coveralls, eye protection) additional PPE may be required, based on the expected chemicals to be sampled, and the environment in which the containers will be located during sampling. Additional PPE that may be required includes:

- Chemical protective boots or over boots;
- Chemical specific coveralls;
- Chemical specific gloves;
- Face shields or other splash or vapor protection;
- Respiratory Protection – air purifying respirators (APR) or self-contained breathing apparatus (SCBA). APRs and SCBA can only be used by those participating in the DR's Respiratory Protection Program.

It is imperative that selected PPE meet the needs of the sampling and are compatible with the chemicals expected to be encountered. PPE and Chemical compatibility can be found from suppliers of PPE, manufacturers of PPE, and OSHA and USEPA websites and guidebooks. Guidance changes as new material for PPE is developed and additional toxicological information is developed. It is imperative that up to date information be obtained. As stated earlier, PPE must be outlined in the sampling plan and references should be included from which compatibility is determined.

Respiratory protection is based on chemicals encountered and the environment of sampling. For example, opening and sampling of containers in a basement with no air exchange may require respiratory protection, whereas sampling of containers in a wide- open field may not. As with the case of PPE, health safety levels of chemical vapors can be found in various OSHA, NIOSH, and USEPA websites and guidebooks, and manufacturers of respiratory sampling equipment. Up to date information must be obtained to assure appropriate respiratory protection decisions are made. The need and requirements for respiratory protection must be addressed on the sampling plan; references for determining levels of respiratory protection should be included.

4.3.2 ENVIRONMENTAL MONITORING EQUIPMENT

It may be necessary to conduct monitoring of the ambient air prior to, during, and after sampling to assure a safe environment, and to determine levels of PPE required. MEDEP/DR and Maine Department of Environmental Protection Division of Technical Services (MEDEP/TS) maintain various environmental monitoring equipment, including but not limited to:

- Flame ionization detector (FID);
- Photoionization detectors (PIDs) with parts per million and parts per billion detection limits; and
- Multi-gas meters (methane, oxygen, hydrogen sulfide, and carbon dioxide).

Staff should receive training on the proper use of monitoring equipment prior to using in the field and review the SOPs for that equipment's use.

It must be documented in the HASP that the field monitoring equipment selected for a sampling event will detect the chemicals of concern at the chemicals' health and safety guidance levels. Information regarding the use and detection limits of specific monitoring equipment is provided by the manufacturer. Detection limits and health levels, including action levels for determining appropriate PPE and can be found at USEPA, NIOSH, and OSHA guidebooks and websites.

Given the potential sampling situation, it may be necessary to rent additional equipment to provide monitoring that MEDEP equipment cannot. All users of rented equipment must be appropriately trained for its use and interpretation of the results.

4.3.3 CONTAINER STAGING EQUIPMENT

If containers need to be moved to be staged or stored, the equipment necessary for moving the containers must be determined prior to the sampling event. This may include items for manual moving, such as drum dollies or other hand carts, and mechanized equipment, such as pallet jacks, bobcats, and excavators with appropriate container grappling equipment. The Sampling and analysis plan will outline the method for moving and securing containers.

4.3.4 CONTAINER OPENING EQUIPMENT

Devices for opening containers depend on the type of containers to be opened, the condition the containers are in, and the material within the container. Some containers have bungs requiring a specific bung wrench; others may be opened with a standard adjustable wrench. Many containers in which the entire top is removed may require only a flat screwdriver. Tool requirements for opening containers should be determined during site reconnaissance. Depending on the suspected material in the container, it may be necessary to utilize non sparking tools constructed from a copper alloy to prevent sparks. Due to corrosion, many containers entry points may be corroded shut. In these instances, puncturing the drum with a hammer and spike, or a spike attached to a hydraulic arm (such as on an excavator or backhoe) may be necessary. Many tools are available constructed from copper alloys to prevent sparks igniting combustible atmospheres.

Possible tools that may be used for opening containers include:

- Bung Wrench, standard and non-sparking;
- Adjustable wrench, standard and non-sparking;
- Flat screwdriver, standard or non-sparking;
- Hammer, standard or non-sparking;
- Spike or other puncturing tool, standard or non-sparking;
- Crowbar, standard or non-sparking;
- Excavator, backhoe, or other powered machinery for more puncturing power.

4.3.5 SAMPLING EQUIPMENT

There are numerous types of sampling devices that are available for the sampling of containers including drum thieves, bomb samplers, Composite liquid waste samplers (COLIWASA), etc. Each device collects samples in a different way; samplers should be selected based upon the expected material and its physical characteristics, phase, viscosity, etc. Standard sampling tools such as dippers, scoops, and even shovels and crow bars may be viable tools for collecting samples from containers.

The following describes the sampling tools specific to containerized chemical sampling.

4.3.5.1 BOMB SAMPLER

A tubular shaped sampler attached to a rope or chain with a remote operated opening. Bomb samplers are made from a variety of material, such as plastic, Teflon, or stainless steel, so the appropriate sampler can be selected for compatibility with expected material to be sampled. Bomb samplers are used to extract liquid samples (typically between 4 and 32 ounces) from tanks, ponds, larger drums, at specific depths. The bomb sampler requires two lines - one to lower and raise the device, and one to open the plunger, which allows the liquid to flow into the sampler.

4.3.5.2 COMPOSITE LIQUID WASTE SAMPLER (COLIWASA)

A Composite liquid waste sampler (COLIWASA) is a “tube” of varying size and material with a means of opening and closing the lower end to allow the material to enter the tube, then close the tube to keep the sample from escaping. A COLIWASA is designed to take a composite (from top to bottom) sample. Originally developed to obtain samples from drums, but currently available in many sizes and materials to allow use for sampling drums, tanks, pails, tank cars, etc. Available construction material includes glass, plastic, acrylic, and Teflon.

4.3.5.3 DRUM THIEF

A drum thief is a rigid length of tubing, which is used to obtain a liquid sampler from a drum or tank. A thief differs from a COLIWASA in that it relies on capillary pressure to hold the sample within the tube. Drum thief samplers are manufactured in both glass and plastic and come in varying sizes.

4.3.5.4 PERISTALTIC PUMP

A peristaltic pump is a vacuum pump that may be used to obtain a sample from a drum by lowing the tubing from the pump into the container and removal of the sample at the desired depth. Peristaltic pump tubing comes in a variety of materials.

4.3.6 SAMPLING CONTAINERS

Sampling containers will be based on the requirements of the laboratory conducting the analysis. Project managers must communicate with the laboratory conducting the analysis to assure appropriate chemical analysis is being conducted, and appropriate containers are procured. Additionally, requirements for sample preservation should also be determined and included in the sampling plan.

4.3.7 DECONTAMINATION EQUIPMENT

Decontamination procedures can be found in MEDEP/DR SOP# RWM-DR-017 –Equipment Decontamination Protocol and must be outlined in the SAP. Sampling tools such as drum thieves and COLIWASAs are considered one use/disposable and will not be decontaminated. Other devices, such as bomb samplers, may be decontaminated. Similarly, PPE, such as gloves, coveralls, booties, etc. are also considered one use/disposable items. However, it may be necessary to remove gross contamination or to neutralize reactive chemicals prior to removal of PPE.

4.4 SAMPLING PROCEDURE

1) Conduct Site Reconnaissance/ Inventory containers. As discussed earlier a complete reconnaissance/inventorying of the containers and possible contents must be conducted.

2) Draft Sampling Plan. Using information obtained during site reconnaissance, research into site activities, possible sources of containers, PPE requirements, and sampling needs; draft an appropriate Sampling and Analysis Plan (SAP), and Health and Safety Plan (HASP). All staff involved in sampling activities must read the SAP and HASP prior to conducting any field event.

3) Mobilize to Site. Prior to conducting any activities, conduct a field team meeting with all staff involved to assure all staff understand their roles and responsibilities. Set up hot/cold zones, decontamination zones, and post-sampling container storage areas, and any other site-specific preparation activities as outlined in the SAP.

4) Set up environmental monitoring equipment (if necessary). As outlined in the Site-Specific SAP, calibrate and set up all required environmental monitoring equipment, following appropriate SOPs and the operator's manual for the specific monitoring device.

5) Don appropriate PPE. Don all appropriate PPE as outlined in SAP/HASP.

6) Stage containers. If determined necessary, move containers to a safe and secure location for conducting the sampling.

7) Open containers. Using the appropriate tools as outlined in the SAP, open the containers to access material. Conduct monitoring of breathing zones with monitoring equipment, as outlined in the SAP. Results of monitoring should be documented in field book, as well as any other observations made such as odors, visible emissions from containers, etc.

8) Collect Samples with selected equipment. Utilizing the chosen equipment, collect samples from containers. Prior to collection, an attempt should be made to determine if contents have separated into different layers that may require multiple collection from one container. Be sure to close containers tightly after sampling to prevent any leakage. Sampling should be documented in field notes as outlined in MEDEP/DR SOP# RWM-DR-013 - Documentation of Field Activities and Development of a Trip Report, and any other requirements as outlined in the SAP. Any observations regarding layers, odors, etc. should be documented in field notebooks, as well as any other observations considered important. It should be noted that during the act of sampling, situations may arise that were not planned for. It is better to back away and sample another day than risk injury by improvising.

9) Seal and secure containers. Replace bungs/covers, or if damaged or samples collected through punctures, seal up containers to prevent any leakage from containers. Secure containers to prevent unauthorized access.

10) Prepare sampling containers for transport. Clean any chemicals from side of jars. It may be necessary to "double wrap" containers to prevent sample container handlers from contacting spilled material on sides of jars. Pack sample jars in cooler or other appropriate carrier to prevent damage while shipping. If transporting containers to lab via public courier such as UPS or FEDEX, make sure appropriate DOT requirements for the potential chemicals are followed.

11) Decontaminate Staff/Equipment. Following the protocol outlined in MEDEP/DR SOP# RWM-DR-017 –Equipment Decontamination Protocol and in the Site-Specific SAP, decontaminate equipment and staff as necessary. If using disposable equipment/PPE, collect material and arrange for appropriate disposal. It may be necessary to store the equipment until results of the sampling have been received; be sure to find a secure location to store this material.

12) Secure containers/Site. Prior to leaving the Site, make sure containers are closed and secure, along with any waste generated not being immediately removed. Be sure to secure the Site to prevent unauthorized access.

5.0 QUALITY CONTROL

Data quality objectives (DQOs) must be determined prior to sampling and outlined in the SAP. If the data collected during the sampling event is to be used for enforcement activities, it may be necessary to conduct more stringent QA/QC activities. Therefore, field staff should coordinate with enforcement staff to assure QA/QC needs are being met.

As with the case with any sampling event, all data generated should be reviewed to determine if DQO's have been met. Noted deficiencies should be documented, along with expected impact to the data in the final activities report.

Quality Assurance/Quality Control (QA/QC) samples may be collected if needed to meet your data quality objectives. The following typical types of QA/QC samples may be collected as part of the QA/QC program for container sampling:

5.1 EQUIPMENT BLANKS

Equipment blanks should be collected at a rate of 5%, one equipment blank every twenty samples collected if using non dedicated/disposable equipment.

5.2 DUPLICATE SAMPLES

It is recommended that duplicate samples be collected at a rate of 5% to assess sample location variability.

For an additional discussion of QA/QC, please refer to the MEDEP/DR Quality Assurance Plan, Sections 4 and 8.

6.0 DOCUMENTATION/CHAIN OF CUSTODY

All sampling activities must be documented as outlined in MEDEP/DR SOP# RWM-DR-013 - Documentation of Field Activities and Development of a Trip Report. Sample custody must be followed as outlined in MEDEP/DR SOP# RWM-DR-012 – Chain of Custody Protocol.

Due to the nature of container sampling and managing of containers, it may be necessary (or just easier) to develop specific forms or use forms generated by EPA, contractors, or other agencies for record keeping. Use of forms not bound by field books is discussed in MEDEP/DR SOP# RWM-DR-013 - Documentation of Field Activities and Development of a Trip Report. Specialized forms should be outlined in the SAP. Specialized forms should be printed on waterproof paper to prevent damage during field use.

As mentioned earlier, if data collected during the sampling event is to be used for enforcement activities, it may be necessary to collect additional or more detailed documentation than normally collected or collect data in a specific format. Therefore, field staff should coordinate with enforcement staff to assure documentation needs are being met.

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