COVERSHEET
STANDARD OPERATING PROCEDURE

Operation Title: **FIELD SCREENING OF SOIL SAMPLES UTILIZING PHOTOIONIZATION AND FLAME-IONIZATION DETECTORS**

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DISTRIBUTION;

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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 DEP/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 field screening volatile organic content of soils using a closed container and a photoionization detector (PID) or a flame ionization detector (FID).

3.0 RESPONSIBILITES

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 INTRODUCTION

In conducting this procedure, a soil sample is placed in an approved container in which the headspace of the volatile compounds are allowed to come to equilibrium. The headspace is then measured with a calibrated PID or FID, with a result expressed in parts per million (ppm). Due to the different vapor pressures and ionization potentials of the volatile compounds, concentrations of individual compounds cannot be determined. However, this technique provides an effective means of screening soil for the presence of total volatile organic compounds. It is also a helpful low-cost field technique that can be used to locate "hot spots", identify the extent of hot-spots, and as a means of screening samples for submittal for laboratory analysis.

This methodology may not be sensitive enough to identify individual VOCs at or near the appropriate guidelines (with the possible exception of petroleum contaminants). The methodology is not a substitute for actual laboratory analysis. The method is a low-cost field screening tool that is most effective when the number of site screening samples is proportional to the size of the area of concern and/or volume of contaminated soil. The methodology effectiveness is also based on the knowledge and experience of the environmental professional and the development of a good conceptual site model.

5.0 PLANNING

As with any sampling event, 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 (SAP) can be found in MEDEP/DR SOP# RWM-DR-014 – Development of a Sampling and Analysis Plan.

6.0 EQUIPMENT

The following equipment is required for conducting the procedure:

- Soil sampling equipment (shovel, bucket auger, soil borer);
- Approved containers (recommend using a metalized aluminum bag or glass jar, see section 6.1);
- A PID or FID; and
- Calibration equipment, including users manual, for particular PID or FID to be used.

6.1 SPECIAL CONSIDERATIONS REGARDING CONTAINERS

Currently, the most commonly used (and recommended) containers are one quart sized metalized aluminum bag (various manufacturers make these types of bags). Also used are wide mouthed, metal screw top 16 oz jars, with a ¼ inch hole drilled through center, with foil over the top to provide the seal.

7.0 PROCEDURE

1) Warm up and calibrate the PID and FID instrument to be used according to the manufacturers recommended procedure (See Section 8 - Additional Considerations With Use of PID/FID). The PID and/or FID should be ready for use prior to collection of the first sample.

2) Collect the soil sample, as outlined in the site specific SAP, utilizing appropriate soil sampling equipment.

3) Place approximately 200 grams of the soil sample into an approved container as stated in the SAP. The same type of container should be consistently used at the site for comparison purposes; do not mix or reuse headspace containers (unless the approved container is reusable and cleaned appropriately between uses). In so far as possible, samples should be mineral soil free of vegetation and stones larger than ½ inches in diameter. If soil samples are of different type (loam, sand, silt), this should be identified in the field log book. If a duplicate sample is to be submitted to the laboratory for analysis, this sample should be containerized and preserved as appropriate **immediately**. Care should be taken to co-locate field screening and laboratory samples from the same soils. Laboratory VOC samples should not be taken from the field screening sample after it is screened, unless approved in the SAP and documented in the field notes and subsequent report. If using jars, the jars should be immediately sealed by placing a square of foil over the mouth and screwing on the lid. If using a metalized bag, the gusset at the bottom should be opened to allow development of the headspace within the entire bag.

4) Knead and break-up soil clods and shake the container for 30 seconds to thoroughly mix the contents.

5) Let Sample equilibrate for 10-minutes and shake again. Allow at least ten minutes but not more than 60-minutes for VOCs to reach headspace equilibrium with the headspace. An attempt should be made to allow the same amount of equilibration time for each sample. When ambient temperatures are greater than 70-degrees, samples should be stored in the shade. When temperatures are below 70 degrees, samples should be warmed in the sunlight or in a running vehicle.

6) Measure and record the samples headspace concentration with the instrument by recording the highest PID/FID response. Collect a sample of the headspace by inserting the PID/FID probe into the appropriate opening for the container you are using. It is important to insert the probe as quickly as possible after the seal to the container has been broken. If the highest reading is related to a spike in the instrument response, then both the spike response and the highest response should be recorded and noted. Documentation of headspace results should be outlined in the SAP.

8.0 ADDITIONAL CONSIDERATIONS WITH USE OF A PID/FID

The protocol for operating a PID/FID can be found in SOP# RWM-DR-019 – Protocol for the Use of Portable Vapor Monitors.

There are limitations of PIDs and FIDs. A PID or FID cannot detect all VOCs, nor do they detect all VOCs equally. Factors that influence the response of the particular compound include ionization potential of compound, particular energy rating of lamp, calibration standard used, response factor, response curve, etc. In some instances, such as when the contaminant of concern is a single known compound, it is possible to calibrate the instrument so that a relatively accurate measurement, when compared to laboratory analysis, can be obtained. Because of this, it is recommended that the operator of the particular instrument that will be conducting this procedure take the time before the sampling event to familiarize themselves with the particular instrument that will be used, if they are not already familiar with that instrument. This includes reviewing the specific user manual, and calibration and practice with the instrument prior to the sampling event. If petroleum constituents are the primary contaminants of concern or there is a mixture of VOCs and petroleum constituents SOP TS004 should be followed unless otherwise stated in the SAP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

Data quality objectives (DQOs) should be stated in the SAP (See SOP# RWM-DR-014). Quality assurance/quality control (QA/QC) samples may be collected if needed to meet your DQOs. The following are typical QA/QC samples or tasks conducted for PID/FID field screening. Additional sampling or tasks may be added based on the DQO requirements of the project.

9.1 RECALIBRATION DURING USE

During the course of the work day, the PID/FID should be bump tested with the appropriate calibration gas every two hours during the work day, or after screening samples with headspaces greater than 1,000 ppm. If the bump test reading is more than 10% different from the calibration gas, then the instrument should be recalibrated. All bump test and recalibration readings must be documented in the field notebook.

9.2 DUPLICATE SAMPLES

Field screening duplicate samples may be collected at a rate of 5% to assess sample location variability.

10.0 DOCUMENTATION

Field notes should be collected following the standard procedures outlined in MEDEP/DR SOP# RWM-DR-013 - Documentation of Field Activities and Development of A Trip Report. It is important that documentation include the specific lamp energy rating, calibration standard, and special response factors or curves that may be employed for the particular sampling event. When documenting such a sampling event, one should include enough information so that a person at a later date can easily duplicate the sampling and be able to compare the results.

As this type of screening is done in the field by the sampling team conducting the sampling, no chain of custody is required.

Specialized forms may be developed for recording field screening data. Additionally, some PID/FIDs have software which can record data. Any special method of recording and documenting results must be outlined in the SAP.