COVERSHEET

Operational Title: Soil Gas Sample Collection Method Utilizing Hand Tools

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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 using hand tools to collect soil gas samples for the evaluation of contaminant vapor intrusion.

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 GUIDANCE AND PROCEDURES

4.1 PREPARATION

4.1.1 SAMPLING PLAN

A Conceptual Site Model (CSM) is important for effective soil gas sampling. Prior to conducting any sampling event, a Sampling and Analysis Plan (SAP) should be developed (see SOP# RWM-DR-014 - Development of a Sampling and Analysis Plan). Included in the sampling plan should be specifics regarding the anticipated substances of concern, data quality objectives, the laboratory conducting analysis, sample containers and tubing for collection, and Quality Assurance/Quality Control (QA/QC).

When evaluating vapor transport it is important to identify preferential vapor pathways that are created by relatively permeable non-native fill associated with site development. Utility trenches are of particular importance because they can facilitate transport of both vapor and groundwater. At a minimum a CSM should identify potential site sources (e.g. current and former USTs, petroleum dispensers, dry cleaning machines, and ventilation hoods), preferential pathways (and interrelationships), surface water drainage patterns (both natural and man made or influenced), and closest receptors in all directions from the site.

4.1.2 SCHEDULING

It should be noted that sampling during heavy precipitation and saturated soil conditions may negatively effect collection of soil gas samples. A provision to have alternate days for conducting field work if scheduled days are raining, or immediately following heavy rains, should be made.

4.2 EQUIPMENT

4.2.1 EQUIPMENT LIST

The Equipment used for the collection of soil gas samples when following this this SOP may include:

- Pilot Hole Tool
  - Mechanical small diameter drill and bit (3/8 to 5/8-inch),
  - Tile Probe with slam bar
  - Removable or fixed drive point and rod,
- Thin walled narrow diameter screened stainless steel sampling tube;
- Vacuum pump, such as peristaltic;
- Bentonite clay or modeling clay;
- Polyethylene tubing (see Section 5.2.3)
- Teflon lined tubing (see Section 5.2.3)
- Containers (Summa Canister or Tedlar Bags, see Section 5.2)

4.2.2 Specific Container and Tubing Considerations for Soil Vapor Sampling

Due to the nature of soil gas sampling, additional planning must be undertaken in order to assure the appropriate sample collection/analysis methods and appropriate containers for a sampling event. Two types of sample containers are described in this SOP; Summa Canisters and Tedlar Bags. When deciding which container to use, staff should consider the data quality objectives (DQOs) for the sample and the availability of a laboratory capable of analyzing the sample that is both State certified and capable of reaching required detection limits.

4.2.2.1 Summa Canisters

A Summa canister is a clean metal container sealed with a vacuum; this vacuum is then used to draw in the gas sample. Summa canisters must be ordered from a laboratory in advance of the sampling event and are available from a limited number of labs. Samples from Summa canisters are analyzed by certified labs only, and by methods which have been approved by EPA and have detection limits that generally meet the ambient air guidelines.

Summa canister samples can collect two types of samples; grab and time elapsed. Grab samples are collected utilizing the vacuum of the canister for a sample with a collection time of

less than 30 minutes. Time elapsed are samples collected utilizing the vacuum of the canister over an extended period of time, up to and beyond 24 hours. Both sample types require a regulator between the tubing and canister to control the length of time the sample is collected. The regulator will be provided and calibrated by the laboratory conducting the analysis of the sample. The type and duration of sample should be indicated as part of the SAP.

Clean Summa canisters must be obtained from the laboratory providing the analysis for each sampling event. Unused canisters will be sent back to the laboratory. The laboratory will need to be informed as to the sample collection method used and the duration of collection time prior to shipping the Summa canisters and regulators for the sampling event.

4.2.2.2 Tedlar Bag

A tedlar bag is a bag manufactured from Tedlar (Polyvinyl fluoride) with a two way valve. Tedlar bag samples require less time for planning because they can be ordered in advance and kept on hand until they are needed. However, the bags must be stored in a clean location. Laboratories capable of analyzing these samples are even more limited than the Summa Canisters. Holding time for tedlar bag samples is 48 hours. However, tedlar bags can be analyzed in the field with a mobile laboratory (that is capable of providing the analysis), providing real time data. Due to detection limits for this analytical method (generally 10 times the indoor air standard for most compounds), tedlar bag collection is most often used for screening purposes. There is not an USEPA approved method; samplers using tedlar bag collection must communicate with the laboratory conducting the analysis, prior to sampling, to be sure DQOs will be met..

4.2.2.3 Tubing Selection

Certain volatile chemicals (especially those found in petroleum products) may interact with certain types of tubing used for collecting samples. Tubing used for vapor sampling is usually a flexible, polyethlene based tubing. These interactions will affect the quality of sample results, and may require a contaminant specific tubing, such as a Teflon lined tubing (e.g. when sampling for petroleum vapors). Therefore, contaminants of concern for the site should be determined before collecting samples (refer to the Site's CSM). If tubing interaction is a concern, the laboratory and/or the DEP Chemist in the DEP's Division of Technical Services should be consulted prior to sample collection to assure appropriate tubing is used. Type of tubing used should be noted in the field notes of the samplers.

4.3 SAMPLE COLLECTION

4.3.1 Overview

The drill or tile probe is used to create a pilot hole between 18 and 48 inches below the ground surface. The thin wall screened stainless steel or aluminum tube is inserted into the pilot hole

and advanced to an optimum depth of 3-4 feet. The sample tube is sealed at the surface with clay and at least one sample tube volume should be purged with a peristaltic pump. To help assure that a representative sample will be collected, atmospheric CO_2 and O_2 can be compared to subsurface CO_2 and O_2 measurements using a multi meter field instrument. Atmospheric O_2 concentrations are usually much higher than subsurface O_2 levels. Atmospheric CO_2 concentrations are usually much lower than subsurface CO_2 levels. To collect a sample for analysis, tubing is connected to the top of the sampling tube and a soil gas sample is either pumped or collected under vacuum directly into the sample container. If utilizing a Summa canister be sure to record both the starting and ending pressures on the canister.

5.0 QUALITY CONTROL

Due to cross contamination issues inherent with soil gas sample collection, more rigorous quality control sampling may be required then the sampling of other media. DQOs should be stated in the SAP. Quality Assurance/Quality Control (QA/QC) samples may be collected if needed to meet your DQOs. The following typical types of QA/QC samples should be collected as part of the QA/QC program for soil gas sample collection. For an additional discussion of QA/QC, please refer to the MEDEP/DR Quality Assurance Plan, Sections 4 and 8.

5.1 EQUIPMENT BLANKS

Equipment blanks should be collected at a rate of 5%, which is equivalent to one equipment blank for every twenty samples collected. The equipment blank will consist of purging a complete drive rod and closed point system with zero air and collecting the air for analysis in either a Tedlar bag or Summa canister.

5.2 DUPLICATE SAMPLES

It is recommended that duplicate samples be collected at a rate of 10% to assess sample location variability.

5.3 BACKGROUND/AMBIENT AIR SAMPLES

One to two ambient air samples per day should be collected at the sampling locations to assess ambient air conditions.

5.4 TRIP BLANK

A trip blank should be collected particularly when utilizing tedlar bags as sample containers. The trip blank will consist of a tedlar bag filled from a canister of zero air that is kept with the sample containers at the start of the day and travels with the containers to the laboratory.

5.5 TRACER GAS DISPERSION

Difficult ground or weather conditions, such as frost or cold weather, may make sealing of the direct push rods from ambient air difficult. This will allow ambient air to intrude into the soil formation, and not provide a true sample of the gas within the soils spaces. In these situations, a tracer gas such as sulfur hexafluoride (SF^6) can be dispersed around the ground penetration point during sample collection to determine if ambient air contamination of the sample is present. If the immediate analysis indicates SF^6 detection in the sample, re-sampling of the location may be warranted. Alternatively, the O_2 - CO_2 comparisons can be used to assure good quality samples were collected.

6.0 SYSTEM DECONTAMINATION

In an effort to provide the most representative soil vapor samples possible, all tooling and materials in contact with the site soils will be cleaned with a detergent wash and potable water rinse prior to re-use, as outlined in MEDEP/DR SOP# RWM-DR-017 – Equipment Decontamination Protocol. Additional cleaning of the tooling with steam cleaning may be warranted depending on the site contamination.

New, flexible tubing (i.e. dedicated) will be used at each different sample location, regardless as to the type of tubing used.

7.0 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 soil gas sampling, attention should be made to the following:

1) Weather conditions particularly precipitation within past 3 days;
2) Depth of sample collection;
3) Possible sources of off site contamination (gas stations, dry cleaners, automotive body shops, etc.) in the vicinity of the investigation field work;
4) Possible sources of cross contamination (fueling vehicles/equipment, etc)
5) Length of time of sample collection.