COVERSHEET
STANDARD OPERATING PROCEDURE

Operation Title: **PROTOCOL FOR COLLECTING INDOOR AIR SAMPLES**

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( ) Division of Remediation……...By:_____Date:_____

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 MEDEP/DR procedure for collecting indoor air samples from buildings in the context of evaluating a complete vapor intrusion pathway.

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 PREPARATION

Investigators should evaluate the potential for vapor intrusion simultaneous with indoor air sample collection or prior to indoor air sampling. Indoor air samples should never be collected without an appropriate vapor intrusion evaluation (appropriate ASTM Guidance, soil gas sampling, sub-slab soil gas sampling, etc.).

4.2 SAMPLING PLAN

A thoroughly developed Site conceptual model is imperative for effective indoor air sampling. Prior to conducting any sampling event, a sampling plan should be developed (see MEDEP/DR SOP# RWM-DR-014 - Development of a Sampling and Analysis Plan). Special considerations should be made to determine the presence of preferential pathways for contamination into the building, and appropriate locations and methodology to assure proper sampling locations are selected. Included in the sampling plan should be specifics regarding the anticipated contaminants of concern (COC), data quality objectives (DQOs), the laboratory conducting the analysis, sample containers and Quality Assurance/Quality Control (QA/QC).

The owner of the property being considered for sampling must be made fully aware of, and approve of, the sampling event and the need for follow-up monitoring. Staff will work with the

Office of Commissioner and the Office of the Attorney General to obtain access if permission is denied by the property owner. Additionally, the owner/operator of the building should identify any sub-slab utilities, foundation/column footings, vapor barriers, radon sub-slab depressurization systems, or any other foundation structures, building renovations, and building contents that might impact the results or collection of indoor air samples.

If collection of indoor air sampling will become part of a routine monitoring program, it is recommended that follow-up samples be collected at the same location, unless the data quality objectives warrant sampling from more than one location.

4.3 SCHEDULING

It should be noted that sampling during times when soil pores are filled with water (spring thaw, extended rain events, or heavy short duration rain events greater than 0.25 inches over an 8-hour period) it may negatively affect collection of indoor air samples. For this reason, rain dates should be planned in the proposed field work schedule. Sampling should not take place when doors and windows remain open to facilitate ventilation during warmer temperatures, unless arrangements have been made to keep them closed. Custody seals are recommended for windows and doors during warmer weather or when building security is an issue.

4.4 EQUIPMENT

The equipment for collection of indoor air samples following this SOP may include:

- Photo-ionization Detector (ppb level)
- Multi-gas Meter for oxygen (%) and carbon dioxide (ppm) (optional for indoor air sampling)
- Sampling Containers (Summa Canister, see Section 5.2.1 and 5.2.2)
- Flow Control Regulator Assembly
- (2) Adjustable Wrenches
- Indoor Air/Sub-slab Sampling Field Sheet
- Camera
- Laboratory Supplied Chain of Custody Form
- Custody seals

4.4.1 SAMPLE CONTAINER CONSIDERATIONS

Care must be given to selecting the appropriate container type and volume based on the analytes, analysis method(s), and sample collection duration, to meet the data quality objectives for the sampling event. It is assumed that indoor air samples will be collected to determine the potential risk to occupants of the building from vapor intrusion into the building. Therefore, this SOP provides details for the use of Summa canisters with 24-hour sample collection duration. However, it may be appropriate to use an alternative sample container and duration based on the data quality objectives. Justification of the alternatives must be provided in an approved Sampling and Analysis Plan.

4.4.1.1 CONTAINER TYPE

The standard container type for collection of indoor air samples is a 6-Liter Summa canister. A Summa canister is a sealed metal container supplied by the contracted laboratory. The laboratory prepares the canister with sub-atmospheric pressure (vacuum) prior to shipment. The sampler must verify the presence of the vacuum by recording the initial vacuum in the canister when sampling begins.

The laboratory must certify that the canister has been appropriately cleaned prior to shipment. Laboratory certification can be done on individual canisters or from one representative can in a batch. **For indoor air sample collection personnel should request individually certified clean canisters unless data quality objectives allow for batch certification.**

With the advancement of technology, it may be possible to utilize alternative containers for the collection of indoor air samples (syringes, tedlar bags, or tubes). Such alternatives will be considered on a case-by-case basis and may require confirmation with Summa canister sampling. Such alternative sampling could be used for screening buildings as part of a larger vapor intrusion investigation.

5.0 SAMPLE COLLECTION DURATION

Time integrated indoor air sampling is considered the best option for evaluating potential risks associated with vapor intrusion into indoor air. Time integrated sampling is completed through the use of a flow controller or regulator that is connected to the sampling container (i.e. Summa canister). The flow controller may have a critical orifice, capillary, or adjustable micro-metering valve to regulate the flow of air into the sample canister. The flow regulator is calibrated by the laboratory for the desired sample duration specified by the sampler at the time the order is placed. The standard sample collection duration for indoor air sampling is 24-hours, regardless of exposure scenario (residential or commercial) because the objective is to collect a representative sample of the air in the building. However, this duration can be modified based on data quality objectives and location specific conditions. The Sampling and Analysis Plan (SAP) should specify the desired sample duration and any changes due to location specific conditions should be clearly noted in the sample documentation and communicated summary report. Depending on the sample program, it may be necessary to obtain permission for the change in sample duration before the samples are collected.

Together, the sample duration, list of analytes, laboratory methods (including quality assurance and control), and desired reporting limits will determine the appropriate sample type and volume.

6.0 SAMPLE COLLECTION PROCEDURE

1) Connect flow control regulator assembly to canister. Using the appropriate fittings (Swagelok^{tm} or similar) connect the controller assembly to the canister and tighten using two

adjustable wrenches. Note that some laboratories supply “quick connect” fittings that connect and release, which substitute threaded fittings with tightening nuts.

2) Select appropriate canister location based on data quality objectives. Ensure location avoids drafts from windows and doors, especially if the building is occupied. Select a location within the breathing zone to determine potential risk exposure or near the floor of a suspected vapor intrusion surface to determine the flux of contamination.

3) Record appropriate information. Use the Indoor Air/Sub-slab Sampling Field Sheet to record building conditions, sample canister and flow controller identification numbers, as well as ambient and pre-sample concentrations from field screening instruments as appropriate. Make an accurate sketch of the building interior with notations that describes the exact location of the canister. If PID screening is conducted, record interior PID readings on the interior sketch. If sampling inside a residential basement or commercial maintenance shop area, note the storage of household chemicals, lubricants, or other products that may influence indoor air sample results.

4) Use a camera to visually document interior. A digital camera can be used to document contents in buildings, features that are hard to sketch, and the location of the sample canister.

5) Open the sample canister valve and record time and pressure in can. Record the Sample Initiation Time and Initial Vacuum on the Indoor Air/Sub-slab Sampling Field Sheet and on the Chain of Custody Form.

6) Retrieve Sampler after sampling period is complete . Efforts should be made to shut off the canister valve while there is still a negative pressure vacuum in the canister (between -1 and -5 inches of Hg) to prevent sample loss. **It is important not to allow the canister to equilibrate to atmospheric pressure during the sampling period**. Therefore, it may be necessary to shorten the sample period in order to maintain a negative pressure within the canister. It is also important to collect sufficient sample volume for the laboratory to meet the data quality objectives for the sampling event. Therefore, it may be necessary to contact the laboratory to determine the appropriate vacuum reading in case the valve becomes clogged during sampling.

7) Record final vacuum and sample end time. Record this information on the Indoor Air/Sub-slab Sampling Field Sheet. The need for post-sampling PID, oxygen, and carbon dioxide concentrations will depend on the data quality objectives.

8) Maintain Chain of Custody form and ship samples for analysis. Sample containers should be packaged in the appropriate carrier for transport. Chain of Custody forms should be filled out, signed, and kept with the containers during transport to the laboratory.

7.0 ANALYTES AND METHODS

Once sample collection is complete, the canister and regulator are returned to the laboratory for analysis. Samples from Summa canisters are to be analyzed by a Maine certified laboratory using Maine certified methods that have laboratory reporting limits which meet the data quality objectives for the sampling event. It is best to contact the laboratory and provide them with the

data quality objectives and analytes of concern, which allows the laboratory to select the appropriate sample container size, regulator type, and method of analysis. Note that Selective Ion Monitoring (SIM) methods may be necessary to meet the data quality objectives.

With the advancement of technology, it may be possible to utilize alternative analytical methods (field laboratory methods) that are not Maine certified. Such alternatives will be considered on a case-by-case basis and will likely require confirmation with Summa canister sampling. Such alternative methods will likely be considered screening within the context of a vapor intrusion investigation.

8.0 QUALITY CONTROL

Due to cross-contamination and carry-over issues inherent with air collection and analysis, data quality objectives should be stated in the sampling plan. 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 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 Section 4 and Section 8 of the MEDEP/DR Quality Assurance Plan.

8.1 DUPLICATE SAMPLES

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

8.2 BACKGROUND/AMBIENT AIR SAMPLES

Depending on data quality objectives, one to two ambient air samples per day may be collected at the sampling locations to assess ambient outdoor air conditions.

8.3 TRIP BLANK

A trip blank should be collected when utilizing tedlar bags as sample containers. The trip blank will consist of a tedlar bag filled from a canister of zero air. Trip blanks should also be collected when using canisters to indicate whether the canisters were clean or not.

9.0 DOCUMENTATION/CHAIN OF CUSTODY

All sampling activities must be documented as outlined in MEDEP/DR SOP# RWM-DR-013 - Documentation of Field Notes and Development of a Sampling Event Trip Report. The Indoor Air/Sub-slab Sampling Field Sheet (updated as of the effective date of this SOP) should be used each time a soil gas sample is collected. Sample custody must be followed as outlined in MEDEP/DR SOP# RWM-DR-012 – Chain of Custody Protocol. Samplers should contact the selected laboratory to determine the most appropriate method for avoiding carry-over of highly

contaminated samples during the laboratory analyses. Due to the complex nature of indoor air, attention should be made to the following:

- Weather conditions (particularly precipitation within past 3 days);
- Building conditions;
- Modifications to the procedure;
- Building Contents;
- Building Construction / Remodeling Materials;
- Possible sources of off-site contamination (gas stations, dry cleaners, automotive body shops, etc.) in the vicinity of the investigation field work;
- Possible sources of cross-contamination (fueling vehicles/equipment, etc);
- Duration of Sample Collection.

As with all sampling events, any deviations from the sampling plan or SOPs must be documented.

10.0 REFERENCES

USEPA. 2013a. *OSWER Final Guidance for Assessing and Mitigating the VI Pathway from Subsurface Sources to Indoor Air* [External Review Draft].

USEPA 2013b. *Guidance for Addressing Petroleum VI at Leaking Underground Storage Tank Sites* [External Review Draft].

USEPA. 2012a. *EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings* [EPA 530-R-10-002].

USEPA. 2012b. *Conceptual Model Scenarios for the Vapor Intrusion Pathway* [EPA 530-R-10-003].

USEPA, 2011. *Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990-2005): A Compilation of Statistics for Assessing Vapor Intrusion* [EPA 530-R-10-001].

MEDEP, 2013. *Maine Remedial Action Guidelines for Sites Contaminated with Hazardous Substances*

MEDEP 2014, *Remediation Guidelines for Petroleum Contaminated Sites in Maine*

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