COVERSHEET
STANDARD OPERATING PROCEDURE

Operation Title: **PROTOCOL FOR DIFFUSION SAMPLERS**

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Standard Operating Procedure: RWM-**DR-018**
REVISION: **01**
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Revised by: **Hank Andolsek**
Reviewed by: **Brian Beneski**

Five Year Review No Changes Needed:

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1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division of Remediation's (MEDEP/DR) procedure for the use of vapor diffusion samplers.

2. APPLICABILITY

MEDEP/DR is responsible for the investigation and remediation of hazardous substance, petroleum, and landfill sites throughout Maine. Vapor diffusion samplers are sometimes used to assist with determining the extent of contamination at these sites. This SOP applies to all staff that may use vapor diffusion samplers.

3.0 RESPONSIBILITIES

All MEDEP staff must follow this procedure when assembling, installing and/ or retrieving vapor diffusion samplers. All managers and supervisors are responsible for ensuring (via training, required reading, etc.) that their staff understand this procedure and strictly adhere to it for all assembly, installation and retrieval of vapor diffusion samplers.

4.0 INTRODUCTION

Vapor diffusion samplers are devices that are put in place and left for a period of time while volatile vapors passively collect in the sampler from the media that they are installed in. This SOP establishes the proper methods for implementation of the vapor diffusion sampler assembly, installation and retrieval procedure and should insure consistency among MEDEP/DR staff. Proper assembly, installation and retrieval of these samplers is essential for obtaining valid data.

5.0 EQUIPMENT

Vapor Diffusion Samplers exist in several forms. Examples of these include: a) *Vaportrace*™ implant device; and, b) GORE™ Module.

In all cases, the sampling method relies on soil vapor diffusing onto the sampling media due to the chemical gradient (i.e., contaminated vapor moves toward clean media) that exists. The media type devices are thermally desorbed and analyzed on a GC/MS.

Reporting limits vary between methods and the reporting units are expressed in mass/sample, and not as a concentration. Developers of proprietary sampling media are working on methods and media that will allow for quantifying the detections in standard soil vapor concentration units (e.g., $\mu g/m^3$). Sampling personnel should check with proprietary sampling device vendors to make sure that the sample results (i.e., measuring units) are consistent with the project DQOs before deploying.

6.0 PREPARATION

Prior to conducting any sampling event, a sampling and analysis plan (SAP) must be developed according to the procedures outlined in MEDEP/DR SOP DR#014 – Development of a sampling

and Analysis Plan. The sampling plan should describe the location of the samplers or the interval of placement (e.g. every 25 feet). The methodology for analysis should be stated in the sampling SAP.

7.0 PREPARING VAPOR DIFFSION SAMPLERS

7.1 VAPORTRACE™

The system does not discriminate between organic vapors that come in contact with the system adsorbents prior to field deployment or during transport to the laboratory. Therefore it is important to not expose the adsorbent system to ambient air or ambient environmental vapors such as gasoline, diesel, or solvent vapors prior to exposure to the project sub-surface environment.

7.2 GORE™ MODULE

Modules are specially cleaned and stored after manufacturing. They must remain sealed in their vials in the shipping boxes until deployment. DO NOT store them near potential sources of organic vapors including petroleum fuels, fuel exhaust, and solvents, or in areas of new construction or remodeling, where paints, adhesives, foam insulating materials, etc. may be present.

8.0 INSTALLATION OF VAPOR DIFFISION SAMPLERS

After installing any passive sampling system, the location and depth of the sampler should be described in the sampler's field log book, and its position should be recorded using a survey-grade GPS system (e.g., Trimble XPS). Each of the sampling devices described below require that they be placed below ground surface. There are numerous methods by which the samplers can be placed, but the most common involves using a geoprobe, hand-operated screw auger, electric drill or tile probe to create a pilot hole for placement of the passive sampler.

8.1 VAPORTRACE™

Typical deployment of the VaporTrace℠ system includes creating a small diameter hole (1.0 - 1.5") using a direct push system, hand auger, electric drill, or open ended tubing. The purpose is to create a small diameter hole approximately 6 – 18" deep or below grade in which to place the opened system.

Once the hole has been created, open the system, saving the cap, and place the system open end down into the hole. Several methods exist to easily place and retrieve the systems from the shallow sub-surface.

- One method of easy placement and retrieval is to use small diameter PVC or copper tubing, slightly larger in diameter than the system diameter. After making the location hole to the desired depth, place the PVC or copper tubing in the hole, open the system and slide into the tubing, open end down. Taping a pin flag to the system makes insertion and retrieval easier. This procedure allows for easy retrieval.

- Tape a pin flag to the vial, which allows insertion into a small diameter hole and leaves a marker for finding the location and retrieval of the system.

Once the system has been placed in the hole, backfill with clean sand or native soil. The purpose of the backfill is to not allow for a less permeable vertical zone to exist next to the system. The system operates from existing site vapors migrating to the surface from natural diffusion and dispersion vertically from the sub-surface soil and/or water.

The amount of time before sampler retrieval is dependant upon several factors, geology, chemical constituents, depth to groundwater, time of year, etc. Since the samplers rely on passive diffusion of the chemical compounds to arrive at the system, it takes several days to weeks for the adsorbents to collect the vapors. Generally, one to two weeks is sufficient before retrieval.

8.2 GORE™ MODULE

Modules can be installed at any depth. Usually they require only a narrow pilot hole (approximately 1/2-inch to 3/4-inch in diameter), typically drilled or driven to a depth of 2-3 feet using hand tools (depending on project objectives, installation depth may vary at your site). When using the GORE™ Modules, the vendor will provide the following items:

- Shipping boxes containing individually numbered GORE-SORBER Modules, including trip blanks;
- Stainless-steel insertion rod in threaded sections (for placement of modules in pre-drilled/driven pilot holes);
- Corks with screw eyes attached;
- String (cord) to allow the module to be installed to the recommended depth; and
- Chain of Custody and Installation/Retrieval Log.

Specific installation instructions for the Modules are provided by GORE and should be followed by samplers deploying these devices.

9.0 RETRIEVAL OF VAPOR DIFFUSION SAMPLERS

1) Find the flagging that marks the location of the sampler or use a GPS unit to locate the sampler.

2) Gently retrieve the sampler from the sample media, being careful not to break it.

4) Submit to a laboratory for analysis by the method stated in the SAP.

10.0 DECONTAMINATION

If the sampler was installed in an obviously contaminated media, the tools which were used to install the sampler or retrieve the sampler must be decontaminated between sample locations as outlined in MEDEP/DR SOP DR#017 – Decontamination Procedures.

11.0 DOCUMENTAION

Field notes should be recorded as described in MEDEP/DR SOP DR#013 – Documentation of Field Notes and Development of a Sampling Event Trip Report.