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Technology Overview of Passive Sampler Technologies (DSP-4)

EXECUTIVE SUMMARY

This document presents technical overviews of 12 passive sampling technologies. It describes each technology's basis of operation, intended applications, advantages, limitations, and development status. Contacts for additional information are provided. This overview is an outgrowth of interest and information generated in preparation of the *ITRC Technical and Regulatory Guidance for Using Polyethylene Diffusion Bag Samplers to Monitor VOCs in Groundwater* in February 2004. While the initial focus was on passive sampling of groundwater monitor wells, many of the technologies are applicable to surface water and/or vapor as well. Although not a comprehensive overview of all passive sampling technologies, it is of interest to those concerned with the development and use of passive sampling devices. A summary table highlighting the important attributes of each technology, including appropriate analytes, availability, and cost information, follows the 12 individual text descriptions.

The authors define a "passive" sampler as one that is able to acquire a sample from a discrete location without the active media transport induced by pumping or purge techniques. All of these passive technologies rely on the sampling device being exposed to media in ambient equilibrium during the sampler deployment period. For example, in wells, the well water is expected to be in natural exchange with the formation water. All of the devices provide a sample from a specific location (i.e., point samples). Spatial integration, if any, is a result of natural ambient flow of the sampled medium.

The passive samplers in this document are classified on the basis of sampler mechanism and nature of the collected sample, as follows:

1. *Devices that recover a grab well water sample.* Samples are an instantaneous representation of conditions at the sampling point at the moment of sample collection.

    - HydraSleeve™ Samplers
    - Snap Sampler™

2. *Devices that rely on diffusion of the analytes for the sampler to reach and maintain equilibrium with the sampled medium.* Samples are time-weighted toward conditions at the sampling point during the latter portion of the deployment period. The degree of weighting depends on analyte and device-specific diffusion rates. Typically, conditions during the last few days of sampler deployment are represented.

    - Regenerated-Cellulose Dialysis Membrane Samplers
    - Nylon-Screen Passive Diffusion Samplers (NSPDS)

- Passive Vapor Diffusion Samplers (PVDs)
- Peeper Samplers
- Polyethylene Diffusion Bag Samplers (PDBs)
- Rigid Porous Polyethylene Samplers (RPPS)

3. *Devices that rely on diffusion and sorption to accumulate analytes in the sampler.* Samples are a time-integrated representation of conditions at the sampling point over the entire deployment period. The accumulated mass and duration of deployment are used to calculate analyte concentrations in the sampled medium.

    - Semi-Permeable Membrane Devices (SPMDs)
    - GORE™ Sorber Module
    - Polar Organic Chemical Integrative Samplers (POCIS)
    - Passive In-Situ Concentration Extraction Sampler (PISCES)

Some of these sampling technologies are relatively mature and accepted for appropriate applications by regulators in some regions and states. Nonetheless, they are still considered to be innovative technologies and few if any specific policies governing their use have been written into official regulations.