Appendix CT-2. Indirect pore-water sampling devices

Method: Diffusion equilibration on thin films		
Description: Thin (<1 mm) film of gel over a rigid support attains equilibrium with pore water. Measures metal concentrations in pore water, and the concentration limit is method specific. **References:** USEPA n.d. "Measurement"	**Advantage:** More rapid equilibrium than with peepers. **Disadvantage:** Need to extract sorbed compounds from the gel for analysis.	**Analyte capability:** Metals, mercury
Method: Dialysis bags		
Description: Contaminant diffuses into permeable dialysis material (polyvinylidene fluoride, polycarbonate) filled with water. Measures pore-water concentrations. Concentration limit is method specific. **References:** USEPA 2001b, n.d. "Measurement"	**Advantages:** Easy to install and extract pore water. **Disadvantages:** Requires modification to water within the bag for different sediment conditions.	**Analyte capability:** Metals, mercury, nonpolar organics
Method: Sediment peeper		
Description: Contaminant diffuses across a permeable membrane surrounding a fixed support filled with water. Measures pore-water concentrations. Concentration limit is method specific. **References:** ITRC 2004; USEPA 2006b, n.d. "Measurement," 2001b	**Advantages:** Easy to install and extract pore water. Vertical distribution of contaminants with depth. **Disadvantages:** Requires modification to water within the bag for different sediment conditions. Low volume of pore water extracted.	**Analyte capability:** Metals, mercury, VOCs, PAHs, PCBs, pesticides, radionuclides, energetic compounds (nonpolar organics)
Method: Diffusion gradients in thin films (DGT)		
Description: Binding agent is selective to target ions in solution immobilized in a thin layer of hyrogel, surrounded by an ion-permeable hydrogel layer. Collects metal ions by diffusion, and measures/estimates contaminant flux in pore water. **References:** USEPA n.d. "Measurement"	**Advantages:** Rapid determination of flux (linear concentration gradient) in sediments. **Disadvantages:** Does not measure equilibrium pore-water concentration.	**Analyte capability:** Metals, mercury
Method: Semipermeable-membrane devices		
Description: Diffusion of hydrophobic contaminants across a semipermeable bag into a purified oil (e.g., triolein) which serves as a surrogate lipid. Integrates pore-water concentrations by averaging over a specified deployment period. Though not an equilibrium sampler, compound-specific flux rates are available. **References:** USEPA n.d. "Measurement"	**Advantages:** Relatively easy to deploy. Reverse extraction of dialysis tubing conducted by vendor. Measures "truly dissolved" pore-water constituents. Low (pg/L) concentration limits. **Disadvantages:** Does not measure pore-water concentration but rather an average concentration over time.	**Analyte capability:** PAHs, PCBs, nonpolar pesticides

Method: SPME fibers		
Description: SPME fibers are disposable glass fibers coated with µm poly(dimethylsiloxane). Fibers are cleaned by sonicating sequentially with hexane, acetonitrile, and water and are inserted directly into sediment in 5–7 cm lengths. Fibers are withdrawn after a set number of days, cut into small pieces, and transferred to autosampling vials, which are then filled with hexane and analyzed on a GC/MS. Measures pore water at low concentrations. **References:** Adams et al. 2007	**Advantages:** In situ or in vitro methods which determine pore-water concentrations and/or can be correlated with bioaccumulation. Low (<pg/mL) detection limits. **Disadvantages:** In situ procedures require site revisits. Methods require equilibrium time with sediments (14–28+ days), and also require method- and compound-specific EqP coefficients.	**Analyte capability:** PAHs, PCBs, nonpolar pesticides
Method: Polyoxymethylene (POM) film		
Description: Sorption onto polymer surface with pore-water concentration determined through compound-specific partition coefficients. Various in situ or in vitro methods are being developed and tested to indirectly measure pore-water concentrations and bioavailable fractions. **References:** Adams et al. 2007, Ghosh and Hawthorne 2010	**Advantages:** In situ or in vitro methods which determine pore-water concentrations and can be correlated with bioavailability. Low (<pg/mL) detection limits. **Disadvantages:** In situ procedures require site revisits. Methods require equilibrium time with sediments (14–28+ days) and also require method- and compound-specific EqP coefficients.	**Analyte capability:** PAHs, PCBs, pesticides, energetic compounds (nonpolar organics)
Method: Polyethylene devices		
Description: Passively accumulate hydrophobic organic compounds in proportion to their freely dissolved concentrations; require equilibrium with the sampled medium. Samples are time-weighted. Measures pore water at low (<pg/L) concentrations. **References:** Adams et al. 2007, Ghosh and Hawthorne 2010, Gschwend 2010	**Advantages:** In situ or in vitro methods which determine pore-water concentrations and can be correlated with bioavailability. Low (<pg/L) detection limits. **Disadvantages:** In situ procedures require site revisits. Methods require equilibrium time with sediments (14–28+ days) and also require method- and compound-specific EqP coefficients.	**Analyte capability:** PAHs, PCBs, nonpolar pesticides, energetic compounds (nonpolar organics)
Method: GORE® Modules		
Description: The GORE Module, a sorbent-based diffusion groundwater sampler, is a waterproof, vapor-permeable GORE-TEX® membrane within a deployment device. The membrane serves as the interface between an aqueous setting (groundwater) and the sorbent housed within the membrane tube. It measures groundwater concentrations (ppb). It has not been validated as a pore-water sampling device. **References:** ITRC 2007, USEPA 2000b	**Advantages:** Rapid equilibrium (hours), inexpensive, and easy to install. **Disadvantages:** Does not sorb higher-molecular-weight compounds; not useful for calculating TUs if higher-molecular-weight compounds are present. Has not been verified as an acceptable pore-water sampling device.	**Analyte capability:** VOCs