

## A.1 Technology Name

### Semi-Permeable Membrane Device

#### A.1.1 Source

Sower, Gregory James, and Kim A. Anderson, 2008. Spatial and Temporal Variation of Freely Dissolved Polycyclic Aromatic Hydrocarbons in an Urban River Undergoing Superfund Remediation. *Environmental Science & Technology* 42(24): 9065–71.  
<https://doi.org/10.1021/es801286z>.

#### A.1.2 Summary

<b>Media:</b>	water column
<b>Study Type:</b>	In-situ
<b>Technology:</b>	SPMD
<b>Peer Reviewed:</b>	Yes
<b>Publication Date:</b>	December 15, 2008

#### A.1.3 Site Description

- In 2004, a sediment cap with organoclay was placed over 23 acres of creosote-contaminated sediment at the McCormick and Baxter Superfund site, located at river mile 7 east.
- In 2005, over 11,500 m<sup>3</sup> of coal tar was removed from river mile 6.3 west, the GASCO site within the Portland Harbor megasite.
- The objective of this study is to assess the effectiveness of the organoclay cap and impacts of coal tar dredging on the concentrations of dissolved PAHs in the water column.
- The study used standard SPMDs from Environmental Sampling Technologies (St. Joseph, MO). A standard SPMD consists of a 91-106 cm segment of 2.5 cm wide low-density polyethylene lay-flat tube having a wall thickness of 70-95 µm and a surface area of 450 cm<sup>2</sup>, contains 1 mL of >=95% pure triolein, and has a total weight of 4.5 g.
- Five SPMDs were deployed 3 meters above river bottom at each location for 14 to 21 days.
- No Performance Reference Compounds (PRCs) were added. Study used laboratory sampling rates from the literature and temperature corrected using a trendline based on rates at three temperatures: 10, 18, and 26 °C (Huckins, et al. 1999 and Booij, et al. 2003).

#### A.1.4 Remedial Phase

Full-Scale Study.

#### A.1.5 Outcome

The study results indicated that the organoclay cap placed at the McCormick and Baxter Superfund Site significantly lowered the concentrations of freely dissolved PAHs (sum of 15 bioavailable PAHs) in the water column. The average level decreased from 440 ± 422 ng/L in

pre-capping 2003 to  $8 \pm 3$  ng/L post-capping in 2005. Additionally, the study observed that the dredging of submerged coal tar at a nearby site led to an almost threefold increase in the concentration of freely dissolved PAHs during the dredging process.

#### A.1.6 References

Booij, K.; Hofmans, H. E.; Fischer, C. V.; Van Weerlee, E. M. Temperature-dependent uptake rates of nonpolar organic compounds by semipermeable membrane devices and low-density polyethylene membranes. *Environ. Sci. Technol.* 2003, 37 (2), 361–366.

Huckins, J. N.; Petty, J. D.; Orazio, C. E.; Lebo, J. A.; Clark, R. C.; Gibson, V. L.; Gala, W. R.; Echols, K. R. Determination of uptake kinetics (sampling rates) by lipid-containing semipermeable membrane devices (SPMDs) for polycyclic aromatic hydrocarbons (PAHs) in water. *Environ. Sci. Technol.* 1999, 33 (21), 3918–3923.