

Diagenetic Magnification of Persistent Organic Pollutants from Combined Sewage Overflow Sources

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Background/Objectives. Combined sewer overflows (CSOs) are a common source of contaminants to coastal sediments, but it can be difficult to estimate the impact of CSOs relative to other sources. Because CSOs generally produce high volumes of organic-rich particulate matter, with relatively low concentrations of contaminants, sampling of suspended particulate matter from current CSO flows may not fully capture how CSO impacts are preserved in the sediment. During sediment settling and deposition, particles are subject to intense weathering and early diagenesis processes. Labile contaminants and organic materials are degraded and removed, while more persistent compounds are enriched, altering both the concentration and fingerprints preserved in the sediment. This process, referred to as diagenetic magnification, has been modeled under fish farms (deBruyn and Gobas, 2004), another source with high concentrations of labile organic matter, to produce a 2- to 4-fold increase in contaminant concentrations in sediment. It was also recently observed in the Buenos Aires coastal sewer sediment area (Cappelletti et al., 2014) to produce a 3- to 4-fold increase in persistent organic pollutant surface sediment concentrations. At many sediment sites, a 2- to 4-fold increase in contaminant concentrations can push contaminant levels above sediment cleanup goals.

Approach/Activities. We evaluated diagenetic magnification of pollutants at several sediment Superfund sites with CSO inputs, looking at how both concentrations and fingerprints of common contaminants of concern change between suspended solids, sediment traps, and near-field surface sediment samples.

Results/Lessons Learned. CSO suspended particulate contaminant concentrations and fingerprints of pollutants do not represent the CSO impacts to the sediment, due to the intense weathering processes that occur during sediment deposition and early diagenesis. Relying on CSO suspended particulate measurements to define CSO contaminant flux can underestimate the full impact of this source to sediment sites.