PAH Partitioning and Organic Matter Characterization in Manufactured Gas Plant Site Sediments (Estuarine)

Background. US EPA's Risk Assessment Guidance for Superfund calls for the determination of site-specific characteristics that may influence fate and transport of contaminants. The partitioning of PAHs between soil and water is typically determined using standard empirical correlations between sorbate octanol-water partition coefficient (K_{ow}) and sorbent organic carbon normalized partition coefficient (K_{oc}). Such empirical correlations are based on PAH partitioning to natural organic matter present in soils/sediments, and do not account for strong binding with carbonaceous matter like coal, coke, or lampblack that may exist in industrial sites. Our earlier work has shown that it is important to understand the nature of contaminant association with sorbents because hydrophobic organic contaminants such as PAHs may bind very strongly to certain organic carbon types found in soils and sediments impacted by industrial processes.

Figure 1. Old Manufactured Gas Plant site in New York.

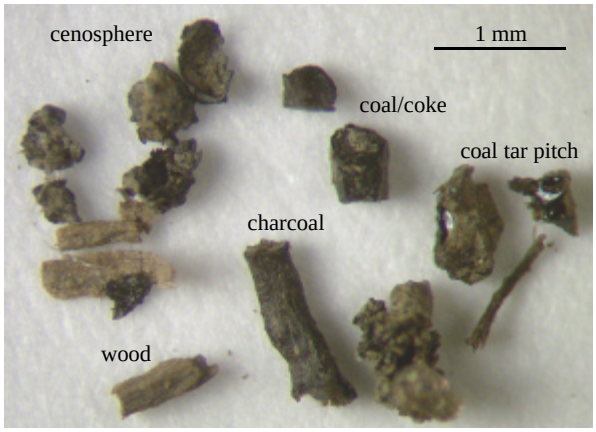

Figure 2. Light microscopy images of representative organic particle types in a MGP site sediment. PAHs were found largely associated with coal tar pitch.

Objectives. This research project is aimed at measuring site-specific partition coefficients for PAHs in sediments from Manufactured Gas Plant (MGP) sites. In our current work involving PAH contaminated soils from oil-gas manufacturing facilities we are finding that site-specific measurement of partitioning may in some cases result in 1-2 orders of magnitude higher values of measured K_{oc} compared to the values predicted using K_{ow}-K_{oc} correlations. Results from proposed work are therefore expected to provide improved site-specific risk assessment for PAH contaminated soils. A major objective of this research is to explain scientifically differences between measured and estimated partition coefficients for PAHs. This explanation will be based on fundamental understanding of the nature of PAH sorption to site soils. This explanation will be aided by density separation of particulate organic matter in sediments, particle-scale PAH measurements, and petrographic characterizations to identify the nature of the organic matter responsible for PAH binding. Identification of the geochemical nature of the soil carbon, specifically the presence of coal, coke, lampblack, and pitch will help explain any differences in site-specific values of PAH partitioning.