Spatial Variations in Ambient PAH Concentrations in Sediment in a Complex Urban River System

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Background/Objectives. With a long history of industrialization, in addition to combined sewer discharges that continue today, the Chicago Rivers (Rivers) have received pollutant loading for centuries. Identifying the input of polycyclic aromatic hydrocarbons (PAH) to the Rivers potentially due to multiple former manufactured gas plant (MGP) sites located throughout the system is complicated by current and historic PAH contributions from myriad sources over this timespan. Determining the incremental input from these MGPs, critical to establishing cleanup targets and liability allocation, is further complicated by a permanent flow reversal of a portion of the river and the engineered nature of the system. Several locations on the Rivers have been selected and studied to represent ambient conditions relative to the former MGPs. These ambient areas are not affected by the former MGPs, but rather represent impacts related to the industrial, urban background nature of the system. Ambient total PAH concentrations throughout the Chicago Rivers are among the highest of recent urban waterway studies. By comparing relevant portions of the Rivers to ambient conditions, the effect of the former MGPs on PAHs in sediment can be determined. This work is currently underway within the Region 5 Superfund Alternative Sites Program.

Approach/Activities. The Rivers have been studied in four separate segments from along a span of over 11 river miles. Segments were selected from the North Branch, South Branch, Bubbly Creek, and the Chicago Sanitary and Ship Canal (CSSC) based on proximity to the former MGPs. Specific locations identified as local ambient areas were selected based on river flow history, known operational periods for the former MGPs, and known current and historical industrial inputs to the system in those areas.

An initial standalone study was conducted to establish ambient conditions for the North Branch. For the other three segments, local ambient areas were identified by expanding the site study areas to include likely ambient locations using earlier lessons learned as guides. Extensive sediment sampling and analysis to depths of over 40 feet below mudline have been conducted. Ambient areas have been characterized using total PAH (tPAH-13) concentrations that represent local ambient conditions and forensic signatures that diverge from those of site-specific MGP residuals. Different ambient tPAH concentrations have been established for three river segments. Characterization of the local ambient area within the CSSC is underway and early results indicate the presence of confounding factors that may be influencing the ability to isolate an ambient area. These confounding factors include the possibility of significant historical and contemporary releases of non-MGP-related PAHs in and near the study area.

Results/Lessons Learned. Rationale and importance of selecting an appropriate ambient area along with study details and actual characteristics of the ambient areas chosen for these studies will be presented. Current conditions and resolutions of ambient area characterization for the CSSC will also be shared, as available. Pros and cons of methods for establishing ambient conditions will be discussed.