BACKGROUND

Multiple tools have been used to characterize PAH contributions from the branches of CAWS during the permanent flow reversal of two complicated by the engineering and environmental aspects of CAWS. Determining the incremental input of polycyclic aromatic hydrocarbons (PAH) to CAWS potentially due to the former MGPs is complicated by PAH contributions from myriad sources. With a long history of industrialization and combined sewer outfall (CSO) discharges, CAWS has received pollutant loading for centuries. Identifying the input of polycyclic aromatic hydrocarbons (PAHs) to CAWS potentially due to the former MGPs is complicated by PAH contributions from myriad sources.

INTRODUCTION

This is a study conducted as part of the development of a sediment investigation of multiple former manufactured gas plants (MGPs) located along CAWS. The areas studied are located along 11 miles of CAWS and reveal local differences within the urban environment. For this work, the entire area is enrolled in the Superfund Alternative Sites Program.

METHODOLOGY

Four areas have been established to represent ambient sediment conditions, one for each MGP area: North Branch MGPs, South Branch MGPs, Bubbly Creek MGPs, and Chicago Sanitary and Ship Canal (CSSC) MGPs. A different characterization method was used for each (Table 1).

RESULTS

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

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VARIATIONS IN PAH CONCENTRATIONS IN AMBIENT AREAS

The range of PAH-13 concentration and 95/95 UTL values differs between the four ambient CAWS areas. Some similarities and differences can be found between these ambient areas:

- The Bubbly Creek ambient area is near the head of Bubbly Creek with only two pumping stations for the wastewater treatment plant upstream of it.
- North and South Branch ambient areas have multiple potential non-MGP sources nearby in addition to CSOs.
- CSSC has potentially significant non-MGP PAH sources adjacent to the MGP area that are influencing local ambient conditions.

CONCLUSIONS and LESSONS LEARNED

Ambient PAH concentrations ranged from 0.196 to 803 mg/kg over 11 miles of the CAWS study area; these are among the highest of recent urban studies. Reach-specific ambient studies were necessary due to variable local conditions and PAH concentrations up to an order of magnitude greater than PEC. Toxicity testing was not an effective tool for identifying toxic effects from the MSIGs as ambient sediments themselves were toxic.

Data suggests the North Branch MGPs may not be influencing the downriver reach, but it is unknown if any portion of the MGP area affects the upriver reach. The double ratio plot in Figure 3 shows ambient samples clustered in the upper right, along with a majority of investigative samples from MGPs #1 and #2. However, a portion of the MGP area (within the blue box) depart from ambient conditions. These MGP-impacted samples were toxic. Under these conditions, toxicity testing is not a useful indicator of the effect of the MGPs.

Despite a potential difficulty in identifying ambient conditions in some areas of CAWS due to reversal in river flow in 1900, use of the selected tools (HPH concentrations, forensic, and geographic locations) allowed for identification of ambient conditions. The role of ambient conditions in remedial design:
- Ambient conditions represent what is achievable for the local area
- Local sediment will backfill or cover remediated areas over time and remediated areas will return to ambient conditions
- Cleanup goals of constituent concentrations less than ambient conditions represent goals that are unattainable over time

OTHER TOOLS FOR CONFIRMING AMBIENT CONDITIONS

In combination with establishing the 95/95 UTL for an ambient area, forensic evaluations were used to identify samples affected by MGP source material and not simply ambient conditions. The double ratio plot in Figure 3 shows ambient samples clustered in the upper right, along with a majority of investigative samples from MGPs #1 and #2. However, a portion of the MGP samples (within the blue box) depart from ambient conditions. These MGP-impacted samples were toxic.