**2022 Americas Site Solutions Technology Transfer Conference**

**Title: Development and Implementation of an Innovative Field UV Screening Method for Identifying NAPL and Distinguishing Sources in Sediments**

**Authors' Names: Marcus Byker, Eric Hritsuk, Jeff Kampman**

**Presenter's Name: Jeff Kampman**

**Key Topic: Innovative Assessment Methods**

**PDP Manager/Managing Principal's Name: Joseph Ridgway**

**Client Name: WEC Business Services, LLC**

**Project Name: Chicago Sanitary and Ship Canal (CSSC)**

**Project Location: Chicago, Illinois**

**Primary Ramboll Project Staff (Office): Chicago, Illinois**

**ABSTRACT**

**Background/Objectives:**

The Chicago Sanitary and Ship Canal (Canal) has received pollutant loading for over a century from diverse industry and combined sewer discharges that continue to the present. Identifying the input of nonaqueous phase liquid (NAPL) in sediment potentially attributable to a former manufactured gas plant (MGP) is complicated by the potential for multiple legacy non-MGP NAPL sources. Ramboll developed an investigation approach to broadly characterize the extent of NAPL in sediment likely attributable to MGP operations.

Petroleum hydrocarbons and coal tar NAPLs are partially composed of individual polycyclic aromatic hydrocarbons (PAHs) of varying concentrations. PAH-rich NAPLs will generally fluoresce under excitation by ultra-violet (UV) light and characteristics of the fluorescence indicate characteristics of the NAPL. The intensity and "color" of the fluorescent response provides a qualitative indication of the relative magnitude of NAPL present and its composition. This phase of investigation at the Canal was identified as a candidate for field testing of Ramboll-developed UV screening tool.

The primary objective of this field test was to qualitatively identify NAPL presence in the field by screening of UV fluorescence response while simultaneously visually inspecting the matrix for the NAPL presence using traditional methods. A supplemental objective was access if the color of fluorescent response correlated with findings from forensic assessments.

**Approach/Activities:**

The custom field fluorescence screening tool develop by Ramboll consisted of an opaque box that was placed on top of a split sediment core. White light and UV light (365 nm) fixtures were mounted within the box with exterior controls. An electronic tablet was configured to provide a viewport to the box interior and collect photos under each lighting condition. The photos collected by the field UV fluorescence screening tool were used to guide selection of core intervals for NAPL mobility sampling and relate fluorescent response to results of forensic analysis.

**Results/Lessons Learned:**

The custom field UV fluorescence screening tool was a cost-effective approach to improve white light photo collection and obtain field data regarding fluorescent response of NAPL-impacted sediment. Field use of fluorescent screening provided an effective means of aiding identification of NAPL within dark-colored sediment. The tool, once calibrated and supplemented by other lines of evidence, was useful to select a diverse set of samples for laboratory testing of forensic and NAPL mobility. Furthermore, the color of the fluorescence response combined with other visual observations correlated with laboratory forensics testing, which allowed for improvement of the forensic characterization of sediments.

**Aspect of Work that Relates to Sustainability:**

Utilizing this innovative method of sediment NAPL characterization can allow for more efficient field data collection and inform project decision making without relying on multiple field mobilizations. This provides the opportunity to achieve project goals more sustainably by generating less greenhouse gas emissions than multiple field mobilizations and submittal of additional samples to similar UV-testing laboratories using traditional shipping methods.