

**2022 Americas Site Solutions Technology Transfer Conference**

**Title: Willowstick Geophysical Investigation at a Chlorinated Solvent Site**

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**Presenter's Name: David Meyer**

**Key Topic: Innovative Assessment Methods**

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**Client Name: Whirlpool**

**Project Name: Whirlpool Fort Smith**

**Project Location: Fort Smith, Arkansas**

**Primary Ramboll Project Staff (Office): Kansas City, St. Louis, Indianapolis, Ann Arbor**

**ABSTRACT**

**Background/Objectives:**

The site has a relatively thin transmissive zone and a complex flow regime with contaminants migrating radially away from the source area making precise identification of contaminant migration pathways difficult. The aquifer is impacted with elevated concentrations of trichloroethene and its degradation products and consists of a highly anisotropic and heterogeneous layer of sands, clays, and gravels at depths of 20-40 feet. Further understanding of the groundwater flow model was needed to develop a more targeted remedy approach for plumes across the site. A geophysical investigation was utilized to characterize and identify preferential groundwater flow paths.

**Approach/Activities:**

Willowstick Technologies, LLC has developed a patented method and proprietary software for assessing and identifying preferential groundwater flow path(s) within the subsurface. Four surveys were conducted to address contaminant plumes migrating in multiple directions from the source area. The geophysical surveys were conducted by (1) inducing an electrical current through the aquifer between electrodes installed in monitoring wells on either side of the survey areas, (2) measuring the magnetic field at predetermined locations throughout the survey areas, and (3) assessing the predicted versus measured magnetic fields with a 3D inversion modelling package that is used to identify potential preferential groundwater flow paths.

**Results/Lessons Learned:**

The six primary and six secondary preferential groundwater flow paths identified in the four survey areas appeared consistent with areas previously known to have experienced contaminant migration, and two boreholes completed after the geophysical survey corroborated results in areas with data gaps. The preferential flow paths are additional lines of evidence that can be used to refine the Site conceptual flow model in addition to site-wide potentiometric surface maps, historical aquifer testing and a recently completed plume flux meter investigation. Together, these and other lines of evidence provide a more complete understanding of Site hydrogeology and potential contaminant migration pathways. This data also helps create a targeted remedial design versus a broader stroke remedial design to help more efficiently address site contamination.

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

Implementing a non-intrusive assessment method, corroborated by a limited amount of intrusive sampling, minimized site disruption and the level of effort to advance understanding of the site subsurface, which will allow for a targeted remedial design to reduce overall costs and disruption to the currently operating facility. The copper clad wire used to create the electrodes was recycled at a nearby metals recycling facility.