Application of High-Resolution Site Characterization Tools for Source Delineation and In Situ Thermal Treatment Design Optimization

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Background/Objectives. In a midwestern town, a Post Office (PO) facility was located on a former manufactured gas plant (MGP) property. In January 2017, the PO was relocated in order to make way for an expedited MGP site investigation and cleanup. The site is located in a downtown urban location that prevented several cleanup remedies for the Site. Previous site investigations identified impacted material (e.g., coal tar and residuals) in several areas of the property including a former gas holder and buried utilities. Of particular importance in such an urban setting is the evaluation and selection of a remedial alternative that will minimize community impacts while mitigating risk to human health and the environment. With these site-specific challenges in mind, application of in situ treatment methods were deemed preferred over excavation and offsite disposal. Existing site characterization information was evaluated in order to confirm that in situ thermal desorption (ISTD) would be applicable for the site-specific subsurface conditions.

Approach/Activities. Once the building was removed, the objective was to complete a rapid and thorough source area delineation (by Triad methods) along with the collection of data to optimize a thermal remedy at the Site. The source area delineation was performed through the use of a combination of direct sensing tools, traditional soil sampling, hydrogeologic testing and both onsite and offsite mobile laboratory analysis. A database was generated that incorporated the following data from across the site: hydraulic head data, TarGOST data, soil concentration data and NAPL observations, hydraulic conductivity data, and groundwater concentration data. These data were incorporated into an Earth Volumetric Studio (EVS) 3-D model for the Site. Data collected from direct sensing tools were collected at high vertical densities to ensure that the entire vertical column of the subsurface was assessed. These data were combined with the more quantitative data sets to provide multiple lines of evidence to support the EVS interpretation of subsurface conditions.

Results/Lessons Learned. The response of the TarGOST tool was evaluated against several other data sources including visual observations, field screening techniques, and onsite and offsite laboratory analysis of samples collected at collocated soil borings. Based on this, a site-specific understanding of the TarGOST response was made. This was used to select the appropriate %RE response to determine the extent of impact that will be used to define the in situ thermal target treatment zone (TTZ). Based on the source zone delineation, a TTZ was assigned that included all source material and was of a minimum practical size and shape which conformed to the distribution of contamination. The 3D delineation of the TTZ provides for an ISTD system configured to the precise geometry (heater depths vary by location) of the source zone. Follow on thermal treatment system design efforts will generate a design that minimizes the consumption of resources such as electricity, waste generated during system installation and operation, and commodities such as metals, concrete, etc.

A sustainability analysis along with the EVS model results will be presented.