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Evaluation of Direct-Push Methods for Quickly Assessing LNAPL Presence, Mobility, and Recoverability

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Background/Objectives. LNAPL transmissivity is increasingly relied upon as a metric for LNAPL saturation reduction and attainment of a “maximum extent practicable” endpoint. However, quantifying LNAPL transmissivity under current practices typically requires: 1) delineation and identification of areas of high LNAPL saturation via soil borings or laser-induced fluorescence (LIF) investigation, 2) installation of monitoring wells, and 3) completion of LNAPL transmissivity tests after equilibration of in-well fluid levels. Alternate approaches using petrophysical testing of soil cores are available, but can involve significant expense and uncertainty. A quicker, lower-cost method of mapping LNAPL presence and transmissivity in a quantitative or semi-quantitative manner could bring significant benefit.

Approach/Activities. By combining LIF investigation equipment and hydraulic profiling equipment in a single direct-push tool string, real-time, collocated data on both LNAPL distribution and saturation (indicated by fluorescence) and permeability of soils (indicated by measuring pressure dissipation and flow while injecting a small amount of water into the formation) can be collected. LNAPL saturation and soil permeability are primary factors controlling LNAPL conductivity and transmissivity, and LNAPL transmissivity can be estimated from the combined data set and compared to results from conventional transmissivity tests at adjacent monitoring wells for calibration. The combined LIF and hydraulic profiling investigation approach could offer a rapid means to characterize not only LNAPL distribution, but also identify areas of LNAPL with greater potential for mobility and practical recoverability.
Arcadis is conducting field trials for verification and refinement of this concept at several automotive manufacturing facilities with known LNAPL impacts. Data from approximately two sites will be selected for discussion, and may include locations where investigation data are used to assess potential recoverability of LNAPL outside of the area of influence of an existing recovery system, or to identify areas where LNAPL may have historically migrated toward a surface water body. Results can also guide locations for future monitoring well installation, and assess the need for remedial measures.

Results/Lessons Learned. The technical aspects of the investigation approach and the available configurations of LIF equipment and hydraulic profiling equipment will be discussed, and the process used to select specific equipment for the field trials will be presented. Selected results from specific locations at each site will be presented in detail, discussing the process used to interpret the high-density data and presenting comparisons to transmissivity tests from monitoring wells adjacent to investigation locations. Cases of good correlation to monitoring-well-based transmissivity results and the existing conceptual site model will be presented, as well as cases where results deviated from expectations.