

Rapid Site Characterization and Conceptual Site Model Development in Light of Data Quality Failure

L. Christopher Oakes.....Norfolk Southern Railway Company
Matthew ZenkerAECOM Technical Services, Inc
Mark Holsing.....AECOM Technical Services, Inc

Site remedies depend on the accuracy and completeness of data supporting the Conceptual Site Model (CSM). But, what happens when the historical data are later found to be inaccurate or incomplete? In April 2015, Norfolk Southern launched the final phase of investigation of a 35-year-old light non-aqueous phase liquid (LNAPL) pump-and-treat remediation site to complete the characterization of LNAPL occurrence using a Triad approach. The goal of the investigation was to fill presumed minor data gaps from prior investigations (dating back to the 1980s) and complete the CSM to support the design of a remedy for protection of a sensitive surface-water body adjacent to the site. Investigative technologies included:

- Cone penetrometer/laser induced fluorescence (LIF) survey,
- Direct push sampling,
- LNAPL fingerprinting,
- Groundwater sampling,
- LNAPL transmissivity/mobility testing(cryogenic soil analyses), and
- Demonstration of natural source zone depletion.

Initial readings from the LIF suggested that site conditions varied substantially from those of a prior LIF survey at many (but not all) of the historical locations. Within the first few hours of the investigation, the NS and AECOM technical project team evaluated the discrepancies between historical and real-time datasets and determined they were the result of false negative field results of the historical dataset. As a result, the objectives and investigative approach were revised in the field immediately and implemented the following day. This resulted in an expansion of the LIF survey to close the newly identified data gaps as well as to fill the anticipated data gaps to define the LNAPL body.

The updated field program was completed within the original budget and schedule despite the radical scope alterations. These studies allowed NS to demonstrate that LNAPL recovery rates by pumping were nearly an order of magnitude lower than the estimated natural biodegradation rate, that less than 2% of LNAPL saturation was mobile, and that the observed LNAPL occurrence was of insufficient mass to migrate to the adjacent surface-water body. The CSM was updated and included in the Site Characterization Report, which was accepted by the regulator without comment. The project moved into the remedial alternatives evaluation phase by the end of 2015. The results of these studies also provided the regulator with confidence that the LNAPL saturation was sufficiently well understood to allow for the shutdown of the pump-and-treat system during remedial design and construction.