

Evaluating Natural Attenuation using Multiple Lines of Evidence in Complex Geologic/Hydrogeologic Conditions

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Background/Objectives. Groundwater impacted with chlorinated volatile organics at a former manufacturing facility has been historically monitored to identify the potential for potential offsite impacts. Based on the ongoing review of historical groundwater monitoring data, a program to further evaluate natural attenuation versus other potential remedial alternatives, should they be required, has been implemented. A deep dive into the historical data in 2020 identified that natural attenuation mechanisms appeared to be active at the site, but a more thorough evaluation was needed given the somewhat complex geologic/hydrogeologic site setting. Project objectives were to collect multiple lines of evidence (LOEs) to bolster the current understanding of subsurface conditions with respect to natural attenuation and the potential to prevent migration of the VOCs beyond the property; prevent exposure of potential receptors; and identify the need for additional remedial actions.

Approach/Activities. To collect additional data related to the multiple LOEs, the current conceptual site model (CSM) and historical data re-evaluation were used to design a supplemental data gathering effort to refine the existing CSM and develop additional lines of NA evidence. The supplemental data gathering included source identification soil boring, high resolution geophysics, seismic, borehole logging, microbiological sampling using multiple analytical approaches (using qPCR with standard and small (nanoliter) sample volumes to compare results), carbon stable isotope analysis (CSIA), along with a focused groundwater monitoring program to gather VOC and other natural attenuation groundwater analytical data. These data were evaluated to develop a multiple LOE assessment of the potential for natural attenuation to maintain groundwater conditions at the property boundary from exceeding established regulatory criteria.

The multiple lines of evidence were combined with the revised CSM to prepare a comprehensive presentation of current site conditions and to guide future decision making related to natural attenuation and/or the feasibility for implementing additional remedial alternatives at the site.

Results/Lessons Learned. The results and findings from the completion of the revised CSM, the evaluation of the supplemental groundwater data, and the other multiple LOEs will be presented and discussed with respect to the evaluation of natural attenuation versus additional remedial measures. The data evaluation is currently being completed and will be available for presentation. Initial review of the data suggests that no additional sources have been identified and that natural attenuation is ongoing and is a viable alternative remedial approach but may need to be enhanced or supplemented in specific subsurface areas to maintain the efficacy of natural attenuation and the provide the justification that additional and more active remedial alternatives are not necessary to meet the established remedial objectives.