Treatability Studies in Support of Full-scale Design for In Situ Remedies

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Ex situ treatment processes are often selected as a means to complete remediation and move towards site redevelopment/re-use. In situ treatment is often more sustainable but also subject to more uncertainty. The cost to excavate and treat materials can be substantial and may not be effective if residual contaminant mass remains which can then re-contaminate materials. Laboratory treatability studies using site soil and groundwater to evaluate treatment effectiveness are very useful for supporting field scale design. After the costs to investigate and delineate a site are incurred it can be challenging to justify more costs to for laboratory assessments for remedy design.

There are remediation technologies for which site specifc laboratory treatability testing can be very useful. Chemical oxidation studies can help measure the natural oxidant demand of site materials and assess the effectiveness of a particular chemical oxidant for specific compounds of concern. Column studies are particularly useful to assess effectiveness of zero valent iron (ZVI) and provide key data to design permeable reactive barriers. Biodegradation tests which can be either laboratory microcosm tests or molecular screening are used to assess the potential for microorganisms to promote degradation of site specific compounds of concern.

Many in situ remedies routinely use treatability tests to verify site specific treatment variables, such as (i) oxidant addition rates, activation chemistry and natural oxidant demand, (ii) evaluation of suitable electron donors or acceptors for degradation of site contaminants, (iii) evaluation of site specific degradation rates, (iv) enumeration and evaluation of specific microbial populations and (v) evaluation of the nature, rate and extent of intrinsic biological and abiotic degradation activities. Customizing laboratory treatability studies based on site-specific geochemical and microbiological conditions provides strong evidence for potential field performance. Success in the laboratory provides technical understanding of the remedial technology and confidence that it can be applied successfully in the field.

This presentation will provide a summary of commonly used laboratory treatability studies, provide a general overview of how this information can be valuable in design for full scale design and give a case study of the benefits of laboratory pre-design tests.