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Solar-Powered ISB System Leveraging Existing Infrastructure

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Background/Objectives. A plume of chlorinated solvents is present in groundwater beneath a former industrial facility. This facility is located in a remote area, and does not have on-site water or electricity. A solar-powered groundwater extraction system had operated at the site since 2010 to mitigate groundwater impacts. Multiple injection events using aerobic in situ bioremediation and in-situ chemical oxidation had also been performed. The goal of remediation is to maintain concentrations below maximum contaminant levels (MCLs) at the downgradient property line. In late 2015, Trihydro was retained by the project owner to evaluate current conditions and potential modifications to the remediation strategy. This review documented that: 1) natural attenuation processes are robust at the site; and 2) chlorinated solvent attenuation rates in the source area could be enhanced by retrofitting the existing solar-powered pumping system to perform as an anaerobic in situ bioremediation (ISB) system. This presentation will detail how existing infrastructure can be used to work with and enhance naturally-occurring processes to optimize treatment effectiveness and level of effort required.

Approach/Activities. The first step in the optimization process was a detailed evaluation of current conditions, including fate and transport, attenuation rates, geochemistry, and the performance results attained by previously-implemented remediation technologies. This evaluation determined that anaerobic reductive dechlorination processes were already robust, and that these processes could be further enhanced by ISB as evidenced by the results of a 2008 ISB pilot test. Both of these considerations suggested that ISB could be an effective remediation technology.

Once ISB was selected for source zone treatment, the next phase of work focused on development of an effective yet efficient delivery process. Because the project owner had already invested in extraction wells and solar-powered pumping equipment, this equipment was leveraged for ISB. Injection wells were installed at a wide spacing based on delivery of a relatively large volume of fluids allowed by continuous operation and also movement of ISB amendment with natural groundwater flow.

Results/Lessons Learned. The solar powered ISB system was installed in late summer 2016, after preparation of planning documents and receipt of the underground injection control (UIC) authorization allowing re-injection of uncontaminated groundwater. Construction consisted of injection well installation and retrofitting of solar pumping infrastructure and piping. Pre-injection sampling of injection wells for chlorinated solvent concentrations determined that one well already met project endpoints. This well therefore used as an extraction location to provide additional makeup water beyond that available from two pre-existing wells in the area. The system was configured to inject into seven well simultaneously. Emulsified vegetable oil (EVO) bioamendment was metered into the makeup water with a proportional mixer. Though makeup water extraction rates were only 5 gpm, approximately 300,000 gallons of mixed EVO was delivered during the course of the injection event. At the time this presentation is delivered, data from two quarterly groundwater monitoring events will be available to evaluate treatment.