Slow Release Multi-Oxidant Cylinders for Remediation of a 1,1-DCE Plume

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Background/Objectives. A slow release oxidant pilot test was conducted at a manufacturing facility in South Carolina to address the dilute downgradient portion of the VOC plume extending from the former hazardous waste surface impoundment. This area of the contaminant plume is being targeted for remediation to prevent off-site migration of the residual dissolved phase contaminant mass that remains in groundwater following source area remediation activities conducted between 1989 and 2005. The remaining VOC plume is defined primarily by low levels of 1,1-DCE in groundwater. The treatment area includes 70 feet of saturated aquifer between the top of the water table and the partially weather rock zone.

Approach/Activities. Sustained release oxidant was selected for pilot testing over traditional oxidant delivery methods to minimize the effort required during repeated application. The sustained release oxidant selected for use is the RemOx® SR+ ISCO reagent developed by Carus Remediation. RemOx® SR+ was developed to provide a sustained release source of potassium permanganate and sodium persulfate for soil and groundwater treatment. RemOx® SR+ cylinders consist of approximately 38% solid potassium permanganate and 38% solid sodium persulfate homogenously dispersed within a solid paraffin wax matrix. The wax matrix serves to slow down the instant dissolution of oxidant and allows for slow sustained release into groundwater. The paraffin wax used to entrap the oxidant is a benign material that is biodegradable.

A total of fifteen 18-inch long multi-oxidant cylinders were placed in seven injection wells in the pilot test area. Each 2-inch PVC injection well was constructed with 30 feet of screen. The injection wells were placed on 5-foot centers.

Results/Lessons Learned. Reductions in 1,1-DCE concentration in the pilot test injection wells between 85% and 100% were observed immediately following cylinder emplacement. The 1,1-DCE data collected from the injection wells indicates that the sustained release cylinders are capable of creating a reactive zone where 1,1-DCE is oxidized, and that reactive zone can be sustained for a period of at least 9 months. Visible oxidant was present at distances up to 30 feet downgradient of the injection well barrier wall within 3 months following emplacement of the cylinders and remained in many of the pilot test wells through the 9-month sampling duration of the study. Based on this data and the 1,1-DCE data collected throughout the duration of the pilot test, it appears that the sustained release oxidant cylinders are capable of reducing and maintaining a reduction in 1,1-DCE concentration at a distance of up to 30 feet from the injection well barrier wall. The emplaced cylinders resulted in a sustained decrease in 1,1-DCE concentration throughout the pilot test area for a period of up to 9 months after cylinder emplacement. This case study will highlight design, installation, and results of the pilot study.