WAVEFRONT
PRIMAWAVE

Electron Donor Injection

Location	DoD Site in Utah, USA
Operator	Local Direct Push Contractor
Formation	Unconsolidated Dense Clay
Aquifer Target	Dissolved Chlorinated Solvent Contaminants
Application	Dissolved Mass Reduction via EHC® Injection
Tool used	Surface Deployed Sidewinder Tool
Date installed	September 2009

Introduction

Primawave, a proprietary technology of Wavefront was used to maximize injection efficacy in an aquifer that has historically proven difficult for remedial injections.

Injection Issue

At this active Department of Defense site in Utah, high chlorinated VOC concentrations under pavement required treatment. Due to previous experience with remedial injections into this clay unit, the proposed approach called for measures to avert product surfacing while maximizing subsurface distribution.

Primawave Installation

The Primawave Sidewider was attached to the top of direct push rod strings, and the EHC® product was pumped through the Sidewinder, down through the rods, and out into the aquifer at depths of approximately 5 to 9 feet below ground surface. EHC® is a controlled-release, integrated carbon and zero valent iron (ZVI) source that yields redox potential (Eh) in the -500 to -650 mV range.

The injection pressures used to deliver the electron donor varied from approximately 50 to 100 psi, and delivery rates ranged from 5 to 10 gallons per minute.

Temporary soil borings installed in the vicinity of the treatment area were used to track the post-injection geochemical response to electron donor delivery.

Results

The successful injection project realized no surfacing of the EHC® product during injection upon application of Primawave. The injection contractor initially was unable to deliver the entire 50 gallon volume of EHC per point as designed without use of Primawave. Without Primawave the injection contractor could only inject 10 to 20 gallons of EHC® product before the product would short-circuit to the surface either along the direct push rods or through cracks in the pavement. The injection contractor was able to inject the targeted 50 gallons of EHC product only when pumping through the Primawave Sidewinder tool.

The presence of the EHC® material was registered at pavement cracks during injection up to 30 feet from the injection point. Soil cores taken immediately after the initial injections indicated the presence of the EHC® approximately 7 feet from the injection point. These results indicated the EHC® traveled farther from the injection points with Primawave.

The implementation of Primawave resulted in the successful *in situ* injection of EHC® product. The results from the Primawave application were immediate, and longer-term benefits will be monitored:

- Product surfacing was eliminated with the Primawave Sidewinder.
- Overall injection efficiency was maximized with Primawave, and the targeted volumes of EHC® were only capable of being delivered with Primawave.
- Post-injection monitoring indicated that Primawave increased the distribution of the EHC in the subsurface as indicated by post-injection soil coring samples.