



Geosyntec designed and managed a treatability column study and developed PRB design parameters.

Client: Confidential Chemical Manufacturer

Services Provided:

- ✓ Treatability Study Design
- ✓ Column Test Performance
- ✓ Development of PRB Design Parameters

Project Objective

Our client's objectives were to evaluate the potential effectiveness of treatment of dissolved arsenic (As) by zero-valent iron (ZVI) in a permeable reactive barrier (PRB) application, and to quantify parameters required for design of a PRB. The specific objectives of the study included determination of the dissolved As removal capacities by commercial ZVI sources tested, including assessment of the behaviour of arsenic species, As(III) and As (V), evaluation of the stability of As sequestered by ZVI, and assessment of the potential mobilization of As in the aquifer matrix by ZVI-treated groundwater.

Geosyntec's Scope of Services

Geosyntec was tasked with developing a testing procedure and overseeing the study performed at SiREM laboratory, a division of Geosyntec, to provide to the client a basis for designing a ZVI PRB for in-situ treatment of As impacts in site groundwater. Two commercial ZVI sources and impacted site waters collected at two site locations were evaluated under flowing conditions. In order to meet the test objectives, three parallel column systems were used for each ZVI source and site groundwater in a 10-week long test:

- A series consisting of a ZVI column and an impacted aquifer material column to determine the As removal capacity and the potential mobilization of As in the downgradient aquifer;
- A ZVI column to evaluate the stability of the ZVI-sequestered As under exposure to non-impacted site water; and
- A sacrificial ZVI column which was dismantled after an initial exposure to As-impacted water, with the spent ZVI material submitted for leachability determination (TCLP) and surface analyses including scanning electron microscopy and energy dispersive X-ray (SEM/EDX) and X-ray diffraction (XRD).

Notable Accomplishments

The study demonstrated the commercial ZVI products were capable of treating total As concentrations of 50 and 100 mg/L with bulk As removal capacities ranging from 2 to 14 mg As per gram ZVI and that As(III) was removed preferentially to As(V). Less than 0.2% of the ZVI-sequestered As mass was shown to be leachable under the TCLP procedure or exposure to As-free site groundwater. The custom testing procedure minimized chemical alteration of groundwater during the long-term test, providing high quality, representative data on dissolved As behaviour in the proposed PRB system.