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TEA Case Study: Use of EZVI to Eliminate a Pump and Treat System for Chlorinated Organics

Background/Objectives. Novel in-situ remediation technologies are increasingly being sought to improve the treatment of soil and groundwater and to replace existing remediation systems that are demonstrating diminishing returns. This case study discusses the implementation of emulsified zero-valent iron (EZVI) as a remediation alternative to an existing pump and treat system at a chemical manufacturing facility located in the San Francisco Bay Area that is impacted with chlorinated organic compounds. A new remedial strategy was implemented due to rising operations and maintenance costs and because the total extraction rate of the pump and treat system had decreased to less than 25% of its original design rate. EZVI is an emulsion of vegetable oil, water, surfactant, and elemental iron and is an in-situ remediation technology that reductively dehalogenates residual chlorinated organic compounds through both abiotic treatment and long-term biodegradation.

Approach/Activities. Prior to injecting EZVI into the target area, a subsurface investigation was performed to refine the site geology and contaminant extent. Soil borings were collected and geophysical logs and membrane interface probe (MIP) profiling were performed. MIP is a field screening tool used to log the relative magnitude of total volatile organic contaminants with depth.

During May through June 2014, approximately **35,000 gallons of EZVI** were injected into an area immediately upgradient of where the groundwater from the site discharges into surface water. A total of 24 locations were injected. The pump and treat system was shut down prior to the EZVI injections.

Results/Lessons Learned. The subsurface investigation data were used to identify the target injection depths. The depths with the highest relative concentrations based on the MIP data were deeper than the preliminary target injection depths based on historical concentration data. Because EZVI is highly viscous, injection of this material into the subsurface can be challenging and injection techniques may vary depending on the formation properties. Direct push technology and “top-down” and “bottom-up” injection techniques were used to deliver EZVI at this site. The radius of influence for each injection location was approximately 25 feet.

After the injections, monitoring of the surface water was performed monthly for one year and once a quarter thereafter. Surface water concentrations have remained below site cleanup standards since the latter part of 2014. The results demonstrate that the EZVI has been effectively reducing the flux of chlorinated organic compounds entering the surface water.

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