

Sustainable Approach for Remediation at an Active Fueling Station

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An active gas station in eastern Oregon is performing remediation of free-phase product (product) and dissolved-phase hydrocarbons extending over two city blocks. Our approach has included sustainability goals from materials selection, to natural resource conservation, to low-impact installation and treatment technology selection. Compared to conventional treatment approaches, this remedy is on-track to reduce granulated activated carbon usage by 200,000 pounds, save 800 megawatt-hours of electricity, and preserve over 150,000,000 gallons of groundwater in this arid agricultural area over the life of the project.

Beginning in March 2008, we incorporated several sustainable approaches to remediate both the 7-acre product plume, measuring up to 2.1 feet thick, along with associated dissolved-phase hydrocarbons. By using a centrally-located liquid-ring pump (LRP) for multi-phase extraction (MPE), we eliminated the need for 14 groundwater pumps, soil vapor extraction equipment, electrical wiring and conduit to each well, and separate manifold piping to convey each fluid. This MPE approach reduced treatment volumes from approximately 30 gallons per minute (gpm) to 6 gpm at the same time preferentially removing product, high concentrations of dissolved hydrocarbons, and volatile hydrocarbons from the vadose zone. We designed the system to use 14 existing monitoring wells, and installed manifold piping using directional drilling equipment to reduce the amount of soil, concrete, and asphalt waste generated by more than 90 percent.

Sustainable hydrocarbon treatment techniques included the use of a catalytic oxidizer to destroy recovered fuel vapors rather than physical capture using just granular activated carbon. After 18 months of system operation, *in situ* oxidative bioremediation treatment was incorporated in areas where product had been removed by using existing infrastructure to re-inject most of the air-stripped groundwater and deliver amendments.

The MPE and oxidative bioremediation approach is accelerating the remediation time frame by directly addressing the fractions of gasoline that frequently cause groundwater concentration rebounds. Approximately 28,500 pounds of petroleum has been physically removed with an additional 3,100 pounds biologically oxidized through September 2010. The system is expected to operate in until the site is ready for monitored natural attenuation in March 2011.