



## CASE STUDY

**SITE:** Former UST at New Retail Development, Cheyenne, Wyoming

**CLIENT:** Wyoming Department Environmental Quality (WDEQ), Storage Tank Program



### INTRODUCTION

Using the comprehensive **TerraCert™** program, LT Environmental, Inc. (LTE) implemented a fast, effective remedial solution for the Wyoming Storage Tank Program (STP) and new landowner.

The site was a 1970s former retail gasoline station. During a road construction project in 1993, the Wyoming Department of Transportation encountered petroleum impacted soil in the highway right-of-way adjacent to the site location. As a result of the identification of the impacted soils, the site was included into the Wyoming Department Environmental Quality (WDEQ) STP. Because LTE is the design engineer for the WDEQ STP program; the firm became responsible for the site.

### EVALUATION/SITE ASSESSMENT

An initial investigation completed in 1995 reported concentrations of benzene above the WDEQ clean-up level in groundwater. Assessment activities were completed by LTE in 2002 and 2003 which confirmed benzene and total petroleum in soil and groundwater. LTE collected samples from geoprobe borings and monitoring wells installations, completed additional fluid elevation measurements and completed aquifer testing.

Soils consisted of interbedded lenses of sand and clay, overlying claystone bedrock at a depth of 10 to 12 feet below ground surface (bgs). The depth to groundwater beneath the site ranged from 4 feet to 11 feet bgs. Total petroleum hydrocarbons–gasoline range (TPH-GRO) at a concentration of 41.0 milligrams per kilogram (mg/kg) and benzene at concentrations of 0.0173 mg/kg and 0.0476 mg/kg were detected, exceeding the calculated WDEQ soil clean-up levels.

Studies also detected concentrations of benzene, toluene, TPH-GRO, and TPH-diesel range (DRO) above the respective WDEQ clean-up levels for groundwater. Groundwater analytical results indicated benzene up to 1.89 milligrams per liter (mg/L) and TPH-GRO up to 26.7 mg/L. To close the site,



groundwater concentrations of less than 0.005 mg/L benzene and less than 10 mg/L combined TPH-GRO and TPH-DRO were required.

## **DESIGN/INSTALLATION**

Ongoing construction activities limited the active remedial options that could be implemented within the desired project construction time frame. It was also desirable to implement the program prior to completion of new retail development. Injection of the carbon based sulfate slurry (BOS-200<sup>®</sup>) was selected to rapidly reduce hydrocarbon impacts, thus achieving regulatory clean-up quickly.

The carbon-based injectate accelerates biodegradation processes by concentrating microbes, electron acceptors, electron donors, and nutrients together in an activated carbon matrix, and immediately reduces the concentration of hydrocarbons in the subsurface. Rates of degradation within the carbon matrix are significantly faster than rates commonly observed using conventional in-situ bioremediation technology due to this concentration effect.

The injection plan called for 62 borehole locations placed on approximate 10-foot centers. The volume of injectate varied from 30 to 360 pounds per borehole. A total of 17,490 pounds of injectate was delivered to the subsurface with 65 gallons of bacteria culture. Injectate, completed in October 2005, was delivered using a track mounted geoprobe direct push rig outfitted with specialized tooling and injection pump apparatus.

## **RESULTS / CLOSURE**

After completion of the injection program, the first sampling indicated that hydrocarbon concentrations were below the WDEQ clean up standards. Results indicate benzene at less than 0.001 mg/L and combined TPH concentrations between <0.002 mg/L to 3.68 mg/L. An additional three-quarters of groundwater monitoring demonstrated that the results remained below the WDEQ clean-up levels. Redevelopment activities were initiated during the monitoring period.

In May 2007, LTE received a closure letter from the WDEQ. Through the **TerraCert™** aggressive evaluation, design, installation and monitoring program LTE was able to meet the rigorous WDEQ regulatory requirements AND the developer's time frame.