

# Redfield Site

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## Off-Site Groundwater Cleanup Program

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September 2006

### **Why is Brown Retail conducting off-site groundwater cleanup activities?**

The off-site groundwater investigations Brown Retail conducted relating to the Redfield site indicate that certain solvents and their breakdown products exceed the State of Colorado's groundwater standards. Since Denver Water supplies residential water in the areas with groundwater impacts, there is no risk to residential drinking water.

Although the groundwater is not being used for drinking water, it has been identified as a source of indoor air vapors in homes located above the impacted groundwater. Because the groundwater is causing indoor air impacts and exceeds the State's groundwater standards, Brown Retail has been ordered to clean it up. Brown Retail is working to remediate off-site groundwater to meet the State of Colorado's groundwater standards within a reasonable amount of time. Over time, the groundwater cleanup will ensure that vapors from various compounds found in the groundwater do not enter homes in quantities that exceed remediation goals established by the Colorado Department of Public Health and Environment (CDPHE).

### **What is being done to clean up off-site groundwater?**

In March 2000, Brown Retail installed and began operating a groundwater containment and treatment system. The system consists of wells located along the north and east boundaries of the Redfield site that pump groundwater to an on-site treatment facility where it is treated to remove solvents, and then re-injected downgradient of the extraction wells. The system operates continuously to prevent solvents in the groundwater from leaving the Redfield site.

In 2004, Brown Retail implemented two additional cleanup measures:

- 1) The enhanced injection system, and
- 2) The groundwater "bioremediation" system.

The enhanced groundwater containment system includes 18 treated-water injection wells and seven extraction wells. This system expands the system described above that was installed in 2000. The expansion of the system allows more treated water to be injected into the ground. This additional clean water will accelerate the flushing and decrease concentrations of residual solvents in the aquifer. Nine new injection wells have been operating since August 2003 and another nine began operating in November 2004.

The bioremediation system was constructed in 2004 and began operating in early 2005. Throughout 2004, engineers installed monitoring wells to be used to assess the bioremediation system's effectiveness and to refine the system's design. Injection wells were installed along the east side of South Jasmine Street south of East Mexico that will be used to inject oxygen, nutrients and food into the groundwater. A building that houses the bioremediation system's operating equipment was built on the Redfield site, and in late 2004, construction of the system was completed with the installation of pipelines that connect the operating equipment to the injection wells. Testing of the system began in December 2004.

The bioremediation system, installed in the natural, narrow bedrock channel beneath part of South Jasmine Street, further enhances the initial groundwater treatment system. The system also enhances natural processes already acting to transform the solvents in the groundwater into harmless breakdown products. The existing groundwater environment in the affected area contains naturally occurring biological organisms that break down the solvents in the groundwater. The

system involves injecting oxygen, nutrients, and “food” into the groundwater, using wells, so that these organisms can multiply and grow. As these organisms consume the food, they also break down the solvents.

By degrading the solvents as they pass through the bedrock channel at Jasmine Street, clean water is created, which continues to flow down the channel. Additionally, some of the oxygen, nutrients and food injected into the treatment zone travel with the groundwater, boosting the natural biodegradation processes.

Therefore, while the enhanced injection system is cleaning the portion of the plume near the Redfield property, the groundwater bioremediation system at Jasmine Street helps flush clean water into the remainder of the plume and further accelerates the degradation of solvents to meet Colorado’s groundwater standards.

## **How will you know if these cleanup efforts are effective?**

EnviroGroup collects quarterly groundwater samples from wells on and downgradient of the Redfield site for testing. The test results indicate that concentrations of chemicals in groundwater in wells north of the Redfield site have been, and continue to be, reduced. EnviroGroup will continue to collect quarterly groundwater samples for testing to monitor the effectiveness of the groundwater treatment systems.

The groundwater containment system has cleaned 30.9 million gallons of water from the time it began operating in March 2000 through September 1, 2006, contributing to the groundwater improvements seen to date. This system should continue to decrease concentrations of chemicals in the off-site groundwater as it continues to operate.

## **Is the construction complete along East Jewell Avenue and South Jasmine Street?**

Yes. There is no additional construction anticipated along these streets in 2005. Monitoring, sampling of groundwater wells, and system maintenance will continue to occur.

## **When will the off-site groundwater cleanup be complete?**

We anticipate that it will take several years, and perhaps longer in certain areas that are most distant from the groundwater treatment systems, for concentrations of solvents in the groundwater to decrease to levels that meet CDPHE’s regulatory standards.

## **For More Information**

For more information on the Redfield site environmental activities, contact:

### **Lisa Sigler**

Brown Retail/Redfield Community Relations Representative  
(303) 778-8355 phone  
(303) 778-8359 fax  
lisa@siglerinc.com

### **Derek Boer**

Colorado Department of Public Health and Environment, Community Involvement Specialist  
(303) 692-3329 phone  
(303) 759-5355 fax  
derek.boer@state.co.us

**Information Line: 303-637-2503**

**Web Site: [www.redfieldsite.org](http://www.redfieldsite.org)**