

Redfield Site

Environmental Fact Sheet

Updated July 2011

The Site

The former Redfield site is located at 5800 E. Jewell Ave. in Denver, Colorado, on approximately 11 acres. It includes a building where binoculars and scopes for rifles were manufactured by various entities using the Redfield name from 1967 to 1998. Brown Retail operated at the site for five years, from 1979 to 1984. In 1984, Brown Retail sold the business and operations to Redfield Rifle Scopes, Inc., (RRSI), which operated the site from 1984 to 1998. RRSI is no longer in business. Today, Brown Retail owns the property and, since 2000, leases the building to CAPCO Tile and Stone, a wholesaler and retailer of stone and tile. No manufacturing is conducted at the site.

Environmental Investigation and Response

Environmental investigations associated with the sale of the property indicated that a degreaser used in the manufacturing facility to remove oil and grease from manufactured parts was a source of cleaning solvents detected in the groundwater below the site. Groundwater in the area travels towards the north and then to the northwest. As a result of these findings, in May 1998, the Colorado Department of Public Health and Environment (CDPHE) issued a Compliance Order formally requiring a site investigation and remediation activities. Since this time, Brown Retail has been working to:

- Prevent the flow of affected groundwater into the adjacent neighborhood;

- Clean up the groundwater;
- Test area houses and buildings for the presence of indoor air vapors that rose up from the affected groundwater;
- Install indoor air mitigation systems where necessary to prevent vapors from entering a house or building.

EnviroGroup Limited, a Denver-based environmental engineering firm, conducts the testing and manages all Redfield site-related remediation activities for Brown Retail.

Chemical Descriptions

Several chemical substances have been found in varying quantities and locations in the groundwater under the site and surrounding areas. Where these substances have been found, they vary in quantity from trace amounts (at or near what can be detected) to levels of about 1 part per million. The primary contaminants CDPHE has focused on related to the Redfield site are 1,1-Dichloroethene (1,1-DCE) and Trichloroethene (TCE). These are part of a family of chemicals known as "volatile organic compounds." The term volatile refers to the ease in which they evaporate in air.

- **1,1 Dichloroethene (1,1-DCE).** This compound can be formed in groundwater as a breakdown product of the solvents 1,1,1 Trichloroethane (TCA), TCE and Perchloroethylene (PCE).
- **Trichloroethene (TCE).** TCE is a solvent that commonly was used in the past for cleaning manufactured and machined parts, and in common household products such as pesticides, glues and adhesives. TCE continues to be used as an industrial cleaner in the automotive and metals industries, and still may be found in household products such as cleaning fluids for rugs, paint removers and cleaning solvents.

Businesses to the south and west of the Redfield site include a gas station, dry cleaner and the Colorado Department of Transportation regional headquarters. All these businesses used volatile organic compounds as well.

Health Effects

Since Denver Water supplies residential water in this neighborhood, there is no impact to drinking water. The most likely way people could be exposed to these compounds is by breathing vapors that have moved from the groundwater, up through the soil, and into

the basements or lower levels of homes. Unless there is adequate ventilation, these vapors can collect inside a house or building.

The concentrations of compounds that have been detected in the houses near the Redfield site are at a level where no clinical health effects in people have ever been observed. Additionally, a cancer incidence study and birth defects incidence study completed by CDPHE in December 2002 concluded the incidences of both cancer and birth defects in the neighborhood were no different than neighborhoods outside the Redfield test area. The studies did not find any excess cancer attributable to the groundwater solvents.

Neighborhood Testing and Remediation

In the spring of 1998, Brown Retail, under the supervision of CDPHE, initiated indoor air testing of select homes near the Redfield site to determine if vapors had entered those homes. The indoor air testing involved placing a vacuum canister in the lowest living level of each home and collecting an indoor air sample over a 24-hour period. The homes were selected for testing based on the likelihood that they may be affected by vapors from groundwater contamination. The canisters were removed after 24 hours and sent to an independent laboratory for analysis. CDPHE and residents were advised of the testing results as soon as they became available. This testing process is still followed today.

Homes with air concentrations above CDPHE's action level of 5.0 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) for 1,1-DCE are offered mitigation systems. Until late 2004, CDPHE's action level for 1,1-DCE had been 0.49 $\mu\text{g}/\text{m}^3$. CDPHE also changed their guidance on TCE in 2004.

Homes testing between 0.8 $\mu\text{g}/\text{m}^3$ to 1.6 $\mu\text{g}/\text{m}^3$ for TCE require further study to determine if the source of contamination is coming from the groundwater or from inside the home (e.g., household products) and whether remediation is required.

Affected homes were remediated by installing a ventilation system identical to the type used to mitigate radon. Ventilation systems usually eliminate vapors in homes within a few days to a week after installation. This type of ventilation system is the most effective method of eliminating vapors from impacted homes. Brown Retail pays for the operation of these systems required by the state.

As of July 2011, 737 homes had been tested in the Cook Park neighborhood. Based on the state's action levels today, 240 houses currently require indoor air mitigation systems.

Groundwater Cleanup

Brown Retail has conducted on- and off-site groundwater monitoring since 1998. An extensive network of wells has been installed both on-site and in the neighborhood. Initially, wells were installed to determine the nature and extent of the groundwater contamination. Today, wells are used to monitor the improvement in groundwater quality resulting from remedial measures undertaken by Brown Retail. Other wells are actively used as part of the groundwater cleanup program.

Brown Retail installed and has operated a groundwater "pump-and-treat" containment system along the northeastern boundaries of the site since March 2000. The system consists of extraction wells that capture contaminated groundwater before it flows off-site and pump it to the surface where it is treated. The treated water is then injected into the ground through injection wells. This system has continuously prevented groundwater solvents from flowing away from the Redfield site and beneath the surrounding area. The system also captures and treats groundwater a short distance beyond the Redfield site fence line. The downgradient (i.e., downstream) portion of the existing groundwater plume is being diluted and flushed by the treated water injected by this system. The system currently is treating 2 million to 3 million gallons of groundwater annually. Groundwater monitoring is conducted utilizing an extensive well network throughout the year both on-site and in the neighborhood, and has shown a general reduction of 1,1 DCE concentrations in the groundwater over time.

Brown Retail enhanced the system in 2003 by installing 18 additional wells along the Redfield property line that are used solely to inject treated water, which accelerates the flushing of residual solvents from the groundwater aquifer.

Additionally, Brown Retail installed a bioremediation system in the area where there is a narrow bedrock channel that naturally funnels the groundwater beneath S. Jasmine St. to south of E. Mexico Ave. This system, which operated from January 2005 to April 2009, injected naturally occurring biological organisms and oxygen that broke down the solvents in the groundwater more rapidly. Operation of the bioremediation system ceased, with CDPHE approval,

in April 2009 to allow the system's wells to monitor the treatment of residual solvents in weathered bedrock. Although shut down, the bioremediation system equipment remains on standby for potential future use.

Additional Groundwater Treatment in the Neighborhood

While the groundwater cleanup efforts have been effective, monitoring in the neighborhood indicates contaminated groundwater still remains around a bedrock ridge located approximately 13 feet to 55 feet below the ground between S. Jasmine St. and S. Kearney St., just north of E. Jewell Ave.

With CDPHE's approval, Brown Retail currently is installing more groundwater injection wells directly above the impacted bedrock ridge. Natural soy bean oil will be injected into the wells serving as food for microorganisms that consume the oil and the unwanted compounds in the groundwater. The work is being done to expedite treatment of contaminated groundwater seeping from the bedrock ridge. Additionally, monitoring wells are being installed at other nearby residential properties to assess the effectiveness of this effort.

Once the groundwater is cleaned to state standards, indoor air testing and groundwater cleanup will no longer be necessary.

For More Information

We will continue to update our neighbors and other interested parties as new information about the cleanup program becomes available. We welcome your questions or comments. Please feel free to contact the following representatives for more information or call the Redfield information line.

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Redfield Information Line:

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Redfield Web Site:

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Information Repository:

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