

Drycleaner Site Profiles

Asian Cleaners, Sanford, FL

Site Description

This is an active PCE drycleaning facility that has been in operation since 1984. The facility is located in a strip mall in a mixed commercial/residential setting, approximately 150 feet northeast of a 40-acre lake. The nearest public water supply well is located approximately 2,500 feet north of the facility.

The contaminant source areas identified at the drycleaners include the soils beneath the building floor slab in the vicinity of the drycleaning machine and the area outside the service door. Two petroleum contaminated sites (service stations) are located approximately 700 feet hydraulically upgradient of the facility. One of these sites is under active remediation.

Site Hydrogeology

Depth to ground water: 2 ft - 4 ft bgs

Lithology/subsurface geology: fine-grained silty sands with some clay interbeds, surface - 48 ft bgs;
sandy clay with silt and shell fragments, 48-53 ft bgs;
fine-grained sand, 53-59 ft bgs

Conductivity: 0.6 to 2.4 ft/day

Gradient: 0.025 ft/ft

Groundwater Contamination

DNAPLs Present: No

Contaminants present: PCE, TCE, cis 1,2-DCE, trans 1,2-DCE, vinyl chloride, toluene, p-isopropyltoluene, xylenes, MTBE

Highest contaminant concentrations: 5.2 µg/l PCE; 4.5 µg/l TCE; 546 µg/l cis 1,2-DCE; 1,100 µg/l vinyl chloride

Deepest significant ground-water contamination: 16 ft bgs

Plume size: 125 ft x 35 ft

Soil Contamination

Contaminants present: PCE, TCE, cis 1,2-DCE, trans 1,2-DCE, vinyl chloride, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, p-isopropyltoluene, naphthalene, toluene

Highest contaminant concentrations 2,880 µg/kg (PCE); 96.2 µg/kg (TCE); 1,430 µg/kg (cis 1,2-DCE); 10.8 µg/kg (vinyl chloride)

Description of Remediation Scenario

Cleanup Goals: Groundwater (MCLs): PCE = 3.0 µg/l; TCE = 3.0 µg/l; cis 1,2-DCE = 70 µg/l; trans 1,2-DCE = 100 µg/l; vinyl chloride = 1.0 µg/l;
Soil (Cleanup target leachability standard): PCE = 30 µg/kg; TCE = 30 µg/kg; cis 1,2-DCE = 400 µg/kg; vinyl chloride = 7 µg/kg

Technologies Used:

Soil Vapor Extraction (SVE)

Any other technologies used:Enhanced Biosparging (PHOSTers/Magnus)

Why was technology or technologies selected: SVE is a cost-effective technology for removing VOCs from permeable unsaturated soils. Since reductive dechlorination is actively occurring in groundwater at the site, the introduction of nutrients (enhanced biosparging or EBS) should enhance contaminant degradation.

Date Implemented: SVE - January 9, 2002; enhanced biosparging - January 11, 2002.

Final remediation design: A horizontal SVE system was installed because of the shallow depth of groundwater at the site. The SVE lateral was installed just outside the service door of the facility. The SVE lateral is piped to a portable trailer-mounted treatment system.

Extraction well: 1- 20 screened section of 4-inch PVC

Depth: 2 ft bgs

SVE motor size: 5 hp Rotron 707F72MXL blower.

Design flowrate: 34 scf/m at design vacuum of 49 in. w.c.

Operational flowrate: 50.5 to 103 scf/m

Design radius of influence: 16 ft

Emissions treatment: 2-200 lb GAC canisters in series.

Biosparging System - Four biosparging wells were installed utilizing a direct push rig - one slant well (installed beneath the drycleaning facility) and three vertical wells. Well screens are constructed of stainless steel and risers are black iron pipe. At the completion of the triethylphosphate/nitrous oxide treatment regime, propane may be added approximately 6 hours biweekly to improve the microbe concentration.

Biosparge wells: screened 33-35 ft bgs

System design radius of influence: 25-30 ft

Actual radius of influence: 31-33 ft

Design injection flow rate: 3-5 scf/m per well (12-20 scf/m total flow rate)

Actual injection rate: 1 scf/m per well, sparging from two wells at a time in one-hour intervals twice per day to allow aquifer stabilization between injections.

Injection concentrations/mass (for project life): nitrous oxide, 0.07% - 0.1% by volume in air (1060 lbs total mass); triethylphosphate, 0.007% by volume in air (106 lbs total mass); oxygen (as air), 3-5 scf/m per well at 15 psig (1,060,000 lbs total mass); propane, 50% of lower explosive limit in air, 6 hours biweekly at end of treatment regime (10 lbs total mass)

Water from the air/water separator is discharged to an infiltration trench located in the radius of influence of both the SVE and EBS systems so that any water extracted will be retreated by the biosparge system.

The SVE system is projected to operate for three months, while the Phoster/Magnus system is projected to run for 12 months.

Results

Based on a minimal run time, the SVE system removed 1.28 lbs of VOCs during the first month of operation. Water intake into the SVE system transfer lines has reduced the system radius of influence. Groundwater monitoring is ongoing and results are not yet available.

Costs

Site assessment: \$ 88,600

Design: \$ 32,000

Implementation: \$ 118,000

O&M: \$ 150,000 (estimated for 12 months operation)

Total costs (only completed sites):

Lessons Learned

1. Biosparge wells needed to be cycled (on/off) to allow for aquifer stabilization, minimization of groundwater mounding and to eliminate the potential for contaminant volatilization.
2. SVE radius of influence has been reduced by water intake into system transfer lines.
3. Direct push installation of a slant sparge well beneath the drycleaning facility allows for treatment of the primary contaminant source area at the site.
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Site Specific References

- Contamination Assessment Report - 7/99
- Remedial Action Plan - 5/01
- Construction Completion Report - 2/02

Contacts

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Drycleaner Site Profiles

Cypress Village Shopping Center, Bridgeton, MO

Site Description

The subject site is a 20-acre shopping center. The entire site is in the Voluntary Cleanup Program. The constituent of concern is tetrachloroethene due to operations from a dry cleaning facility in this shopping center.

Site Hydrogeology

Depth to ground water: 11 ft bgs

Lithology/subsurface geology: Brown silty clay

Conductivity: 0.08 ft/day

Gradient: 0.012 to 0.021 ft/ft

Groundwater Contamination

DNAPLs Present: Unknown

Contaminants present: Groundwater contamination with tetrachloroethylene, trichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, and vinyl chloride

Highest contaminant concentrations: 110 mg/L

Deepest significant ground-water contamination: 17 ft bgs

Plume size: A shallow plume approximately 150 feet long extends under the shopping center's parking lot.

Soil Contamination

Contaminants present: None.

Highest contaminant concentrations:

Description of Remediation Scenario

Cleanup Goals: Groundwater 5 µg/L Soil 55 mg/kg

Technologies Used:

Hydrogen Release Compound ® (HRC)

Any other technologies used:

Why was technology or technologies selected:

This technology has been suggested, but not given final approval yet.

Date Implemented:

Final remediation design:

Results

Results achieved to date:

Eight quarterly samplings have been conducted. Natural degradation of PCE is ongoing. While there appears to be some breakdown of PCE and its degradation products, no appreciable difference was detected in the size or concentrations of the contaminant plume during the second year of monitoring.

Costs

Site assessment: Unknown

Design and implementation: Unknown.

O&M:

Total costs (only completed sites):

Lessons Learned

1. Nothing new was learned about groundwater during quarters 5 - 8. The remedy could have been selected a year earlier based on quarters 1 - 4.

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Site Specific References

Not Provided

Contacts

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Drycleaner Site Profiles

Dry Clean USA # 11204, Fort Lauderdale, FL

Site Description

Drycleaning using PCE was performed at this site from 1985 to 1996. The facility currently is a dry drop-off location. The facility is located in a mixed commercial/residential setting. The nearest public water supply well is located approximately 2,670 ft east of the facility. An irrigation well is located approximately 120 ft southwest of the facility.

Site Hydrogeology

Depth to ground water: 5 ft bgs

Lithology/subsurface geology: Fine-grained sand, surface-7 ft bgs;
Organic rich soil, 7-8 ft bgs;
Very fine to fine-grained sand, 8-23 ft bgs;
Sandy, oolitic limestone, 23-34 ft bgs;
Very fine-grained sand to medium-grained sand, 34-50 ft bgs;
Limestone 50-70 ft bgs

Conductivity: 44 ft/day (shallow aquifer to 33 ft bgs); 27 ft/day (intermediate aquifer 33-47 ft bgs)

Gradient: 0.0015 ft/ft

Groundwater Contamination

DNAPLs Present: Yes

Contaminants present: PCE, TCE, cis 1,2-DCE, trans 1,2-DCE, vinyl chloride (VC)

Highest contaminant concentrations: 87,200 µg/L (PCE); 28,500 µg/L (TCE); 23,200 µg/L (cis 1,2-DCE); 1,780 µg/L (trans 1,2-DCE); 3,140 µg/L (VC)

Deepest significant ground-water contamination: 53 ft bgs

Plume size: 60 ft x 210 ft

Soil Contamination

Contaminants present: PCE

Highest contaminant concentrations 765 µg/kg

Description of Remediation Scenario

Cleanup Goals: Groundwater (MCLs): PCE = 3.0 µg/L, TCE = 3.0 µg/L; cis 1,2-DCE =

70 µg/L; trans 1,2-DCE = 100 µg/L; VC = 1.0 µg/L

Soil: (soil cleanup target leachability standard) PCE = 30 ug/kg

Technologies Used:

Bioremediation

Removal

Any other technologies used:

Why was technology or technologies selected: Excavation was chosen as a more practical removal technology for soil contamination than SVE, because the drycleaning machine had been removed and the source area was accessible. Also, there is little room for a remedial system at the site. Bioremediation using Cl Solution's Cl-out was chosen for the pilot study as a method to enhance degradation of contaminants in groundwater. Reductive dechlorination is occurring in groundwater and permeable sediments are present.

Date Implemented: Excavation & infiltration - December 17-19, 2001; Cl-out injection - January 23, 2002

Final remediation design: Following a bench-scale study of Cl-out, a pilot test was designed to be implemented concurrently with the soil excavation. A portion of the building floor slab was removed and approximately 5.4 cubic yards of soil was hand-excavated to a depth of 6 ft. The pilot test consisted of two events, conducted a month apart. The Cl-out treatment was infiltrated into the source removal excavation in December 2001 and then the CL-out solution was introduced into the subsurface through injection wells installed inside the facility in January 2002.

Number of events: 2

3 Injection wells: 2 - 1" diameter PVC wells screened 5-10 ft bgs & 1 - 1/2" diameter PVC well screened 5-10 ft bgs.

Quantity per event: 55 gallons of solution (50 lbs. of dextrose & ~ 10⁹ colony forming units (CFU)/milliliter of bacteria (Pseudomonous sp.)

Quantity per well: ~ 20 gallons

Injected with variable speed peristaltic pump ~ 1 gallon/minute.

Results

Sampling of the source area monitor well performed one month after the second and final injection reveals almost a complete reduction of PCE and TCE. A substantial increase in cis 1,2-DCE (3,200%) and vinyl chloride (300%) and a corresponding decrease in the bacteria count, suggests that microbes were exhausted after the breakdown of PCE and TCE. Below are the results for MW001, the source area monitor well located in the middle of a four-spot injection pattern. Analytical data for VOCs is in µg/L.

Date	PCE	TCE	cis	VC	CFU/ml
			1,2-DCE		

12-17-01	48,300	6,110	2,950	890	1x101
1/21/02	1,260	2,950	84,800	921	1.9x105
			(PQL)		
2/20/02	96	100	94,500	2,810	8.7x101
			(PQL)	(U)	

FDEP is currently reviewing pilot study results.

Costs

- Site assessment:** \$126,405
- Design and Implementation:**
 - Feasibility study; \$ 4,658
 - Soil excavation & removal: \$ 18,000
 - Cl-out injection: \$ 7,100
 - Well installation, sampling & reporting \$ 20,708
- O&M**
- Total costs (only completed sites):**

Lessons Learned

1. Since there was active reductive dechlorination of VOCs in groundwater at the site prior to the Cl-out application, it would be interesting to inject a dextrose-only solution at a similar site to determine the exclusive effect on degradation of dextrose.
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Site Specific References

Site Assessment Report & Remedial Alternatives Analysis - 2/01

Bioremediation Feasibility Study - 6/2001

Cl-out Pilot Study Plan 11/01

Interim Source Removal & Bioremediation Pilot Study Report - 3/01

Contacts

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Drycleaner Site Profiles

Tiger Cleaners, Memphis, TN

Site Description

Tiger Cleaners is located in the Bellbrook Retail and Industrial Complex, Memphis, Tennessee. It is part of a strip-mall type structure built between 1965 and 1984. The subject site has been utilized as a drycleaning facility since 1984.

The main contaminant source area is located beneath the drycleaning machine in the rear of the facility. A secondary source of contamination is located just outside the back door of the facility where filters were drained.

Site Hydrogeology

Depth to ground water: 5-9 ft bgs

Lithology/subsurface geology:

Clayey silt surface-11 ft bgs
Silt 11-15 ft bgs
Clayey silt 15-18 ft bgs
Silt 18-20 ft bgs
Clayey silt 20-23 ft bgs
Fine sand 23-26 ft bgs
Medium sand 26-30 ft bgs

Enter **Conductivity:**0.03-35.4 ft/day (based on seasonal and soil variations)

Gradient:0.02-0.04 ft/ft

Groundwater Contamination

DNAPLs Present: Unknown

Contaminants present: Perchloroethylene (PCE) and associated daughters products - trichloroethylene (TCE), cis 1,2-dichloroethylene (cis 1,2-DCE), trans 1,2-DCE, Vinyl Chloride (VC).

Highest contaminant concentrations: PCE - 20,000 µg/L, TCE - 16,985 µg/L, trans 1,2-DCE - 26,300 µg/L, cis 1,2-DCE - 8,345 µg/L and VC - 2,800 µg/L.

Deepest significant ground-water contamination:12 ft bgs

Plume size:Approximately 20,000 square feet(.5 acre)

Soil Contamination

Contaminants present:PCE, TCE, cis 1,2-DCE, trans 1,2-DCE, VC.

Highest contaminant concentrations

PCE - 4,313 mg/kg

TCE - 0.041 mg/kg

cis 1,2-DCE - 0.111 mg/kg

trans 1,2-DCE - 0.005 mg/kg

VC - 0.065 mg/kg

Description of Remediation Scenario

Cleanup Goals: Goals are site- specific based on potential receptors, risk assessment and other factors. The State of Tennessee uses the EPA's Clean Water Act MCLs for groundwater and the EPA Region 9 PRG's for soil as clean-up guidelines.

Technologies Used:

Bioremediation

Hydrogen Release Compound ® (HRC)

Any other technologies used: A passive soil-gas survey (EMFLUX®) was utilized to delineate the contaminant plume before groundwater monitoring wells or DPT soil sampling was conducted. This was helpful in pinpointing contaminant hot spots.

Why was technology or technologies selected: The Regenes HRC® technology was selected because of the cost factor and because many of the *in situ* bioremediation and *in situ* chemical oxidation technologies require the payment of proprietary fees and/or active involvement in the remediation process by the companies that own the patents. This technology was also selected, because the bioremediation of chlorinated hydrocarbons is considered a less costly and less intrusive remedial alternative.

Date Implemented: Implementation will begin on April 22, 2002.

Final remediation design: The HRC® pilot study consists of the following events:

Outside Source Area: a total of eight injection borings will be located within the fire-main trench located outside the Tiger Cleaners. The borings will be 5 ft apart and HRC® will be injected at a rate of 10 lbs/ft, for a total of 100 lbs/boring. The injections will be from a depth of 3-13 ft bgs.

Contaminant Plume: A total of 97 injection borings will be located throughout the contaminant plume. Injection borings will be installed at a spacing of 10 feet. The HRC® will be injected at a rate of approximately 3.5 lbs/ft, for a total of 21 lbs/boring.

Inside Source Area: A directional drill rig will be utilized to bore 7 horizontal injection points under the slab of the building, into the main source of contamination. The borings will be spaced 5 ft apart. The drill rods will be filled with the HRC®, and as the rods are removed 4 lbs of the material will be injected for each linear foot, for a total of 160 lbs/boring. The injections will be accomplished at a depth of 6 ft bgs and over a total

linear distance of 280 ft.

The total amount of HRC® to be injected at the site for the Pilot Study is 3,957 lbs.

This Pilot Study is scheduled to last for a period of one year and will include four quarterly groundwater monitoring events to determine the effectiveness of the HRC® injections.

Results

Results achieved to date: Pilot study has not begun.

Costs

Site assessment: \$68,284.75

Design and implementation: \$96,545.70

O&M:

Total costs (only completed sites):

Lessons Learned

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Site Specific References

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TDEC-DCERP Files

Facility Inspection Report - Sept 10, 1998

Prioritization Investigation - Jan 06, 1999

Preliminary Solvent Impact Assessment - Mar 02, 1999

Supplemental Solvent Impact Assessment - Jun 17, 1999

Comprehensive Solvent Impact Assessment - Nov 04, 1999

Groundwater Monitoring Reports:

1st Quarter GWM Rpt - May 18, 2000

2nd Quarter GWM Rpt - Aug 30, 2000

3rd Quarter GWM Rpt - Jul 09, 2001

4th Quarter GWM Rpt - Dec 12, 2001

Remedial Alternatives Study - June 30, 2000
Supplemental Remedial Alternatives Study - Jan 09, 2002

TDEC-DCERP by Eckland

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