



Shelton Laundry and Cleaners Groundwater Monitoring Results, May 2014: Data Summary Report

Abstract

Tetrachloroethene (PCE) contamination of shallow groundwater underlying Shelton Laundry and Cleaners was discovered in 1997. The contaminant source was assumed to be a 1993 solvent spill outside the dry cleaner's commercial building. Monitoring of four shallow wells in 1998 detected PCE in groundwater at concentrations as high as 280 ug/L in the well located nearest to the reported spill location (well 4W). The Washington State Model Toxics Control Act (MTCA) Method A cleanup level for PCE is 5 ug/L.

In 2002, the Washington State Department of Ecology (Ecology) began monitoring groundwater quality at the site. From 2002 to 2005, PCE was consistently detected in well 4W at concentrations ranging from 10 to 25 ug/L. Attempts to remediate the contamination were undertaken in June 2005, when a hydrogen release compound (HRC[®]) was injected into the groundwater around well 4W. The HRC injection appears to have temporarily reduced contaminant concentrations. However, after August 2006 contaminant concentrations gradually increased to pre-HRC injection levels.

This report describes the water quality results for groundwater samples collected in May 2014 from three shallow wells at Shelton Laundry. PCE was detected in well 4W at an estimated concentration of 4.5 ug/L. Trichloroethene (TCE) and cis-1,2-dichloroethene (cis-DCE) were also detected in well 4W, at concentrations below the reporting limit of 1 ug/L. No contaminants of concern were found in other sampled wells.

Ecology will continue to monitor the site's groundwater until PCE concentrations in well 4W are consistently below the MTCA Method A cleanup level of 5 ug/L.

Publication Information

This report is available on the Department of Ecology's website at <https://fortress.wa.gov/ecy/publications/SummaryPages/1403051.html>

Data and associated annual monitoring reports for this project are available at Ecology's Environmental Information Management (EIM) website www.ecy.wa.gov/eim/index.htm. Search Study ID, PMART001.

Ecology's Activity Tracker Code for this study is 04-064.

Water Resource Inventory Area (WRIA) and 8-digit Hydrologic Unit Code (HUC) numbers for the study area:

- WRIA: 14
- HUC number: 17110019

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This report was prepared by a licensed hydrogeologist. A signed and stamped copy of the report is available upon request.

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Background

Shelton Laundry and Cleaners is an active laundromat located in downtown Shelton, Washington (Figure 1). In 1997, shallow groundwater beneath the site was found to be contaminated with tetrachloroethene (PCE) (Building Analytics, 1997). The contaminant source is assumed to be a 1993 solvent spill in the alley behind the dry cleaner's commercial building.

Environmental investigations conducted at the site between 1997 and 2000 showed that PCE contamination was present in groundwater in the southeastern portion of the site beneath the alley. Groundwater samples collected from shallow (approximately 15 feet deep) monitoring wells showed PCE contamination was primarily detected in well 4W (the well located nearest to the reported spill location). Between 1997 and 2000, PCE concentrations in this well decreased from 280 to 25 ug/L (GeoEngineers, 2000).

Ecology conducted a follow-up investigation in 2002 during which four deeper wells (approximately 45 to 60 feet deep) were installed to gain a better understanding of contaminant concentrations at greater depths. PCE was not detected in any of the deep wells. Between 2002 and 2005, PCE continued to be detected in well 4W at concentrations ranging from approximately 10 to 25 ug/L.

In June 2005, an effort was made to remediate the contamination. A hydrogen release compound (HRC[®]) was injected into the ground to stimulate biodegradation of the chlorinated compounds present in the soil and groundwater. The HRC was injected below the water table at depths of 5 to 20 feet below ground surface (bgs) at 16 locations between wells 4W and 7W (Figure 1) (Balaraju, 2005).

Results from the first year of monitoring following the HRC injection suggest that enhanced degradation was occurring. PCE and trichloroethene (TCE) concentrations decreased while cis-1,2-dichloroethene (cis-DCE) concentrations increased (Figure 2). The contaminant concentrations in well 4W were at their lowest in August 2006, 15 months after the HRC injection. After 2006, concentrations gradually increased to pre-injection levels. HRC typically has an effective longevity of about 12 to 18 months (Willett, 2004).

Ecology continues to monitor the site groundwater on a regular basis because PCE concentrations in well 4W continue to exceed (not meet) Model Toxics Control Act (MTCA) Method A cleanup level of 5 ug/L.

The data and associated annual monitoring reports for this project are available at Ecology's Environmental Information Management (EIM) website www.ecy.wa.gov/eim/index.htm. Search Study ID, PMART001.

Results

In May 2014, Ecology collected groundwater samples from three shallow monitoring wells. All wells were sampled in accordance with Ecology's SOP EAP078 (Marti, 2011).

Samples were submitted for analysis of volatile organic compounds (VOCs) to determine PCE concentrations in the vicinity of well 4W. Analytical results are summarized in Tables 1 and 2.

A blind field duplicate was collected from well 4W in May. The relative percent difference (RPD) for the PCE duplicate results was 20% as shown in Table 1.

Table 1. Relative Percent Difference (RPD) of Duplicate Sample Results (ug/L), May 2014.

Well Sample ID	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Cis-1,2-Dichloroethene (cis-DCE)
4W	4.0	0.72 J	0.65 J
4W-A	4.9	0.8 J	0.69 NJ
RPD ¹ (%)	20%	--	--

MW-4A is the duplicate sample identification.

J: Analyte was positively identified, and the associated numerical result is an estimate.

NJ: Analyte was tentatively identified, and the associated numerical result is an estimate.

¹ RPD target $\pm 15\%$.

The PCE duplicate data from well 4W did not meet the data quality objectives of 15% established in the Quality Assurance Project Plan (Marti, 2002). Because the RPD was only slightly above the data quality objective, concentrations of the duplicate results will be presented as an estimated average in the remainder of this report. The laboratory data quality control and quality assurance results indicate that the analytical performance was good and that the results are usable as qualified.

As shown in Table 2, PCE was detected in well 4W at an estimated concentration of 4.5 ug/L, which is slightly below the MTCA cleanup level of 5 ug/L. TCE and cis-DCE were also detected in well 4W at concentrations below the reporting limit of 1 ug/L.

PCE, TCE, and cis-DCE were not detected in shallow wells 1W and 7W. These contaminants have not been detected in well 1W since monitoring began in 1998. PCE was last detected in well 7W in February 2006 at a concentration of 0.53 ug/L.

Volatile organics have never been detected in the deep wells since the wells were installed in July 2002.

A summary of monitoring results since 2002 is presented in Table 3.

Table 2: Sample Results for Shelton Laundry and Cleaners, May 2014.

Well ID	Field Measurements						Laboratory Analysis		
	Well Depth (TOC)	Ground-water Elevation (feet msl)	pH (std. units)	Cond. (uS/cm)	Diss. Oxygen (mg/L)	ORP (mV)	PCE	TCE	Cis-DCE
							<i>MTCA Cleanup Levels</i>		
							5 ug/L	5 ug/L	70 ug/L
Shallow Wells									
1W	14.56	9.68	7.4	206	4.8	88	1 U	1 U	1 U
4W	13.77	9.74	7.4	204	4.8	88	4.5 J^a	0.72 J	0.65 J
7W	14.83	9.61	7.5	206	5.3	89	1 U	1 U	1 U
Deep Wells									
MW-5	45.50	9.75	NS	NS	NS	NS	NS	NS	NS
MW-6	45.30	9.66	NS	NS	NS	NS	NS	NS	NS

TOC: Top of Casing

Cond: Conductivity

ORP: Oxidation Reduction Potential

U: Analyte was not detected at or above the reported value.

J: Analyte was positively identified. The associated numerical result is an estimate.

Bold: Analyte was detected.

^a Average concentration of duplicate samples.

NS: Not sampled.

Conclusions

Shallow groundwater underlying the Shelton Laundry and Cleaners site continues to be contaminated in the area of well 4W. PCE continues to be detected in this well near the MTCA cleanup level of 5 ug/L.

TCE and cis-DCE, associated with the breakdown of PCE, were also detected in well 4W but at concentrations below the reporting limit of 1 ug/L, which is below their respective MTCA cleanup levels of 5 ug/L and 70 ug/L.

The remaining shallow and deep wells continue to have no detectable levels of contamination.

Recommendations

Groundwater monitoring should continue in the three shallow wells (1W, 4W, and 7W) until PCE concentrations in well 4W are consistently below the MTCA Method A cleanup level of 5 ug/L. To capture seasonal variation in the PCE concentrations, monitoring should continue on an 18-month cycle.

Because contaminants have never been detected in deep wells MW-5 and MW-6, a sample frequency of every 36 months should continue to be sufficient.

Elevated PCE concentrations (88-269 ug/Kg) were detected in shallow soil samples (4-8 feet) near well 4W in June 2005. PCE concentrations decreased to approximately 1 ug/Kg in deeper soils (12-16 feet) from the same borings. Since PCE concentrations in the groundwater continue to be near or exceed MTCA Method A cleanup level in well 4W, even after the HRC injection treatment, evaluation of additional soil remediation is recommended.

References

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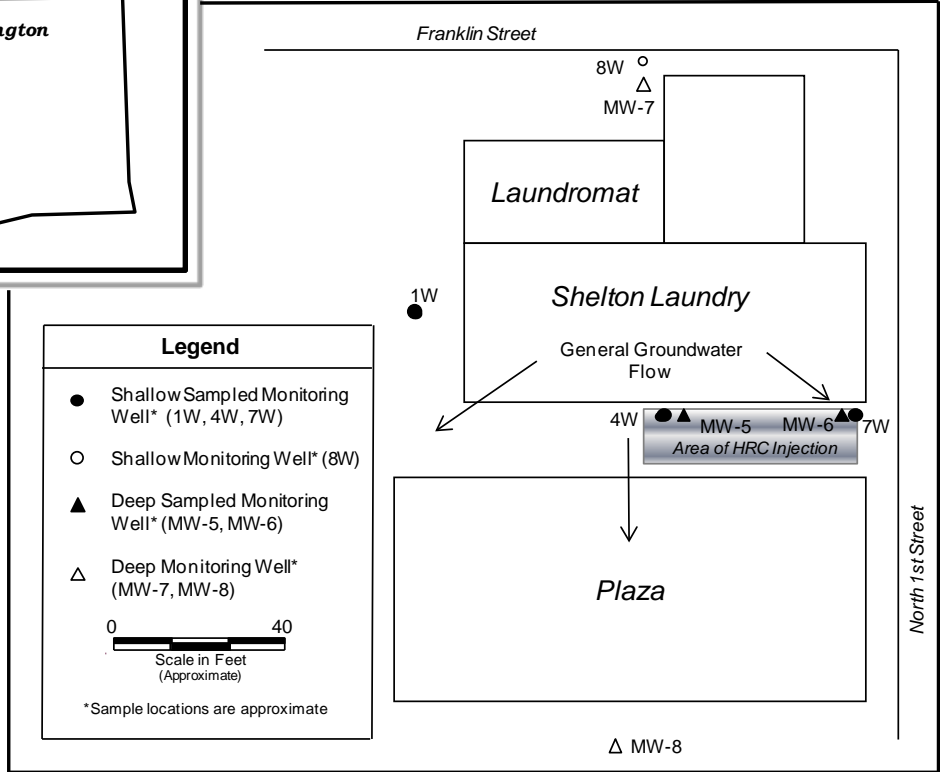
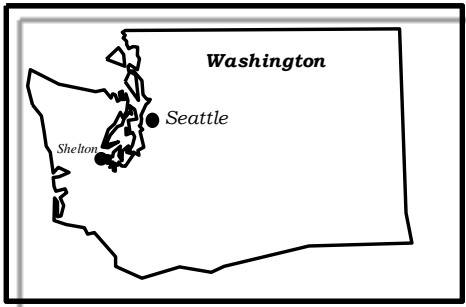
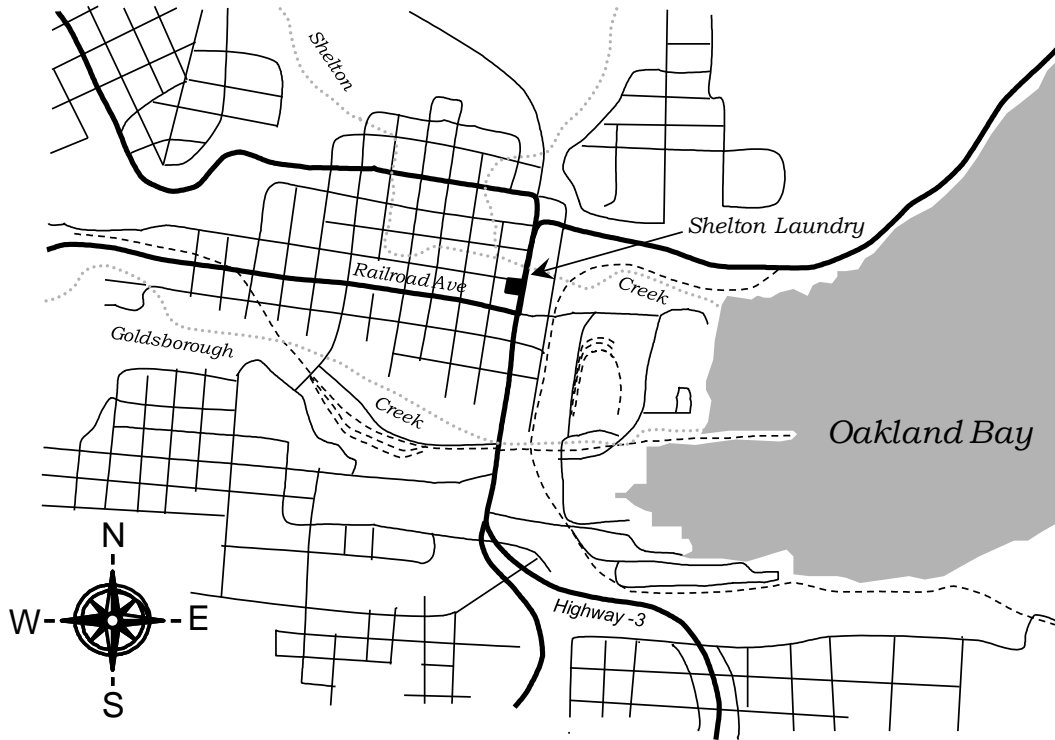


Figure 1. Shelton Laundry and Cleaners Location and Site Detail.

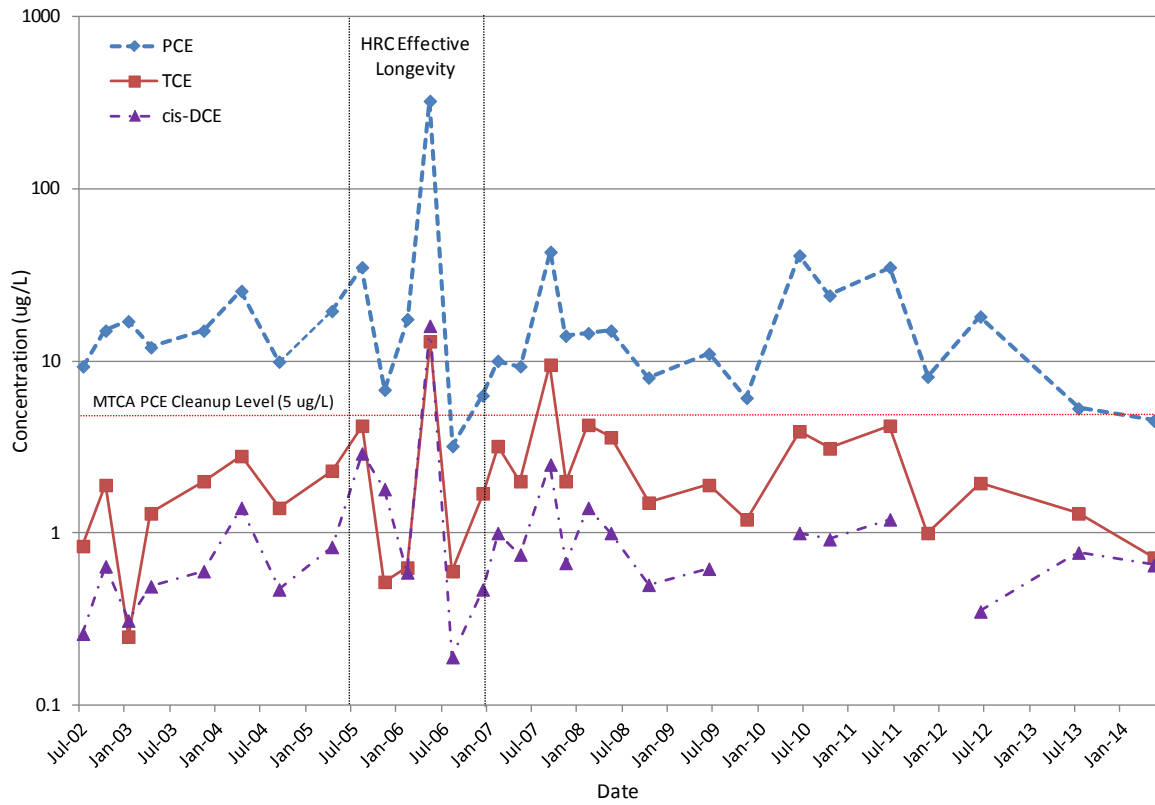


Figure 2. PCE, TCE, and cis-DCE Concentrations (ug/L – log scale) in Well 4W, July 2002 through May 2014.

Table 3. PCE, TCE, and DCE Groundwater Results (ug/L), July 2002 through May 2014.

Well ID	Ecology															
	7/17/02	10/3/02	1/22/03	4/3/03	11/5/03	4/1/04	9/23/04	4/20/05	8/19/05	11/3/05	2/1/06	5/3/06	8/22/06	12/1/06	2/15/07	5/14/07
1W																
PCE	1 U	1 U	1 U	1 U	--	--	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TCE	1 U	2 U	1 U	1 U	--	--	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4W																
PCE	9.3	15	17	12	15	26^a	9.9	20^a	35^a	6.8	18^a	324	3.2 J	6.3	10	9.3
TCE	0.84 J	1.9 J	0.25 J	1.3	2	2.8^a	1.4	2.3	4.2^a	0.52 J	0.63 J	13	0.60 J	1.7	3.2	2
DCE	0.26 J	0.64 J	0.31 J	0.49 J	0.60 J	1.4	0.47 J	0.83 J	2.9^a	1.8	0.59 J	16	0.19 J	0.47 J	1	0.75 J
7W																
PCE	1 U	0.19 J	1 U	1 U	1 U	1.7	0.47 J	0.15 J	0.38 J	1 U	0.53 J	1 U	1 U	1 U	1 U	1 U
TCE	1 U	2 U	1 U	1 U	1 U	1 U	0.26 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
DCE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
8W																
PCE	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--
TCE	1 U	2 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--
MW-5																
PCE	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U
TCE	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-6																
PCE	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U
TCE	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-7																
PCE	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--
TCE	1 U	2 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--
MW-8																
PCE	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--
TCE	1 U	2 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--

Table 3 (continued). PCE, TCE, and DCE Groundwater Results (ug/L), July 2002 through May 2014.

Well ID	Ecology															
	9/7/07	11/30/07	2/19/08	5/14/08	10/20/09	6/12/09	11/20/09	6/10/10	10/15/10	6/10/11	11/8/11	6/12/12	7/17/13	5/22/14		
1W																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U		
TCE	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
4W																
PCE	43	14	15 J^a	15 J	8	11	6.1 J^a	41 J^a	24	35 J	8.1 J^a	18.1 J^a	5.3	4.5 J^a		
TCE	9.5	2	4.3 J^a	3.6	1.5	1.9	1.2	3.9 J^a	3.1	4.2 J	1.0 J	1.95 J^a	1.3	0.72 J		
DCE	2.5	0.67 J	1.4 J	1	0.5 J	0.62 J	1 U	1	0.92 J	1.2	1 U	0.35 J	0.77 J	0.65 J		
7W																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U		
TCE	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
8W																
PCE	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
TCE	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
MW-5																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	--	1 U	--		
TCE	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	--	1 U	--		
MW-6																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	--	1 U	--		
TCE	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	--	1 U	--		
MW-7																
PCE	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
TCE	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
MW-8																
PCE	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
TCE	--	--	--	--	--	--	--	--	--	--	--	--	--	--		

Bold: Analyte was detected.

Shade: Values are greater than (did not meet) MTCA cleanup levels.

U: Analyte was not detected at or above the reported value.

J: Analyte was positively identified, and the associated numerical result is an estimate.

UJ: Analyte was not detected at or above the reported estimated result.

^a Average concentration of duplicate samples.