

Shelton Laundry and Cleaners Groundwater Monitoring Results, October 2021: Data Summary Report



Environmental Assessment Program

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Abstract

This data summary report is one in a series describing the results of long-term groundwater monitoring at the Shelton Laundry and Cleaners site in Shelton, WA. 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 micrograms per liter ($\mu\text{g/L}$) 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 $\mu\text{g/L}$.

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 $\mu\text{g/L}$. In June 2005, a hydrogen release compound (HRC®) was injected into the groundwater around well 4W. The HRC injection appeared to have temporarily reduced PCE concentrations. However, after August 2006, concentrations gradually increased to pre-HRC injection levels.

This report describes the water quality results for groundwater samples collected in October 2021 from three shallow monitoring wells at Shelton Laundry. PCE was detected in well 4W at a concentration of 6.45 $\mu\text{g/L}$. Trichloroethene (TCE) and Cis-1,2-Dichloroethene (cis-1,2-DCE) were also detected in well 4W at a concentration near the reporting limit of 1 $\mu\text{g/L}$. No contaminants of concern were found in the other two sampled wells.

Ecology has been using a small-diameter mechanical bladder pump to sample these wells. To compare analytical results using a different sample method, a second set of samples were collected from well 4W using a peristaltic pump. For quality control, duplicate samples were collected using both sample methods.

The concentrations of PCE, TCE, and cis-1,2-DCE were higher in the samples collected from well 4W with the peristaltic pump than those collected with the mechanical bladder pump. These results suggest that the reported results from the mechanical bladder pump may be biased low, and the actual concentrations in groundwater may be higher.

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 $\mu\text{g/L}$.

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Background

Shelton Laundry and Cleaners is an active laundromat and former dry cleaners located at 117 N 1st St. in downtown Shelton, Washington (Figure 1). In 1997, a consulting firm working for the neighboring Wells Fargo Bank identified tetrachloroethene (PCE) contamination in shallow groundwater beneath the Shelton Laundry and Cleaners site (Building Analytics, 1997).

The geology in the area surrounding Shelton Laundry and Cleaners is primarily composed of sand and gravel deposits. Recessional outwash of the Vashon Stade underlies the entire downtown Shelton area. This unit consists of stratified, moderately to well-rounded, poorly to moderately sorted sand and gravel with relatively minor silt and clay in places (Schasse et al., 2003). Available well logs indicate that deposits beneath the site are composed of silty gravel to a depth of 8 ft. and interbedded sand and gravel from 8 ft. to a depth of at least 60 ft. Deeper production well logs near the site indicate that the recessional deposits can attain a thickness of more than 100 feet in the area of Oakland Bay.

The regional groundwater flow direction is to the south (Molenaar and Noble, 1970). In the area surrounding the Shelton Laundry and Cleaners site, the groundwater gradient measured in shallow wells is to the southeast and southwest (Figure 1). The gradient measured in deep wells is typically to the east-southeast. Water level data collected at paired wells during sampling events show that vertical gradients are small and overall appear to be upward (e.g., Marti, 2012).

Investigations conducted at the site from 1997 through 2000 showed that PCE contamination was present in groundwater in the southeastern portion of the site beneath the alley. A 1993 solvent spill that occurred in the alley behind the dry cleaner's commercial building is the likely source of the contamination (GeoEngineers, 2000).

Groundwater samples collected from shallow (about 15 feet deep) monitoring wells showed PCE contamination was primarily detected in well 4W (the well located nearest to the reported spill location). During 1997-2000, PCE concentrations in this well decreased from 280 to 25 µg/L (GeoEngineers, 2000; See Appendix, Tables A1 through A4).

In 2002, Ecology conducted a follow-up study. Four new wells completed deeper in the recessional outwash (about 45 to 60 feet deep) were installed to determine whether contaminants had migrated downward. PCE was not detected in any of the deep wells. During continued monitoring from 2002-2005, PCE was detected in well 4W at concentrations ranging from about 10 to 25 µg/L. Two of the deep wells (MW-7, MW-8) and one shallow well (8W) were removed from the sampling schedule in 2003 and have not been sampled since.

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 (Balaraju, 2005).

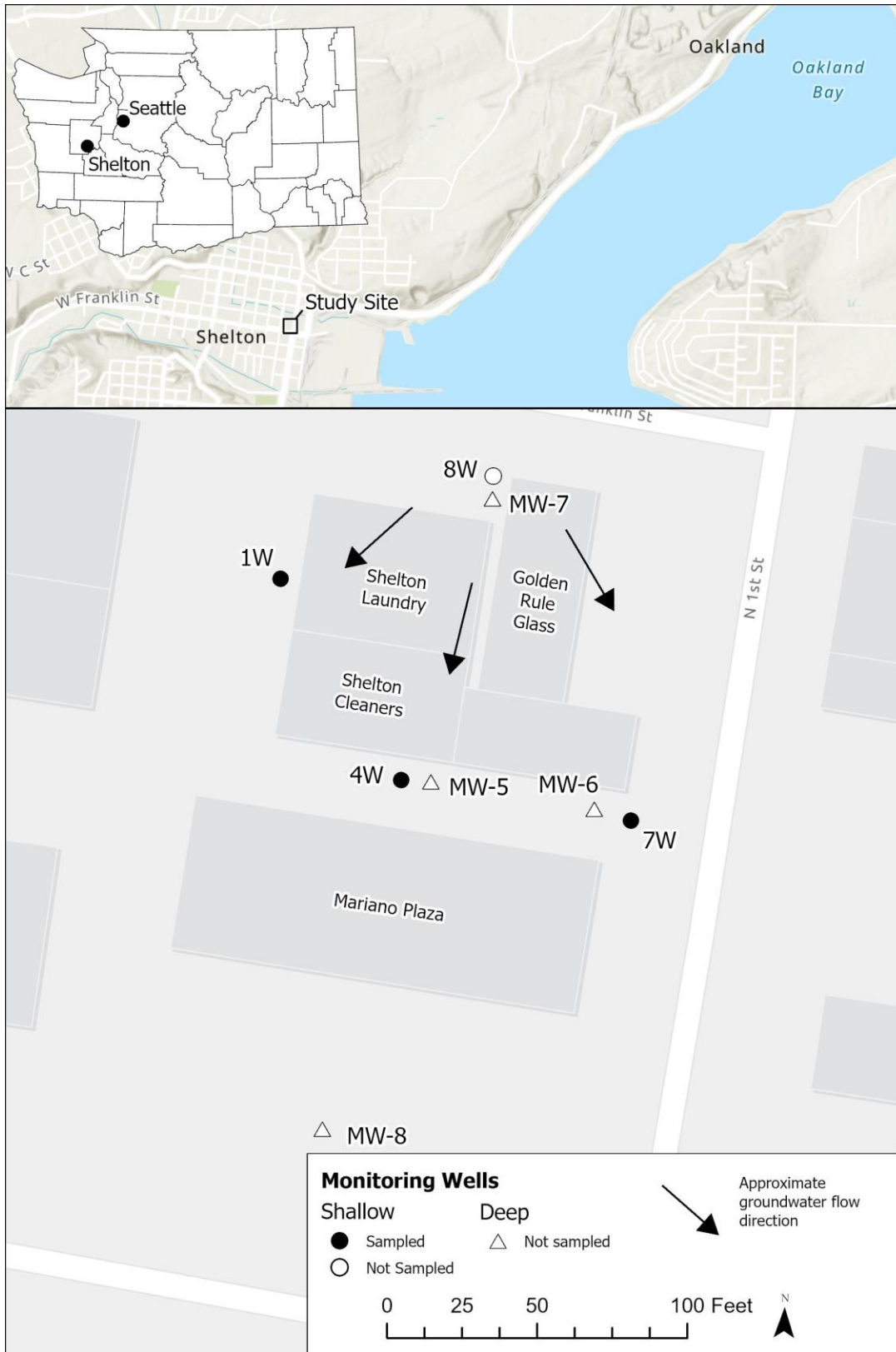


Figure 1. Shelton Laundry and Cleaners location and site details.

Results from the first year of monitoring following the HRC injection suggest that enhanced degradation was occurring. Concentrations of PCE, trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE) fluctuated in the months following injection (See Appendix, Figure A1). 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 et al., 2004).

Ecology continues to monitor the site's groundwater because PCE concentrations in well 4W do not consistently meet (fall below) the Model Toxics Control Act (MTCA) Method A cleanup level of 5 µg/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.

Methods and Results

In October 2021, Ecology collected groundwater samples from three shallow monitoring wells (1W, 4W, and 7W). The wells were sampled in accordance with Ecology's Standard Operating Procedure (SOP) EAP078 (Marti, 2020). Water level measurements were taken at all eight site monitoring wells (Figure 1). Water levels were measured and recorded from all wells in succession to minimize tidal influence (Table 1).

The three shallow wells (1W, 4W, and 7W) that were sampled are completed with 1-inch PVC casing to a depth of about 15 ft (Table 1). Two deep wells (MW-5, MW-6) are on a 36-month sampling schedule and were not sampled during this round. The deep wells are completed with 2-inch PVC casing to a depth of about 45 ft.

The small-diameter casing of the shallow wells requires the use of a small-diameter pump. Ecology has been using a small-diameter mechanical bladder pump to sample these wells. In October, Ecology collected a second sample from well 4W using a peristaltic pump to compare results from the two pumping methods.

Ecology employed industry-standard low-flow sampling techniques for both pumping methods. Before sampling, groundwater in the wells was purged through a continuous flow cell at a rate of 0.5 liter/minute (L/min) or less. Purging continued until field parameters (pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction potential, and turbidity) stabilized (Table 2). For samples collected from well 4W, after replacing the mechanical bladder pump with the tubing for the peristaltic pump, the well was purged a second time to ensure stable parameters and low turbidity.

Table 1. Well construction details and water levels collected at Shelton Laundry and Cleaners, October 2021

Well ID	Land Surface Elevation ^a (feet)	Well Depth (feet bgs)	Screened Interval (feet bgs)	Groundwater Elevation ^a (feet)
1W	15.10	14.56	4 – 14	9.41
4W	14.67	13.77	3.5 – 13.5	9.56
7W	14.10	14.83	4.5 – 14.5	9.45
8W	14.04	14.8	4.5 – 14.5	9.67
MW-5	14.66	45.5	35 – 45	9.55
MW-6	14.25	45.3	35 – 45	9.49
MW-7	14.17	45.4	35 – 45	9.67
MW-8	15.32	60.5	50 – 60	9.54

bgs: Below ground surface.

^a Vertical datum is NAVD29

Table 2. Field data for Shelton Laundry and Cleaners, October 2021

Well ID	pH (std. units)	Specific Conductance (μS/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Turbidity (NTU)
1W	6.9	193	4.7	91	0.55
4W (bladder)	6.9	193	4.5	100	0.20
4W (peristaltic)	6.8	193	4.6	102	0.14
7W	6.8	193	4.9	94	0.17

Samples were analyzed for volatile organic compounds to determine PCE concentrations near well 4W. Analytical results for volatile organics of concern (PCE, TCE, and cis-1,2-DCE) are summarized in Table 3.

Quality control samples collected in the field consisted of two blind field duplicate and matrix spike/matrix spike duplicate samples taken from well 4W. Table 4 presents replicate results from well 4W, including the duplicate samples collected with the mechanical bladder pump and those collected with the peristaltic pump. The relative percent differences (RPD) for PCE in the mechanical bladder pump duplicate samples was 28.2%, and the RPD from the peristaltic pump duplicate samples was 4.5%, both meeting the data quality objective of 30% or less. Results below the method reporting limit (e.g., cis-1,2-DCE) are automatically qualified as estimates. The laboratory data quality control and quality assurance results indicate that the analytical performance was good and that the results are usable as qualified.

Table 3. Summary of analytical sample data for Shelton Laundry and Cleaners, October 2021

Well ID	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
1W	1U	1U	1U
4W	<u>6.45</u>	1.38	0.65J
7W	1U	1U	1U
Cleanup Levels	5 ^a	5 ^a	70 ^b

Bold: Analyte was detected in the sample.

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

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

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

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

^a Cleanup levels for PCE and TCE are based on MTCA Method A cleanup levels (WAC 173-340-720)

^b The cleanup level for Cis-1,2-DCE is based on the Federal Maximum Contaminant Level (40 CFR Part 141.61)

Table 4. Replicate results from well 4W.

Well	4W (Bladder)	4W (Bladder Duplicate)	4W (Peristaltic)	4W (Peristaltic duplicate)	RPD (Bladder)	RPD (Peristaltic)
PCE	<u>6.45</u>	<u>8.57</u>	<u>12.9</u>	<u>13.5</u>	28.2	4.5
TCE	1.38	1.62	2.2	2.23	16.0	1.4
Cis-1,2-DCE	0.65J	0.75J	0.86J	0.86J	14.3	0.0

Bold: Analyte was detected in the sample.

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

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

The concentration of PCE detected in the primary sample (mechanical bladder pump) from well 4W was 6.45 µg/L, above the MTCA cleanup level of 5 µg/L. The TCE concentration in 4W was 1.38 µg/L, below the 5 µg/L cleanup level. Cis-1,2-DCE was detected in well 4W at an estimated concentration of 0.65 µg/L, below the 1 µg/L reporting limit.

The sample collected from 4W with a peristaltic pump had a PCE concentration of 12.9 µg/L and a TCE concentration of 2.2 µg/L. Cis-1,2-DCE was detected at an estimated concentration of 0.86 µg/L, below the 1 µg/L reporting limit.

Volatile organics of concern were not detected in any other wells sampled in October 2021. These contaminants have never 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 µg/L. Volatile organics have never been detected in the deep wells (MW-5, MW-6) since the wells were installed in July 2002. Vinyl chloride, another degradation product of PCE, has never been detected at the site.

Summaries of monitoring results since 1998 are presented in the Appendix.

Discussion and Conclusions

Shallow groundwater contamination persists at the Shelton Laundry and Cleaners site in the area of well 4W. In October 2021, PCE was detected in this well at a concentration of 6.45 µg/L, exceeding the MTCA cleanup level of 5 µg/L. Since 2013, the PCE concentration has ranged from 3.7 µg/L to 6.45 µg/L.

TCE, associated with the breakdown of PCE, was detected in well 4W but at a concentration near the reporting limit of 1 µg/L. Cis-1,2-DCE was detected at a concentration below the 1 µg/L reporting limit.

The remaining wells sampled, 1W and 7W, continue to have no detectable levels of contamination.

In June 2020 and October 2021, Ecology sampled well 4W using a mechanical bladder pump and then a peristaltic pump to compare analytical results between the two pumping methods. In both years, contaminant concentrations detected in the samples collected with a peristaltic pump were higher than in samples collected with the mechanical bladder pump. During the 2020 sampling event, the sample collected using the peristaltic pump was taken immediately after the primary and duplicate samples were collected with the mechanical bladder pump, with no additional purging. In 2021, the well was purged with the peristaltic pump until field parameters stabilized before the second sample was collected.

Contaminant concentrations in samples collected with the mechanical bladder pump are lower than in samples collected with the peristaltic pump. In 2020, the PCE concentration in the sample taken with the peristaltic pump (13.6 µg/L) was almost three times higher than the concentration obtained with the mechanical bladder pump (5.5 µg/L). In 2021 the PCE concentration in the sample collected with the peristaltic pump (12.9 µg/L) was double the PCE concentration in the sample from the mechanical bladder pump (6.45 µg/L). The degradation products TCE (2020 and 2021) and cis-1,2-DCE (2021) were both higher in the samples collected with the peristaltic pump. These results suggest that the reported results from the mechanical bladder pump may be biased low, and the actual concentrations in groundwater may be higher.

Recommendations

Groundwater monitoring should continue in the three shallow wells (1W, 4W, 7W) until PCE concentrations in well 4W are consistently below the MTCA Method A cleanup level of 5 µg/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 sampling frequency of every 36 months for these wells should continue to be sufficient.

Uncertainty exists around the cause of the differing results from samples collected with the mechanical bladder pump and the peristaltic pump. To help determine if the cause is a low bias associated with the mechanical bladder pump or if the well is not completely stabilizing during the first purge, well 4W should again be sampled with both pumps during the next sampling event. Purging and sampling first with the peristaltic pump, then re-purging and re-sampling

with the mechanical bladder pump should provide insight into the cause of the discrepancy. The peristaltic pump should also be used to sample the other two shallow wells on the sampling schedule to help determine if the bias observed in well 4W is present in 1W or 7W.

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Appendix A.

Figure A1 shows variations of PCE, TCE, and cis-1,2-DCE concentrations in monitoring well 4W from 2002 through 2021.

Tables A1 through A12 list historical results from groundwater sampling at the Shelton Laundry and Cleaners site.

- Tables A1 – A4 show results from four shallow monitoring wells (1W, 4W, 7W, 8W) collected by GeoEngineers from July 1998 to September 2000.
- Tables A5 – A7 show results from three shallow monitoring wells (1W, 4W, 7W) collected by Ecology from July 2002 through June 2021.
- Tables A8 – A9 show results from two deep monitoring wells (MW-5, MW-6) collected by Ecology from July 2002 through June 2021.
- Tables A10 – A12 show results from one shallow monitoring well (8W) and two deep monitoring wells (MW-7, MW-8) collected by Ecology from July 2002 through April 2003.

The following symbols and qualifiers are used in the tables:

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

Bold: Analyte was detected in the sample.

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.

--: Not sampled/measured

NA: Not applicable

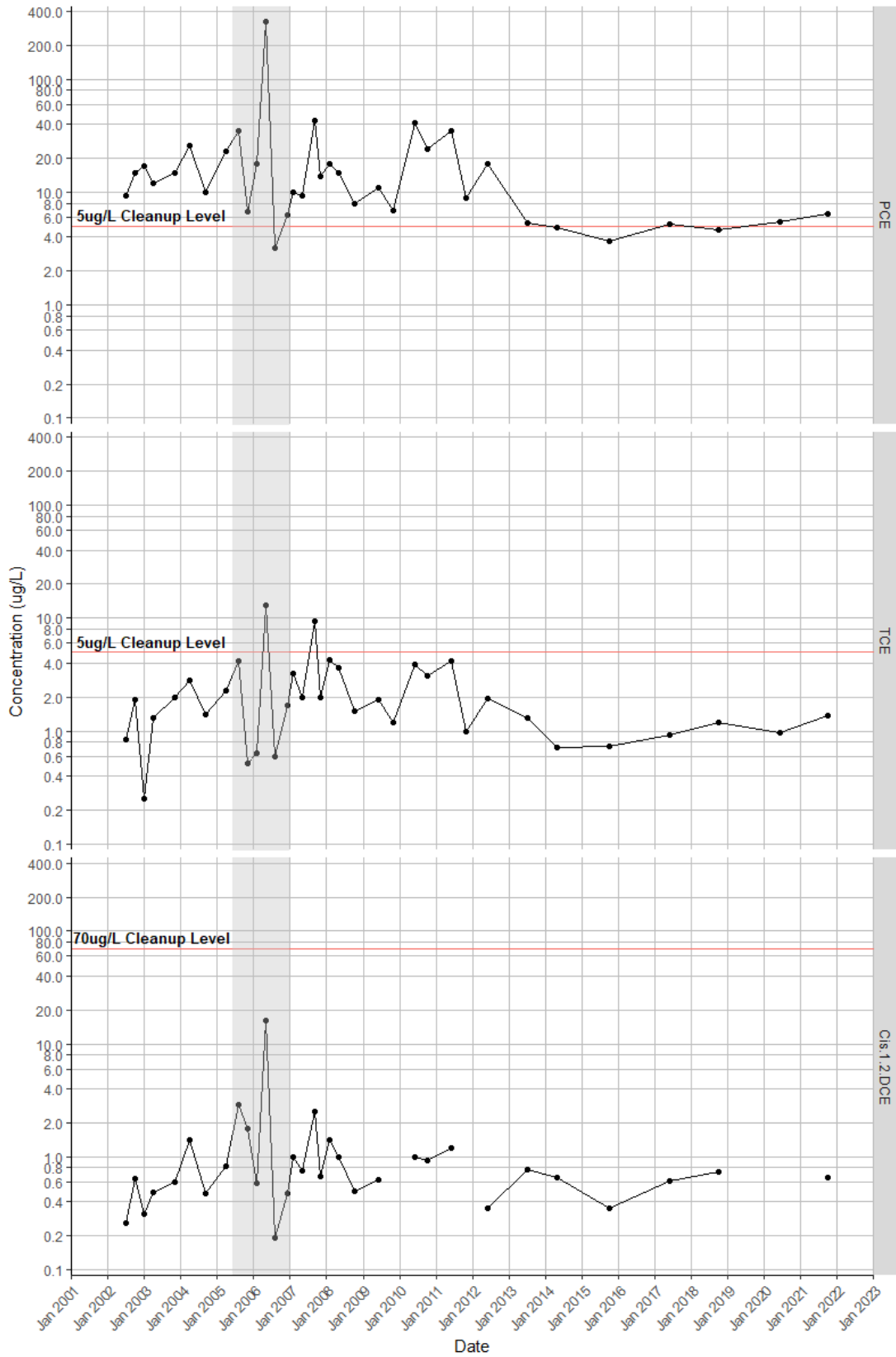


Figure A1. Contaminant concentrations (µg/L, log scale) in well 4W, 2002 – 2021. The gray area represents the effective period of the HRC injection.

Table A1. Historical sample results collected by GeoEngineers from shallow monitoring well 1W, July 1998 to July 1999.

Date	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/1998	<1.0	<1.0	--
11/1998	<1.0	<1.0	--
7/1999	<1.0	<1.0	--

Table A2. Historical sample results collected by GeoEngineers from shallow monitoring well 4W, July 1998 to September 2000.

Date	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/1998	280	4.7	33
11/1998	130	<1.0	<1.0
7/1999	39	<1.0	<1.0
9/2000	25	<1.0	<1.0

Table A3. Historical sample results collected by GeoEngineers from shallow monitoring well 7W, July 1998 to September 2000.

Date	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/1998	4.3	<1.0	6.4
11/1998	3	<1.0	<1.0
7/1999	<1.0	<1.0	<1.0
9/2000	1.2	<1.0	<1.0

Table A4. Historical sample results collected by GeoEngineers from shallow monitoring well 8W, July 1998 to September 2000.

Date	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/1998	<1.0	<1.0	--
11/1998	<1.0	<1.0	--
7/1999	<1.0	<1.0	--
9/2000	--	--	--

Table A5. Historical sample results and water levels collected by Ecology from shallow monitoring well 1W, July 2002 to October 2021.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	5.78	1 U	1 U	1 U
10/2002	6.08	1 U	2 U	1 U
1/2003	5.19	1 U	1 U	1 U
4/2003	5.25	1 U	1 U	1 U
11/2003	5.64	--	--	--
4/2004	5.36	--	--	--
9/2004	5.89	--	--	--
4/2005	5.23	--	--	--
8/2005	5.86	1 U	1 U	1 U
11/2005	5.23	1 U	1 U	1 U
2/2006	4.00	1 U	1 U	1 U
5/2006	5.46	1 U	1 U	1 U
8/2006	5.89	1 U	1 U	1 U
12/2006	5.15	1 U	1 U	1 U
2/2007	4.79	1 U	1 U	1 U
5/2007	5.25	1 U	1 U	1 U
9/2007	7.45	2 U	2 U	1 U
11/2007	6.89	2 U	1 U	1 U
2/2008	4.95	1 U	1 U	2 U
5/2008	5.44	2 U	1 U	1 U
10/2008	5.81	1 U	1 U	1 U
6/2009	5.5	1 U	1 U	1 U
11/2009	4.05	1 U	1 U	1 U
6/2010	--	1 U	1 U	1 U
10/2010	5.49	1 U	1 U	1 U
6/2011	5.18	2 U	1 U	1 U
11/2011	5.66	1 U	1 U	1 U
6/2012	5.18	1 U	1 U	1 U
7/2013	5.93	1 U	1 U	1 U
5/2014	5.42	1 U	1 U	1 U
10/2015	5.41	1 U	1 U	1 U
6/2017	5.38	1 U	1 U	1 U
10/2018	5.86	1 U	1 U	1 U
6/2020	5.62	1 UJ	1 UJ	1 UJ
10/2021	5.69	1 U	1 U	1 U
<i>Project Cleanup Level</i>	<i>NA</i>	<i>5</i>	<i>5</i>	<i>70</i>

Table A6. Historical sample results and water levels collected by Ecology from shallow monitoring well 4W, July 2002 to October 2021.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	5.25	<u>9.3</u>	0.84 J	0.26 J
10/2002	5.84	<u>15</u>	1.9 J	0.64 J
1/2003	4.66	<u>17</u>	0.25 J	0.31 J
4/2003	4.75	<u>12</u>	1.3	0.49 J
11/2003	5.13	<u>15</u>	2	0.6 J
4/2004	4.84	<u>26 J^a</u>	2.8 J ^a	1.4
9/2004	5.37	<u>9.9</u>	1.4	0.47 J
4/2005	4.72	<u>23</u>	2.3	0.83 J
8/2005	5.28	<u>35 J^a</u>	4.2 J ^a	2.9 J ^a
11/2005	--	<u>6.8</u>	0.52 J	1.8
2/2006	3.39	<u>18 J^a</u>	0.63 J	0.59 J
5/2006	4.94	<u>324</u>	<u>13</u>	16
8/2006	5.34	<u>3.2 J</u>	0.6 J	0.19 J
12/2006	4.44	<u>6.3</u>	1.7	0.47 J
2/2007	4.29	<u>10</u>	3.2	1
5/2007	4.75	<u>9.3</u>	2	0.75 J
9/2007	7.01	<u>43</u>	<u>9.5</u>	2.5
11/2007	6.38	<u>14</u>	2	0.67 J
2/2008	4.45	<u>18</u>	4.3 J ^a	1.4 J
5/2008	4.91	<u>15 J</u>	3.6	1
10/2008	5.26	<u>8</u>	1.5	0.5 J
6/2009	4.99	<u>11</u>	1.9	0.62 J
11/2009	3.55	<u>6.9 J</u>	1.2	1 U
6/2010	--	<u>41 J^a</u>	3.9 J ^a	1
10/2010	4.96	<u>24</u>	3.1	0.92 J
6/2011	4.66	<u>35 J</u>	4.2 J	1.2
11/2011	5.12	<u>8.9 J</u>	1 J	1 U
6/2012	4.66	<u>18 J^a</u>	1.95 J ^a	0.35 J
7/2013	5.41	<u>5.3</u>	1.3	0.77 J
5/2014	4.93	<u>4.9</u>	0.72 J	0.65 J
10/2015	5.38	<u>3.7 J</u>	0.74 J	0.35 J
6/2017	4.84	<u>5.2</u>	0.92 J	0.61 J
10/2018	5.32	<u>4.6</u>	1.2	0.74 J
6/2020	5.09	<u>5.5 J^a</u>	0.96 J ^a	1 UJ
10/2021	5.11	<u>6.45</u>	1.38	0.65
<i>Project Cleanup Level</i>	NA	5	5	70

^a Average concentration of duplicate samples when RPD > 30%.

Table A7. Historical sample results and water levels collected by Ecology from shallow monitoring well 7W, July 2002 to October 2021.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	5.21	1 U	1 U	1 U
10/2002	5.08	0.19 J	2 U	1 U
1/2003	4.25	1 U	1 U	1 U
4/2003	4.32	1 U	1 U	1 U
11/2003	4.69	1 U	1 U	1 U
4/2004	4.39	1.7	1 U	1 U
9/2004	4.92	0.47 J	0.26 J	1 U
4/2005	4.28	0.15 J	1 U	1 U
8/2005	4.80	0.38 J	1 U	1 U
11/2005	--	1 U	1 U	1 U
2/2006	2.96	0.53 J	1 U	1 U
5/2006	4.51	1 U	1 U	1 U
8/2006	4.9	1 UJ	1 U	1 U
12/2006	4.01	1 U	1 U	1 U
2/2007	3.84	1 U	1 U	1 U
5/2007	4.30	1 U	1 U	1 U
9/2007	6.65	2 U	2 U	1 U
11/2007	6.01	2 U	1 U	1 U
2/2008	4.00	1 U	1 U	2 U
5/2008	4.45	2 U	1 U	1 U
10/2008	4.8	1 U	1 U	1 U
6/2009	4.53	1 U	1 U	1 U
11/2009	3.13	1 U	1 U	1 U
6/2010	4.30	1 U	1 U	1 U
10/2010	4.51	1 U	1 U	1 U
6/2011	4.24	2 U	1 U	1 U
11/2011	4.21	1 U	1 U	1 U
6/2012	4.67	1 U	1 U	1 U
7/2013	4.21	1 U	1 U	1 U
5/2014	4.96	1 U	1 U	1 U
10/2015	4.49	1 U	1 U	1 U
6/2017	5.00	1 U	1 U	1 U
10/2018	4.38	1 U	1 U	1 U
6/2020	4.84	1 UJ	1 UJ	1 UJ
10/2021	4.65	1 U	1 U	1 U
<i>Project Cleanup Level</i>	NA	5	5	70

Table A8. Historical sample results and water levels collected by Ecology from deep monitoring well MW-5, July 2002 to October 2021.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	5.21	1 U	1 U	1 U
10/2002	5.52	1 U	2 U	1 U
1/2003	4.66	1 U	1 U	1 U
4/2003	4.75	1 U	1 U	1 U
11/2003	5.13	1 U	1 U	1 U
4/2004	4.83	1 UJ	1 U	1 U
9/2004	5.38	1 U	1 U	1 U
4/2005	4.71	1 U	1 U	1 U
8/2005	5.27	1 U	1 U	1 U
11/2005	4.70	1 U	1 U	1 U
2/2006	3.24	1 U	1 U	1 U
5/2006	4.94	1 U	1 U	1 U
8/2006	5.34	1 UJ	1 U	1 U
12/2006	4.44	1 U	1 U	1 U
2/2007	4.27	1 U	1 U	1 U
5/2007	4.76	1 U	1 U	1 U
9/2007	7.00	2 U	2 U	1 U
11/2007	6.34	2 U	1 U	1 U
2/2008	4.45	1 U	1 U	2 U
5/2008	4.89	2 U	1 U	1 U
10/2008	5.28	1 U	1 U	1 U
6/2009	4.98	1 U	1 U	1 U
11/2009	3.55	1 U	1 U	1 U
6/2010	4.64	1 U	1 U	1 U
10/2010	4.94	1 U	1 U	1 U
6/2011	4.65	2 U	1 U	1 U
11/2011	5.11	1 U	1 U	1 U
6/2012	4.65	--	--	--
7/2013	5.38	1 U	1 U	1 U
5/2014	4.91	--	--	--
10/2015	5.35	1 U	1 U	1 U
6/2017	4.84	1 U	1 U	1 U
10/2018	5.30	--	--	--
6/2020	5.08	1 U	1 U	1 U
10/2021	5.11	--	--	--
<i>Project Cleanup Level</i>	<i>NA</i>	<i>5</i>	<i>5</i>	<i>70</i>

Table A9. Historical sample results and water levels collected by Ecology from deep monitoring well MW-6, July 2002 to October 2021.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	4.90	1 U	1 U	1 U
10/2002	5.15	1 U	2 U	1 U
1/2003	4.34	1 U	1 U	1 U
4/2003	4.39	1 U	1 U	1 U
11/2003	4.77	1 U	1 U	1 U
4/2004	4.49	1 UJ	1 U	1 UJ
9/2004	5.02	1 U	1 U	1 U
4/2005	4.37	1 U	1 U	1 U
8/2005	4.88	1 U	1 U	1 U
11/2005	4.32	1 U	1 U	1 U
2/2006	3.04	1 U	1 U	1 U
5/2006	4.59	1 U	1 U	1 U
8/2006	4.99	1 UJ	1 U	1 U
12/2006	4.12	1 U	1 U	1 U
2/2007	3.93	1 U	1 U	1 U
5/2007	4.38	1 U	1 U	1 U
9/2007	6.71	2 U	2 U	1 U
11/2007	6.15	2 U	1 U	1 U
2/2008	4.08	1 U	1 U	2 U
5/2008	4.55	2 U	1 U	1 U
10/2008	4.90	1 U	1 U	1 U
6/2009	4.64	1 U	1 U	1 U
11/2009	3.20	1 U	1 U	1 U
6/2010	4.30	1 U	1 U	1 U
10/2010	4.59	1 U	1 U	1 U
6/2011	4.30	2 U	1 U	1 U
11/2011	4.75	1 U	1 U	1 U
6/2012	4.30	--	--	--
7/2013	5.04	1 U	1 U	1 U
5/2014	4.59	--	--	--
10/2015	5.00	1 U	1 U	1 U
6/2017	4.49	1 U	1 U	1 U
10/2018	4.94	--	--	--
6/2020	4.74	1 U	1 U	1 U
10/2021	5.76	--	--	--
<i>Project Cleanup Level</i>	NA	5	5	70

Table A10. Historical sample results and water levels collected by Ecology from shallow monitoring well 8W, July 2002 to April 2003.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	4.51	1 U	1 U	1 U
10/2002	4.81	1 U	2 U	1 U
1/2003	3.93	1 U	1 U	1 U
4/2003	4.97	1 U	1 U	1 U
<i>Project Cleanup Level</i>	NA	5	5	70

Table A11. Historical sample results and water levels collected by Ecology from deep monitoring well MW-7, July 2002 to April 2003.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	4.61	1 U	1 U	1 U
10/2002	4.87	1 U	2 U	1 U
1/2003	4.06	1 U	1 U	1 U
4/2003	4.15	1 U	1 U	1 U
<i>Project Cleanup Level</i>	NA	5	5	70

Table A12. Historical sample results and water levels collected by Ecology from deep monitoring well MW-8, July 2002 to April 2003.

Date	Water Level (feet bgs)	PCE (µg/L)	TCE (µg/L)	Cis-1,2-DCE (µg/L)
7/2002	5.90	1 U	1 U	1 U
10/2002	6.51	1 U	2 U	1 U
1/2003	5.30	1 U	1 U	1 U
4/2003	5.41	1 U	1 U	1 U
<i>Project Cleanup Level</i>	NA	5	5	70