



Lakewood Plaza Cleaners Groundwater Monitoring Results, May 2014: Data Summary Report

Abstract

This data summary report is one in a series describing results of long-term groundwater monitoring at the former Lakewood Plaza Cleaners site south of Tacoma. The Washington State Department of Ecology (Ecology) began collecting groundwater data at the site in the early 1990s as part of its responsibilities for operation and maintenance of the site remedial actions. Wellhead protection of the nearby Lakewood Water District Wells H1 and H2 continues to be the remedial option identified in the EPA ROD. The monitoring goal is to evaluate the effectiveness of wells H1 and H2 to contain and remove groundwater contaminated by improper waste management practices at the former cleaners.

This report describes water quality results for groundwater samples collected in May 2014 from 4 project monitoring wells and Lakewood Water District municipal well H1.

Tetrachloroethene (PCE) concentrations in monitoring wells MW-20B (130 ug/L) and MW-16A (65 ug/L) still do not meet the project cleanup level of 5 ug/L established for this site. Trichloroethene and cis-1,2-dichloroethene were also detected in these wells but at concentrations near the reporting limit of 1 ug/L.

Samples collected from municipal well H1 prior to treatment continue to have PCE concentrations near the project cleanup level.

PCE was also detected in well LPMW-2 at a concentration of 2.7 ug/L. This well is near the former septic system of Lakewood Plaza Cleaners which was identified as a source of the contamination.

The use of municipal wells H1 and H2 to contain, remove, and treat contaminated groundwater associated with the Lakewood Plaza Cleaners site continues, since the cleanup goals have not been achieved. Project data indicate that it will take much longer than initially projected to meet the cleanup goals. The Environmental Protection Agency (EPA) has recommended the treatment remedy be reevaluated to determine if it is adequate to meet the cleanup goals. If the cleanup goals cannot be achieved through current actions, then EPA and Ecology need to determine what additional actions are needed to achieve site cleanup.

Publication Information

This report is available on the Department of Ecology's website at <https://fortress.wa.gov/ecy/publications/SummaryPages/1503007.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, LAKEWOOD.

Ecology's Activity Tracker Code for this study is 99-001.

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- WRIA: 12 - Chambers/Clover
- HUC number: 17110019

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Background

In 1981, the U.S. Environmental Protection Agency (EPA) confirmed that Lakewood Water District production wells H1 and H2 were contaminated with volatile organic compounds; tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE). Lakewood is south of Tacoma in Pierce County. The source of the contamination was identified as the former Lakewood Plaza Cleaners, a nearby dry cleaning and laundry facility (EPA, 1983). The contamination resulted from the dumping of PCE into on-site septic tanks and the disposal of dry cleaning sludge on the ground surface. The Lakewood Plaza Cleaners site was added to the National Priorities List (NPL) in 1982 under the site name: Lakewood/Ponders Corner. The site is currently occupied by Rainier Lighting and Electric Supply.

EPA began remedial activities at the site in 1983. Remediation included the installation and operation of groundwater air-strippers at Lakewood Water District wells H1 and H2, which are located approximately 800 feet southwest of the contaminant source area. Contaminated soils and sludge were also removed from the source area and a small portion of the contaminated septic field soils were treated with vapor extraction. Soil remediation was completed in 1993. The soils unit of the site was removed from the NPL in 1996 (EPA, 1996). Treatment of the contaminated groundwater extracted by wells H1 and H2 continues, since groundwater cleanup levels for PCE of 5 ug/L have not been achieved.

Although the Washington State Department of Ecology's (Ecology) responsibilities for operation and maintenance of the remedial actions did not begin until 1997, Ecology began semi-annual groundwater compliance monitoring at the site in 1991. The objective of the sampling was to collect groundwater quality data to evaluate the effectiveness of Lakewood water supply wells H1 and H2 to contain, remove, and treat the groundwater contaminated by Plaza Cleaners.

In accordance with EPA policy and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA § 121(42 U.S.C. Section 9621) and the National Contingency Plan (NCP), five-year reviews are required on projects, as long as cleanup goals have not been achieved. Five 5-year reviews for the Lakewood Plaza Cleaners site have been completed by EPA, in consultation with Ecology, in 1992, 1997, 2002, 2007, and 2012. The latest 5-year review concluded that the current remedy is not performing as expected or providing long-term protectiveness towards attaining the groundwater cleanup goals. The review acknowledged that the continuing migration of contaminants from lower permeability soils is the likely cause for ongoing impacts to groundwater. This represents one of the major physical barriers to attaining groundwater cleanup levels throughout the plume in a reasonable timeframe (USACE, 2012).

Therefore, remediation and monitoring of the groundwater is ongoing at the Lakewood Plaza Cleaners/Ponders Corner site, under a long-term response action. Project data indicate that it will take much longer than the initial projected timeframe to meet the cleanup goals. Because of this, it was recommended in the latest 5-year review that the treatment remedy be evaluated

to determine if it is adequate to meet the cleanup goals. If the goals cannot be achieved, then EPA and Ecology need to determine what additional actions are needed to achieve site cleanup.

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, LAKEWOOD.

Groundwater Monitoring

Groundwater monitoring has been modified over the years to focus primarily on wells in the immediate vicinity of the former Plaza Cleaners. Currently there are eight monitoring wells and the two production wells (H1 and H2) in the monitoring program (Figure 1) that are sampled on an alternating schedule. In May 2014, Ecology collected groundwater samples from two of the shallow and three of the deep wells (Table 1), to evaluate volatile organics in groundwater at the Lakewood Plaza Cleaners/Ponders Corner site.

Of the two sampled shallow wells, one is screened in the Steilacoom Gravel unit (LPMW-2) and the other in the Vashon Till (MW-20B). Both wells are located near the contaminant source area. The Steilacoom Gravel is composed of permeable Vashon recessional sand and gravel deposits. This unit typically ranges from about 0 to 30 feet below ground surface (bgs). The Steilacoom gravels, which are typically unsaturated, contain an area of perched groundwater in the immediate vicinity of the former Plaza Cleaners and near wells H1 and H2 (EPA, 1985a). The underlying Vashon Till consists of semi-confining silt and clay-rich layers that contain lenses of clean gravel. This unit, which is highly variable in thickness, typically ranges from about 30 to 75 feet bgs. At least one gravel lens is present beneath the former Plaza Cleaners site and covers a fairly large area. This permeable interval appears to be hydraulically interconnected with the Steilacoom gravels (EPA, 1985b).

The three deep wells (MW-16A, MW-20A, and municipal well H1) are screened in the highly permeable sands and gravels of the Advance Outwash deposits, the primary water-supply aquifer for the area. This unit is typically 75 to 110 feet bgs. Although regional groundwater flow in the Advance Outwash is generally to the west-northwest toward Gravelly Lake, the pumping of production wells H1 and H2 creates a capture zone influencing groundwater flow directions in the area. The horizontal hydraulic conductivities for this unit vary from 400 to 2000 feet per day. Linear flow velocities range from 2.7 ft/day to 100 ft/day (USACE, 2012).

Monitoring wells MW-16A and MW-20A were purged and sampled, using dedicated bladder pumps. Wells MW-20B, and LPMW-2 were purged and sampled with a stainless-steel submersible pump. Ecology sampled all monitoring wells in accordance with Ecology's SOP EAP078 (Marti, 2014a). Municipal well H1 was operating at the time of the May sampling. The sample was collected from a tap prior to any treatment systems, in accordance with Ecology's SOP EAP077 (Marti, 2014b).

Results

Groundwater samples were submitted for analysis of volatile organic compounds (VOCs). Analytical results for volatile organics of concern (PCE, TCE, cis-1,2-DCE and vinyl chloride) are summarized in Table 1 and Figure 1.

Quality control samples collected in the field consisted of a blind field duplicate collected from well MW-16A. The relative percent difference (RPD) for the May data ranged from 0% to 10%, which meets the data quality objective of 10% established for the project (Marti, 1991). 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 1: Sample Results for Lakewood Plaza Cleaners/Ponders Corner, May 2014.

Field Measurements							Laboratory Analysis			
Well ID	Well Depth (feet)	Ground Water Elevation (feet)	pH (Std. Units)	Cond. (uS/cm)	Diss. Oxygen (mg/L)	ORP (mV)	PCE	TCE	Cis-1,2 DCE	Vinyl Chloride
							Project Cleanup Levels			
							5 ug/L	5 ug/L	70 ug/L	0.2 ug/L
Shallow Wells										
LPMW-2	29	260.74	6.6	235	3.6	130	2.7	1 U	1 U	1 U
MW-20B	50.4	260.20	6.6	377	4.2	174	130	2.1	3	1 U
Deep Wells										
MW-16A	109	251.70	6.9	274	7.0	190	65	1.1	1.3	1 U
MW-16A (dup)	--	--	--	--	--	--	66	1	1.3	1 U
MW-20A	97.3	258.38	7.5	232	4.8	118	1 U	1 U	1 U	1 U
H1	110	--	6.6	206	--	--	2.9	1 U	1 U	1 U

Cond: Conductivity

ORP: Oxidation Reduction Potential

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

Bold: Analyte was detected.

Shade: Values are greater than project cleanup levels.

Monitoring wells MW-20B and MW-16A continue to have PCE concentrations that far exceed the cleanup level of 5 ug/L. While samples collected from municipal well H1 and H2 prior to treatment continue to have PCE concentrations near the cleanup level (Table 1).

PCE concentrations in well LPMW-2 also continue to be detected near the cleanup level. This well is located near the former septic system of Plaza Cleaners, which was identified as a source of the contamination (Figure 1).

Vinyl chloride was not detected in any of the sampled wells. Although the reporting limit was 1 ug/L, the method detection limit for the May 2014 analysis was 0.22 ug/L. Vinyl chloride has not been detected in any of the samples collected by Ecology since we began sampling in 1991.

A summary of monitoring results since 1991 is presented in Table 2 and Figures 2 and 3.

Conclusions

Concentrations of PCE in groundwater have generally decreased from their 1980s levels with the implementation of remedial activities at the Lakewood Plaza Cleaners/Ponders Corner site. However, concentrations still do not meet the project groundwater cleanup goal of 5 ug/L. Since Ecology began sampling in 1991, PCE concentrations have varied. Concentrations in well MW-20B fluctuate but continue to be far above the cleanup level (Figure 2). PCE concentrations in well MW-16A also continue to exceed the cleanup level (Figure 3). Statistical trend analysis performed during the 2012 five-year review suggests that PCE concentrations in well MW-16A are actually increasing (USACE, 2012). The increasing trend in well MW-16A is attributed to the likely migration of contaminants from the Vashon Till to the Advance Outwash. This supports the conceptual site model that contaminants migrate from the lower permeability till to the more permeable outwash. Once in the outwash, the contaminants move in the capture zone towards pumping wells H1 and H2. The latest 5-year review concludes that the continuing migration of contaminants from the Vashon Till represents one of the major physical barriers to attaining groundwater cleanup levels throughout the plume in a reasonable timeframe (USACE, 2012).

The use of municipal wells H1 and H2 to remove and treat contaminated groundwater associated with the Lakewood Plaza Cleaners/Ponders Corner site continues, since the cleanup goals have not been achieved. Project data indicate that it will take much longer than initially projected to meet the cleanup goals.

Recommendations

EPA has recommended and Ecology is in agreement that since the cleanup goals throughout the contaminant plume have not been achieved, then the current remedial activities should be evaluated. The first three recommendations were made in the 2012 five-year review to evaluate the current remedial activities (USACE, 2012):

1. **Determine the capture zone in the Advance Outwash for wells H1 and H2 at the current pumping rates.** Wells H1 and H2 are currently operated on an alternate six-month rotation with seasonal flow variations. Weak hydraulic control of groundwater in the Advance Outwash and Vashon Till aquifers may result, since only one well operates at a time. Paired wells MW-20A and MW-20B appear to show vertical flow reversing seasonally, which may indicate a response to the changing pumping rates of production wells H1 and H2 (USACE, 2012). Previous studies in the 1980s (EPA, 1985b) showed that drawdown occurs in shallow monitoring wells drilled in the Steilacoom Gravel when wells

H1 and H2 are pumping. However, this may have occurred when both production wells were pumping.

2. **Update characterization of groundwater flow directions and extent of the contaminant plume in the Steilacoom Gravel and Vashon Till.** There is insufficient groundwater data to assess either of these issues, since there is only one well in each unit in the current monitoring program. All other wells in these units have either been decommissioned or lost over the course of the project.
 3. **Evaluate the restoration timeframe for the aquifer and alternatives to accelerate the restoration if necessary.** The estimated aquifer restoration timeframe has ranged from a minimum of 10 years to greater than 100 years. The shorter timeframe was apparently based on both production wells operating simultaneously and continuously. As of 2012, wells H1 and H2 have been used for 28 years to treat the contaminated groundwater. The variable pumping rates and continued leaching of PCE from the Vashon Till may be contributing to the increased length of time to achieve the cleanup goals. Additional treatment options for the source area (Steilacoom Gravel and Vashon Till) should be evaluated to determine if any could accelerate aquifer restoration.
- Since Ecology began groundwater compliance monitoring in 1991, the monitoring program has been modified over the years to focus primarily on wells in the immediate vicinity of the former Plaza Cleaners. Currently there are eight monitoring wells and the two production wells in the monitoring program. Primary wells (MW-16A, MW-20A, MW-20B, LPMW-2 and H1/H2) are sampled on an annual basis. Ecology recommends that these wells be changed to an 18-month monitoring cycle to capture seasonal variation in the contaminant concentrations. Monitoring of the remaining wells on a bi-annual (MW-33) and 5-year (MW-19A, MW-31, MW-32) cycle should continue to be sufficient to meet the project goals.

References

EPA, 1983. Report of the Groundwater Investigation – Lakewood, Washington, October 1981 to February 1983. U.S. Environmental Protection Agency.

EPA, 1985a. EPA Superfund Record of Decision: Lakewood EPA ID:WAD050075662 OU 01 Lakewood, WA 09/30/1985. U.S. Environmental Protection Agency. EPA/ROD/R10-85/006.

EPA, 1985b. Final Draft Remedial Investigation Report – Ponders Corner, Washington. U.S. Environmental Protection Agency. EPA 112-0L22.

EPA, 1992. EPA Superfund Explanation of Significant Differences: Lakewood EPA ID: WAD050075662 OU 01 Lakewood, WA 09/15/1992. U.S. Environmental Protection Agency. EPA/ESD/R10-92/500.

EPA, 1996. Fact Sheet: Notice of Intent to Delete - September 27, 1996 Federal Register. EPA announcement in the Federal Register the partial deletion of the Lakewood site “Soil Unit” from the NPL. U.S. Environmental Protection Agency.

Marti, P., 1991. Lakewood/Plaza Cleaners Ground Water Monitoring Plan. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program.

Marti, P., 2014a. Standard Operating Procedure for Purging and Sampling Monitoring Wells plus Guidance on Collecting Samples for Volatiles and other Organic Compounds. Washington State Department of Ecology, Environmental Assessment Program, EAP078, Version 2.0. www.ecy.wa.gov/programs/eap/quality.html.

Marti, P., 2014b. Standard Operating Procedure for Purging and Sampling Water Supply Wells plus Guidance on Collecting Samples for Volatiles and other Organic Compounds. Washington State Department of Ecology, Environmental Assessment Program, EAP077, Version 2.0. www.ecy.wa.gov/programs/eap/quality.html.

U.S. Army Corps of Engineers (USACE), 2012. Fifth Five-Year Review Report for Lakewood/ Ponders Corner Superfund Site, Lakewood, WA – September 2012. Prepared for U.S. Environmental Protection Agency.

Figures

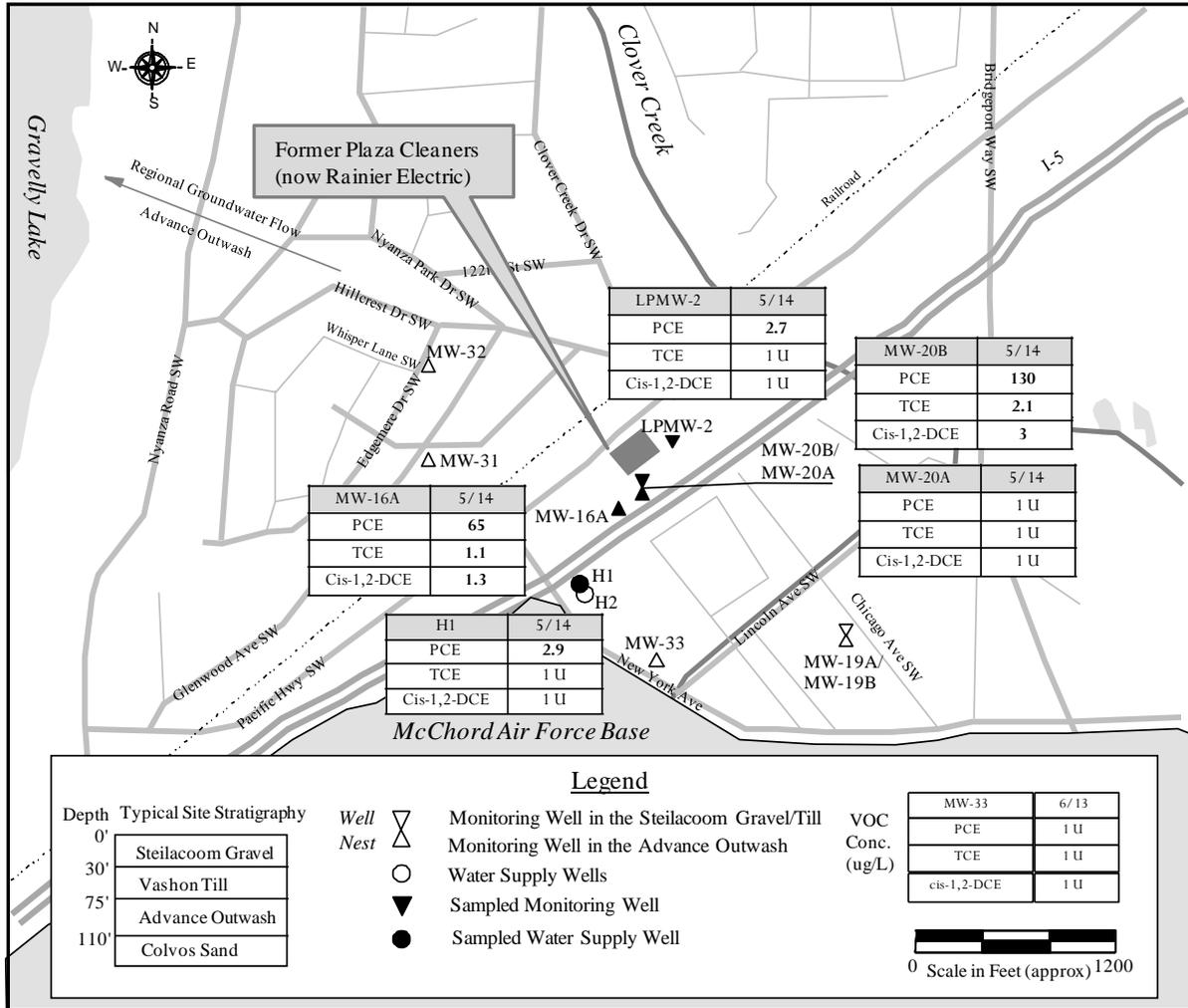


Figure 1. Lakewood Plaza Cleaners Sampling Locations and Results (ug/L), May 2014.

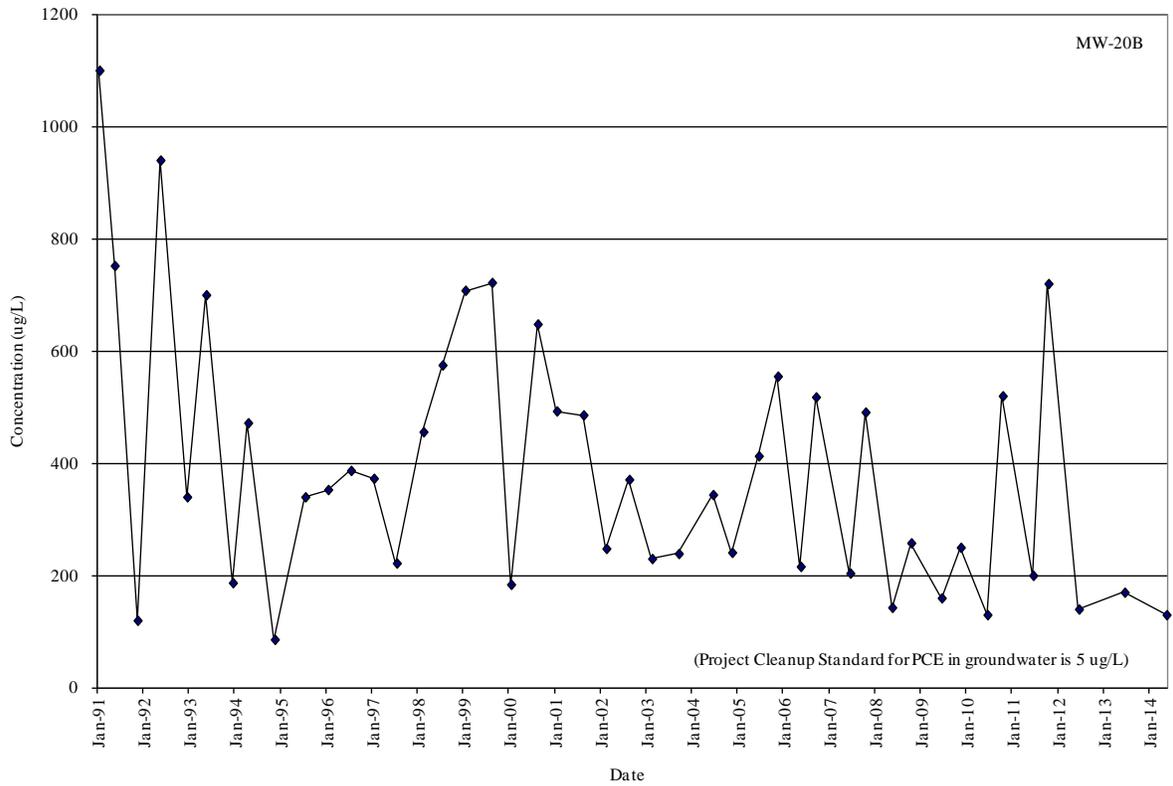


Figure 2. PCE Concentrations for Well MW-20B, January 1991 to May 2014.

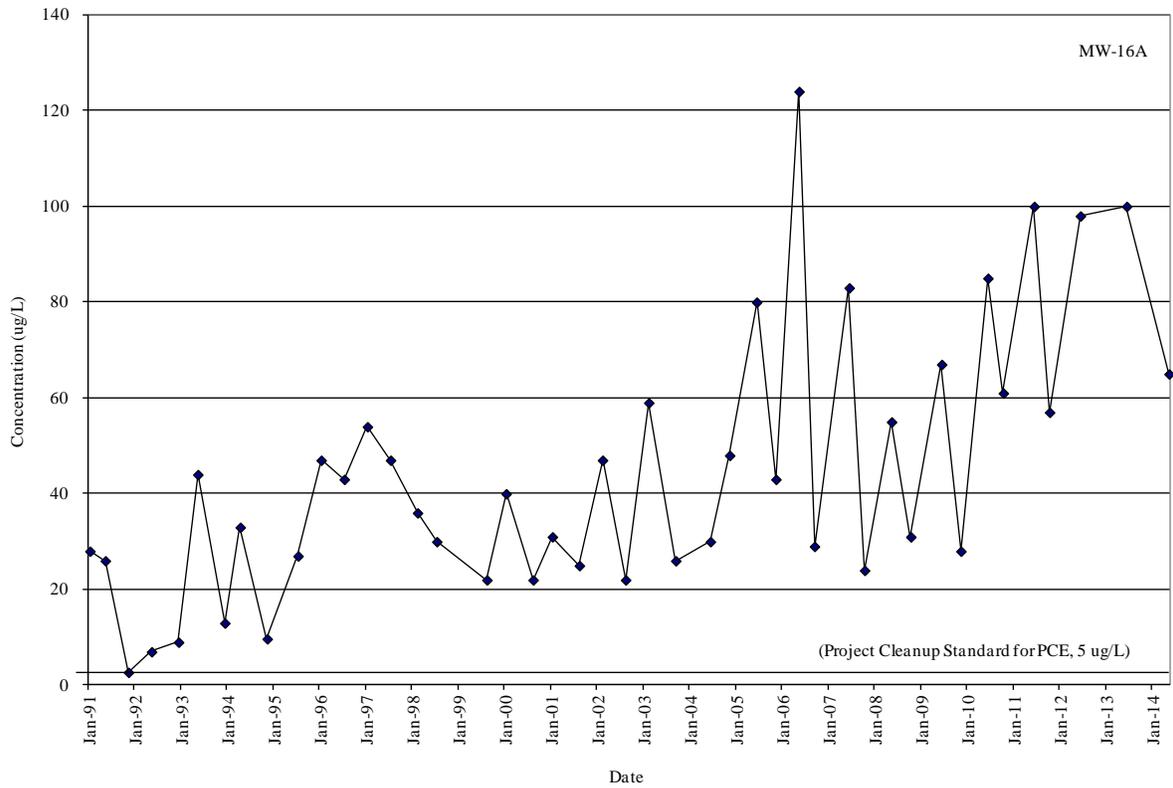


Figure 3. PCE Concentrations for Well MW-16A, January 1991 to May 2014.

Tables

Table 2. Summary of Sample Results (ug/L), January 1991 to May 2014.

Well Number	January 1991			May 1991			November 1991			May 1992			December 1992		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	28	1 J	2.4 J	26	0.6 J	2	2.7 J	1 U	0.6 J	7	1 U	1	9 J	0.3 J	0.8 J
MW-20A	1 U	1 U	1 U	0.4 J	1 U	1 U	0.4 J	1 U	1 U	0.5 J	1 U	1 U	0.8 J	1 UJ	1 UJ
MW-20B	1100 D	18	33	752	16	30	120	2.6 J	6.7	940	13	32	340 J	14 J	20 J
MW-21	2.1 J	1 U	1 J	2	1 U	0.7 J	2.2 J	1 U	1.0 J	2	1 U	0.6 J	2	0.2 J	0.3 J
MW-27	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 UJ	1 UJ	1 UJ
MW-28A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-31	1 J	1 U	1.9 J	0.6 J	1 U	2	0.9 J	1 U	2.2 J	0.8 J	1 U	1	0.5 J	1 UJ	0.9 J
MW-32	1 J	1 U	1.1 J	1	1 U	2	0.6 J	1 U	0.6 J	0.7 J	1 U	1	0.7 J	1 UJ	0.5 J
MW-41	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 UJ	1 UJ	1 UJ
MW-19A	--	--	--	--	--	--	1 U	0.5 J	1 U	--	--	--	1 UJ	1 UJ	1 UJ
MW-33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-40	1 U	1 U	1 U	--	--	--	1 U	1 U	1 U	--	--	--	1 UJ	1 UJ	1 UJ
H1/H2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Well Number	May 1993			December 1993			April 1994			November 1994			July 1995		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	44	10 U	2 J	13	0.3 J	0.7 J	33	0.6	1.4	9.7	0.3 J	0.5 J	27	0.5 J	0.8 J
MW-20A	10 U	10 U	10 U	0.3 J	1 U	1 U	0.4	0.2 U	0.2 U	0.3 J	1 U	1 U	0.4 J	1 U	1 U
MW-20B	700 D	12	21	187	50 U	8.2 J	472	8.6 J	12.6	86	50 U	3 J	340 D	8.4	17
MW-21	1 J	10 U	10 U	1.6	1 U	0.4 J	1.5	0.2 J	0.3	1.8	0.2 J	0.3 J	--	--	--
MW-27	10 U	10 U	10 U	1 U	1 U	1 U	0.2 U	0.2 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-28A	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1 U	1 U
MW-31	10 U	10 U	10 U	0.8 J	1 U	1.2 J	0.7	0.2 U	1.0	0.8 J	1 U	1	0.6 J	1 U	0.5 J
MW-32	10 U	10 U	10 U	0.7 J	1 U	0.6 J	0.7	0.2 U	0.6	0.6 J	1 U	0.5 J	0.7 J	1 U	0.5 J
MW-41	10 U	10 U	10 U	1 U	1 U	1 U	0.2 U	0.2 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-19A	--	--	--	1 U	0.4	1 U	0.2 U	0.5	0.2 U	--	--	--	1 U	0.4 J	1 U
MW-33	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1 U	1 U
MW-40	--	--	--	1 U	1 U	1 U	0.2 U	0.2 U	0.2 U	--	--	--	1 U	1 U	1 U
H1/H2	--	--	--	--	--	--	--	--	--	--	--	--	9	0.3 J	1 U

Table 2 (cont.). Summary of Sample Results (ug/L) from January 1991 to May 2014.

Well Number	January 1996			July 1996			January 1997			July 1997			February 1998		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	47 E	0.8 J	1.5	43	0.7 J	1.9	54	1.1	3.1	47	0.7 J	2.5	36	0.7 J	2 J
MW-20A	0.2 J	1 U	1 U	0.4 J	1 U	1 U	0.4 J	1 U	1 U	0.3 J	1 U	2 U	0.4 J	1 U	1 U
MW-20B	353	7.2	15	387	7.6	15	373	100 U	6.4 J	222	4	6.4	456	7 J	12
MW-21	--	--	--	Well Decommissioned											
MW-27	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U
MW-28A	1 U	1 U	1 U	Well Decommissioned											
MW-31	0.6 J	1 U	0.7 J	--	--	--	--	--	--	0.9 J	1 U	0.9 J	--	--	--
MW-32	0.8 J	1 U	0.6 J	--	--	--	--	--	--	--	--	--	--	--	--
MW-41	1 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--
MW-19A	--	--	--	--	--	--	--	--	--	1 U	0.3 J	2 U	--	--	--
MW-33	--	--	--	1 U	1 U	1 U	--	--	--	1 U	1 U	2 U	--	--	--
MW-40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H1/H2	8.4	0.2 J	0.2 J	0.1 J	1 U	1 U	18	0.4 J	0.4 J	8.8	0.3 J	0.6 J	11	0.4 J	0.3 J

Well Number	July 1998			January 1999			August 1999			January 2000			August 2000		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	30	1 U	1.5 J	--	--	--	22	0.4 J	1.1	40	0.7 J	1.9	22	0.3 J	0.7
MW-20A	0.6 J	1 U	1 U	1 U	2 U	1 U	0.8 J	2 U	1 U	0.2 J	2 U	1 U	0.1 J	2 U	1 U
MW-20B	575 D	10	23	708	5.2	12	722	8.4 J	16 J	184	6	13	648	200 U	100 U
MW-27	0.05 J	1 U	1 U	1 U	2 U	1 U	1 U	2 U	1 U	1 U	2 U	1 U	1 U	2 U	1 U
MW-31	--	--	--	--	--	--	0.9 J	2 U	0.4 J	--	--	--	--	--	--
MW-32	--	--	--	--	--	--	--	--	--	--	--	--	0.8 J	2 U	1 U
MW-41	--	--	--	--	--	--	--	--	--	--	--	--	1 U	2 U	1 U
MW-19A	--	--	--	--	--	--	1 U	0.4 J	1 U	--	--	--	--	--	--
MW-33	1 U	1 U	1 U	--	--	--	1 U	2 U	1 U	--	--	--	1 U	2 U	1 U
MW-40	--	--	--	--	--	--	--	--	--	--	--	--	1 U	2 U	1 U
H1/H2	10	1 U	0.1 J	1.5	1 U	1 U	5.2	0.2 J	1 U	10	1 U	1 U	8.7	0.03 J	1 U

Table 2 (cont.). Summary of Sample Results (ug/L) from January 1991 to May 2014.

Well Number	January 2001			August 2001			February 2002			August 2002			February 2003		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	31	0.4 J	1	25	0.3 J	0.7 J	47	0.8 J	2.3	22	0.3 J	0.8 J	59 J	0.2 J	2.4
MW-20A	0.2 J	1 U	1 U	1 U	2 U	1 U	--	--	--	--	--	--	1 U	1 U	1 U
MW-20B	493	6.6 J	12	486	8.2	18	248	200 U	100 U	371	8.5	16	230	100 U	100 U
MW-27	1 U	1 U	1 U	1 U	2 U	1 U	1 U	2 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U
MW-31	--	--	--	0.4 J	2 U	0.3 J	--	--	--	--	--	--	--	--	--
MW-32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-19A	--	--	--	1 U	0.3 J	1 U	--	--	--	--	--	--	--	--	--
MW-33	--	--	--	1 U	2 U	1 U	--	--	--	1 U	1 U	1 U	--	--	--
MW-40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H1/H2	11	0.2 J	1 U	6.8	0.2 J	1 U	12	0.2 J	0.2 J	6.1	1 U	1 U	1.3	1 U	1 U

Well Number	September 2003			June 2004			November 2004			June 2005			November 2005		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	26	0.3 J	0.5 J	30	0.4 J	0.8 J	48	1 U	1.4	80	1.3	2.8	43	0.7 J	1.0 J
MW-20A	0.1 J	1 U	1 U	0.2 J	1 U	1 U	0.3 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-20B	239	5.4 J	12	344	6.5 J	15	241	6.7	13	413	6.6	12	555	6.4	11
MW-27	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
MW-31	0.5 J	1 U	0.1 NJ	--	--	--	--	--	--	0.5 J	1 U	1 U	--	--	--
MW-32	--	--	--	--	--	--	--	--	--	1.4	1 U	1 U	--	--	--
MW-41	--	--	--	--	--	--	--	--	--	1 U	1 U	1 U	--	--	--
MW-19A	1 U	0.4 NJ	1 U	--	--	--	--	--	--	1 U	0.6 J	1 U	--	--	--
MW-33	1 U	1 U	1 U	--	--	--	--	--	--	1 U	1 U	1 U	--	--	--
MW-40	--	--	--	--	--	--	--	--	--	1 U	1 U	1 U	--	--	--
H1/H2	6.4	0.2 NJ	1 U	7.9	0.2 J	0.1 J	2.6	1 U	1 U	14	0.3 J	1 U	6.4	1 U	1 U

Table 2 (cont.). Summary of Sample Results (ug/L) from January 1991 to May 2014.

Well Number	May 2006			September 2006			June 2007			October 2007			May 2008		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	124	1.8	4.6	29	0.3 J	0.48 J	83	1.2	2.5	24	1 U	0.64 J	55	1.2	2.8
MW-20A	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
MW-20B	216	4.2	6.6	518	5.6	11	204	4.4	7.8	491	7.5	15	143	5.5	12
MW-27	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
MW-31	--	--	--	--	--	--	1.6 J	2 U	2 U	--	--	--	--	--	--
MW-32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-19A	--	--	--	--	--	--	2 U	1.2 J	2 U	--	--	--	--	--	--
MW-33	1 U	1 U	1 U	--	--	--	2 U	2 U	2 U	--	--	--	1 U	1 U	1 U
MW-40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LPMW-2	9.9	1 U	1 U	--	--	--	4.8	1 U	1 U	--	--	--	2.5	1 U	1 U
LPMW-3	1 U	1 U	1 U	--	--	--	2 U	1 U	1 U	--	--	--	--	--	--
H1/H2	7.3	0.2 J	1 U	4.8	1 U	1 U	5.2	2 U	2 U	3.8	1 U	1 U	9.6	1 U	1 U

Well Number	October 2008			June 2009			November 2009			June 2010			October 2010		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	31	0.45 J	0.6 J	67	0.94 J	2.2	28	0.52 J	0.83 J	85	1.3	1.6	61	0.86 J	1.2
MW-20A	1 U	1 U	1 U	1 U	1 U	1 U	0.64 J	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U
MW-20B	258	4.5	9	160	4.1	7.4	250	4.7	9.6	130	3.7	6.3	520	5.8	10
MW-27	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-31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-32	--	--	--	--	--	--	--	--	--	1.8	1 U	1 U	--	--	--
MW-41	--	--	--	--	--	--	--	--	--	1 U	1 U	1 U	--	--	--
MW-19A	--	--	--	1 U	1 U	1 U	--	--	--	--	--	--	--	--	--
MW-33	--	--	--	1 U	1 U	1 U	--	--	--	1 U	1 U	1 U	--	--	--
MW-40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LPMW-2	--	--	--	4.1	1 U	1 U	11	1 U	1 U	4.4	1 U	1 U	5	1 U	1 U
H1/H2	5.1	1 U	1 U	6.8	1 U	1 U	--	--	--	4.3	1 U	1 U	--	--	--

Table 2 (cont.). Summary of Sample Results (ug/L) from January 1991 to May 2014.

Well Number	June 2011			October 2011			June 2012			June 2013			May 2014		
	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE	PCE	TCE	cis-1,2-DCE
MW-16A	100	1.4	1.6	57	0.75 J	1	98	1.3	2.4	100	1.3	2.6	65	1.1	1.3
MW-20A	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
MW-20B	200	3.5	5.6	720	4.8	7.9	140	3.3	5.7	170	3.9	7	130	2.1	3
MW-27	1 U	1 U	1 U	1 U	1 U	1 U	Well Decommissioned								
MW-31	--	--	--	0.65 J	1 U	1 U	--	--	--	--	--	--	--	--	--
MW-32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-41	--	--	--	--	--	--	Well Decommissioned								
MW-19A	--	--	--	1 U	0.42 J	1 U	--	--	--	--	--	--	--	--	--
MW-33	--	--	--	1 U	1 U	1 U	--	--	--	1 U	1 U	1 U	--	--	--
MW-40	--	--	--	1 U	1 U	1 U	Well Decommissioned								
LPMW-2	3.2	1 U	1 U	--	--	--	2.4	1 U	1 U	2.2	1 U	1 U	2.7	1 U	1 U
H1/H2	5.9	1 U	1 U	1.4	1 U	1 U	5.2	1 U	1 U	4.9	1 U	1 U	2.9	1 U	1 U

U: The analyte was not detected at or above the reported result.

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

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

NJ: The analyte that has been tentatively identified. The associated numerical result is an estimate.

D: Analysis performed at secondary dilution.

E: The concentration of the associated value exceeds the known calibration range.

-- Not tested

Bold: The analyte was positively identified.