

**SEVENTH FIVE-YEAR REVIEW REPORT FOR
LAKEWOOD-PONDERS CORNER SUPERFUND SITE
PIERCE COUNTY, WASHINGTON**



July 2022

Prepared by

**U.S. Environmental Protection Agency
Region 10
Seattle, Washington**

**CALVIN
TERADA**

Digitally signed by
CALVIN TERADA
Date: 2022.07.26
14:36:25 -07'00'

July 26, 2022

**Calvin J. Terada, Division Director
Superfund and Emergency Management Division**

Date

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS.....	iv
I. INTRODUCTION.....	1
Site Background.....	1
FIVE-YEAR REVIEW SUMMARY FORM	2
II. RESPONSE ACTION SUMMARY.....	4
Basis for Taking Action	4
Response Actions.....	4
Status of Implementation	6
Systems Operations/Operation and Maintenance (O&M)	10
III. PROGRESS SINCE THE PREVIOUS REVIEW.....	12
IV. FIVE-YEAR REVIEW PROCESS.....	14
Community Notification, Community Involvement and Site Interviews	14
Data Review.....	14
Site Inspection.....	17
V. TECHNICAL ASSESSMENT	18
QUESTION A: Is the remedy functioning as intended by the decision documents?	18
QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?.....	19
QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?.....	20
VI. ISSUES/RECOMMENDATIONS	20
OTHER FINDINGS.....	21
VII. PROTECTIVENESS STATEMENT.....	21
VIII. NEXT REVIEW	21
APPENDIX A – REFERENCE LIST	A-1
APPENDIX B – SITE CHRONOLOGY	B-1
APPENDIX C – INSTITUTIONAL CONTROL SUPPLEMENT.....	C-1
APPENDIX D – PRESS NOTICE	D-1
APPENDIX E – INTERVIEW FORMS	E-1
APPENDIX F – DATA REVIEW SUPPLEMENT.....	F-1
APPENDIX G – SITE INSPECTION CHECKLIST	G-1
APPENDIX H – SITE INSPECTION PHOTOS	H-1
APPENDIX I – DETAILED ARARS REVIEW	I-1
APPENDIX J – VAPOR INTRUSION SCREENING	J-1
APPENDIX K – LAND USE MAP	K-1

Tables

Table 1: Site COCs, by Media.....	4
Table 2: Groundwater COC Cleanup Levels.....	6
Table 3: Summary of Planned and/or Implemented ICs	8
Table 4: Groundwater Monitoring Schedule	10
Table 5: Protectiveness Determinations/Statements from the 2017 FYR Report	12
Table 6: Status of Recommendations from the 2017 FYR Report.....	12
Table 7: PCE in Select Wells, Sampling Results, 2017 to 2020	16
Table 8: PCE in H1 and H2 Supply Wells, Pre- and Post-Treatment, 2017 to 2021	17
Table B-1: Site Chronology.....	B-1
Table F-1: Ecology Historical Groundwater Data.....	F-5
Table I-1: Previous and 2022 MCLs for Groundwater COCs.....	I-1
Table J-1: Vapor Intrusion Screening, MW-20B	J-1
Table J-2: Vapor Intrusion Screening, LPMW-2	J-2

Figures

Figure 1: Site Vicinity Map	3
Figure 2: Institutional Control Map.....	9
Figure 3: Monitoring Well Location Map	11
Figure C-1: Area of 2016 PCE Plume	C-1
Figure C-2: Parcels Above the 2016 PCE Plume	C-2
Figure F-1: PCE Concentrations in MW-16A, 1991 to 2020	F-1
Figure F-2: PCE Concentrations in MW-20B, 1991 to 2020	F-1
Figure F-3: PCE Concentrations in LPMW-2, 2006 to 2020	F-2
Figure F-4: Groundwater Flow Conceptual Site Model When H1 and H2 Are Pumping (1985)	F-3
Figure F-5: Monitoring Wells and Zone of Contribution (2020)	F-4
Figure K-1: City of Lakewood Future Land Use Map (2021).....	K-1

LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DCE	Dichloroethylene
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
GAC	Granular Activated Carbon
gpm	Gallons Per Minute
HQ	Hazard Quotient
IC	Institutional Control
IRM	Initial Remedial Measure
MCL	Maximum Contaminant Level
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
MTCA	Model Toxics Control Act
MW	Monitoring Well
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethylene
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonic Acid
ppt	Parts per Trillion
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SVE	Soil Vapor Extraction
TBC	To-Be-Considered
TCE	Trichloroethylene
UU/UE	Unlimited Use and Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR Report pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9621(c), consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations (C.F.R.) Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the seventh FYR for the Lakewood-Ponders Corner Superfund site (the Site). The triggering action for this review is the completion date of the previous FYR. A FYR is to be performed every five years following the initiation of remedial action. This seventh FYR Report has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two operable units (OU). OU1 addresses groundwater. OU2 addresses soil. This FYR Report addresses the groundwater OU (OU1). This FYR Report does not address the OU2 soil remedy because soil has been cleaned up to UU/UE. EPA deleted OU2 from the Superfund program's National Priorities List (NPL) in 1996.

EPA remedial project manager (RPM) Brandon Perkins led the FYR. Participants included Washington State Department of Ecology (Ecology) cleanup project manager Andrew Smith, Ecology hydrogeologists Pam Marti and Jacob Carnes, and EPA FYR support contractors Jill Billus and Colleen Scott from Skeo. The review began on 11/9/2021.

Appendix A lists references reviewed for this FYR. Appendix B provides the Site chronology table.

Site Background

The Site is located south of Tacoma in the city of Lakewood in Pierce County, Washington (Figure 1). The Site consists of the former Plaza Cleaners property and groundwater contamination resulting from historical operations of the Plaza Cleaners dry cleaning and laundry business. An electrical supply and lighting company now operates at the property, located at 12511 Pacific Highway Southwest. The Site is in a commercial and light industrial use zoned area. Interstate 5 borders the former dry-cleaning property to the south. Multi-family residential areas are south of Interstate 5 and one-tenth of a mile north and northwest of the property. Joint Base Lewis-McChord is a quarter mile south and east of the former Plaza Cleaners.

The groundwater underlying the Site is a drinking water source. Residents and businesses in the area obtain their water from the Lakewood Water District public water supply. The Lakewood Water District has two active water supply wells, H1 and H2, located south of Interstate 5 and about 800 feet southwest of the former Plaza Cleaners property (Figure 1). Wellhead treatment at H1 and H2, installed as part of the Site's remedy, removes Site-related contamination from groundwater prior to distribution. There are no known private wells within areas of Site-related groundwater contamination.¹

The primary hydrogeological units of interest under the Site include the Steilacoom gravel unit (about 0 feet to 30 feet below ground surface (bgs)), the low-permeability Vashon till (about 30 feet to 75 feet bgs) (Zone B) and the Advance outwash sands forming the primary aquifer (about 75 feet to 110 feet bgs) (Zone A). These units are

¹ The Site's 2019 Explanation of Significant Differences (ESD) noted that there are no known private water wells at the Site which could extract water from the contaminated groundwater plume. Ecology confirmed this information with the Tacoma-Pierce County Health Department in April 2022.

underlain by the generally less-permeable Colvos sand that grades to a clayey sand or blue clay at its base (beyond 110 feet bgs). Lakewood Water District supply wells H1 and H2 are screened in the Advance outwash sands (Zone A).

Groundwater contamination at the Site is found in the Vashon till and gradually migrates into the underlying Advance outwash sands due to a seasonal downward vertical gradient. Regional groundwater flow is generally to the west-northwest toward Gravelly Lake. Pumping of the supply wells influences localized groundwater flow at the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Lakewood-Ponders Corner		
EPA ID: WAD050075662		
Region: 10	State: Washington	City/County: Lakewood/Pierce
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the Site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Brandon Perkins, with additional support provided by Skeo		
Author affiliation: EPA Region 10		
Review period: 11/9/2021 - 6/30/2022		
Date of site inspection: 1/13/2022		
Type of review: Statutory		
Review number: 7		
Triggering action date: 9/8/2017		
Due date (<i>five years after triggering action date</i>): 9/8/2022		

Note: The Site is final on the NPL; however, EPA deleted a portion of the Site, OU2 (soils), from the NPL in 1996.

Figure 1: Site Vicinity Map



II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In July 1981, EPA identified volatile organic compounds (VOCs) in Lakewood Water District supply wells H1 and H2. At that time, wells H1 and H2 supplied water to the Ponders/Nyanza Park area and provided over 10% of the District's production.

Between late 1981 and early 1983, EPA and Ecology identified the Plaza Cleaners property as the source of the supply well contamination. The dry-cleaners business flushed solvents in three bottomless septic tanks and dumped liquid wastes onto the ground outside the dry-cleaners building. EPA and Ecology determined that the probable sources of groundwater contamination were the three septic tanks and the ground disposal areas. EPA added the Site to the NPL in September 1983.

EPA's 1984 Interim Record of Decision (ROD) concluded that untreated groundwater from supply wells H1 and H2 was a threat to human health if used for drinking water. A human health risk assessment included in the final ROD, issued in 1985, found potentially unacceptable risks for a construction worker breathing contaminated dust and vapor during soil excavation activities at the Plaza Cleaners property. EPA did not identify unacceptable risks for any of the other human or environmental exposure pathways evaluated.

Table 1 identifies the Site's contaminants of concern (COCs).

Table 1: Site COCs, by Media

COC	Media
Tetrachloroethylene (PCE)	Groundwater, soil
Trichloroethylene (TCE)	Groundwater
cis-1,2-Dichloroethylene (DCE)	Groundwater
<i>Source:</i> 1985 ROD, remedial alternative selection.	

Response Actions

In 1981, after EPA identified VOC contamination in the aquifer, the Lakewood Water District took supply wells H1 and H2 out of service temporarily and notified customers. Ecology supervised soil removal at Plaza Cleaners in the spring of 1983 and issued enforcement orders for the business to cease dumping solvents and eliminate all groundwater discharges. Plaza Cleaners agreed to discontinue its prior solvent disposal practices, install a system for reclaiming cleaning solvents, send drummed wastewater and contaminated soil to a suitable off-site disposal facility, and cooperate in the immediate cleanup of the sludge disposal areas. Plaza Cleaners successfully fulfilled the terms of the agreement and ceased commercial laundry operations.

Ecology turned further cleanup of the Site over to EPA in January 1984. In March 1984, EPA authorized a Focused Feasibility Study of treatment alternatives that could be implemented on wells H1 and H2 to restrict the spread of contamination and restore water service in the surrounding area. In June 1984, EPA issued the Interim ROD which documented that untreated water from supply wells H1 and H2 was a threat to human health if used for drinking water. The Interim ROD selected an initial remedial measure (IRM) to address the most immediate threats to public health. EPA identified groundwater treatment via air stripping at wells H1 and H2 as an IRM. The Interim ROD defined the following as primary objectives:

- Restrict the spread of contamination in the aquifer to reduce ultimate cleanup needs and protect the quality of water supply from other wells.
- Restore full water service to the area of the Lakewood Water District that is adversely affected by the shutdown of wells H1 and H2.
- Initiate groundwater treatment as soon as is practical.

EPA conducted a remedial investigation (RI) from 1984 to 1985 to define the extent of groundwater contamination, test the soil at Plaza Cleaners for remaining contaminants and determine whether other sources were contributing to the groundwater contamination. Based on the results, EPA issued a ROD in September 1985 to select the final remedy for the Site. EPA subsequently modified the remedy in a November 1986 ROD Amendment, a September 1992 Explanation of Significant Differences (ESD) and a September 2019 ESD.

The 1985 ROD defined the following remedial action objectives (RAOs) for the Site's remedy, which did not change in subsequent decision documents:

- Evaluate the potential health risks associated with the no-action alternative, which assumes the status quo of continued operation of the stripping towers.
- Reduce potential health risks associated with on-site excavation and use of contaminated groundwater below those risks for the no-action alternative.
- Meet the requirements of other environmental regulations.
- Increase the efficiency of the existing IRM, to reduce energy requirements and thereby reduce costs.

The selected remedy components in the 1985 ROD, as modified by the 1986 ROD Amendment, 1992 ESD and 2019 ESD consisted of:

OU1 – Groundwater

- Continued operation of the H1 and H2 wellhead air stripping treatment system (1985 ROD).
- Installation of higher-efficiency equipment or modification of existing equipment used in the treatment system (1985 ROD).
- Installation of more monitoring wells, upgrade of existing wells and continued sampling of the aquifer to monitor progress and provide early warning of potential new contaminants (1985 ROD).
- Placement of administrative restrictions on the installation and use of groundwater wells (1985 ROD).
- Maintenance of existing groundwater use restrictions, such as public outreach and education for homeowners who have or could potentially install private drinking water wells (1992 ESD).
- Clarification of required public outreach and education activities and incorporation of local regulatory requirements as an institutional control for the Site (2019 ESD) (see the Institutional Control Review section of the FYR Report for more information on required activities).

OU2 – Soil

- Cleanout of three existing bottomless septic tanks at the Plaza Cleaners property (1986 ROD Amendment).
- Construction of a soil vapor extraction (SVE) system concentrated along the utility and drain field lines, with soil and vapor analysis until soil treatment is complete (1986 ROD Amendment).
- Excavation of remaining tetrachloroethylene (PCE)-contaminated sludge/soil after implementation of SVE (1992 ESD).
- Elimination of land use restrictions at the Plaza Cleaners property after completion of the Soil OU remedial action soil (1992 ESD).

Cleanup Levels

The 1992 ESD established groundwater cleanup levels for the Site (Table 2). The 1992 ESD also established a PCE soil cleanup level of 500 micrograms per kilogram ($\mu\text{g}/\text{kg}$). The 1992 ESD stated that this cleanup level is in compliance with state regulatory requirements, is within EPA's acceptable risk range of 10^{-4} to 10^{-6} , and will be protective of the groundwater.

Based on an assumption that the treatment system would operate on a continuous basis, EPA estimated that the remedial action would clean up the groundwater in 10 to 15 years.

Table 2: Groundwater COC Cleanup Levels

COC	Cleanup Level (µg/L)	Basis
PCE	5	Federal maximum contaminant level (MCL)
TCE	5	Federal MCL
cis-1,2-DCE	70	Federal MCL
<i>Notes:</i> Cleanup levels established in the 1992 ESD. µg/L = micrograms per liter		

Status of Implementation*OU1 – Groundwater*

EPA selected a wellhead treatment system as the remedy for groundwater. In September 1984, treatment and monitoring of groundwater began at Lakewood Water District supply wells H1 and H2. The Lakewood Water District completed initial upgrades to the treatment system, as required by the 1985 ROD. Water extracted from wells H1 and H2 is treated prior to delivery by the Lakewood Water District. After air stripping, the treated groundwater meets Safe Drinking Water Act maximum contaminant level (MCL) standards. The groundwater treatment system is still in operation since groundwater cleanup levels have not been achieved throughout the Site.

In 1992, Ecology began a groundwater monitoring program at the Site. Groundwater monitoring has been modified over the years to focus primarily on wells near the former Plaza Cleaners. Ecology decommissioned one monitoring well (MW-21) in 1996 and decommissioned additional monitoring wells (MW-21, MW-27, MW-28 and MW-41) in 2012. EPA re-installed monitoring wells in 2016 at the location of two previous wells (MW-28R and MW-41R) in locations based on the groundwater flow when the supply wells were not in operation. Figure 3 shows the location of the current monitoring network at the Site.

Over time, the Lakewood Water District began operating wells H1 and H2 discontinuously, due to seasonal demand and other factors. From 2016 to 2017, EPA conducted a groundwater sampling and hydraulic monitoring event at the Site to determine if the non-continuous pumping affected protectiveness of the Site’s remedy. EPA’s July 2017 Technical Memorandum Regarding Groundwater Sampling and Hydraulic Monitoring (2017 Technical Memorandum) presented the results of the evaluation. The 2017 Technical Memorandum concluded:

- The treatment system appears to produce a capture zone which contains the contaminated groundwater in the lower Advance outwash sands (Zone A) while both H1 and H2 are pumping.
- The capture zone created by pumping H1 and H2 does not directly impact the overlying low-permeability till unit (Zone B). However, pumping does have a positive impact on controlling the contamination migrating down from Zone B to Zone A closer to the supply wells.
- The gradual downward vertical migration gradient of contamination from Zone B is the likely cause for ongoing impacts to groundwater in Zone A.

In response to an aging system, the Lakewood Water District replaced both air strippers in the treatment system in January 2020. The Lakewood Water District also installed granular activated carbon (GAC) units to treat elevated levels of per- and polyfluoroalkyl substances (PFAS) in wells H1 and H2. The PFAS source is believed to be Joint Base Lewis-McChord directly upgradient from the Site. The upgraded treatment system is designed to maintain a flow rate of 2,800 gallons per minute (gpm). Wells H1 and H2 have been operating daily since the treatment system upgrades and to compensate for other shutdowns in the well network.

OU2 – Soil

EPA completed the remedial design for the soil component of the remedy in September 1987 and began the remedial action shortly thereafter. EPA removed contaminated solids and water from three septic tanks located

behind Plaza Cleaners for off-site disposal. However, not all the solids could be excavated from one of the bottomless septic tanks. Therefore, EPA decided to address remaining contamination with SVE.

The SVE system operated intermittently between 1988 and April 1989. Follow-up soil sampling conducted in October 1990 indicated elevated concentrations of PCE at about 10 feet to 12 feet bgs within one septic tank. Based on the uncertainty of reducing PCE concentrations in the septic tank sludge below the 500 µg/kg cleanup level using SVE, EPA decided to excavate the contaminated sludge and soil from within and around the septic tank for off-site disposal. Excavation finished by July 1992. Subsequent sampling confirmed that sitewide and subsurface soil concentrations were well below 500 µg/kg. With soil remediation complete, EPA decommissioned and dismantled the SVE system. In November 1996, EPA deleted the Soil OU from the NPL.

Institutional Control (IC) Review

The 1985 ROD included a requirement to place administrative restrictions on the installation and use of new wells within the area of contamination to minimize the potential use of contaminated groundwater. The 1986 ROD Amendment did not change this requirement. The 1992 ESD determined that public education and outreach were sufficiently protective of human health, and that other administrative controls such as deed restrictions were not necessary. The 1992 ESD also removed the requirement for land use controls at the former Plaza Cleaners property because EPA cleaned up soil to UU/UE levels.

The 2019 ESD clarified the timeline and nature of public education and outreach, and added local regulatory requirements designed to limit the installation of private wells in areas of contaminated groundwater as an additional institutional control. The Tacoma-Pierce County Health Department (Health Department) requires by regulation (Tacoma-Pierce County Environmental Health Code (Chapter 3, Water Regulations; April 1, 2015) that new wells be subject to approval by the Health Department prior to drilling, and that such approval may be withheld for wells or well sites which are subject to known or potential sources of contamination.

While no new wells have been drilled in the area of concern for at least 35 years and the local regulations in place since 2015 restrict drilling new wells in areas subject to known or potential sources of contamination, the 2019 ESD required the following public education and outreach activities:

- Periodic public notification of the presence of the groundwater contamination and advisement against the use of contaminated groundwater. At a minimum, such notification will be provided at least once every five years and will be mailed to all property owners whose land overlies areas of groundwater contamination.
- The Health Department will be contacted to ascertain whether there has been installation of any individual drinking water wells at the Site or land use changes which potentially impact the use of wells.

The ESD also clarified that these activities will be implemented as part of the O&M activities for the Site and documented in FYRs. As required by the 2019 ESD, Ecology contacted the Tacoma Pierce County Health Department in April 2022. The Health Department confirmed no drinking water wells are in the vicinity of the Site and Lakewood Water District service area. The Health Department also confirmed that any new proposed wells would need approval. Public outreach has not yet occurred but will prior to September 2024 (five years from signature date of the 2019 ESD). The Site's O&M plan will be updated to document responsibilities, procedures, frequency and reporting of the required public education and outreach activities.

Figure 2 includes the properties specified for outreach in the 2019 ESD and the monitoring wells with recent VOC exceedances in groundwater. Table 3 summarizes institutional controls for the Site.

Table 3: Summary of Planned and/or Implemented ICs

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	Yes	Parcels that overlie groundwater contamination ^a	Restrict exposure to untreated drinking water.	Tacoma-Pierce County Health Department, Environmental Health Code Chapter 3, Water Regulations (April 1, 2015)
Groundwater	Yes	Yes	Parcels that overlie groundwater contamination ^a	Educate public of risks from drinking contaminated groundwater.	Outreach described in 2019 ESD, to be documented in O&M plan and planned to occur prior to September 2024
<p><i>Notes:</i></p> <p>a. The 2019 ESD identified affected parcels, based on a 2016 PCE plume map (Figures C-1 and C-2, Appendix C). Figure 2 also shows the parcels identified in the 2019 ESD.</p>					

Figure 2: Institutional Control Map



Systems Operations/Operation and Maintenance (O&M)

In October 1985, the Lakewood Water District assumed all O&M responsibilities associated with the air stripping towers at wells H1 and H2. This included influent/effluent water sampling and analysis, pump maintenance and inspection, general equipment observations and maintenance of data records. In 1997, Ecology assumed O&M responsibilities related to sitewide groundwater monitoring.

The Lakewood Water District personnel collect influent samples at H1 and H2 and treated effluent samples quarterly for VOCs. In 2019, wells in the Lakewood Water District were shut down temporarily because PFAS, most likely from Joint Base Lewis-McChord, was detected above EPA's 2016 health advisory threshold of 0.07 micrograms per liter ($\mu\text{g/L}$). In June 2022 EPA released updated interim health advisories for PFAS compounds. The interim updated health advisories are 0.004 ppt for PFOA, 0.02 ppt for PFOS, 10 ppt for GenX chemicals, and 2,000 ppt for PFBS. Lakewood Water District completed planned upgrades to the treatment system in January 2020 and the system has been online since that time. The Lakewood Water District conducts O&M of the treatment system, as needed, to ensure its continued operation and effectiveness.

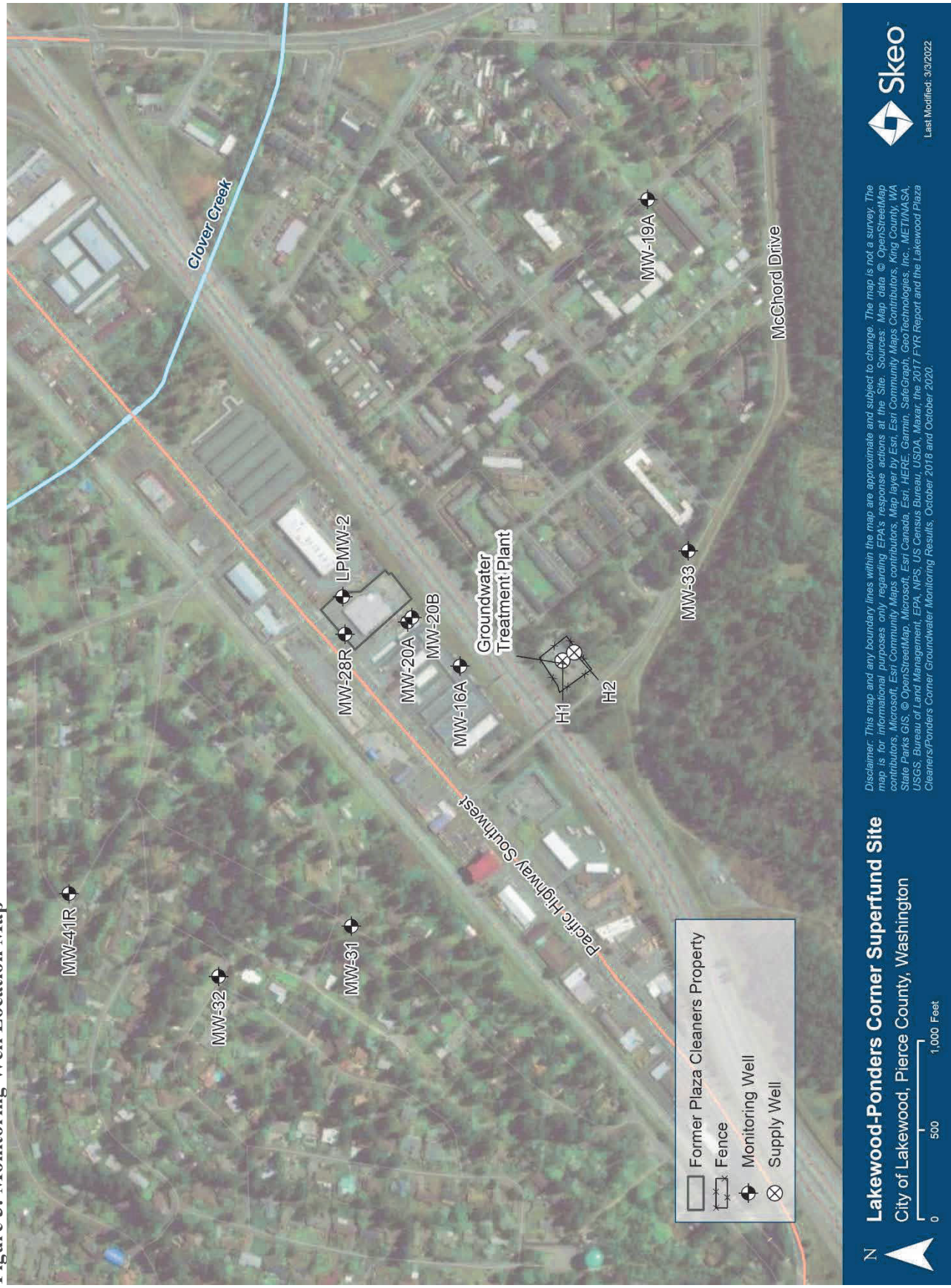
Ecology currently conducts routine groundwater monitoring at the Site for VOCs. The current monitoring plan for the Site includes 10 monitoring wells and two supply wells. To capture seasonal variation in contaminant concentrations, Ecology now samples primary wells (H1, H2, MW-16A, MW-20A, MW-20B, MW-31, MW-32 and LPMW-2) every 18 months, effective April 2018. Ecology delayed monitoring in 2020 due to restrictions associated with the COVID-19 public health emergency. Table 4 includes the monitoring frequency for all wells in the network. Figure 3 includes the locations of the monitoring wells. In the 2017 FYR Report, EPA proposed installation of a new well to monitor the Advance outwash sand zone at the corner of Pacific Highway Southwest and New York Avenue Southwest (McChord Drive Southwest). Ecology concurred with this recommendation, but installation has not yet occurred.

Table 4: Groundwater Monitoring Schedule

Well ID	Well Depth (feet bgs)	Monitoring Frequency
H1	108	18 months
H2	105	18 months
MW-16A	109	18 months
MW-19A	106	3 years
MW-20A	103	18 months
MW-20B	53	18 months
MW-28R	102	3 years
MW-31	93	18 months
MW-32	118	18 months
MW-33	97	3 years
MW-41R	97	5 years
LPMW-2	29	18 months

Sources: Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, October 2018 and October 2020, Table 1, 2017 FYR Report.

Figure 3: Monitoring Well Location Map



III. PROGRESS SINCE THE PREVIOUS REVIEW

This section includes the protectiveness determinations and statements from the 2017 FYR Report (Table 5) as well as the recommendations from the 2017 FYR Report and the status of those recommendations (Table 6).

Table 5: Protectiveness Determinations/Statements from the 2017 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	<p>The OU1 groundwater remedy is currently protective of human health and the environment because exposure pathways that could result in unacceptable risks are being controlled through the treatment of groundwater to concentrations below MCLs, and institutional controls are in place to prevent exposure to, or the ingestion of, contaminated groundwater.</p> <p>For the remedy to be protective in the long-term, the following actions need to be taken: Revise the groundwater monitoring program as specified in Table 4 of this FYR. Install a new well at the corner of Pacific Highway Southwest and New York Avenue Southwest (McChord Drive Southwest), west of MW-16A, and sample this well on an 18-month frequency. The new well must monitor the A-zone similar to MW-20A and MW-28R. The approximate depth of the new well should be 90 to 100 feet bgs. Replace and upgrade the groundwater treatment system to allow pumping rates that can maintain hydraulic control of the groundwater contaminant plume. Clarify how often and by what means the groundwater institutional controls for the Site will be implemented. Consider whether a decision document is needed to incorporate Tacoma-Pierce County Health Department restrictions on installation of private wells on and near the Site as part of the remedy. Coordinate with Joint Base Lewis-McChord to continue monitoring for PFAS.</p>

Table 6: Status of Recommendations from the 2017 FYR Report

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	The long-term groundwater monitoring program does not include the newly installed wells and other key monitoring points. Also, there are no wells located west of MW-16A, where PCE concentrations are above the MCL.	Revise the groundwater monitoring program, as specified in Table 4 of the 2017 FYR Report. Consider installation of a new well at the corner of Pacific Highway Southwest and New York Avenue Southwest (McChord Drive Southwest), west of MW-16A, and sample this well on an 18-month frequency. The new well should monitor the A-zone similarly to MW-20A and MW-28R. The approximate depth of the new well should be 90 feet to 100 feet bgs.	Ongoing	Ecology revised the monitoring program to sample primary wells every 18 months to capture seasonal variation in contaminant concentrations. Ecology's October 2021 groundwater monitoring report concurs with EPA's recommendation from the 2017 FYR Report to install a new monitoring well, but installation has not yet occurred.	N/A

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	PCE and TCE continue to exceed groundwater cleanup levels. Limitations of the current treatment system limit pumping capacity of the wells. The treatment system is also nearing the end of its useful life.	Replace and upgrade the groundwater treatment system to allow pumping rates that can maintain hydraulic control of the groundwater contaminant plume.	Completed	The Lakewood Water District replaced the wellhead air strippers on supply wells H1 and H2.	1/3/2020
1	The 1992 ESD requires public outreach and education as institutional controls to restrict groundwater use at the Site, but it is unclear how often and by what means these administrative tools should be implemented to inform the public of the potential risks associated with groundwater use in the area. Decision documents did not require groundwater use restrictions implemented by the Tacoma-Pierce County Health Department.	Clarify how often and by what means the groundwater institutional controls for the Site will be implemented. Consider whether a decision document is needed to incorporate Tacoma-Pierce County Health Department restrictions on installation of private wells on and near the Site as part of the remedy.	Completed	EPA issued an ESD in September 2019 to identify Tacoma-Pierce County Health Department, Environmental Health Code Chapter 3, Water Regulations as an institutional control for the Site. The 2019 ESD also clarified the timeline and nature of public education and outreach activities, required by the 1992 ESD (see the Institutional Control section of the FYR Report for more information).	9/3/2019
1	Perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) have been detected in groundwater at the nearby Joint Base Lewis-McChord. Recent sampling of the Lakewood Water District supply wells H1 and H2 did not detect PFAS above the EPA 2016 health advisory level of 0.07 ug/L.	Coordinate with Joint Base Lewis-McChord on PFAS monitoring program in nearby water supply wells including Lakewood.	Completed	The U.S. Army is conducting a PFAS remedial investigation at Joint Base Lewis-McChord. The Army is aware of PFAS detections in the Lakewood Water District wells. Wells H1 and H2 were sampled in 2017 and 2018 for PFAS and measured below the EPA 2016 health advisory level of 0.07 µg/L, but above this level in 2019. Lakewood Water District installed a GAC system on both wells to treat PFAS in January 2020. PFAS contamination in wells H1 and H2 is unrelated to the Site. More information on the Army's PFAS investigation is provided after this table.	1/3/2020

Joint Base Lewis-McChord PFAS Investigation

The U.S. Army began testing its drinking water sources for perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) in 2016. Test results confirmed the presence of PFOS and PFOA in several on-base drinking water wells and in drinking water wells located downgradient of the installation. These included one of the Lakewood Water District wells (note that the Lakewood Water District wells are now treated for PFAS prior to distribution). A Preliminary Assessment/Site Inspection to assess if PFAS compounds have been released to the environment at Joint Base Lewis-McChord was completed in 2020.

In March 2022, the U.S. Army prepared a work plan for a PFAS remedial investigation. Proposed activities include investigation of 12 PFAS areas of interest. The investigation will include soil, sediment, groundwater and surface water sampling, including sampling at two on-base monitoring wells located upgradient of Lakewood Water District supply well H-2. Sampling programs were also established for all drinking water wells at and near the installation, including the Lakewood Water District supply wells. Sampling efforts and test results have been discussed with Lakewood Water District personnel.

EPA and the U.S. Army are continuing to coordinate to address PFAS impacts to the Site and the Lakewood Water District supply wells from historical use of PFAS at Joint Base Lewis-McChord.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was made available by a posting in the *Tacoma News Tribune* in print ad on 2/13/22 and digital ads on 2/14/22. Appendix D includes the public notice. It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the review and the report will be made available at the Ecology document repository at 300 Desmond Drive Southeast in Lacey, Washington. The report will also be available at EPA's online document repository for the Site at <http://www.epa.gov/superfund/lakewood> and Ecology's online document repository at <https://apps.ecology.wa.gov/cleanupsearch/site/735#site-documents>.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The interviews are summarized below. Appendix E includes the completed interview forms.

Andrew Smith of Ecology indicated that the remedy has taken longer than initially expected but that it is performing as designed. Ecology replaced the entire drinking water treatment system in 2020 at a cost of \$4.1 million. He noted that monitoring is less frequent since the system was replaced. Mr. Smith also provided a summary of the findings from Ecology's recent monitoring data, with MW-16, MW-20B and LPMW-2 being above the state cleanup level for PCE.

Don Stanley, the head of pumping and water treatment for the Lakewood Water District, indicated that the upgraded treatment system is working well, with little maintenance required. Staff conduct weekly visual inspections and change out the air filters annually. He noted that Lakewood Water District personnel conduct VOC sampling on raw groundwater prior to treatment. He noted that PCE levels in raw water infrequently exceeded MCLs during this FYR period but are treated to non-detect levels.

Data Review

Data evaluated in this FYR include routine groundwater monitoring data collected by Ecology in June 2017, October 2018 and October 2020. Figure 3 depicts Ecology's groundwater monitoring well locations. The data review also evaluates quarterly sampling data for supply wells H1 and H2 submitted by Lakewood Water District. The findings from the data review are summarized below:

- PCE is the only COC to exceed groundwater cleanup levels in monitoring wells during the review period.

- PCE was detected above the cleanup level in monitoring MW-16A, MW-20B and LPMW-2, located near the former dry cleaner property in all sampling events during this review period (note LPMW-2 was not sampled in 2020, see Table 7).
- Monitoring data show an upward vertical hydraulic gradient during the October 2018 and October 2020 sampling events at well pair 20B/20A.
- The air strippers consistently treat groundwater in supply wells H1 and H2 to levels below MCLs.

Hydrogeology Background

There are four hydrogeological units of interest under the Site (Figure F-4 in Appendix F):

- The Steilacoom gravel unit (about 0 feet to 30 feet bgs).
- The low-permeability silt and clay-rich Vashon till (about 30 feet to 75 feet bgs) (referred to as Zone B).
- The Advance outwash sands forming the primary aquifer (about 75 feet to 110 feet bgs) (referred to as Zone A).
- The generally less permeable Colvos sand that grades to a clayey sand or blue clay at its base (beyond 110 feet bgs).

Groundwater contamination at the Site has been detected in the Vashon till (Zone B) and deeper Advance outwash sands (Zone A). Regional groundwater flow in Zone A – the Advance outwash sand unit – is generally to the west-northwest, toward Gravelly Lake. Groundwater flow in Zone B is generally to the northwest. Groundwater flow direction in the Advance outwash sands is influenced by the pumping of supply wells H1 and H2 when in operation.

EPA’s 2017 Technical Memorandum found that groundwater elevations at the Site are strongly influenced by seasonal changes. Groundwater elevations are up to 15 to 20 feet higher during winter and early spring than in the summer and early fall in some wells, and may reflect natural rainfall patterns, a higher pumping rate at H1 and H2 during the summer months, or a combination of both. EPA’s study also found an upward vertical groundwater gradient near MW-16A and MW-20B from the Advance outwash to the Vashon till during the dry season (April to November), but hypothesized that the vertical gradient reverses in the winter months. Evaluation of monitoring data collected by Ecology during this FYR period showed an upward vertical gradient at well pair 20B/20A in October 2018 and October 2020, consistent with the findings in the 2017 Technical Memorandum.²

Groundwater Sampling Results

PCE was the only COC to exceed groundwater cleanup levels during this FYR period. Trichloroethylene (TCE) and cis-1,2-dichloroethylene (DCE) were detected in several wells, but concentrations were below the MCLs of 5 µg/L for TCE and 70 µg/L for cis-1,2-DCE. No other VOCs, including vinyl chloride, have been detected above reporting limits during the FYR period. Table F-1 in Appendix F includes Ecology’s historical monitoring data for the Site.

PCE was above the cleanup level of 5 µg/L in monitoring wells MW-16A and MW-20B during every monitoring event conducted during this FYR period (Table 7). MW-20B reported the highest concentrations. LPMW-2 also had PCE above the cleanup level in 2017 and 2018. Low water levels prevented sampling of LPMW-2 in 2020.

² Ecology’s Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, October 2018 and October 2020 Report indicates in Table 2 that wells MW-20B and MW-20A had groundwater elevations of 250.41 feet and 250.42 feet (NAVD88), respectively, in October 2018, which correlate with a slight upward gradient between MW-20A, screened in the Advance outwash, and MW-20B, screened in the Vashon till. Table 3 of the report indicates wells MW-20B and MW-20A had groundwater elevations of 243.14 feet and 245.13 feet (NAVD88), respectively, in October 2020, which also results in an upward gradient.

Table 7: PCE in Select Wells, Sampling Results, 2017 to 2020

Well ID	PCE MCL (µg/L)	June 2017 (µg/L)	October 2018 (µg/L)	October 2020 (µg/L)
H1 (pre-treatment)	5	3 J	1.0 U	3.13
MW-16A		82 J/69	54.7/59.3	28.4 J/27.8
MW-19A		1 U	NS	1.0 U
MW-20A		1 U	1.0 U	1.0 U
MW-20B		174 J	124	157
MW-28R		NS	NS	1.0 U
MW-31		0.7 J	NS	0.97 J
MW-32		1.4	NS	1.28/1.34
MW-33		1 U	NS	1.0 U
LPMW-2		5.7	18.8	NS ^a

Notes:
a. LPMW-2 was not sampled in 2020 because the water levels were too low.
Bold results indicate the detected concentration exceeds the PCE MCL.
NS = not sampled.
U = the analyte was not detected at or above the reported value.
J = estimated concentration.
XX/XX = primary and duplicate sampling results.
Source: June 2017, October 2018 and October 2020 Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results.

MW-16A and MW-20B, the wells reporting the highest PCE concentrations, are within the capture zone of the H1 and H2 pumping wells (Figure F-5 in Appendix F). MW-16A is a deep well screened in the Advance outwash sands (Zone A). PCE concentrations in MW-16A show an increasing trend since sampling began in 1991. However, PCE concentrations appear to be decreasing during the FYR period (Figure F-1 in Appendix F).

MW-20B is a shallow well screened in the Vashon till (Zone B). PCE concentrations in MW-20B have decreased since sampling began in 1991, but remain two orders of magnitude above the PCE cleanup level (Figure F-2 in Appendix F).

LPMW-2 is the shallowest monitoring well in the network and is screened in the Steilacoom gravel. The well is in the vicinity of the former Plaza Cleaners septic system that was a source of contamination. PCE concentrations have sporadically measured above the cleanup level since sampling began in 2006. The 2018 sampling recorded an unusually high PCE concentration compared to past levels. Ecology noted that sampling in 2018 was conducted with a peristaltic pump due to low water levels. Previously, the well was sampled with a submersible pump. Ecology was unable to sample the well in 2020 due to low water levels. Overall, PCE concentrations in LPMW-2 remain low compared to MW-16A and MW-20B but display an increasing trend since 2013 (Figure F-3 in Appendix F). Ecology will continue to sample LPMW-2 as part of its groundwater monitoring program.

Ecology’s most recent groundwater monitoring report, dated October 2021, also included several recommendations for future monitoring, including:

- A year-long study to collect hydraulic data to help determine the timing and magnitude in seasonal reversals in the vertical hydraulic gradient.
- Installation of a new monitoring well (as previously recommended by EPA in the 2017 Technical Memorandum) west of MW-16A at the corner of Pacific Highway Southwest and New York Avenue Southwest. The recommended completion depth of the well is 115 feet, similar to MW-16A (Zone A).
- Installation of additional monitoring wells to better characterize groundwater flow gradients and contaminant extent in the Steilacoom gravel and Vashon till (Zone B).

Lakewood Water District Supply Well Sampling Results

The Lakewood Water District samples raw water from supply wells H1 and H2 for VOCs approximately quarterly, prior to treatment by the air strippers. Samples are also collected post-treatment to determine the effectiveness of the air strippers in treating water to below MCLs. In raw (untreated) water, PCE was the only VOC exceeding cleanup levels at supply wells H1 and H2 between 2017 and 2021. PCE was not detected in any post-treatment sample (Table 8). The treated water consistently meets MCLs for all Site-related contaminants.

Table 8: PCE in H1 and H2 Supply Wells, Pre- and Post-Treatment, 2017 to 2021

Date	PCE MCL (µg/L)	PCE (µg/L)	
		Pre-Treatment	Post-Treatment
February 2017	5	5.2	ND
May 2017		2.1	
July 2017		3.1	
October 2017		1.8	
January 2018		3.7	
April 2018		5.3	
July 2018		2.62	
November 2019		0.64/4.86	
April 2020		5.3	
July 2020		2.53	
September 2021		6.44	

Notes:
Bold results indicate the detected concentration exceeds the PCE MCL.
 ND = the analyte was not detected at or above the detection limit (0.5 µg/l).
 XX/XX = data for H1/H2.
Source: Volatile Organic Chemicals Analysis Reports (2017-2021). Prepared by Water Management Laboratories Inc. Submitted by Lakewood Water District.

Site Inspection

The Site inspection took place on 1/13/2022. Participants included Brandon Perkins with EPA, Pam Marti and Jacob Carnes with Ecology, a representative from the Lakewood Water District, and Jill Billus and Colleen Scott with EPA FYR support contractor Skeo. The purpose of the inspection was to assess the protectiveness of the remedy. The completed site inspection checklist is in Appendix G. Site photos are included in Appendix H.

EPA and Skeo representatives met at the former Plaza Cleaners property, now Rainier Lighting & Electric Supply Company. On-property wells were confirmed present and secured. Although participants did not visually confirm the location of LPMW-2, Ecology representatives later clarified it was covered by gravel but still accessible for sampling. EPA, Ecology, Skeo and Lakewood Water District participants then visited the Lakewood Water District groundwater treatment plant. Participants observed the new air strippers and GAC system to treat water from supply wells H1 and H2. Site participants discussed well operations and the potential impacts of Washington state action levels for PFAS. Participants visited a subset of the monitoring wells in the upgradient and downgradient residential areas and confirmed that they were accessible and secure.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

Yes, the remedy is functioning as intended by the Site's decision documents. The remedy for the groundwater operable unit (OU1) includes wellhead treatment at supply wells H1 and H2, groundwater monitoring and institutional controls. The Lakewood Water District recently replaced both air strippers in the treatment system at supply wells H1 and H2 in January 2020. The treatment system continues to operate and effectively treat extracted groundwater to levels below MCLs before its distribution into the drinking water supply. Lakewood Water District now operates the wells daily.

Groundwater monitoring data show that a limited area of groundwater contamination remains near the former dry-cleaning property. PCE is the only COC to exceed groundwater cleanup levels at site monitoring wells during this FYR period. Monitoring wells MW-16A, MW-20B and LPMW-2 report PCE exceedances during most sampling events. PCE contamination in the upper Zone B (Vashon till) is expected to continue to migrate to the lower Zone A unit (Advance outwash sand) when seasonal downward hydraulic gradients occur.

As noted in EPA's 2017 Technical Memorandum, supply wells H1 and H2 can provide hydraulic control when in operation. Historically, H1 was pumped from June to September, as it is the higher yield well and H2 was pumped the remainder of the year. With upgrades to the treatment system, H1 and H2 are now currently pumped simultaneously on a continuous schedule. Both supply wells are pumped at the same time at a lower yield for a longer duration. This current pumping schedule yields the same amount of water without constant cycling of the pumps on and off. Two of the wells (MW-16A and MW-20B) that reported PCE exceedances are within the capture zone of H1 and H2. LPMW-2 also reported a PCE exceedance during this FYR period which may be attributable to a different sampling method and low water levels. In the 2017 FYR Report, EPA recommended installing an additional monitoring well downgradient of MW-16A, at the corner of Pacific Highway Southwest and New York Avenue Southwest, to better determine the extent of capture. Ecology has also made several recommendations for improving the groundwater monitoring program that should be implemented. These recommendations are detailed in the Data Review section of this FYR Report.

MW-28R (Zone A) is downgradient of the source area under non-pumping conditions and did not report COCs above reporting limits (Table 7). Downgradient wells, MW-31 and MW-32 have also met the COC groundwater cleanup levels. The sampling data suggest that the groundwater contamination above cleanup levels is limited in extent. The proposed additional monitoring well downgradient of MW-16A would better determine the extent of impact closest to the source area. Groundwater monitoring is ongoing.

The remedy is progressing toward meeting remedial action objectives (RAOs), although the timeline for cleanup is longer than originally anticipated in the 1985 ROD. In the ROD, EPA estimated that the pump-and-treat operation would clean up the groundwater in 10 to 15 years. However, the Responsiveness Summary of the ROD indicated that "the estimated times were found to be unrealistically short and, at best, can only be used as absolute minimum cleanup times."

Site decision documents required institutional controls at the Site to limit exposure to contaminated groundwater. The 2019 ESD clarified the timeline and nature of public education and outreach, and added local regulatory requirements designed to limit the installation of private wells in areas of contaminated groundwater as an additional institutional control. Residents whose properties overlie the existing contaminated groundwater must receive a public notice and advisory against consuming contaminated groundwater, to be issued at a minimum of once every five years. The mailed notice has not yet been issued during this FYR period. It should be issued by September 2024, within five years of the 2019 ESD. As required by the 2019 ESD, Ecology contacted the Tacoma Pierce County Health Department in April 2022. The Health Department confirmed no drinking water wells are in the vicinity of the Site and Lakewood Water District service area. The Health Department also confirmed that any new proposed wells would need approval.

The 2019 ESD also clarified that the public education and outreach activities will be implemented as part of the O&M activities for the Site. The Site's O&M plan should be updated to document responsibilities, procedures, frequency and reporting of the required public education and outreach activities.

During upgrades to the air strippers in 2020, the Lakewood Water District simultaneously installed a granular activated carbon (GAC) system to protect the drinking water supply from PFAS that has emerged as a groundwater contaminant. The upgradient Joint Base Lewis-McChord plans to conduct a remedial investigation to better characterize potential sources and the extent of the PFAS contamination. EPA and the U.S. Army are continuing to coordinate to address PFAS impacts to the Site and the Lakewood Water District supply wells from the Joint Base Lewis-McChord.

The Lakewood Water District last reported PFAS wellhead monitoring data of supply wells H1 and H2 in spring 2020, prior to the Washington Department of Health's establishment of state action levels for several PFAS chemicals. The Lakewood Water District consistently found PFOS in concentrations in pre-treated groundwater significantly above the 15 parts per trillion (ppt) action level and PFOA to be slightly above the 10 ppt action level. This could potentially impact the operation of H1 and H2, since PFAS concentrations detected above state action levels could trigger a shutdown of the supply wells. If H1 and H2 are not pumping for an extended period, site-related VOC contamination in groundwater may not be contained and could migrate further downgradient. The Lakewood Water District will continue to share updates with EPA on operation of the supply wells. If extended shutdown of the wells is necessary, EPA will assess the need for further action at the Site.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Question B Summary:

Yes, the exposure assumptions, toxicity data, cleanup levels and RAOs are still valid. The 1992 ESD identified federal MCLs and state regulatory requirements, which were within EPA's acceptable risk range of 10^{-4} to 10^{-6} , for the three groundwater COCs. Based on the evaluation of applicable or relevant and appropriate requirements (ARARs), there have been no changes to the federal or state MCLs since the 1992 ESD (Appendix I). Vinyl chloride, although not identified as a COC in decision documents, continues to be monitored since it is a degradation product of PCE. Vinyl chloride is consistently below the associated MCL.

The exposure pathways for groundwater evaluated in the 1985 human health risk assessment remain valid. Residents obtain treated drinking water from the Lakewood Water District public water supply. There are no known private drinking water wells within the contaminated aquifer and restrictions on well installation are in place.

The vapor intrusion pathway was not evaluated in the 1985 human health risk assessment. To address this, during the 2012 FYR, EPA evaluated the potential for vapor intrusion to indoor air. EPA found that vapor intrusion is unlikely to pose an unacceptable risk for workers above the groundwater contamination. A screening-level vapor intrusion evaluation using EPA's Vapor Intrusion Screening Level (VISL) calculator was conducted for this FYR to determine if the 2012 vapor intrusion conclusions remain valid for a commercial worker.³ A second evaluation was conducted using a residential exposure scenario because land use at the former Plaza Cleaners property is not restricted to commercial use. Based on the evaluations (Appendix J), the vapor intrusion pathway is not a concern at this time. However, if VOC concentrations increase or Site conditions change, the vapor intrusion pathway should be re-evaluated.

Ecological risks have not been evaluated for the Site. The Site is in an area of mixed industrial, commercial and residential uses. Interstate 5, a six-lane highway, is located between the former source area and the water treatment facility. Therefore, ecological risks are not anticipated due to lack of suitable habitat.

³ VISL calculator: <https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator> (accessed 1/10/2022).

Since the time of the 1985 ROD, Site conditions and surrounding land use have not changed significantly. Land use has remained commercial/industrial near the former cleaners. Rainier Lighting & Electric Supply currently occupies the former Plaza Cleaners property. The current land use around the area of the groundwater treatment facility is residential and military. No land use changes are expected in the near future (Figure K-1, Appendix K).

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations	
OU(s) without Issues/Recommendations Identified in the FYR:	
None	

Issues and Recommendations Identified in the FYR:	
---	--

OU: 1	Issue Category: Operations and Maintenance			
	Issue: The Site's O&M plan has not been updated to incorporate the public education and outreach activities, as required by the 2019 ESD. These activities include mailed notices to property owners whose land overlies areas of groundwater contamination and contact with the Tacoma-Pierce County Health Department to determine if any new private wells have been installed in the area.			
	Recommendation: Update the Site's O&M plan to document responsibilities, procedures, frequency and reporting of the required public education and outreach activities. Implement the required public education and outreach activities.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	State	EPA	9/3/2024

OU: 1	Issue Category: Monitoring			
	Issue: PCE continues to be detected above MCLs and changes to the Site's groundwater monitoring program have been recommended by EPA and Ecology to improve understanding of process towards achieving RAOs.			
	Recommendation: Implement recommended changes to the Site's groundwater monitoring program as summarized in the data review section and Table 6 of this FYR Report. Installation of a new monitoring well should be completed within one year to allow for multiple sampling events before the next FYR.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	State	EPA	7/31/2023

OU: 1	Issue Category: Remedy Performance			
	Issue: The 1985 ROD estimated that groundwater restoration would take 10 to 15 years. However, PCE continues to be detected above MCLs in groundwater after over 35 years.			
	Recommendation: Complete an optimization and update the estimated timeframe to meet groundwater cleanup goals.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	State	EPA	7/31/2023

OTHER FINDINGS

One additional recommendation was identified during the FYR. This recommendation does not affect current and/or future protectiveness.

- Continue to coordinate with the Lakewood Water District and Joint Base Lewis-McChord on the results of the PFAS investigations and actions. Between 2016 and 2020, PFOS and PFOA were consistently detected in pre-treated groundwater to supply wells H1 and H2 above the current Washington state action levels (effective January 1, 2022). Post-treatment samples collected after installation of the GAC treatment system in January 2020 were non-detect. Exceedance of the state action levels could result in a shutdown of one or both supply wells, affecting localized groundwater flow and hydraulic containment of site-related contamination.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
<i>Protectiveness Determination:</i> Short-Term Protective
<i>Protectiveness Statement:</i> The OU1 groundwater remedy is currently protective of human health and the environment because exposure pathways that could result in unacceptable risks are being controlled through the treatment of groundwater to concentrations below MCLs, and institutional controls are in place to prevent exposure to, or the ingestion of, contaminated groundwater. For the remedy to be protective in the long-term, the following actions need to be implemented: update the Site's O&M plan to document responsibilities, procedures, frequency and reporting of the required public education and outreach activities and implement those activities. Implement recommended changes to the Site's groundwater monitoring program as summarized in the data review section of this FYR Report. Installation of a new monitoring well should be completed within one year to allow for multiple sampling events before the next FYR. An optimization and update of the estimated timeframe to meet groundwater cleanup goals should also be conducted within one year.

VIII. NEXT REVIEW

The next FYR Report for the Lakewood-Ponders Corner Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

2017 Annual Water Quality & Business Report. Lakewood Water District. 2018.

2018 Annual Water Quality & Business Report. Lakewood Water District. 2019.

2019 Annual Water Quality & Business Report. Lakewood Water District. 2020.

Amended Record of Decision, Remedial Alternative Selection, Ponders Corner, Washington. EPA Region 10. November 1986.

Explanation of Significant Differences for the Lakewood Superfund Site. EPA Region 10. August 1992.

Explanation of Significant Differences, Lakewood-Ponders Corner Superfund Site, Lakewood, Washington. EPA Region 10. September 2019.

Fifth Five-Year Review Report for Lakewood/Ponders Corner Superfund Site, Lakewood, Washington. United States Army Corps of Engineers. September 2012.

Fourth Five-Year Review Report for Lakewood/Ponders Corner Superfund Site, Lakewood, Washington. EPA Region 10. September 2007. Prepared by Arcadis.

Installation Specific Work Plan for Per- and Polyfluoroalkyl Substances Remedial Investigation - 2022, Joint Base/Lewis-McChord, Pierce County, Washington. March 2022.

Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, June 2017. State of Washington Department of Ecology, Environmental Assessment Program. December 2017.

Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, October 2018 and October 2020. State of Washington Department of Ecology, Environmental Assessment Program. October 2021.

Pierce County Unified Sewer Plan Physical and Environmental Inventory. Pierce County Public Works and Utilities. December 2010.

PFAS Results. Prepared by Lakewood Water District. August 2016 – March 2020.

Ponders Wells Treatment Plant Replacement Predesign Report. Prepared by Kennedy/Jenks Consultants. January 2017.

Record of Decision, Initial Remedial Measure for Ponders Corner Site, Washington. EPA Region 10. June 1984.

Record of Decision, Remedial Alternative Selection, Ponders Corner, Washington. EPA Region 10. September 1985.

Sixth Five-Year Review Report for Lakewood/Ponders Corner Superfund Site, Lakewood, Washington. EPA Region 10. September 2017.

Technical Memorandum: Groundwater Sampling and Hydraulic Monitoring at Lakewood/Ponders Corner Superfund Site, April – November 2016. EPA Region 10. July 2017.

Third Five-Year Review Report for Lakewood/Ponders Corner Superfund Site, Lakewood, Washington. EPA Region 10. September 2002.

Volatile Organic Chemicals (VOC's) Analysis Report. Prepared by Water Management Laboratories Inc.
Submitted by Lakewood Water District. February 2016 – September 2021.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

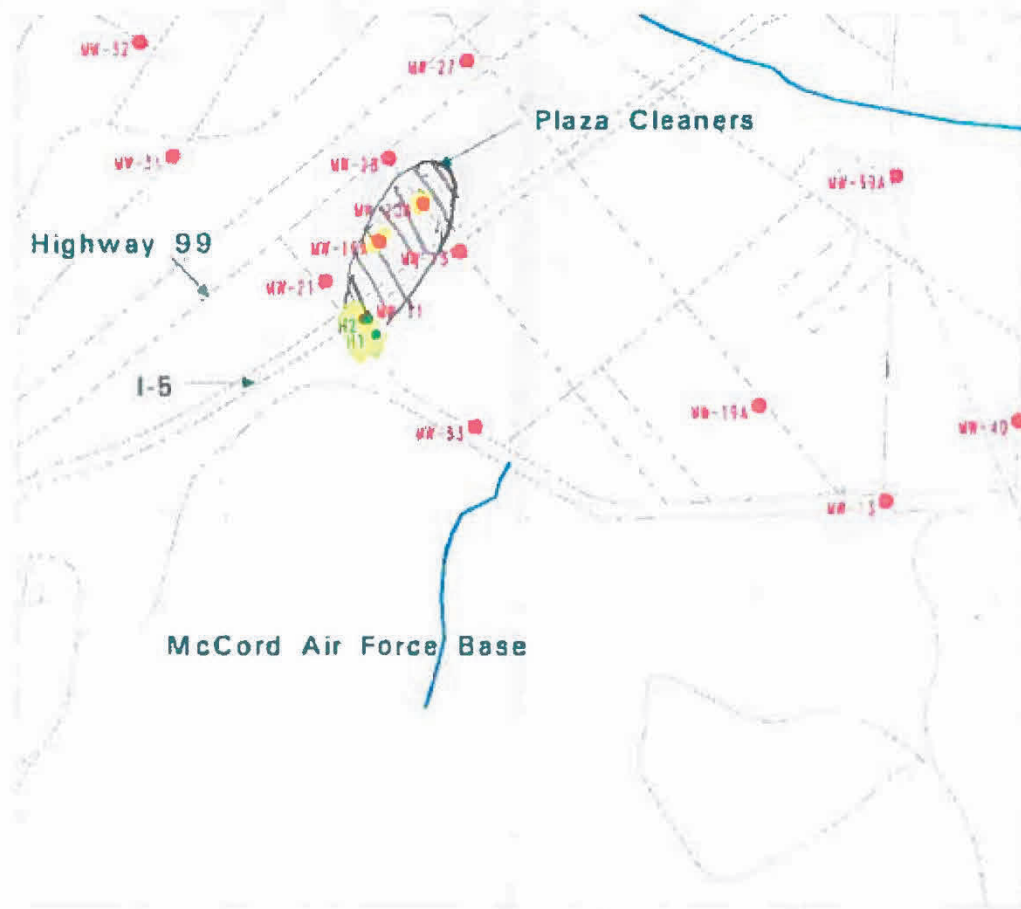
Event	Date
EPA identified PCE, TCE and cis-1,2-DCE contamination in Lakewood Water District drinking water supply wells H1 and H2	July 1981
Lakewood Water District temporarily took wells H1 and H2 out of service while monitoring wells were installed	August 1981
EPA proposed listing the Site on the NPL	December 1982
EPA finalized the Site's listing on the NPL	September 1983
Ecology and Plaza Cleaners reached a stipulated agreement for remedial action	September 1983
Plaza Cleaners removed contaminated soil and wastewater EPA conducted soil cleanup and installed an SVE system	1983 – 1987
EPA began the RI and feasibility study (FS)	March 1984
EPA completed a focused feasibility study identifying an IRM	May 1984
EPA issued an Interim ROD selecting the air stripping remedy for contaminated groundwater	June 1984
Lakewood Water District installed two air strippers for drinking water supply wells H1 and H2 to treat contaminated groundwater	September 1984
EPA completed the RI/FS EPA issued a final ROD selecting continued operation of the air strippers, installation of more groundwater monitoring wells, excavation of septic tanks and the drain field, excavation of contaminated soils, and the placement of administrative restrictions on wells	September 1985
EPA began the remedial design	May 1986
EPA issued a ROD Amendment for modifications to the Soil OU cleanup – the amended remedy included installation of an SVE system for treatment of soils in place, reduction in the amount of septic tank contents to be removed and treated off site, and continued soil and vapor testing until soil treatment was deemed complete	November 1986
EPA completed the remedial design and began the remedial action for the soil component of the remedy	September 1987
Intermittent operation of the SVE system	1988 – 1989
EPA completed a potentially responsible party (PRP) search – no viable PRPs were identified	December 1989
EPA excavated more soil from the Site	June – July 1992
EPA issued an ESD to establish site-specific cleanup levels for contaminants in soil and groundwater, to eliminate the requirement to implement institutional controls on land and groundwater use, and to document revisions to the remedial action necessary to remove the source of contamination at the Site	September 1992
EPA issued the Site's first FYR Report	September 1992
EPA signed the Site's Preliminary Close-Out Report	September 1992
EPA completed the remedial action for the soil cleanup	May 1993
EPA announced, in the Federal Register, the partial deletion of the Soil OU from the NPL	November 1996
EPA sent letters to residences, realtors and well drillers regarding administrative control restrictions	February 1997
EPA transferred O&M responsibilities to the state (Ecology) as a part of the ongoing long-term response action	July 1997
EPA issued the Site's second FYR Report	September 1997
EPA issued the Site's third FYR Report, prepared by the state	September 2002
EPA sent letters to residences, realtors and well drillers regarding administrative control restrictions EPA also sent notices to trade magazines (for well drillers) and realtors	March 2007
EPA issued the Site's fourth FYR Report	September 2007

Event	Date
EPA sent letters to realtors and well drillers regarding administrative control restrictions	March 2008
EPA sent out fact sheets notifying homeowners, realtors and well drillers about administrative control restrictions and providing site information	May 2012
Ecology decommissioned three monitoring wells	July 2012
EPA signed the Site's fifth FYR Report, prepared by the United States Army Corps of Engineers	September 2012
EPA began a supplemental investigation at the Site, which included installation of two monitoring wells, sampling of 10 monitoring wells and hydraulic monitoring with transducers	August 2015
EPA's hydrogeologist issued a Technical Memorandum to document the results of the supplemental investigation	May 2017
EPA issued the Site's sixth FYR Report	September 2017
EPA issued an ESD to clarify institutional controls at the Site	September 2019
Lakewood Water District replaced the wellhead air strippers and installed a GAC system for supply wells H1 and H2	January 2020
Ecology contacted the Health Department and confirmed there are no private wells near the Site	April 2022

APPENDIX C – INSTITUTIONAL CONTROL SUPPLEMENT

Figure C-1: Area of 2016 PCE Plume

Figure 2: Area of 2016 Plume



General Area of 2016 Plume - Lakewood/Ponders Site Monitoring Wells and Lakewood Water District Wells H1 and H2 (Data from EPA Region 10 Monitoring Well Database, Extraction Date: 9/12/94)

Source: 2019 ESD

Figure C-2: Parcels Above the 2016 PCE Plume

Table 2: Parcels Above the 2016 PCE Plume; Lakewood - Ponders Corner Superfund Site								
ID	Parcel	Current Use	Water	Size (acres)	Zoning (2019)	Address	Location Relative to 2016 PCE Plume & Source Area	Location relative to Extraction Wells
1	0219113007	Retail	Installed	0.51	Commercial	12621 Pacific Highway SW	Adjacent to area of concern	N of wells; across I-5
2	0219113055	Public Storage	Installed	0.71	Commercial	12611 Pacific Highway SW	SE corner w/in area of likely concern	N of wells; across I-5
3	0219114172	Public Storage	Installed	2.25	Commercial	12611 Pacific Highway SW	Source area in SE corner	N of wells; across I-5
4	0219114217	Commercial	Installed	0.49	Commercial	12521 Pacific Highway SW	South third @ level of concern; adjacent to source	N of wells; across I-5
5	0219114218	Commercial	Installed	1.18	Commercial	12521 Pacific Highway SW	Adjacent to area of concern	N of wells; across I-5
6	0219114116	Water District	Available	1.15	Multi-Family	5612 New York Ave SW	Location of extraction wells	Location of wells
7	0219114018	Vacant	No	0.3*	Multi-Family	xxx I-5 Highway N	West half w/in area of likely concern	Adjacent; East of wells
8	0219141004	Residence	Installed	1.16	Multi-Family	(b) McChord Drive SW	Adjacent to area of concern	Adjacent; South of wells
9	0219114158	Apartments	Installed	1.82	Multi-Family	5628 Boston Ave SW	Northwest corner w/in area of likely concern	Adjacent; East of wells
Source: Pierce County Assessor-Treasurer electronic Information Profil; https://epip.co.pierce.wa.us/CFApps/atr/ePIP/search.cfm ; July 26, 2019.								
*0.3 acre = 13,067 sq ft								

Source: 2019 ESD

APPENDIX D – PRESS NOTICE



Seventh Five-Year Review for Lakewood-Ponders Corner Superfund Site

We Want to Hear from You

If you have questions about the site or would like to participate in a community interview, you may contact:

Brandon Perkins
EPA Remedial Project Manager
Phone: (206) 553-6396
Email: perkins.brandon@epa.gov

Mailing Address
U.S. EPA Region 10
1200 Sixth Avenue, Suite 155
Seattle, Washington 98101

More Information Is Available

Prior Five-Year Reviews, site information, and other documents are available:

Online at:
www.epa.gov/superfund/lakewood

In person at:
Washington State Department of
Ecology
300 Desmond Drive SE
Lacey, Washington 98503

Telecommunications Device for the Deaf (TDD) and/or Teletype (TTY) users may call the Federal Relay Service at 800-877-8339.

Give the operator number (206) 553-6396 for Brandon Perkins.

What and Why

The U.S. EPA is conducting a Five-Year Review of the remedy for the Lakewood-Ponders Corner Superfund site (the Site) in Lakewood, Pierce County, Washington. The purpose of the Five-Year Review is to make sure the selected cleanup actions effectively protect human health and the environment.

Site Background

The Site consists of the former Plaza Cleaners property and groundwater contamination resulting from historical operations of the former dry cleaning and laundry business. In 1981, EPA discovered volatile organic compound contamination in two Lakewood Water District drinking water supply wells. The Water District immediately took the wells out of service and notified residents of the contamination. EPA confirmed the former dry cleaning and laundry business as the source of the contamination. EPA added the Site to the Superfund program's National Priorities List (NPL) in 1983.

Site Cleanup

EPA designated two operable units (OUs) to address groundwater and soil contamination. OU1 addresses groundwater and OU2 addresses soil. The OU1 remedy included groundwater treatment at the drinking water supply wells, long-term monitoring and institutional controls to restrict groundwater use. The OU2 remedy included soil vapor extraction and excavation of contaminated soil at the former dry-cleaning property. Following the soil cleanup, EPA deleted the soil unit of the Site (OU2) from the NPL. Long-term groundwater monitoring is ongoing.

Five-Year Reviews

The 2017 Five-Year Review confirmed that conditions are currently safe and recommended actions to ensure cleanup measures will be protective in the long term. The seventh Five-Year Review is scheduled to be completed and available to the public after September 2022.

(b)(4) copyright

(b)(4) copyright



(b)(4) copyright

Print ad ran in the News
Tribune on Sunday February
13, 2022
Sunday circulation of 31,185

APPENDIX E – INTERVIEW FORMS

LAKWOOD-PONDERS CORNER SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Lakewood-Ponders Corner	
EPA ID: WAD050075662	
Interviewer name: Jill Billus	Interviewer affiliation: Skeo
Subject name: Andrew Smith	Subject affiliation: Ecology
Subject contact information: 360-485-3987	
Interview date: 2/11/2022	Interview time: N/A
Interview format (identify one): In Person Phone Mail Email Other:	
Interview category: State Agency / O&M	

State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

It has taken longer than we expected. Ecology has recently replaced the whole system, so it should last at least 20 more years. It is unfortunate that concentrations slowly leak from a low permeable aquifer.

2. What is your assessment of the current performance of the remedy in place at the Site?

The remedy is performing as designed.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

No.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

Yes. The well head drinking water treatment system was completely replaced at a cost of approximately \$4.1 million.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

Yes.

7. Are you aware of any changes in projected land use(s) at the Site?

No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

No.

O&M

9. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

Groundwater at the well head has slowly been reducing and has been below the State's cleanup levels for PCE since 2013. Groundwater collected from MW-16 has fluctuated but seems to have a flat trend with seasonal variations and is currently above the state's cleanup level for PCE. Groundwater collected from MW-20B fluctuates but appears to have a downward trend in concentrations of PCE over the past decade, but is above the state's cleanup level for PCE. Groundwater collected from LPMW-2 has been increasing in concentrations of PCE since 2014 and is currently above the state's cleanup level for PCE.

10. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

O&M is handled by the Lakewood Water District.

11. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

A new system was installed in 2020. There are likely new O&M procedures with the new system.

12. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

Nothing unexpected.

13. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

Monitoring is less frequent (annually) since startup.

14. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

No.

15. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

Yes.

LAKWOOD-PONDERS CORNER SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Lakewood-Ponders Corner	
EPA ID: WAD050075662	
Interviewer name: Jill Billus	Interviewer affiliation: Skeo
Subject name: Don Stanley	Subject affiliation: Head of the Pumping and Water Treatment Department, Lakewood Water District
Subject contact information: dstanley@lakewoodwater.org	
Interview date: 1/18/2022	Interview time: N/A
Interview format (identify one): In Person Phone Mail <u>Email</u> Other:	
Interview category: Local Government / O&M	

Local Government

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

Yes.
2. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

Yes.
3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

We do have a significant, unhoused population but they stay outside our fences.
4. Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy?

No.
5. Are you aware of any changes in projected land use(s) at the Site?

No.
6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

Yes, to the best of my knowledge, EPA has kept neighbors informed if questions arise. Future site-related information could be provided by signage at the Site.
7. Do you have any comments, suggestions or recommendations regarding the project?

No.

O&M

8. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

As this is a new site, I am pleased with the project and the removal of the PCE with the stripping towers. There is little maintenance with the towers. We change out the air filters on a yearly basis and visually inspect the Site on a weekly basis.

9. What is your assessment of the current performance of the remedy in place at the Site?

I am very pleased with the Site. It is doing what it was designed for with minimal maintenance.

10. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

The PCE levels vary between 2 µg/L and 6 µg/L coming from the raw water. After treatment through the stripping towers, the levels are brought down to a “non-detect” level.

11. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

There is not a continuous on-site O&M presence. O&M activities are broken into weekly, monthly, bi-annual and annual maintenance activities. Staff do visual weekly inspections of the Site and maintain any emergency repairs they observe. Other activities are regarding motor maintenance, cleaning and air filter replacement.

12. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

There have not been any changes since startup for the stripping towers. The only change is we have started sampling for PFAS on a regular basis checking for breakthrough on the GAC material.

13. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

No.

14. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

No, there have not been any optimizations or cost savings. The new site is a replacement for the former 40-year-old site changing out the equipment, piece for piece.

15. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

No.

16. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

Yes.

APPENDIX F – DATA REVIEW SUPPLEMENT

Figure F-1: PCE Concentrations in MW-16A, 1991 to 2020

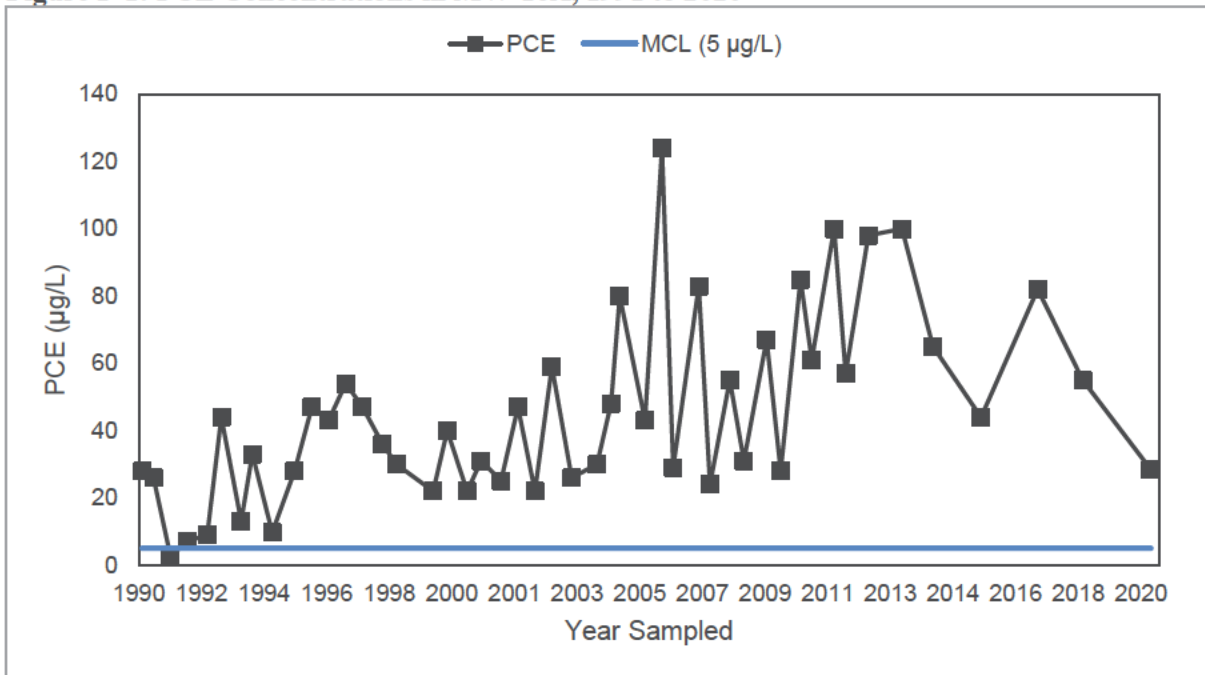


Figure F-2: PCE Concentrations in MW-20B, 1991 to 2020

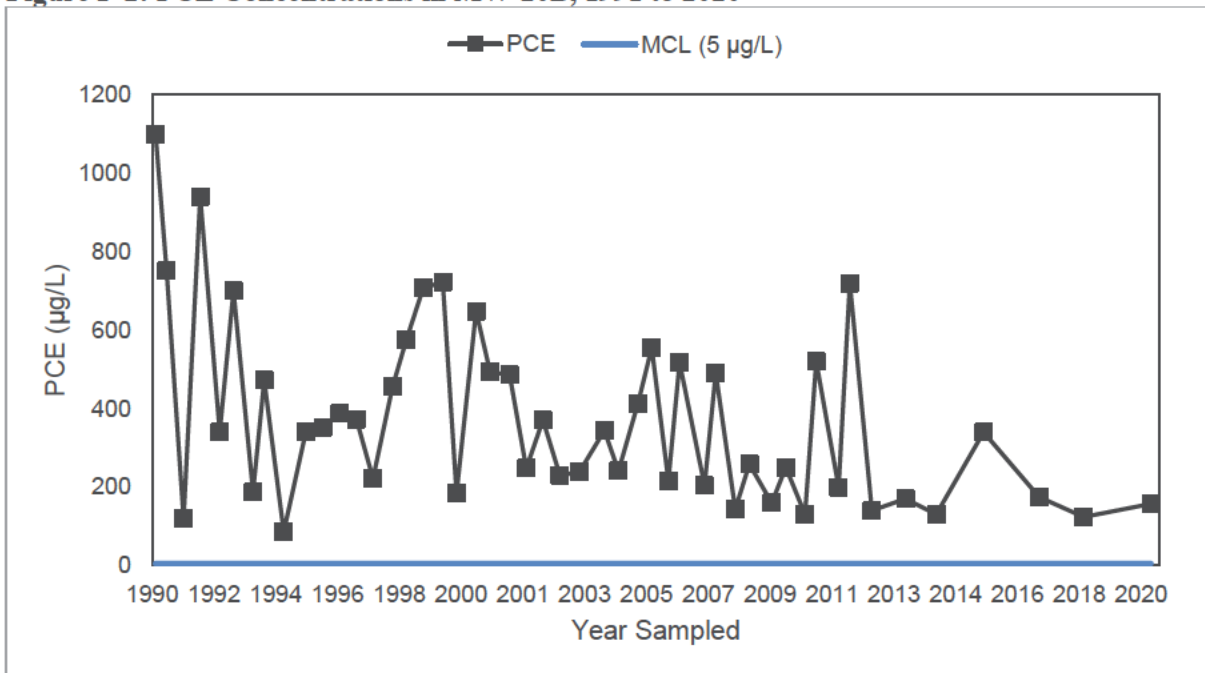


Figure F-3: PCE Concentrations in LPMW-2, 2006 to 2020

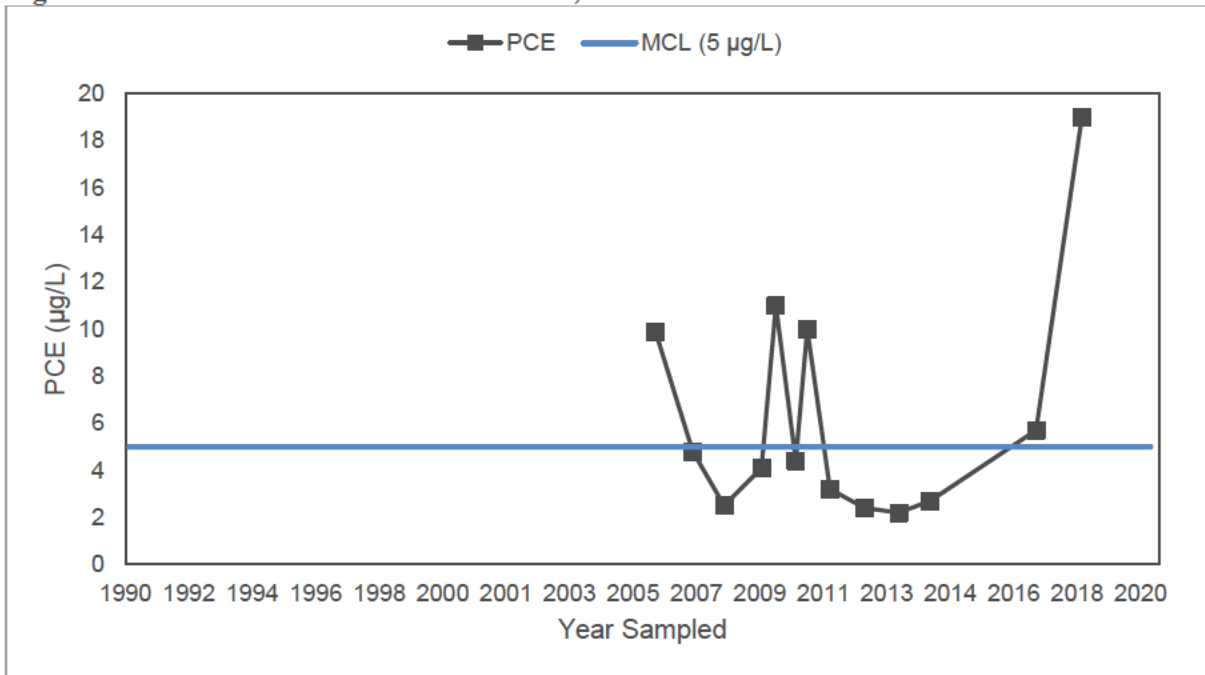


Figure F-4: Groundwater Flow Conceptual Site Model When H1 and H2 Are Pumping (1985)

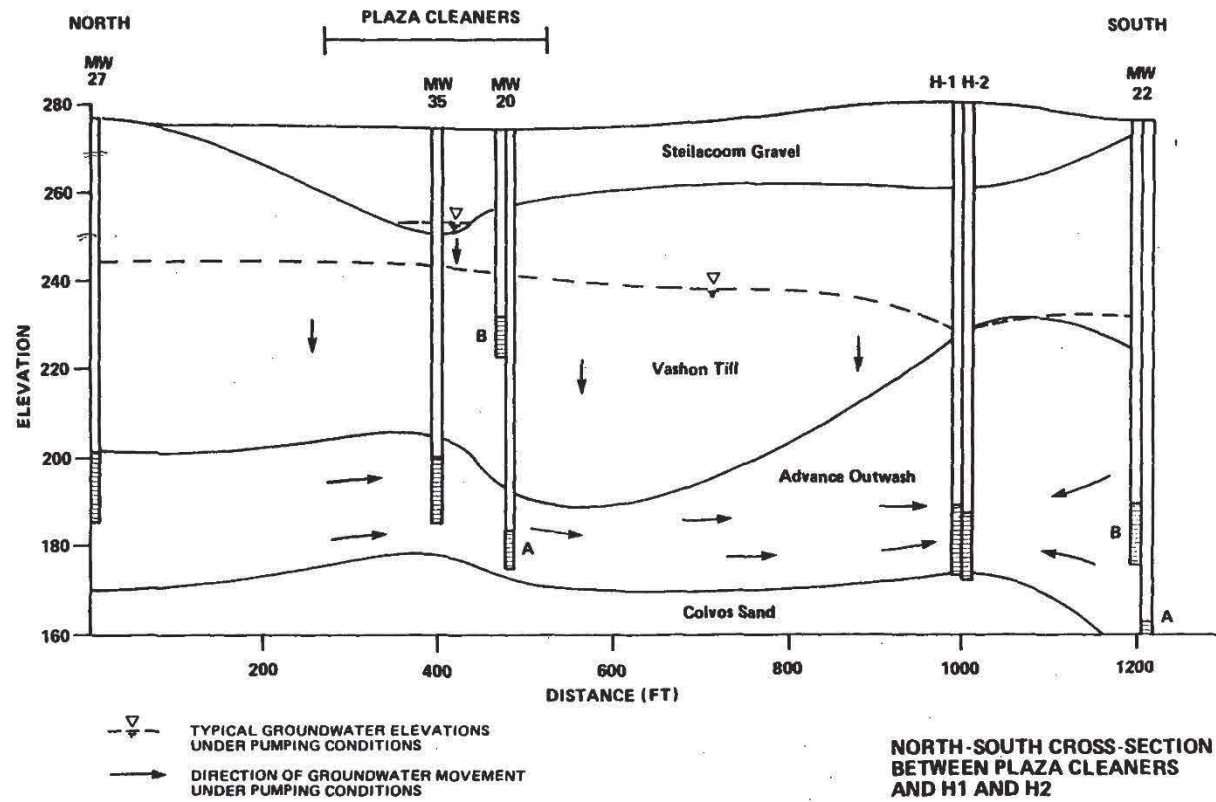
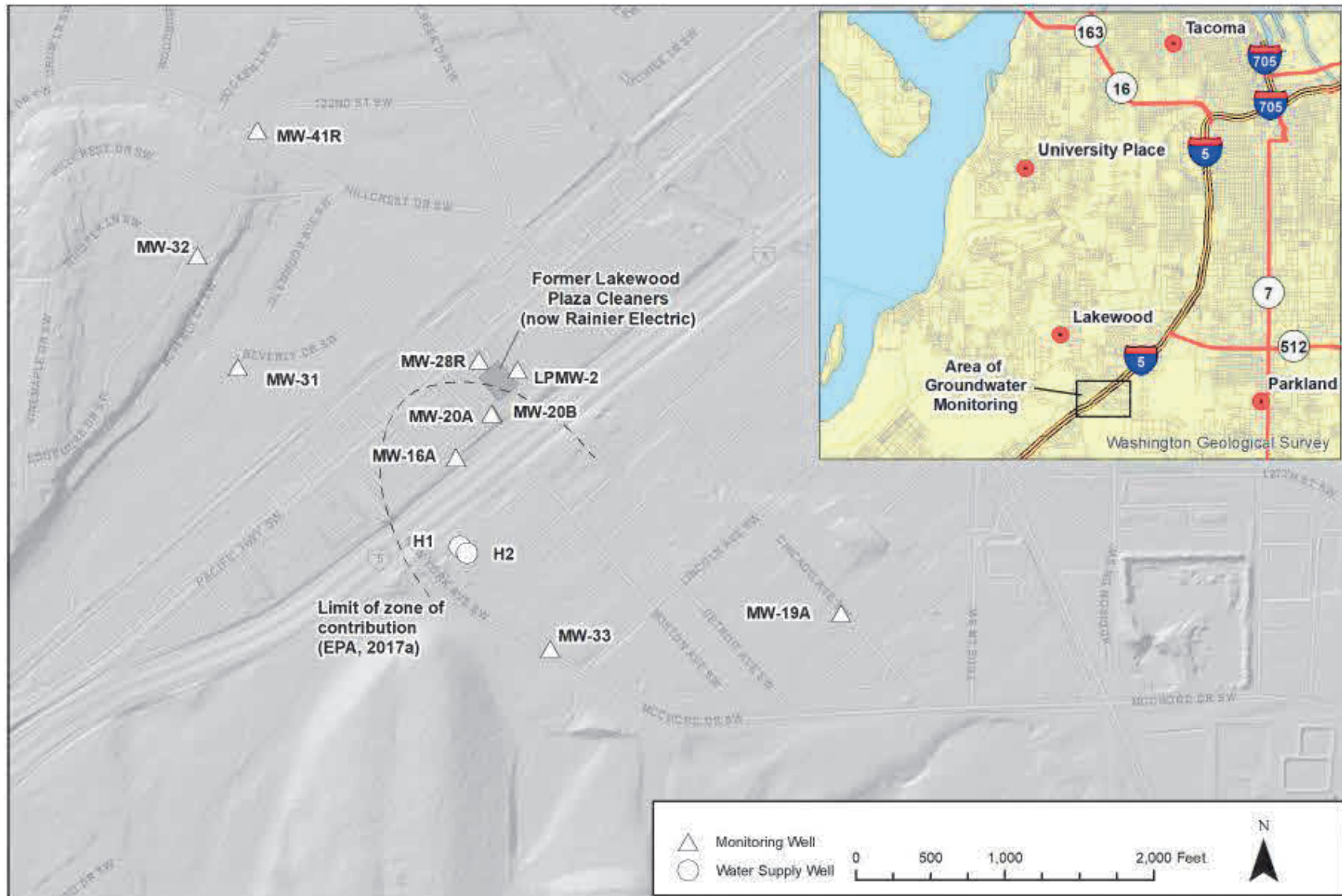


FIGURE 3

Source: 1985 ROD, Figure 3.

Figure F-5: Monitoring Wells and Zone of Contribution (2020)



Source: Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, October 2018 and October 2020. Figure 2. Prepared by Ecology. October 2021.

Table F-1: Ecology Historical Groundwater Data

Table A1. Summary of sample results (µg/L) in wells H1 or H2 from July 1995 to October 2020.

Date	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
7/1995	9	0.3 J	1 U	1 U
1/1996	8.4	0.2 J	0.2 J	2 U
7/1996	0.1 J	1 U	1 U	1 U
1/1997	18	0.4 J	0.4 J	1 U
7/1997	8.8	0.3 J	0.6 J	1 U
2/1998	11	0.4 J	0.3 J	1 U
7/1998	9.8	1 U	0.1 J	1 U
1/1999	1.5	1 U	1 U	1 U
8/1999	5.2	0.2 J	1 U	1 U
1/2000	10	2 U	1 U	1 U
8/2000	8.7	0.03 J	1 U	1 U
1/2001	11	0.2 J	1 U	1 U
8/2001	6.8	0.2 J	1 U	1 U
2/2002	12	0.2 J	0.2 J	1 UJ
8/2002	6.1	1 U	1 U	1 U
2/2003	1.3	1 U	1 U	1 U
9/2003	6.4	0.2 NJ	1 U	5 U
6/2004	7.9	0.2 J	0.1 J	1 U
11/2004	2.6	1 U	1 U	5 U
6/2005	14	0.3 J	1 U	2 U
11/2005	6.4	1 U	1 U	2 U
5/2006	7.3	0.2 J	1 U	5 U
9/2006	4.8	1 U	1 U	2 U
6/2007	5.2	2 U	2 U	2 U
10/2007	3.8	1 U	1 U	2 U
5/2008	9.6	1 U	1 U	1 U
10/2008	5.1	1 U	1 U	1 U
6/2009	6.8	1 U	1 U	1 U
6/2010	4.3	1 U	1 U	1 U
6/2011	5.9	1 U	1 U	1 UJ
10/2011	1.4	1 U	1 U	2 U
6/2012	5.2	1 U	1 U	1 U
6/2013	4.9	1 U	1 U	1 U
5/2014	2.9	1 U	1 U	1 U
10/2015	1.8	0.2 J	1 U	1 U
6/2017	3 J	1 U	1 U	1 UJ
10/2018	1 U	1 U	1 U	1 U
10/2020	3.13	1 U	1 U	1 U
Project Cleanup Level	5	5	70	0.2

Source: Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, October 2018 and October 2020. Tables A1-A12. Prepared by Ecology. October 2021.

Table A2. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-16A from January 1991 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	41.32	28	1 J	2.4 J	1 U
5/1991	39.48	26	0.6 J	2	1 U
11/1991	45.18	2.7 J	1 U	0.6 J	1 U
5/1992	45.15	7	1 U	1	1 U
12/1992	--	9 J	0.3 J	0.8 J	1 UJ
5/1993	38.96	44	10 U	2 J	10 U
12/1993	45.53	13	0.3 J	0.7 J	1 U
4/1994	41.67	33	0.6	1.4	1 U
11/1994	46.95	9.7	0.3 J	0.5 J	1 U
7/1995	42.34	27	0.5 J	0.8 J	1 U
1/1996	36.03	47 E	0.8 J	1.5	2 U
7/1996	38.65	43	0.7 J	1.9	1 U
1/1997	26.32	54	1.1	3.1	1 U
7/1997	39.07	47	0.7 J	2.5	1 U
2/1998	33.82	36	0.7 J	2 J	5 U
7/1998	42.58	30	1 U	1.5	1 U
8/1999	44.14	22	0.4 J	1.1	1 U
1/2000	36.24	40	0.7 J	1.9	1 U
8/2000	45.06	22	0.3 J	0.7	1 U
1/2001	40.93	31	0.4 J	1	1 U
8/2001	44.46	25	0.3 J	0.7 J	1 U
2/2002	32.47	47	0.8 J	2.3	1 UJ
8/2002	44.64	22	0.3 J	0.8 J	1 U
2/2003	32.60	59 J	0.2 J	2.4	1 U
9/2003	47.91	26	0.3 J	0.5 J	5 U
6/2004	43.29	30	0.4 J	0.8 J	1 U
11/2004	38.47	48	1 U	1.4	5 U
6/2005	35.06	80	1.3	2.8	5 U
11/2005	38.01	43	0.7 J	1 J	2 U
5/2006	36.59	124	1.8	4.6	5 U
9/2006	41.93	29	0.3 J	0.5 J	2 U
6/2007	35.95	83	1.2	2.5	2 U
10/2007	40.61	24	1 U	0.6 J	2 U
5/2008	38.23	55	1.2	2.8	1 U
10/2008	43.76	31	0.5 J	0.6 J	1 U
6/2009	34.43	67	0.9 J	2.2	1 U
11/2009	36.75	28	0.5 J	0.8 J	1 U
6/2010	32.04	85	1.3	1.6	1 U
10/2010	36.52	61	0.9 J	1.2	1 U
6/2011	32.93	100	1.4	1.6	1 UJ
10/2011	37.76	57	0.8 J	1	2 U
6/2012	33.37	98	1.3	2.4	1 U
6/2013	34.81	100	1.3	2.6	1 U
5/2014	28.8	65	1.1	1.3	1 U
10/2015	42.5	44	0.5 J	0.6 J	1 U
6/2017	34.54	82 J	0.82 J	1.3	1 UJ
10/2018	36.71	55	0.73 J	0.99 J	1 U
10/2020	45.37	28.4 J	0.44 J	0.78 J	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A3. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-20A from January 1991 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	31.74	1 U	1 U	1 U	1 U
5/1991	29.93	0.4 J	1 U	1 U	1 U
11/1991	37.77	0.4 NJ	1 U	1 U	1 U
5/1992	35.75	0.5 J	1 U	1 U	1 U
12/1992	37.17	0.8 J	1 UJ	1 UJ	1 UJ
5/1993	30.87	10 U	10 U	10 U	10 U
12/1993	37.82	0.3 J	1 U	1 U	1 U
4/1994	33.27	0.4	0.2 U	0.2 U	1 U
11/1994	38.30	0.3 J	1 U	1 U	1 U
7/1995	34.51	0.4 J	1 U	1 U	1 U
1/1996	27.89	0.2 J	1 U	1 U	2 U
7/1996	33.02	0.4 J	1 U	1 U	1 U
1/1997	18.45	0.4 J	1 U	1 U	1 U
7/1997	30.78	0.3 J	1 U	2 U	1 U
2/1998	25.50	0.4 J	1 U	1 U	1 U
7/1998	34.68	0.6 J	1 U	1 U	1 U
1/1999	25.02	1 U	2 U	1 U	1 U
8/1999	35.57	0.8 J	2 U	1 U	1 U
1/2000	26.68	0.2 NJ	2 U	1 U	1 U
8/2000	36.53	0.1 J	2 U	1 U	1 U
1/2001	32.92	0.2 J	1 U	1 U	1 U
8/2001	36.23	1 U	2 U	1 U	1 U
2/2003	27.73	1 U	1 U	1 U	1 U
9/2003	37.27	0.1 J	1 U	1 U	5 U
6/2004	34.58	0.2 J	1 U	1 U	1 U
11/2004	31.88	0.3 J	1 U	1 U	5 U
6/2005	30.15	1 U	1 U	1 U	2 U
11/2005	31.98	1 U	1 U	1 U	2 U
5/2006	29.22	1 U	1 U	1 U	5 U
9/2006	36.19	1 U	1 U	1 U	2 U
6/2007	30.54	2 U	2 U	2 U	2 U
10/2007	35.02	2 U	1 U	1 U	2 U
5/2008	31.33	1 U	1 U	1 U	1 U
10/2008	36.32	1 U	1 U	1 U	1 U
6/2009	29.07	1 U	1 U	1 U	1 U
11/2009	31.10	0.6 J	1 U	1 U	1 U
6/2010	26.90	1 U	1 U	1 U	1 U
10/2010	31.69	2 U	1 U	1 U	1 U
6/2011	26.18	1 U	1 U	1 U	1 UJ
10/2011	32.57	1 U	1 U	1 U	2 U
6/2012	27.70	1 U	1 U	1 U	1 U
6/2013	29.52	1 U	1 U	1 U	1 U
5/2014	24.02	1 U	1 U	1 U	1 U
10/2015	35.58	0.2 J	1 U	1 U	1 U
6/2017	28.85	1 U	1 U	1 U	1 UJ
10/2018	31.98	1 U	1 U	1 U	1 U
10/2020	37.27	1 U	1 U	1 U	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A4. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-20B from January 1991 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	33.94	1100	18	33	1 U
5/1991	30.57	752	16	30	1 U
11/1991	40.99	120	2.6 J	6.7	1 U
5/1992	38.57	940	13	32	1 U
12/1992	40.57	340 J	14 J	20 J	5 UJ
5/1993	32.48	700	12	21	10 U
12/1993	41.38	187	50 U	8.2 J	50 U
4/1994	35.49	472	8.6 J	12.6	50 U
11/1994	41.12	86	50 U	3 J	50 U
7/1995	36.48	340	8.4	17	1 U
1/1996	27.90	353	7.2	15	2 U
7/1996	33.15	387	7.6	15	1 U
1/1997	15.60	373	100 U	6.4 J	100 U
7/1997	30.31	222	4	6.4	1 U
2/1998	25.28	456	7 J	12	10 U
7/1998	35.78	575	10	23	1 U
1/1999	27.14	708	5.2	12	1 U
8/1999	37.18	722	8.4 J	16 J	1 U
1/2000	27.87	184	6	13	1 U
8/2000	38.39	648	200 U	100 U	100 U
1/2001	33.88	493	6.6 J	12	10 U
8/2001	37.67	486	8.2	18	100 U
2/2002	23.50	248	200 U	100 U	100 UJ
8/2002	37.92	371	8.5	16	1 U
2/2003	26.60	230	100 U	100 U	100 U
9/2003	39.49	239	5.4 J	12	50 U
6/2004	35.76	344	6.5 J	15	10 U
11/2004	32.36	241	6.7	13	5 U
6/2005	29.06	413	6.6	12	5 U
11/2005	32.58	555	6.4	11	2 U
5/2006	27.56	216	4.2	6.6	5 U
9/2006	39.00	518	5.6	11	2 U
6/2007	29.64	204	4.4	7.8	2 U
10/2007	36.9	491	7.5	15	2 U
5/2008	30.65	143	5.5	12	1 U
10/2008	37.48	258	4.5	9	1 U
6/2009	28.24	160	4.1	7.4	1 U
11/2009	32.04	250	4.7	9.6	1 U
6/2010	25.86	130	3.7	6.3	1 U
10/2010	31.79	520	5.8	10	1 U
6/2011	23.39	200	3.5	5.6	1 UJ
10/2011	33.18	720	4.8	7.9	2 U
6/2012	26.85	140	3.3	5.7	1 U
6/2013	29.00	170	3.9	7	1 U
5/2014	21.80	130	2.1	3	1 U
10/2015	36.91	340	5.4	12	1 U
6/2017	27.71	174 J	2.9	4.5	1 UJ
10/2018	31.59	124	1.8	2.7	1 U
10/2020	38.86	157	4.34	6.73	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A5. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-27 from January 1991 to October 2011.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	--	1 U	1 U	1 U	1 U
5/1991	--	1 U	1 U	1 U	1 U
11/1991	--	1 U	1 U	1 U	1 U
5/1992	--	1 U	1 U	1 U	1 U
12/1992	--	1 UJ	1 UJ	1 UJ	1 UJ
5/1993	--	10 U	10 U	10 U	10 U
12/1993	--	1 U	1 U	1 U	1 U
4/1994	--	0.2 U	0.2 U	0.2 U	1 U
11/1994	--	1 U	1 U	1 U	1 U
7/1995	--	1 U	1 U	1 U	1 U
1/1996	--	1 U	1 U	1 U	2 U
7/1996	--	1 U	1 U	1 U	1 U
1/1997	--	1 U	1 U	1 U	1 U
7/1997	--	1 U	1 U	1 U	1 U
2/1998	--	1 U	1 U	1 U	1 U
7/1998	--	0.05 J	1 U	1 U	1 U
1/1999	--	1 U	2 U	1 U	1 U
8/1999	--	1 U	2 U	1 U	1 U
1/2000	--	1 U	2 U	1 U	1 U
8/2000	--	1 U	2 U	1 U	1 U
1/2001	--	1 U	1 U	1 U	1 U
8/2001	--	1 U	2 U	1 U	1 U
2/2002	--	1 U	2 U	1 U	1 UJ
8/2002	--	1 U	2 U	1 U	1 U
2/2003	--	1 U	1 U	1 U	1 U
9/2003	--	1 U	1 U	1 U	5 U
6/2004	--	1 U	1 U	1 U	1 U
11/2004	--	1 U	1 U	1 U	5 U
6/2005	--	1 U	1 U	1 U	2 U
11/2005	--	1 U	1 U	1 U	2 U
5/2006	--	1 U	1 U	1 U	5 U
9/2006	34.20	1 U	1 U	1 U	2 U
6/2007	28.95	2 U	2 U	2 U	2 U
10/2007	33.31	2 U	1 U	1 U	2 U
5/2008	29.91	1 U	1 U	1 U	1 U
10/2008	34.42	1 U	1 U	1 U	1 U
6/2009	28.35	1 U	1 U	1 U	1 U
11/2009	29.05	1 U	1 U	1 U	1 U
6/2010	26.62	1 U	1 U	1 U	1 U
6/2011	25.58	1 U	1 U	1 U	1 UJ
10/2011	31.58	1 U	1 U	1 U	2 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A6. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well LPMW-2 from May 2006 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
5/2006	22.62	9.9	1 U	1 U	5 U
6/2007	23.99	4.8	1 U	1 U	2 U
5/2008	24.90	2.5	1 U	1 U	1 U
6/2009	22.48	4.1	1 U	1 U	1 U
11/2009	22.81	11	1 U	1 U	1 U
6/2010	21.60	4.4	1 U	1 U	1 U
10/2010	25.27	5	1 U	1 U	1 U
6/2011	20.07	3.2	1 U	1 U	1 U
6/2012	22.27	2.4	1 U	1 U	1 U
6/2013	22.90	2.2	1 U	1 U	1 U
5/2014	19.22	2.7	1 U	1 U	1 U
6/2017	22.87	5.7	1 U	1 U	1 U
10/2018	23.89	19	1 U	1 U	0.2 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A7. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-19A from May 1991 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
11/1991	43.40	1 U	0.5 NJ	1 U	1 U
12/1992	42.80	1 U	1 U	1 U	1 U
12/1993	43.00	1 U	0.4 J	1 U	1 U
4/1994	38.62	0.2 U	0.5	0.2 U	1 U
7/1995	39.42	1 U	0.4 J	1 U	1 U
7/1997	35.94	1 U	0.3 J	2 U	1 U
8/1999	40.37	1 U	0.4 J	1 U	1 U
8/2001	41.18	1 U	0.3 J	1 U	1 U
9/2003	42.69	1 U	0.4 NJ	1 U	5 U
6/2005	35.26	1 U	0.6 J	1 U	2 U
6/2007	35.00	2 U	1.2 J	2 U	2 U
6/2009	34.59	1 U	1 U	1 U	1 U
10/2011	38.41	1 U	0.4 J	1 U	2 U
6/2017	33.58	1 U	1 U	1 U	1 U
10/2020	42.42	1 U	0.39 J	1 U	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A8. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-31 from May 1991 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	--	1 J	1 U	1.9 J	1 U
5/1991	--	0.6 J	1 U	2	1 U
11/1991	--	0.9 NJ	1 U	2.2 J	1 U
5/1992	--	0.8 J	1 U	1	1 U
12/1992	--	0.5 J	1 UJ	0.9 J	1 UJ
5/1993	--	10 U	10 U	10 U	10 U
12/1993	--	0.8 J	1 U	1.2 J	1 U
4/1994	--	0.7	0.2 U	1	1 U
11/1994	--	0.8 J	1 U	1	1 U
7/1995	--	0.6 J	1 U	0.5 J	1 U
1/1996	--	0.6 J	1 U	0.7 J	2 U
7/1997	--	0.9 J	1 U	0.9 J	1 U
8/1999	--	0.9 J	2 U	0.4 J	1 U
8/2001	--	0.4 J	2 U	0.3 J	1 U
9/2003	--	0.5 J	1 U	0.1 NJ	5 U
6/2005	--	0.5 J	1 U	1 U	2 U
6/2007	--	1.6 J	2 U	2 U	2 U
10/2011	38.05	0.7 J	1 U	1 U	2 U
6/2017	34.61	0.7 J	1 U	1 U	1 U
10/2020	41.95	0.97 J	1 U	1 U	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A9. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-32 from May 1991 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	60.1	1 J	1 U	1.1 J	1 U
5/1991	58.66	1	1 U	2	1 U
11/1991	64.71	0.6 NJ	1 U	0.6 J	1 U
5/1992	62.54	0.7 J	1 U	1	1 U
12/1992	64.67	0.7 J	1 UJ	0.5 J	1 UJ
5/1993	60.03	10 U	10 U	10 U	10 U
12/1993	65.02	0.7 J	1 U	0.6 J	1 U
4/1994	61.44	0.7	0.2 U	0.6	1 U
11/1994	65.63	0.6 J	1 U	0.5 J	1 U
7/1995	62.31	0.7 J	1 U	0.5 J	1 U
1/1996	57.2	0.8 J	1 U	0.6 J	2 U
8/2000	63.08	0.8 J	2 U	1 U	1 U
6/2005	59.41	1.4	1 U	1 U	2 U
6/2010	57.93	1.8	1 U	1 U	1 U
6/2017	58.18	1.4	1 U	1 U	1 U
10/2020	64.57	1.28	1 U	1 U	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A10. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-33 from July 1995 to October 2020.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
7/1995	--	1 U	1 U	1 U	1 U
7/1996	--	1 U	1 U	1 U	1 U
7/1997	--	1 U	1 U	2 U	1 U
7/1998	--	1 U	1 U	1 U	1 U
8/1999	--	1 U	2 U	1 U	1 U
8/2000	--	1 U	2 U	1 U	1 U
8/2001	--	1 U	2 U	1 U	1 U
8/2002	--	1 U	1 U	1 U	1 U
9/2003	--	1 U	1 U	1 U	5 U
6/2005	--	1 U	1 U	1 U	2 U
5/2006	--	1 U	1 U	1 U	5 U
6/2007	--	2 U	2 U	2 U	2 U
5/2008	--	1 U	1 U	1 U	1 U
6/2009	--	1 U	1 U	1 U	1 U
6/2010	--	1 U	1 U	1 U	1 U
10/2011	34.83	1 U	1 U	1 U	2 U
6/2013	31.41	1 U	1 U	1 U	1 U
10/2015	38.18	1 U	0.2 J	1 U	1 U
6/2017	29.95	1 U	1 U	1 U	1 UJ
10/2020	40.12	1 U	1 U	1 U	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A11. Summary of water levels (ft. below measuring point) and sample results (µg/L) in monitoring well MW-40 from January 1991 to October 2011.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	32.76	1 U	1 U	1 U	1 U
11/1991	37.65	1 U	1 U	1 U	1 U
12/1992	36.60	1 UJ	1 UJ	1 UJ	1 UJ
12/1993	37.83	1 U	1 U	1 U	1 U
4/1994	34.20	0.2 U	0.2 U	0.2 U	1 U
7/1995	35.25	1 U	1 U	1 U	1 U
8/2000	37.82	1 U	2 U	1 U	1 U
6/2005	34.3	1 U	1 U	1 U	2 U
10/2011	35.98	1 U	1 U	1 U	2 U
Project Cleanup Level	n/a	5	5	70	0.2

Table A12. Summary of water levels (ft. below measuring point) and sample results ($\mu\text{g/L}$) in monitoring well MW-41 from January 1991 to June 2010.

Date	Water Level	PCE	TCE	Cis-1,2-DCE	Vinyl Chloride
1/1991	28.45	1 U	1 U	1 U	1 U
5/1991	27.26	1 U	1 U	1 U	1 U
11/1991	32.29	1 U	1 U	1 U	1 U
5/1992	30.36	1 U	1 U	1 U	1 U
12/1992	31.49	1 UJ	1 UJ	1 UJ	1 UJ
5/1993	27.95	10 U	10 U	10 U	10 U
12/1993	32.90	1 U	1 U	1 U	1 U
4/1994	29.40	0.2 U	0.2 U	0.2 U	1 U
7/1995	30.17	1 U	1 U	1 U	1 U
1/1996	25.87	1 U	1 U	1 U	2 U
8/2000	30.98	1 U	2 U	1 U	1 U
6/2005	28.42	1 U	1 U	1 U	2 U
6/2010	26.69	1 U	1 U	1 U	1 U
Project Cleanup Level	n/a	5	5	70	0.2

Remarks: _____			
3.	O&M and OSHA Training Records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A
Remarks: _____			
4.	Permits and Service Agreements		
	<input type="checkbox"/> Air discharge permit	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Effluent discharge	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Waste disposal, POTW	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Other permits: _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks: <u>Air effluent from the air strippers is vented to the atmosphere. Monitoring is not conducted or required. Treated water (effluent) is sampled quarterly for VOCs. Four instances of PCE exceeding MCLs were recorded between 2016 and 2018. Since the upgrades in January 2020, no VOCs have been detected.</u>			
5.	Gas Generation Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks: _____			
6.	Settlement Monument Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks: _____			
7.	Groundwater Monitoring Records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A
Remarks: _____			
8.	Leachate Extraction Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks: _____			
9.	Discharge Compliance Records		
	<input type="checkbox"/> Air	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Water (effluent)	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks: _____			
10.	Daily Access/Security Logs	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks: _____			
IV. O&M COSTS			
1.	O&M Organization		
	<input checked="" type="checkbox"/> State in-house	<input type="checkbox"/> Contractor for state	
	<input type="checkbox"/> PRP in-house	<input type="checkbox"/> Contractor for PRP	
	<input type="checkbox"/> Federal facility in-house	<input type="checkbox"/> Contractor for Federal facility	
<input checked="" type="checkbox"/> <u>Lakewood Water District conducts O&M activities for the air strippers and pumping wells. Ecology conducts O&M activities for the remainder of the Site.</u>			
2.	O&M Cost Records		
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	
	<input type="checkbox"/> Funding mechanism/agreement in place	<input checked="" type="checkbox"/> Unavailable	
Original O&M cost estimate: <u>\$85,700</u> <input type="checkbox"/> Breakdown attached			

Total annual cost by year for review period if available			
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**
Describe costs and reasons: None.

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

1. **Fencing Damaged** Location shown on site map Gates secured N/A
Remarks: The Lakewood Water District supply wells (H1 and H2) and treatment system are located within a locked, fenced area. The fence is about 10 feet tall and appears to be in good condition.

B. Other Access Restrictions

1. **Signs and Other Security Measures** Location shown on site map N/A
Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented Yes No N/A
Site conditions imply ICs not being fully enforced Yes No N/A
Type of monitoring (e.g., self-reporting, drive by): Self-reporting
Frequency: Ecology's groundwater monitoring frequency ranges from 18 months to five years.
Responsible party/agency: EPA/State

Contact: <u>Jacob Carnes, PG</u>	Hydrogeologist 2	1/13/2022	360-407-6498
Name	Title	Date	Phone

Reporting is up to date Yes No N/A
Reports are verified by the lead agency Yes No N/A
Specific requirements in deed or decision documents have been met Yes No N/A
Violations have been reported Yes No N/A
Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks: Public notice and advisory have not yet been sent out to property owners above areas of contamination – these actions are required within five years of the 2019 ESD (by September 2024).

D. General			
1.	Vandalism/Trespassing	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No vandalism evident
Remarks: _____			
2.	Land Use Changes On Site	<input type="checkbox"/> N/A	
Remarks: <u>None. Rainier Light & Electric currently occupies the former dry-cleaners property.</u>			
3.	Land Use Changes Off Site	<input type="checkbox"/> N/A	
Remarks: <u>None.</u>			
VI. GENERAL SITE CONDITIONS			
A. Roads		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Roads Damaged	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
Remarks: _____			
B. Other Site Conditions			
Remarks: _____			
VII. LANDFILL COVERS		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
VIII. VERTICAL BARRIER WALLS		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
IX. GROUNDWATER/SURFACE WATER REMEDIES		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
A. Groundwater Extraction Wells, Pumps and Pipelines		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Pumps, Wellhead Plumbing and Electrical		
	<input checked="" type="checkbox"/> Good condition	<input checked="" type="checkbox"/> All required wells properly operating	<input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A
Remarks: <u>Treatment system upgraded in January 2020 with GAC and air stripper replacement. Supply wells are now operating daily and are in good condition.</u>			
2.	Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances		
	<input checked="" type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance	
Remarks: _____			
3.	Spare Parts and Equipment		
	<input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Good condition	<input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided
Remarks: _____			
B. Surface Water Collection Structures, Pumps and Pipelines		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Collection Structures, Pumps and Electrical		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance	
Remarks: _____			
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance	
Remarks: _____			
3.	Spare Parts and Equipment		
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Good condition	<input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided
Remarks: _____			

C. Treatment System		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Treatment Train (check components that apply)		
	<input type="checkbox"/> Metals removal	<input type="checkbox"/> Oil/water separation	<input type="checkbox"/> Bioremediation
	<input checked="" type="checkbox"/> Air stripping	<input checked="" type="checkbox"/> Carbon adsorbers	
	<input type="checkbox"/> Filters: _____		
	<input type="checkbox"/> Additive (e.g., chelation agent, flocculent): _____		
	<input type="checkbox"/> Others: _____		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance	
	<input type="checkbox"/> Sampling ports properly marked and functional		
	<input type="checkbox"/> Sampling/maintenance log displayed and up to date		
	<input type="checkbox"/> Equipment properly identified		
	<input type="checkbox"/> Quantity of groundwater treated annually: _____		
	<input type="checkbox"/> Quantity of surface water treated annually: _____		
	Remarks: <u>The treatment system consists of a pump house for each supply well and two air strippers that are run in series. The stripper media consists of 2-inch balls. The stripper effluent flows into a wet well in the treatment building. Chlorination occurs in-line prior to entering the wet well. Water in the wet well is then pumped into the Lakewood Water District distribution system.</u>		
2.	Electrical Enclosures and Panels (properly rated and functional)		
	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance
	Remarks: _____		
3.	Tanks, Vaults, Storage Vessels		
	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Good condition	<input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs maintenance
	Remarks: <u>Four tanks, maximum capacity of 2,000 gallons. Look to be in good condition.</u>		
4.	Discharge Structure and Appurtenances		
	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance
	Remarks: _____		
5.	Treatment Building(s)		
	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Good condition (esp. roof and doorways)	<input type="checkbox"/> Needs repair
	<input type="checkbox"/> Chemicals and equipment properly stored		
	Remarks: _____		
6.	Monitoring Wells (pump and treatment remedy)		
	<input checked="" type="checkbox"/> Properly secured/locked	<input checked="" type="checkbox"/> Functioning	<input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition
	<input checked="" type="checkbox"/> All required wells located	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A
	Remarks: _____		
D. Monitoring Data			
1.	Monitoring Data		
	<input checked="" type="checkbox"/> Is routinely submitted on time	<input type="checkbox"/> Is of acceptable quality	
2.	Monitoring Data Suggests:		

<input type="checkbox"/> Groundwater plume is effectively contained	<input type="checkbox"/> Contaminant concentrations are declining
E. Monitored Natural Attenuation	
1. Monitoring Wells (natural attenuation remedy)	
<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning
<input type="checkbox"/> All required wells located	<input type="checkbox"/> Needs maintenance
	<input type="checkbox"/> Routinely sampled
	<input type="checkbox"/> Good condition
	<input checked="" type="checkbox"/> N/A
Remarks: _____	
X. OTHER REMEDIES	
EPA dismantled and removed the SVE system after soil cleanup in 1992.	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). <u>Excavation at the former dry-cleaning property effectively removed contaminated soil from the Site. The groundwater remedy is designed to extract and treat contaminated groundwater to meet MCLs. Lakewood Water District supply wells H1 and H2 pump groundwater. Wellhead air strippers treat the groundwater to acceptable levels. Treated groundwater consistently meets MCLs. The remedy is effective and functioning as designed. The supply wells now operate daily to compensate for shutdowns of other wells in the District's network. Reduced pumping rates noted during the previous FYR period have contributed to an extended timeframe for treatment. The 1984 ROD originally estimated a treatment period of 10 to 12 years. However, treatment has been ongoing for nearly 40 years.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>New wells were installed in 2015 as part of EPA's hydrogeologic investigation. The groundwater monitoring program incorporates these wells. Lakewood Water District has updated its O&M Plan since the 2020 treatment system upgrades.</u>	
C. Early Indicators of Potential Remedy Problems	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. <u>The 1984 ROD assumed continuous pumping of supply wells H1 and H2, but discontinuous pumping noted in the previous FYR Report has extended the treatment timeframe. The air strippers were recently replaced and the wells now operate daily. However, pumping rates vary by the season (lower in the winter, higher in the summer). The remedy will continue to extend beyond the original timeframe estimated in the ROD.</u>	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>None.</u>	

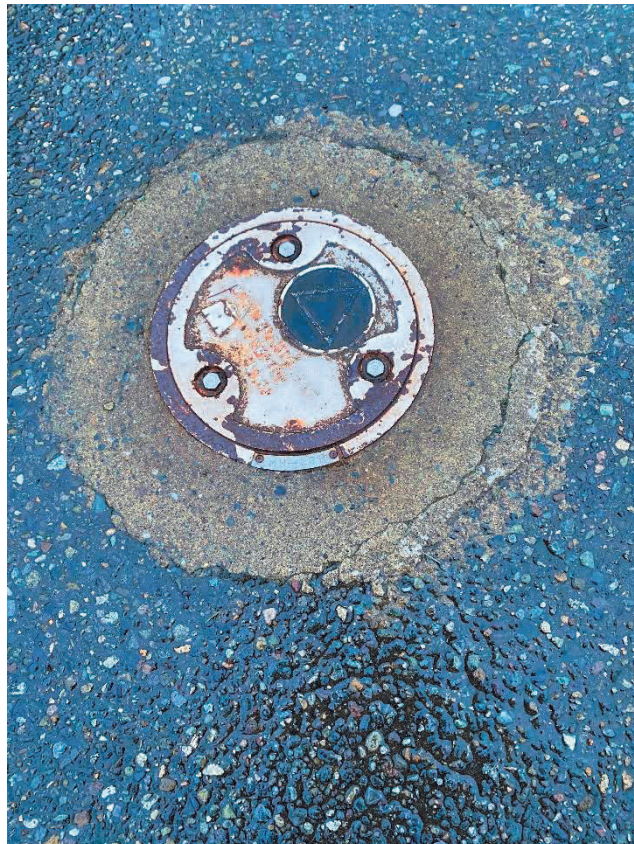
Site Inspection Participants:

- Brandon Perkins, EPA
- Jill Billus, Skeo
- Colleen Scott, Skeo
- Pam Marti, Ecology
- Jacob Carnes, Ecology
- Lakewood Water District representative

APPENDIX H – SITE INSPECTION PHOTOS



Rainier Lighting and Electric Supply



MW-28R at the parking lot



Area of LPMW-2 (under gravel)



1992 soil excavation area



Nested wells MW-20A and MW-20B



Lakewood Water District treatment facility



H1 supply well pump house



H2 supply well pump house



Air strippers



Four new GAC units



Treatment plant interior



MW-33 along McChord Drive



MW-31 in a residential yard

APPENDIX I – DETAILED ARARS REVIEW

Section 121 (d)(2)(A) of CERCLA, 42 U.S.C. § 9621(d)(2)(A), specifies that Superfund remedial actions must meet any federal standards, requirements, criteria or limitations that are determined to be applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site. State ARARs are to be attained if they are more stringent than the associated federal ARARs. To-Be-Considered (TBC) are other advisories, criteria and guidance that are not legally binding but should be considered in determining the protection of human health or the environment. While TBCs do not have the status of ARARs, EPA’s approach to determining if a remedial action is protective of human health and the environment involves consideration of TBCs along with ARARs.

Chemical-specific ARARs are specific numerical quantity restrictions on individually listed hazardous substances, pollutants or contaminants in specific media. An example of chemical-specific ARARs are the MCLs specified under the Safe Drinking Water Act. The remedy selected for this Site was designed to meet or exceed all chemical-specific ARARs and meet location- and action-specific ARARs.

Groundwater

The 1992 ESD identified federal and state drinking water standards for three groundwater COCs and established groundwater cleanup levels for the Site. There have been no changes to the standards upon which the groundwater cleanup levels were based (Table I-1).

Table I-1: Previous and 2022 MCLs for Groundwater COCs

COC	1992 ESD Groundwater Cleanup Goal (µg/L) ^a	Current Federal MCL (µg/L) ^b	Current State MCL (µg/L) ^c	Change
PCE	5	5	5	None
TCE	5	5	5	None
cis-1,2-DCE	70	70	70	None

Notes:

- a. Obtained from 1992 ESD.
- b. Based on Safe Drinking Water Act MCLs. Current MCLs located at <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulation> (accessed 1/7/2022).
- c. Based on Washington State MCLs (Groundwater: Method A, Method B and ARARs). Current MCLs located at <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables> (accessed 1/7/2022).

APPENDIX J – VAPOR INTRUSION SCREENING

The vapor intrusion pathway was not evaluated in the 1985 human health risk assessment. EPA later determined that vapor intrusion is applicable due to the presence of VOCs in groundwater. During the 2012 FYR, EPA evaluated the potential for vapor intrusion to indoor air and found that vapor intrusion was unlikely to pose an unacceptable risk for workers above the areas of groundwater contamination based on data at that time. EPA is updating its evaluation for the potential for vapor intrusion to indoor air using EPA’s VISL calculator and the most recent groundwater concentrations.

The VISL calculator is an empirical model that predicts indoor air concentrations from groundwater concentrations using conservative “generic” attenuation factors and current toxicity information. These factors reflect worst-case conditions and do not consider any site-specific conditions such as site soil strata, depth to water table or building properties that may reduce the transport of vapors from groundwater through the soil column. Data from two shallow-zone wells were selected for the assessment based on EPA guidance recommendations to use groundwater samples from the uppermost part of the aquifer that underlies the study area of interest (i.e., where buildings are located) in characterizing representative vapor source concentrations for vapor intrusion assessment.⁴

Monitoring well MW-20B reported the highest PCE concentration based on the most recent data collected in October 2020. MW-20B is screened in the Vashon till (Zone B), about 50 feet bgs, and is located on the former Plaza Cleaners property. This property is currently zoned for commercial use but does permit future residential use. The vapor intrusion assessment for this FYR therefore considers both commercial and residential exposure assumptions. The 2020 PCE concentration in MW-20B of 157 µg/L corresponds to a cancer risk of 2×10^{-6} under a commercial use scenario. This is greater than the target risk of 1×10^{-6} but below 1×10^{-4} , within EPA’s acceptable risk management range. The noncancer HQ does not exceed EPA’s target HQ of 1. An evaluation based on conservative residential exposure assumptions indicates the same October 2020 PCE concentration at MW-20B is equivalent to a cancer risk of 1×10^{-5} and a noncancer HQ of 3. This cancer risk is within EPA’s acceptable risk management range. The noncancer HQ is greater than the target HQ of 1 for noncarcinogens (Table J-1). However, no residences are located in the area with elevated VOC concentrations and the Site is in a commercial and light industrial use zoned area.

Table J-1: Vapor Intrusion Screening, MW-20B

MW-20B October 2020 PCE Concentration ^a (µg/L)	VISL Calculator Output ^b			
	Commercial		Residential	
	Cancer Risk	Non-cancer HQ	Cancer Risk	Non-cancer HQ
157	2×10^{-6}	0.6	1×10^{-5}	3

Notes:

- Concentration obtained from Ecology’s Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, October 2018 and October 2020. PCE was the only COC detected in MW-20B.
- Risk and HQ calculated using EPA’s VISL calculator (<https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator>), assuming commercial and residential exposures and default groundwater temperature of 25 degrees Celsius.

Monitoring well LPMW-2 reported lower PCE concentrations than MW-20B, but is screened within the Steilacoom gravel, less than 30 feet bgs. Ecology sampled the well in October 2018; the PCE concentration was 19 µg/L. This concentration results in a cancer risk below EPA’s acceptable risk range for commercial exposure and within EPA’s acceptable risk range for residential exposure scenarios. The PCE concentration is below a HQ of 1 for both commercial and residential exposure scenarios (Table J-2).

⁴ EPA Office of Solid Waste and Emergency Response. Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (June 2015).

Based on this screening-level evaluation, vapor intrusion does not appear to be an issue of concern at this time. However, if VOC concentrations increase or site conditions change, the vapor intrusion pathway should be re-evaluated.

Table J-2: Vapor Intrusion Screening, LPMW-2

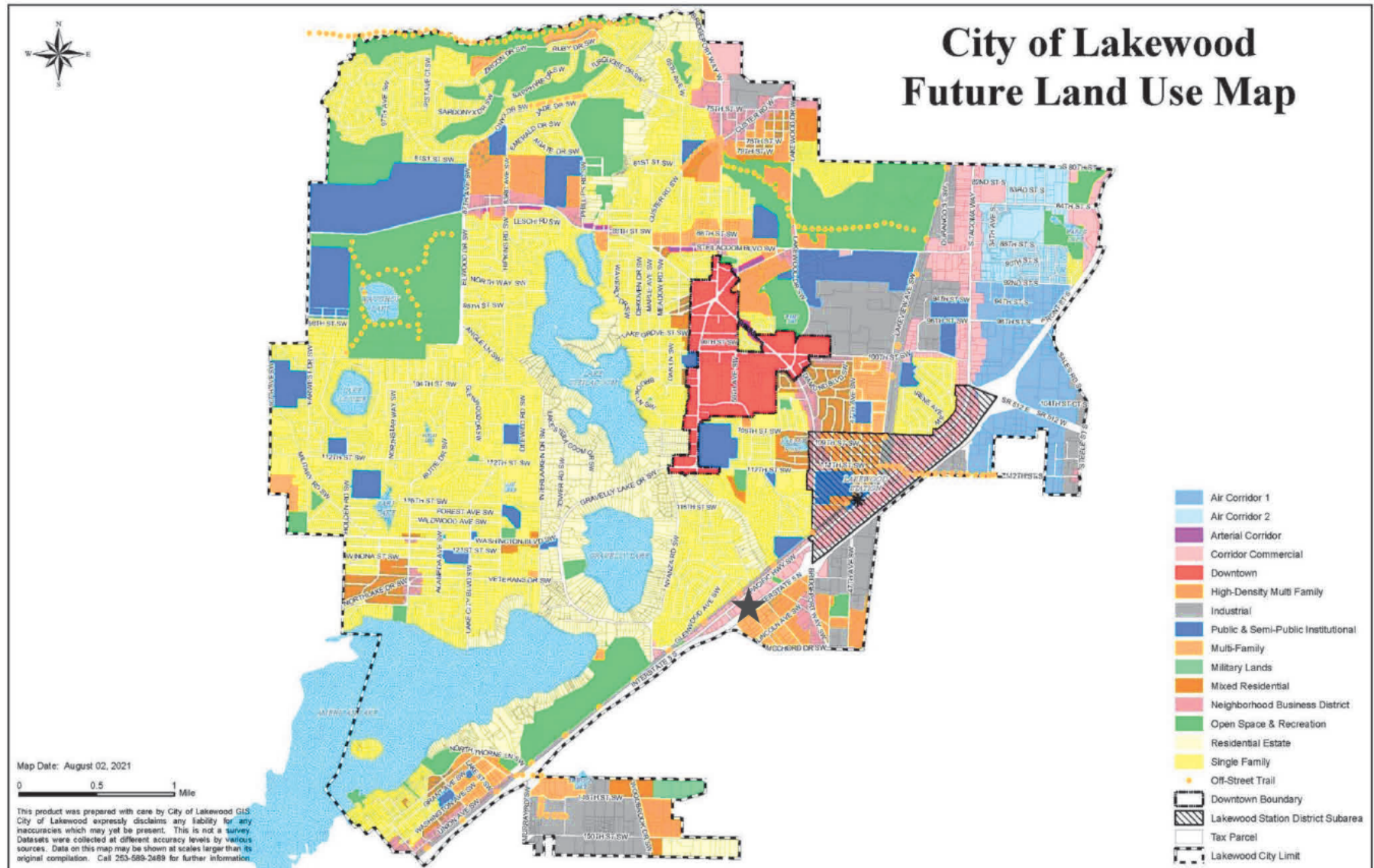
LPMW-2 October 2018 PCE Concentration ^a (µg/L)	VISL Calculator Output ^b			
	Commercial		Residential	
	Cancer Risk	Non-cancer HQ	Cancer Risk	Non-cancer HQ
19	3×10^{-7}	0.08	1×10^{-6}	0.3

Notes:

- a. Concentration obtained from Ecology’s Lakewood Plaza Cleaners/Ponders Corner Groundwater Monitoring Results, October 2018 and October 2020. PCE was the only COC detected in MW-20B.
- b. Risk and HQ calculated using EPA’s VISL calculator (<https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator>), assuming commercial and residential exposures and a default groundwater temperature of 25 degrees Celsius.

APPENDIX K – LAND USE MAP

Figure K-1: City of Lakewood Future Land Use Map (2021)



★ = denotes site location.