THIRD FIVE-YEAR REVIEW REPORT FOR VIENNA TETRACHLOROETHENE SUPERFUND SITE WOOD COUNTY, WEST VIRINIA

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Prepared by

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Date

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LIST OF ABBREVIATIONS AND ACRONYMS

AS/SVE	Air Sparge/Soil Vapor Extraction
BGS	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminants of Concern
EPA	United States Environmental Protection Agency
EX	Extraction Well
FS	Feasibility Study
FYR	Five-Year Review
IC	Institutional Control
LTRA	Long-Term Response Action
MCL	Maximum Contaminant Level
MW	Monitoring Well
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethene
PW	Production Well
RI	Remedial Investigation
RAO	Remedial Action Objective
ROD	Record of Decision
RPM	Remedial Project Manager
TCE	Trichloroethene
TU	Treatment Unit
UU/UE	Unlimited Use and Unrestricted Exposure
UVB	Unterdruck Verdampfer Brunnen
VI	Vapor Intrusion
VOC	Volatile Organic Compound
WVDEP	West Virginia Department of Environmental Protection

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 pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the third FYR for the Vienna Tetrachloroethene Superfund Site (the Site). The triggering action for this policy review is the completion date of the previous (second) FYR on December 22, 2014. This FYR has been prepared due to the fact that 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 one operable unit (OU), which addresses groundwater contamination.

EPA remedial project manager (RPM) Chris Vallone led the FYR. Participants included EPA community involvement coordinator (CIC) Meg Keegan, EPA technical support staff Ayowale Ayodele, Nancy Rios-Jafolla and Kimberly Plank, and West Virginia Department of Environmental Protection (WVDEP) project manager William Huggins. The review began on 4/25/2019.

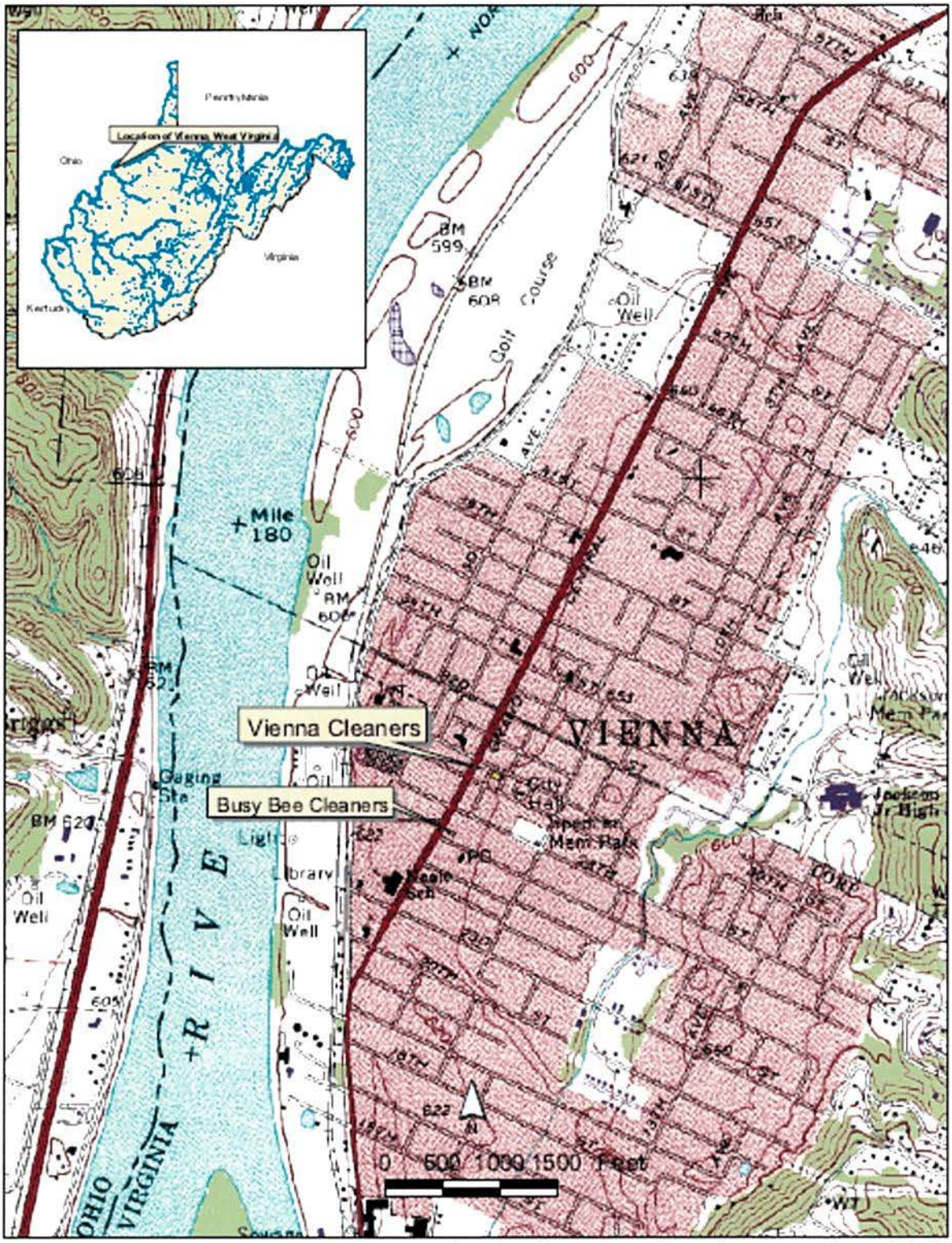
Site Background

The Site is located in Wood County, West Virginia within the city of Vienna (see Figure 1). The city of Parkersburg is immediately south of Vienna. Vienna, a residential, industrial, and commercial community is approximately three-square miles in area. The Site is on the eastern bank of the Ohio River, which flows southwards in the vicinity of the Site.

The Site consists of areas affected by two confirmed, separate and distinct sources of Tetrachloroethene (PCE) (Vienna Cleaners and Busy Bee Cleaners), as well as a suspected third source which has not been confirmed via delineation sampling (see Figure 2). Vienna Cleaners started operating in the late 1940s and ceased operations in the mid 1990's. It was located at the intersection of 30th Street and 5th Avenue, approximately two blocks west of City Hall. Busy Bee Cleaners operated from the 1960s to the early 2000s. It was located at the intersection of 27th Street and Grand Central Avenue. The third source, a suspected former dry-cleaning facility, which could not be substantiated in county records, was reportedly located along 29th street, between Grand Central Avenue and 3rd Avenue. The surrounding area consists of single-family dwellings and private businesses. The former Johns Manville industrial facility is downgradient of the Site, adjacent to the River.

Groundwater below the city of Vienna is the primary drinking water supply for the municipality. The shallowest aquifer in the Vienna area is the Ohio River alluvium aquifer. Groundwater in the aquifer is derived from infiltration of precipitation and river water. There is hydraulic connectivity between the river and the abutting alluvial strata. The water table fluctuations correspond with changes in the river stage. In the site area, the water table is approximately 50 feet below ground surface (bgs) adjacent and east of the Ohio River. The aquifer is unconfined and highly transmissive.

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: Detailed Site Map

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Appendix A provides a list of additional Site resources. Appendix B provides the Site's chronology of events.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Vienna Tetrachloroethene		
EPA ID: WVD988798401		
Region: 3	**State:** WV	**City/County:** Vienna / Wood
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Chris Vallone		
Author affiliation: EPA Region 3		
Review period: 4/25/2019 - 12/20/2019		
Date of site inspection: 5/15/2019		
Type of review: Policy		
Review number: 3		
Triggering action date: 12/22/2014		
Due date ***(five years after triggering action date)***: 12/22/2019		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

PCE, a dry-cleaning solvent, was detected in four of twelve Vienna municipal drinking water production wells - PW-V1, PW-V2, PW-V3 and PW-V4 in 1992. The Vienna Cleaners and Busy Bee Cleaners were identified as the probable sources of the groundwater contamination. The city of Vienna sampled for and detected PCE at high levels in surface and subsurface soils at Vienna Cleaners, in groundwater beneath the facility, and in city sewers in the immediate vicinity of Vienna Cleaners. Lower, but significant concentrations of PCE were detected in the groundwater near Busy Bee Cleaners.

In 1992, the four affected production wells were shut down and two others appeared to be threatened by the unchecked movement of the PCE plume. EPA, using removal authorities, constructed two new replacement municipal wells in 1993 after the contaminated wells were shut down. EPA proposed the Site for listing on the Superfund Program's National Priorities List (NPL) on April 23, 1999 and finalized the Site on the NPL on October 22, 1999.

Sampling conducted during the Site's remedial investigation (RI) identified a PCE groundwater plume extending from the source area near Vienna Cleaners to the northwest. A less extensive plume associated with the Busy Bee Cleaners source area was also identified. A total of 37 groundwater wells were installed at shallow, intermediate, and deep intervals, as part of the investigation of the extent of the groundwater impacts. Shallow wells were typically set at 60 to 65 feet bgs, intermediate wells at 80 feet bgs and deep wells at 90 feet bgs.

A human health risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environment effects from exposure to contaminants associated with the Site. The risk assessment identified exposure of future residents to groundwater through ingestion, inhalation, and dermal contact as the potential exposure pathway of concern. Three chemicals were identified as contributing to overall groundwater risks and are the Chemicals of Concern (COCs). Please see Table 1 for a list of COCs.

Table 1: Contaminants of Concern

Medium	Contaminants
Groundwater	Trichloroethene (TCE) Tetrachloroethene (PCE) 1,2-Dichloroethane (1,2-DCA)
Soil	PCE
Notes: Source: EPA's 2002 Record of Decision	

Response Actions

In 2000, the EPA removal program designed a pilot Unterdruck Verdampfer Brunnen (UVB) system to remove subsurface contamination using a single air sparge/soil vapor extraction (AS/SVE) well. UVB, German for Vacuum Vaporizing Well, is an in-situ groundwater remediation technology that combines air-lift pumping and air stripping to clean aquifers contaminated with volatile compounds. The system was located in a small building adjacent to Vienna Cleaners and began removing contamination from an approximately 1,500 square foot area of soil in March 2001.

EPA issued a Record of Decision (ROD) for the Site in September 2002. The ROD identifies Remedial Action Objectives (RAOs) for the Site as follows:

1. Reduce concentrations of COCs in groundwater to levels that result in less than or equal to a 1×10^{-5} cumulative excess cancer risk and a Hazard Index less than 1.0 and achieve drinking water standards (maximum contaminant levels, MCLs). Successfully achieving the cumulative excess cancer risk goal will result in concentrations for each COC decreasing at least to its respective MCL of 5 micrograms per liter (µg/L).
2. Prevent/minimize human exposures, including ingestion, inhalation and dermal contact, by current and future residents and industrial workers to contaminated groundwater.
3. Minimize the migration of contaminated groundwater into the Ohio River through treatment to achieve risk-based levels identified in RAO 1 above.

The remedy selected in the Site's 2002 ROD included:

1. Implementation of an in-situ AS/SVE system to reduce groundwater concentrations of COCs to risk-based
   drinking water levels.
2. Continued operation of the UVB system to reduce concentrations of PCE in soils to the point where soils no longer contribute contamination to the groundwater at levels above the MCL of 5 µg/L.
3. Implementation of institutional controls (zoning restrictions, county ordinances or local ordinances) to ensure that no one uses the groundwater for potable or hygienic uses such as drinking, bathing or cooking until cleanup levels are achieved.

Status of Implementation

The soil component of the remedy was initially addressed by the pilot UVB system installed by EPA's Removal Program. The UVB system began removing subsurface soil contamination in the area of the Vienna Cleaners facility in 2001. EPA's Removal Program reconfigured the system in June 2004 with the addition of a groundwater air stripping well at the UVB well location and the addition of two soil vapor circulation wells. The purpose of this was to incorporate the UVB system into the overall remedial action of AS/SVE at the Site. Operation of the EPA Removal Program's pilot UVB system ceased in 2005 and the remedial action began.

The remedy consists of three discrete in-situ AS/SVE treatment units (TUs). Currently, there are two active treatment systems (TU-1 and TU-3), and one idle treatment system (TU-2). A fourth treatment unit (TU-4), was decommissioned in 2009. EPA completed construction of the TUs and began operation in July 2005. Below outlines the three active TUs and one former TU and their relationship to the Site. See Figure 3 below for an overall layout of the TUs.

Vienna Cleaners Source Area – TU-1

This area is located east of Grand Central Avenue. The objective of TU-1 is to remove the highest percentage of the contaminant mass located under and near the Vienna Cleaners building and to minimize further migration away from this source area. TU-1 consists of 23 AS wells and nine SVE wells, including the two existing SVE wells previously installed by the EPA Removal Program. The AS/SVE process equipment includes two air compressors, an AS well manifold header to distribute the pressurized air to the sparge wells, an SVE well manifold header to collect the vapors, an air/water separator to remove water from the extracted vapors, an SVE blower, and two vapor phase granular activated carbon (VPGAC) units operating in series to remove contaminants from the extracted vapor prior to discharge to the atmosphere through an exhaust stack. The equipment is housed in a metal building on the Vienna Cleaners property.

Vienna Well Protection Area – TU-2

This area is located directly southeast of the City of Vienna's production wells PW-V7 and PW-V8. The objective of TU-2 is to provide a sparge curtain on the downgradient edge of the Vienna Cleaners plume to protect the city of Vienna's drinking water production wells PW-V7 and PW-V8. TU-2 consists of an AS system, with 15 AS wells located perpendicular to the plume gradient along River Road and 32nd Street. Given the low levels of contaminant expected to migrate into this area, no SVE is required, as there would be very little contaminant mass present to be captured in the vapor phase. The air compressor and AS well manifold header are located in a metal treatment building on the west side of River Road near PW-V7 and PW-V8. TU-2 has never operated and is currently on stand-by status in case the plume migrates towards the supply wells. The TU is turned on periodically to ensure it remains functional and ready for operation.

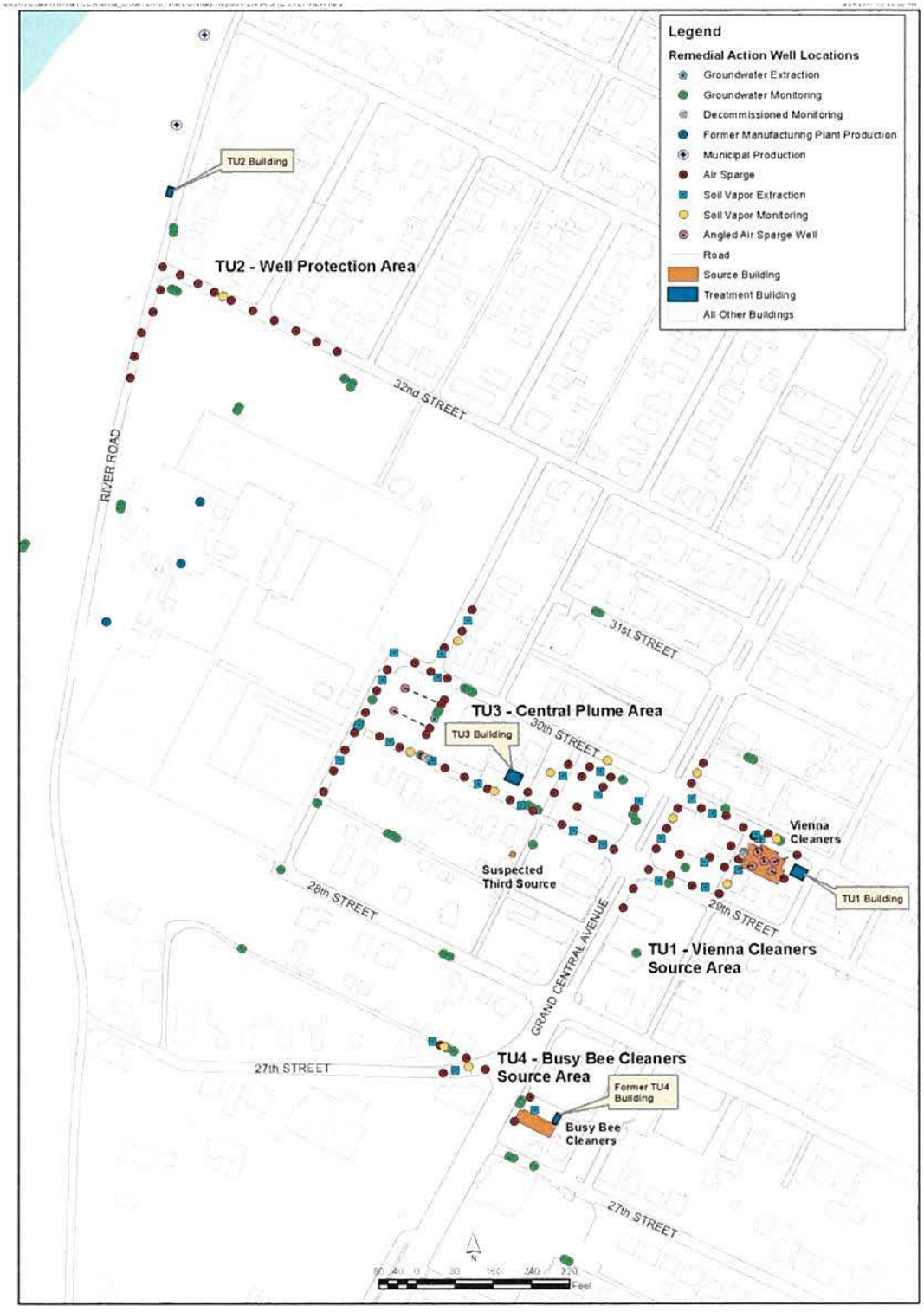
Vienna Cleaners Central Plume Area – TU-3

This area is located west of Grand Central Avenue, downgradient of the Vienna Cleaners source area. The objective of TU-3 is to address the high levels of contaminant mass in the central portion of the Vienna Cleaners plume. TU-3 consists of AS, SVE, and hydraulic control systems, with 37 AS wells, 17 SVE wells, and one groundwater extraction well (EW-1) for hydraulic control. A sparge curtain was installed on 3rd Avenue to intercept the groundwater plume before it migrates under the former manufacturing facility. The TU-3 AS/SVE process equipment includes two air compressors, an AS well manifold header, an SVE well manifold header, an air/water separator, an SVE blower, two VPGAC units operating in parallel, and an exhaust stack. TU-3 also contains the treatment system to treat groundwater extracted from EW-1. Groundwater pumped from the hydraulic control well (EW-1) passes through a treatment train consisting of bag filters and two VPGAC units in series. Treated groundwater is discharged to the City storm drain system adjacent to the treatment building that drains to the west and empties into the Ohio River. The metal treatment building is located on the north side of 29th Street, west of the church parking lot.

Busy Bee Cleaners Area – TU-4 (Decommissioned; no longer present)

This area is located adjacent to the Busy Bee Cleaners building and along 27th Street. The objective of TU-4 was to address the Busy Bee Cleaners plume, which is separate from the Vienna Cleaners plume. TU-4 consisted of AS and SVE systems, with six AS wells and three SVE wells. The process equipment included an air compressor, an AS well manifold header, an SVE well manifold header, an air/water separator, an SVE blower, two VPGAC units operating in series, and an exhaust stack. The unit was decommissioned and relocated to the Ravenswood PCE Superfund Site in 2009 because the concentrations of COCs at Busy Bee Cleaners plume had largely decreased.

Figure 3: Overall Layout of Treatment Units



EPA completed the Final Long-Term Response Action (LTRA) Summary Report on May 31, 2017 and turned operation and maintenance (O&M) of the remedy over to the WVDEP. Prior to WVDEP assuming the O&M requirements of the remedy, EPA conducted an In-Situ Chemical Oxidation (ISCO) pilot study in 2016. The pilot study was to evaluate the effectiveness of potassium permanganate as a treatment of the Site's groundwater plume and the potential acceleration of PCE mass removal to reduce operation costs. Recent groundwater data from this pilot area suggests that the potassium permanganate is effectively treating the PCE. PCE concentrations have been decreasing since the injection in 2016.

Institutional Control (IC) Review

On May 14, 2015, the city of Vienna signed an ordinance restricting the use of groundwater in Vienna. The ordinance bans the construction, digging, or drilling of any groundwater wells within the city of Vienna. This document can be reviewed as part of Appendix C. Table 2 below summarizes the institutional control restricting use of groundwater.

Table 2: Summary of Institutional Controls (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 Parcels	IC Objective	Title of IC Instrument Implemented and Date
Groundwater	Yes	Yes	City of Vienna, Wood County	Restrict use of groundwater until cleanup levels are achieved.	05/14/2015 - Ordinance banning the construction, digging or drilling of groundwater wells within the city of Vienna.

Systems Operations/Operation and Maintenance (O&M)

CDM Smith (EPA's O&M Contractor) operated and maintained the Vienna treatment system for EPA from system start up in July 2005 until the turnover of O&M of remedy to WVDEP in May 2017. In 2016, repairs were made to TU-1 and TU-3 systems due to normal wear and tear. The repairs included replacing inlet valves, outlet temperature sensors, air compressor fans, as well as reconditioning the compressor motors. WVDEP, through a WV state contract, retained the services of KEMRON Environmental Services, Inc. (KEMRON) to continue O&M activities. These activities include biannual groundwater sampling and overall system performance monitoring for the remedy at the Site.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This section includes the protectiveness determinations and statements from the previous FYR.

Table 3: Protectiveness Determinations/Statements from the 2014 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective[1]	The remedy protects human health and the environment in the short-term because there are no current exposures to soil or groundwater contamination. However, there are several actions which are required to address issues that have been identified during this Five-Year Review: 1) Institutional Controls for groundwater are not in place. 2) A change in the groundwater plume configuration has been detected. An investigation will be conducted to determine the cause of this change in plume configuration and whether the plume will migrate beyond the range of the remediation system. The investigation will include, at a minimum, a capture zone analysis and additional monitoring points. 3) Vapor Intrusion sampling conducted in 2014 indicates there are no current exposures to site related contamination. However, follow-up sampling is necessary to confirm these findings. 4) Treatment Unit #4 was shut down and removed from the Site in 2009 because the MCLs were achieved in this location. However, continued monitoring indicates some rebounding of PCE. This area should be evaluated for feasibility of using an in-situ treatment technology to address the residual PCE that has been detected. Long-term protectiveness will be achieved when the above issues are addressed, and groundwater cleanup levels are achieved.

[1] There was disagreement between the protectiveness statement in the 2014 Five-Year Review which correctly stated that the remedy was protective in the short term and the protectiveness determination that indicated that protectiveness was being deferred. Consistent with the text of the whole 2014 report and the protectiveness statement, the protectiveness determination from the 2014 report is reported here as "short-term protective."

Table 4 below summarizes the Site issues identified in the 2014 FYR Report at that time.

Table 4: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description*	Completion Date (if applicable)
1	Institutional controls are not in place to restrict exposure to contaminated groundwater.	Finalize groundwater institutional controls.	Completed	EPA and WVDEP worked with the city of Vienna to issue an ordinance banning the construction, digging, or drilling of groundwater wells within the city of Vienna.	5/14/2015
1	The Vienna Cleaners plume has increased in size and it appears the groundwater direction has shifted.	Conduct an investigation to determine the cause of change in plume configuration and whether the plume will migrate beyond the range of the system. The investigation will include, at a minimum, a capture zone analysis and additional monitoring points to evaluate and determine causes of changes in plume configuration.	Completed	EPA completed an optimization study in November 2017. The report recommends additional PCE source characterization, source treatment, and improving the monitoring network. EPA is currently working with WVDEP on implementing recommendations from the report, as appropriate.	11/1/2017
1	Vapor intrusion is still a potential issue at the Site	Continue to evaluate the potential for vapor intrusion.	Completed	At the end of the 2014 Vapor Intrusion study, EPA found that there were no current exposures to Site related contamination and the Site was protective. The data collected from this FYR period indicates decreasing PCE concentrations in the groundwater plume previously monitored for VI. The Site remains protective however, the groundwater plume is migrating and could pose a Vapor Intrusion issue to properties that were not previously evaluated. EPA will continue to monitor the plume direction and groundwater concentrations.	4/8/2015
1	PCE in the Vicinity of TU4 has rebounded.	Conduct a treatability study to determine if an in-situ technology would be effective in reducing residual PCE contamination.	Completed	CDM Smith conducted injection activities as part of an ISCO pilot study to evaluate the effectiveness of potassium permanganate for treatment of impacted groundwater, and to ultimately accelerate PCE mass removal to reduce O&M costs	9/29/2016

				at the Site. Recent groundwater data from this pilot area suggests that the potassium permanganate may be effectively treating the PCE. PCE concentrations have been decreasing since the injection in 2016.	
1	There appears to be an outdoor source of PCE.	Ensure PCE concentrations are not due to the SVE System.	Completed	The 2014 VI study indicated PCE concentrations exceeding standards in ambient air samples near TU-3. In 2015, follow-up VI samples were collected and did not detect PCE. There does not appear to be outdoor source of PCE.	4/8/2015

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was placed in the *Parkersburg News & Sentinel* newspaper in August 2019 (see Appendix D). It stated that the FYR was underway and invited the public to submit any comments to EPA. No comments were received in response to the public notice.

During the period of June 7 to June 10, 2019, the CIC, Meg Keegan, conducted five interviews in-person and over the telephone to document any perceived concerns or successes with the remedy that has been implemented to date. The CIC interviewed residents and government officials, including the Mayor of Vienna, concerning their knowledge and perceptions of the EPA's activities at the Site. Sample questions from the interviews can be found in Appendix E. The interviews are summarized below.

Interview responses indicated an overall positive impression of the cleanup activities, noting that EPA's activities have improved the community. Respondents noted that relative to other environmental issues faced by the community, the Site is less concerning to the community. Respondents also indicated that the Site has had minimal effect on the surrounding community, aside from the groundwater ordinance that was implemented in 2015. Most respondents indicated a lack of regular information about the cleanup progress and status of the Site, and local government officials suggested that a factsheet mailing or an annual update to the Vienna City Council could assist in keeping the community informed. The CIC visited the designated site repository at the Vienna Public Library (VPL) located at 2300 River Road on June 7, 2019 and found that the repository was incomplete. EPA coordinated with the VPL to restore a complete repository of information in July 2019. EPA will make the final FYR Report available to the public at the local repository at the VPL and through the online Site Profile Page at https://www.epa.gov/superfund/vienna.

Data Review

Groundwater:

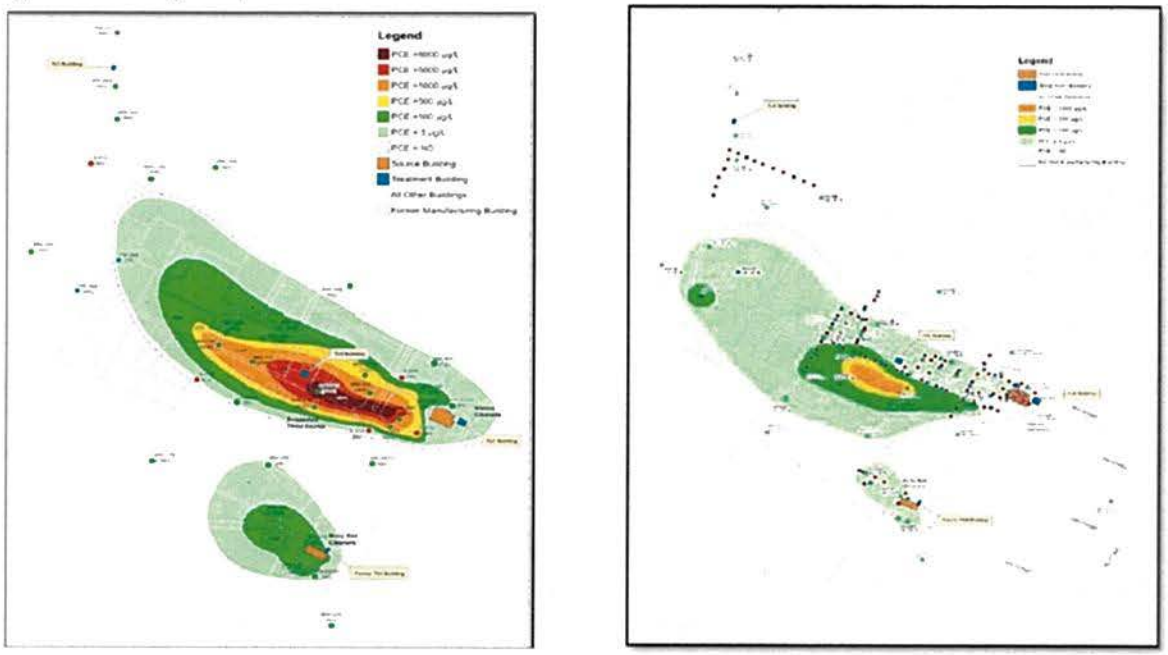
EPA completed the LTRA summary report on May 31, 2017. This report presents a summary of the LTRA activities conducted at the Site and includes groundwater data during the period of this FYR, from 2014 through 2016. The Site O&M activities were turned over to the WVDEP in 2017 which includes conducting environmental monitoring on a biannual basis. Groundwater data after 2016 is included in WVDEP's O&M and groundwater monitoring reports.

Groundwater monitoring data from this FYR period indicate significant decreases in PCE concentrations along and north of 29th street in the vicinity of TU-1. The TU-3 system continues to capture areas of highest PCE concentrations; however, concentrations from the November 2018 sampling event are elevated in the furthest downgradient monitoring wells indicating that the groundwater plume may be migrating to the northwest.

Additional monitoring wells are needed in this area to delineate the plume northwest, west and downgradient of TU-3, and to assess the performance of the TU-3 remedial system. Vienna's Municipal wells PW-V7 & PW-V8 are anticipated to be turned on in September 2019[2]. Continued monitoring will be evaluated to determine if these municipal wells are migrating the groundwater contaminated plume. TU-2 may have to be activated if contamination threatens city of Vienna production wells.

Figure 4 below shows a comparison of PCE concentrations in shallow groundwater in 2005 (left), at the time of startup of the full-scale cleanup system, with PCE concentrations in shallow groundwater in 2016 (right). The figure shows the Busy Bee Cleaners plume (TU-4) in the south is diminishing in concentration and size. The Vienna Cleaners plume is generally stable on the north portion of the plume (TU-1) while migrating west along the southern portion of the plume (TU-3).

Figure 4: Comparison of PCE Plumes in the Shallow Groundwater[1]



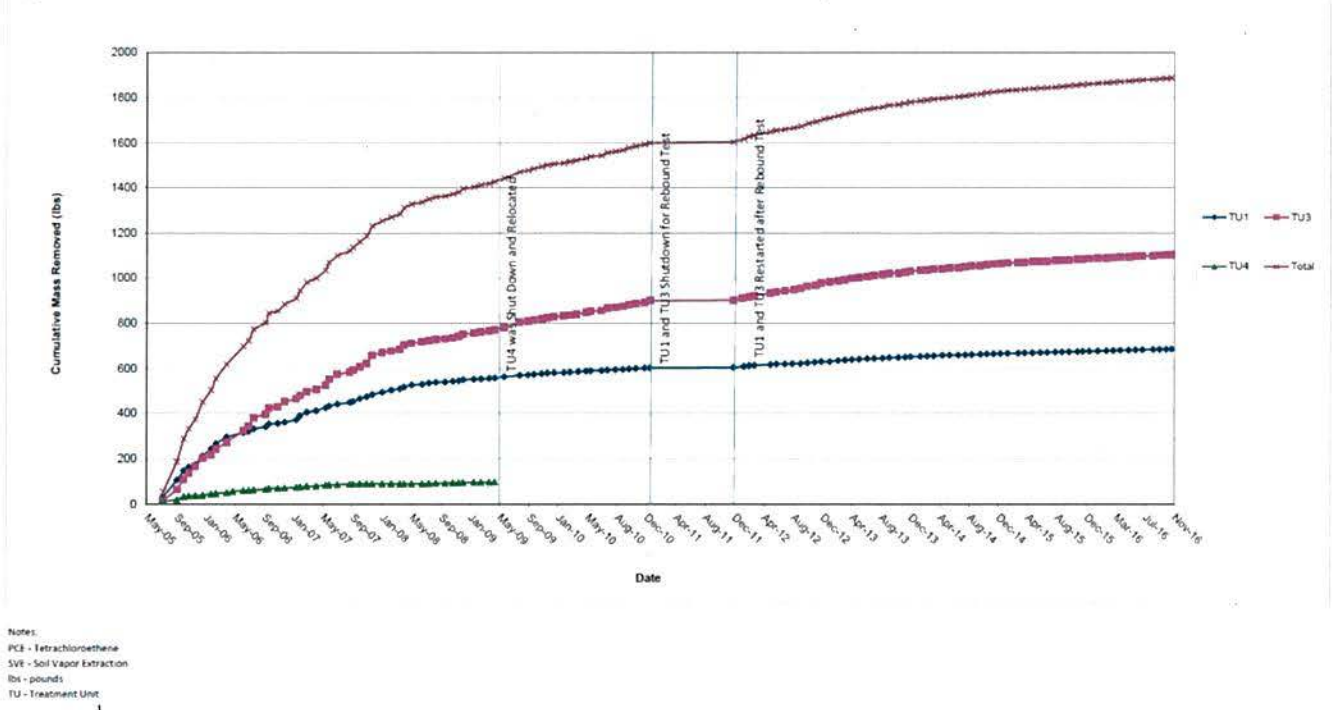
PCE in Shallow Groundwater July 2005 **PCE in Shallow Groundwater August 2016**

[1] From Final Long-Term Response Action Summary Report, Vienna PCE Superfund Site, Vienna, West Virginia, CDM Smith, May 31, 2017

Figure 5 below shows the cumulative PCE mass that was removed from all of the TUs at the Site from startup in 2005 to 2016. The graph shows an increase in PCE mass removed, indicating that the TUs have been effective in mass removal overtime. Appendix H includes time series graphs which highlights the historical decreasing PCE concentrations of individual monitoring wells over time. Appendix I includes the most groundwater data collected from the Site between 2017 and 2018.

[2] Vienna Municipal water supply wells have been impacted by an area wide contaminant source, which is not related to the Vienna TCE Superfund Site. Carbon treatment units have been added to the Vienna Municipal water system, to address this non-Site related contaminant. The carbon treatment units effectively remove the contaminant from the Municipal water supply prior to distribution.

Figure 5: Cumulative PCE Mass Removal – Groundwater -SVE Systems[1]



Notes:
PCE - Tetrachloroethene
SVE - Soil Vapor Extraction
lbs - pounds
TU - Treatment Unit

[1] From Final Long-Term Response Action Summary Report, Vienna PCE Superfund Site, Vienna, West Virginia, CDM Smith, May 31, 2017

Vapor Intrusion:

EPA completed a VI study on April 30, 2014 to determine whether volatile organic compounds (VOCs) were present in the sub-slab vapor and indoor air at structures near the Site's groundwater plumes. The VI sampling program consisted of the collection a total of 88 of sub-slab vapor, indoor air, and ambient (outdoor) air samples at 11 residential properties, six existing vapor monitoring points associated with the treatment system, nine SVE wells and one day care facility located above the Site groundwater plume. EPA used the investigation data to evaluate whether VI poses a threat to human health. The 2014 FYR summarizes the details of VI sampling and recommendations. Additional VI sampling at Property 18 was recommended to confirm if the elevated levels of PCE in the kitchen of this home is from an indoor source or VI from the groundwater plume. The follow-up sampling was conducted in 2015 at Property 18 and the results indicated that PCE was not detected in the samples collected. PCE was also not detected in the ambient air samples collected that were elevated during the 2014 VI study. EPA determined that the VI sampling results from the 2014 study and the 2015 follow-up sampling did not indicate a risk to human health due to PCE vapor concentrations which required action. Based on the evaluation of recent groundwater data showing an overall decrease in PCE concentrations, the Site remains protective with regard to VI.

Site Inspection

The Site inspection took place on 5/15/2019. Participants included EPA RPMs Chris Vallone, Anthony Iacobone, and Evelyn Sorto, EPA Hydrogeologist Mark Leipert, WVDEP representatives William Huggins, Jason McDougal, Rob Rice, Casey Korbini, and Kemron Environmental representatives Chris Hedrick and Chris Amick. The purpose of this inspection was to assess the protectiveness of the remedy. Appendix F provides the completed Site inspection checklist. Appendix G provides photographs from the FYR site inspection.

Site inspection participants met at the TU-3 building. Participants toured the TU (i.e., the sparge well piping, SVE piping, carbon filters, the extraction unit and the control center). After the inspection of TU-3, participants walked to TU-2. On the way, participants observed MWs and AS wells that are part of the system. All wells that were installed as part of the remedy and monitoring network are all flush mounted and locked. Labels are located inside the well. At TU-2, there was discussion that the municipal production wells PW-V7 and PW-V8, which are located near this TU-2 building, are scheduled to be turned on in September 2019. Continued biannual monitoring in this area will be important to see if the plume is migrating towards these wells and determine if TU-2 needs to be activated. TU-2 is not in use but is maintained and able to operate in case contaminants threaten these wells. After this discussion, the participants observed more monitoring and AS wells and toured the TU-1 building. The buildings are locked, and vandalism has not been an issue at the Site. The remedy is well maintained and appears to be functioning as intended. No issues were observed with any of the treatment units.

V. TECHNICAL ASSESSMENT

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

Yes, the remedy is functioning as intended by the Site's 2002 ROD. The 2002 ROD included an RAO of reduction of PCE in soils to the point where soils no longer contribute contamination to the groundwater at levels above the MCL of 5 ug/L. A UVB System was initially operating to reduce soil concentrations at the Site. The UVB system was reconfigured in June 2004 to be incorporated in the overall remedial action of AS/SVE at the TUs which continue to remove PCE from both soil and groundwater. TU-3 maintains the historic gradient of the contaminated groundwater plume.

The remedy is in-situ AS/SVE. It originally consisted of four discrete TUs. Two of the TUs are currently operational. TU-2, the third remaining treatment unit, will be activated if contamination from the Site threatens the City of Vienna production wells. TU-4 was shut down in April 2009 and taken out of service (decommissioned and relocated to another NPL site) when MCLs were achieved at this location. Increasing PCE concentrations were initially observed after TU-4 was removed. As part of the ISCO study, injections of potassium permanganate oxidant were performed in the TU-4 area. Recent groundwater data from this pilot area suggests that the potassium permanganate is effectively treating the PCE at the pilot area. PCE concentrations have been decreasing since the injection in 2016, and monitoring is ongoing.

Groundwater contaminant concentrations in the most contaminated areas of the plume are mostly decreasing, concentrations from the November 2018 sampling event are elevated in the furthest downgradient monitoring wells indicating that the groundwater plume may be migrating. Additional monitoring wells are needed in this area to delineate the plume northwest, west and downgradient of TU-3, and to assess the performance of the TU-3 remedial system.

ICs are required by the 2002 ROD to restrict the use of groundwater. EPA, WVDEP, the city of Vienna, and Wood County worked together and put in place an ordinance to restrict drinking water use in May 2015. There are no known current exposure pathways to impacted groundwater.

The remedial action is working to achieve cleanup levels and an optimization study of the groundwater remedy was completed in 2017. The optimization study recommended installing additional wells to assess the performance of TU-3.

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

Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy for the Site are still valid. The 2002 ROD selected MCLs as the cleanup goals in groundwater; the MCL for each of the three COCs has not changed since the time of remedy selection. There have been no recent changes in land use or exposure pathways. An evaluation of vapor intrusion was completed in 2014 and 2015 to determine whether VOCs were present in the sub-slab vapor and indoor air at structures near the Site's groundwater plumes. EPA determined that VI did not present a risk to human health due to PCE vapor concentrations which required action. Based on the evaluation of recent groundwater data showing decrease in PCE concentrations, the Site remains protective for VI.

Recent data suggests the groundwater plume is migrating toward the northwest. Per the existing ROD, TU-2 may have to be activated if contamination threatens city of Vienna production wells. Continued monitoring in this area will be important to see if the plume is migrating towards the Vienna Municipal wells PW-V7 & PW-V8.

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 and Recommendations Identified in the Five-Year Review:

OU: 1	Issue Category: Monitoring			
	Issue: The PCE plume is not well delineated west and downgradient from TU-3, northwest and west of the former Johns Manville facility. The lack of groundwater concentration data in this area limits assessment of the performance of the TU-3 remedial system.			
	Recommendation: Install additional plume delineation wells to quantify the area of groundwater exceeding remedial cleanup levels.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	12/31/2020

OTHER FINDINGS

In addition, the following concern was identified during the FYR. This concern does not affect current or future protectiveness.

- Vienna's Municipal wells PW-V7 & PW-V8 are anticipated to be turned on in September 2019. Per the existing ROD, TU-2 may have to be activated if contamination threatens city of Vienna production wells. Continued monitoring will be evaluated to determine if these municipal wells are migrating the groundwater contaminated plume.
- EPA will evaluate future groundwater data to monitor plume concentrations to determine if additional VI sampling is warranted.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement	
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy protects human health and the environment, in the short term, because there are no current exposures to soil or groundwater contamination. The city of Vienna has an ordinance in place, which bans the construction, digging, or drilling of groundwater wells within the City limits. In order to achieve long-term protectiveness, the following actions need to be taken: 1) Install additional plume delineation wells to quantify the area of groundwater exceeding remedial clean up levels.	

VIII. NEXT REVIEW

The next FYR Report for the Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Record of Decision: Vienna Tetrachloroethene OU-1. EPA. September 27, 2002

Remediation System Operation and Maintenance (O&M) and Groundwater Monitoring Report, Second Half 2018, WVDEP Vienna PCE Superfund Site, Vienna, West Virginia, KEMRON, March 1, 2019

Remediation System Operation and Maintenance (O&M) and Groundwater Monitoring Report, First Half 2018, WVDEP Vienna PCE Superfund Site, Vienna, West Virginia, KEMRON, November 30, 2018

Optimization Review Report, Long-Term Response Action Optimization Study. Vienna Tetrachloroethene Site, Vienna, Wood County, West Virginia, EPA. November 2017

Final Long-Term Response Action Summary Report, Vienna PCE Superfund Site, WV. CDM Smith, May 31, 2017

Annual Operation and Maintenance (O&M) and Monitoring Report 2015, Vienna PCE Superfund Site, Vienna, WV, CDM Smith, June 30, 2016

ISCO Optimization Study Summary Report, Vienna PCE Superfund Site, Vienna, WV, CDM Smith, April 21, 2017

Second Five-Year Review Report for Vienna Tetrachloroethene Superfund Site, Wood County, West Virginia. EPA Region 3. December 22, 2014

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Tetrachloroethene (PCE) detected in Vienna Municipal drinking water production wells; municipal production wells PW-V1 through PW-V4	1992
EPA discovered the Site.	September 9, 1992
EPA began removal action (construction of two new wells for municipal water).	May 5, 1993
EPA began site inspection	June 7, 1994
EPA completed site inspection	June 27, 1994
EPA proposed site for listing on the National Priorities List (NPL)	April 23, 1999
EPA began remedial investigation and feasibility study	August 10, 1999
EPA listed site on NPL	October 22, 1999
EPA completed remedial investigation and feasibility study. EPA signed Record of Decision (ROD)	September 27, 2002
EPA began remedial design	January 14, 2003
EPA completed remedial design	May 13, 2004
EPA began remedial action	July 7, 2004
EPA completed removal action of pilot Unterdruck Verdampfer Brunnen	March 24, 2005
EPA completed remedial action and prepared Preliminary Close-Out Report	August 23, 2005
EPA began long-term response action	August 23, 2006
EPA completed first FYR	December 22, 2009
EPA completed Vapor Intrusion Investigation Report	April 30, 2014
EPA completed second FYR	December 22, 2014
EPA ISCO Optimization Study Summary Report	April 21, 2017
EPA completed long-term response action and transfer O&M responsibilities to WVDEP	May 31, 2017
Optimization Review Final Report	November 2017

APPENDIX C – May 14, 2015 CITY OF VIENNA ORDINANCE

O-04-15

City of Vienna

ORDINANCE BANNING THE CONSTRUCTION, DIGGING, OR DRILLING OF GROUND WATER WELLS WITHIN THE CITY OF VIENNA

BE IT ORDAINED BY THE COMMON COUNCIL OF THE CITY OF VIENNA, and

WHEREAS in order to promote the health, safety, and general welfare of the public by protecting the integrity of the groundwater remedial action installed by the U.S. Environmental Protection Agency (EPA), the EPA has directed the City of Vienna to prohibit the drilling of groundwater wells within the City, and

WHEREAS the Vienna City Council, in order to remain compliant with the directive issued by the U.S. Environmental Protection Agency, hereby ORDAINS as follows:

Section 1 - Definitions

1. **Ground water well** is hereby defined as:
    a. Any well that is dug or drilled- either by hand or machine or otherwise constructed that makes groundwater accessible.

Section 2 – Prohibition

1. No ground water well which may be used for drinking water may be drilled, dug – either by hand or by machine, or otherwise constructed within the boundaries of the City of Vienna.

Section 3 – Penalty

1. Any person, firm, corporation or other entity which shall construct or attempt to construct a ground water well within the City of Vienna shall be fined $100.00 for each day that said well, constructed or attempted to be constructed, remains accessible to or by any person, entity, firm, or corporation.
2. Citations may be issued by either the Vienna City Police, the City Building Inspector or the Code Enforcement Officer.

3. This Ordinance shall go into effect 30 days after its passage.

Section 4 – Exceptions

1. The Government of the United States, the State of West Virginia and the City of Vienna and any of its political subdivisions including the Vienna Utility Board, are hereby exempt from the provisions of this ordinance.

Dated this 14th day of May, 2015

Randall C. Rapp

Randall C. Rapp, Mayor

ATTEST:

Cathy Smith

Cathy Smith, Recorder

04/23/15 1st Reading

05/14/15 2nd Reading

APPENDIX D – PRESS NOTICE

EPA PUBLIC NOTICE

EPA REVIEWS CLEANUP
VIENNA PCE SUPERFUND SITE

The U.S. Environmental Protection Agency (EPA) is reviewing the cleanup that was conducted at the Vienna Tetrachloroethene (PCE) Superfund Site located in Vienna, West Virginia. EPA inspects sites regularly to ensure that cleanups conducted protect public health and the environment. EPA's 2014 review of the Site concluded that the cleanup was protective in the short-term. Findings from the current review will be available in December 2019.

To access detailed site information, including the review report once finalized, visit: https://www.epa.gov/superfund/vienna

For questions or to provide site-related information for the review, contact:
Meg Keegan, EPA Community Involvement Coordinator
215-814-5494 or keegan.megan@epa.gov

APPENDIX E – INTERVIEW FORMS

VIENNA PCE SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Vienna PCE	
EPA ID:	
Interviewer name:	**Interviewer affiliation:**
Subject name:	**Subject affiliation:**
Subject contact information:	
Interview date:	**Interview time:**
Interview location:	
Interview format (circle one): In Person Phone Mail Email Other:	
Interview category: Resident	

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

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

3. Were you involved with or had an opinion concerning how the cleanup was decided and implemented?

4. What have been the effects of this Site on the surrounding community, if any?

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

6. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

7. Do you feel well informed about EPA's activities and progress? How can EPA best provide site-related information in the future?

8. What extent of community involvement do you wish to have during the future work at the site?

9. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

APPENDIX F – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Vienna Tetrachloroethene	**Date of Inspection: 5/15/2019**
Location and Region: Vienna, WV; Region 3	**EPA ID:** WVD988798401
Agency, Office or Company Leading the Five-Year Review: EPA Region 3	**Weather/Temperature:** Low 70s, Partly Sunny

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: In-situ AS/SVE
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

4.	**Other Interviews** (optional) ☐ Report attached:				
	III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)				
1.	**O&M Documents**				
	☐ O&M manual	☒ Readily available	☒ Up to date	☐ N/A	
	☐ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A	
	☐ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A	
	Remarks: _____				
2.	**Site-Specific Health and Safety Plan**	☒ Readily available	☐ Up to date	☐ N/A	
	☐ Contingency plan/emergency response plan	☒ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
3.	**O&M and OSHA Training Records**	☒ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
4.	**Permits and Service Agreements**				
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Effluent discharge	☒ Readily available	☐ Up to date	☐ N/A	
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
7.	**Groundwater Monitoring Records**	☒ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
8.	**Leachate Extraction Records**	☒ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
9.	**Discharge Compliance Records**				
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A	
	☒ Water (effluent)	☒ Readily available	☒ Up to date	☒ N/A	
	Remarks: _____				
10.	**Daily Access/Security Logs**	☒ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☒ Contractor for state

☐ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: _____

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): EPA site visits

Frequency: at least every five years

Responsible party/agency: EPA

Contact	Christopher Vallone	remedial project manager	5/15/2019	215-814-3306
	Name	Title	Date	Phone no.

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: _____

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☒ N/A

Remarks: _____

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads Damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths: _____ Widths: Depths: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Area extent: _____ Depth: _____
   Remarks: _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Area extent: _____ Depth: _____
   Remarks: _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/shrubs (indicate size and locations on a diagram)
   Remarks: _____

6. **Alternative Cover** (e.g., armored rock, concrete) ☐ N/A
   Remarks:

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Area extent: _____ Height: _____
   Remarks: _____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident

   ☐ Wet areas ☐ Location shown on site map Area extent: _____
   ☐ Ponding ☐ Location shown on site map Area extent: _____
   ☐ Seeps ☐ Location shown on site map Area extent: _____
   ☐ Soft subgrade ☐ Location shown on site map Area extent: _____
   Remarks: _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map
   ☒ No evidence of slope instability
   Area extent: _____
   Remarks: _____

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
   Remarks: _____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
   Remarks: _____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
   Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
   Material type:_____ Area extent: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
   Area extent: _____ Depth: _____
   Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
   Area extent: _____ Depth: _____
   Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
   ☐ Location shown on site map Area extent: _____
   Size: _____
   Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Area extent: _____
   Remarks: _____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

4. **Extraction Wells Leachate**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
   Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs maintenance
   Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs maintenance
   Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs maintenance ☐ N/A
   Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A
   ☐ Siltation not evident
   Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____
   ☐ Erosion not evident
   Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement: _____ Vertical displacement: _____
   Rotational displacement: _____
   Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Area extent: _____ Type: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Area extent: _____ Depth: _____
   Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Performance Monitoring** Type of monitoring: _____

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A (ROD net yet issued for groundwater)

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☒ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☒ Air stripping ☒ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☒ Good condition ☐ Needs maintenance

☒ Sampling ports properly marked and functional

☒ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☒ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☒ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☐ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

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).

The SVE remedy, along with hydraulic control and a sparge curtain, is designed to contain the plume and decrease concentrations of PCE. The remedy is effectively functioning as intended.

EPA and WVDEP worked with the City of Vienna to issue an ordinance in 2015, banning the construction, digging, or drilling of groundwater wells within the City of Vienna.

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.

WVDEP took over O&M operations in 2017. There were no issues with O&M observed.

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.

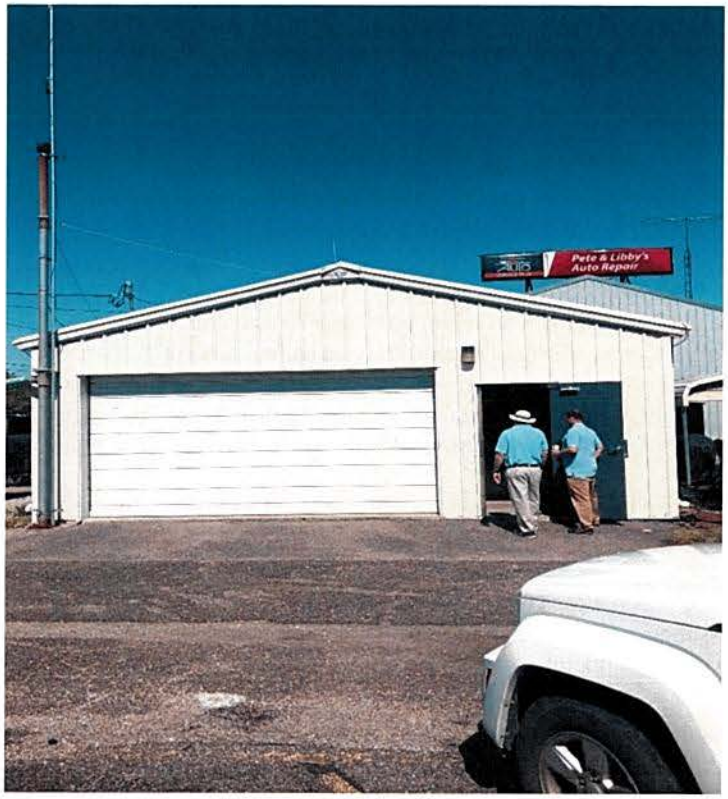
No issues were identified

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

In 2017, EPA completed an optimization Study Summary Report. EPA is looking to install additional delineation wells based off that study.

APPENDIX G – SITE INSPECTION PHOTOS

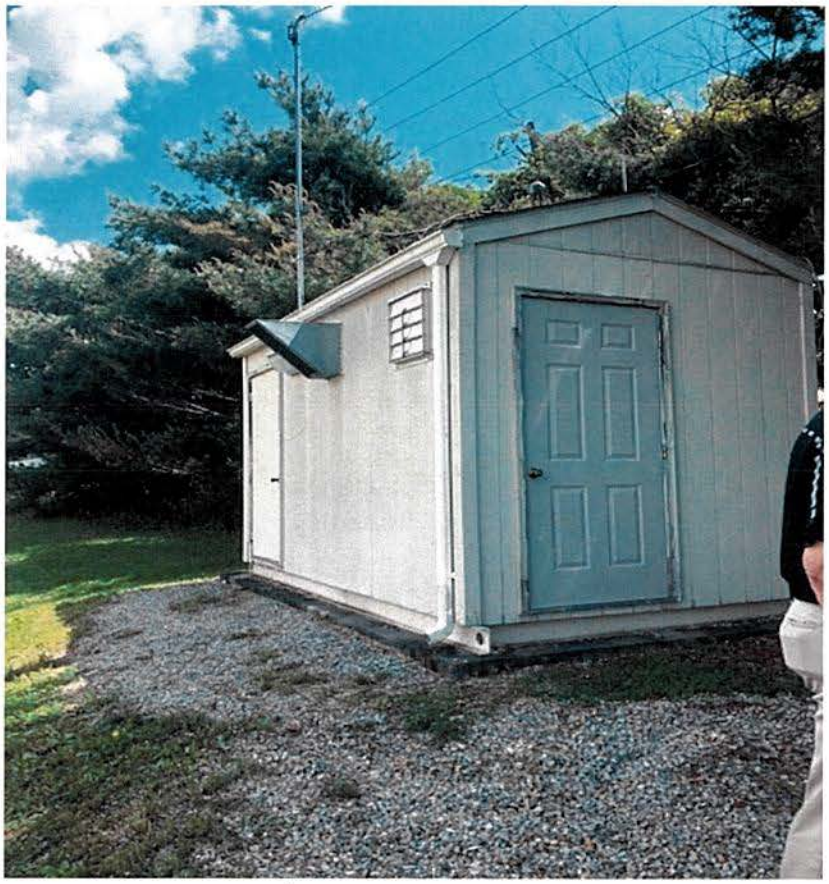


Treatment Unit 3 building

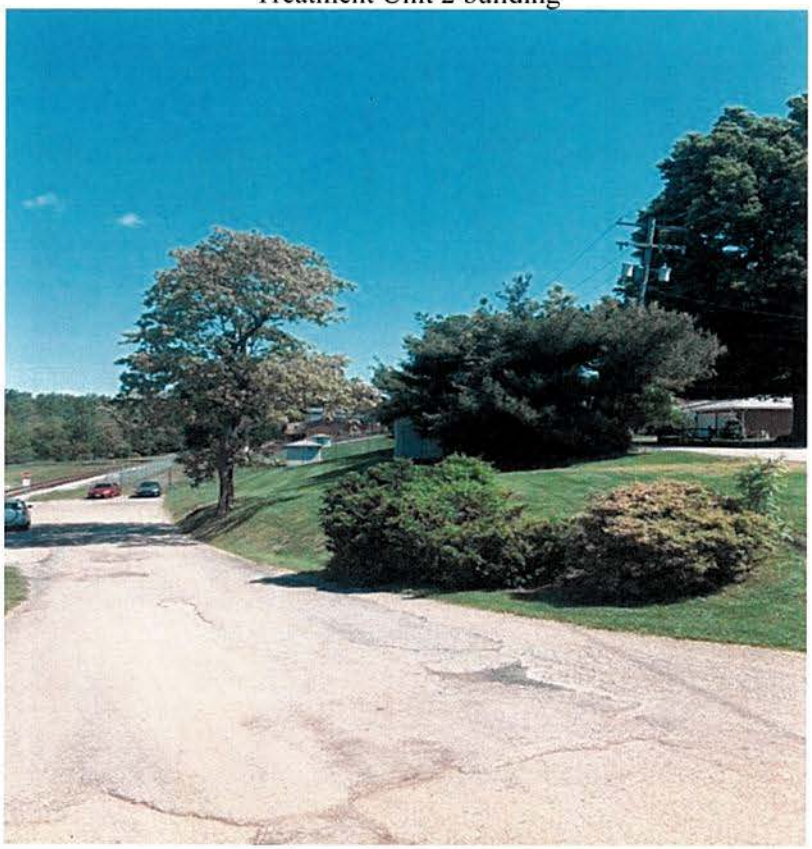
Treatment Unit 3

Treatment Unit 3 – Inside

Treatment Unit 3 - System



Treatment Unit 2 building



Treatment Unit 2 building and Municipal Wells

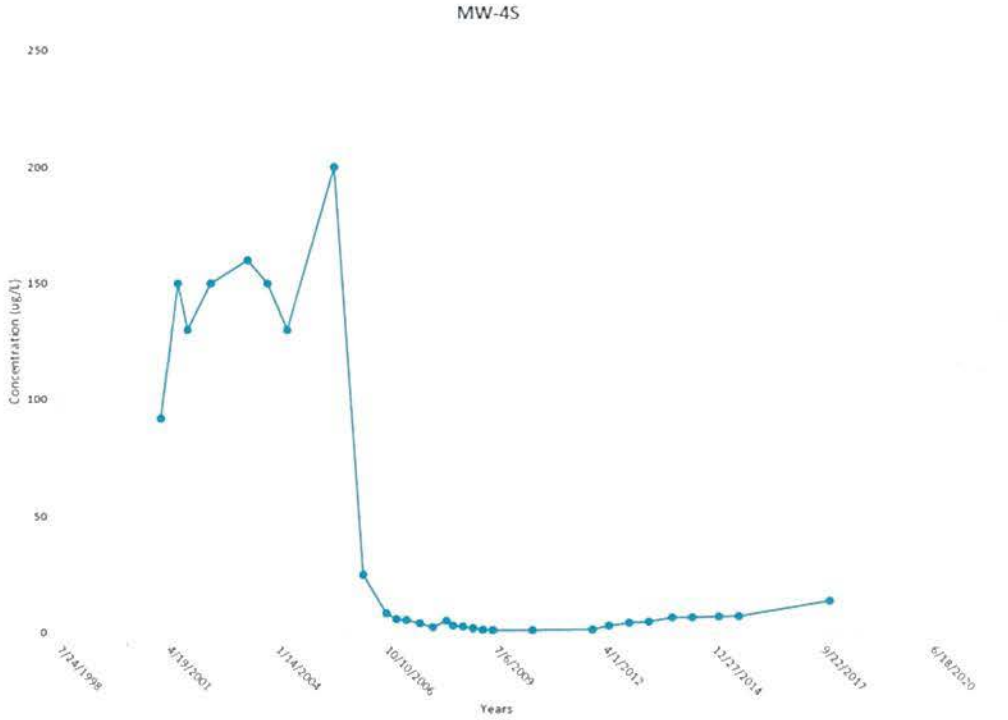
Treatment Unit 1 building

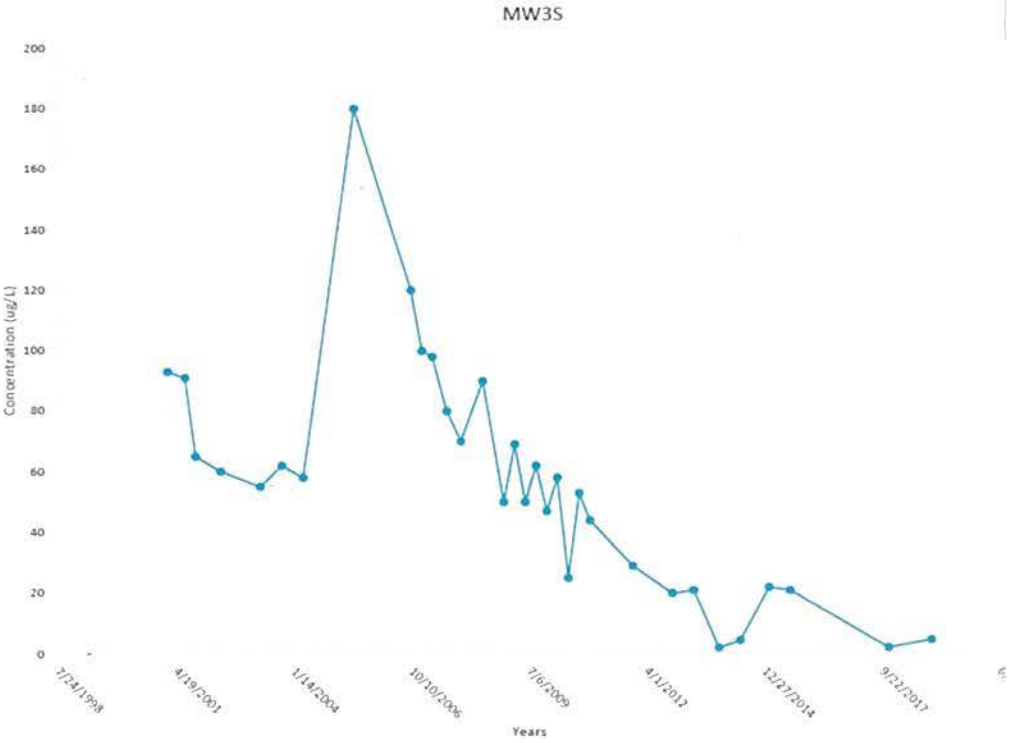
Former Vienna Cleaners location

View of Monitoring Wells and AS Wells

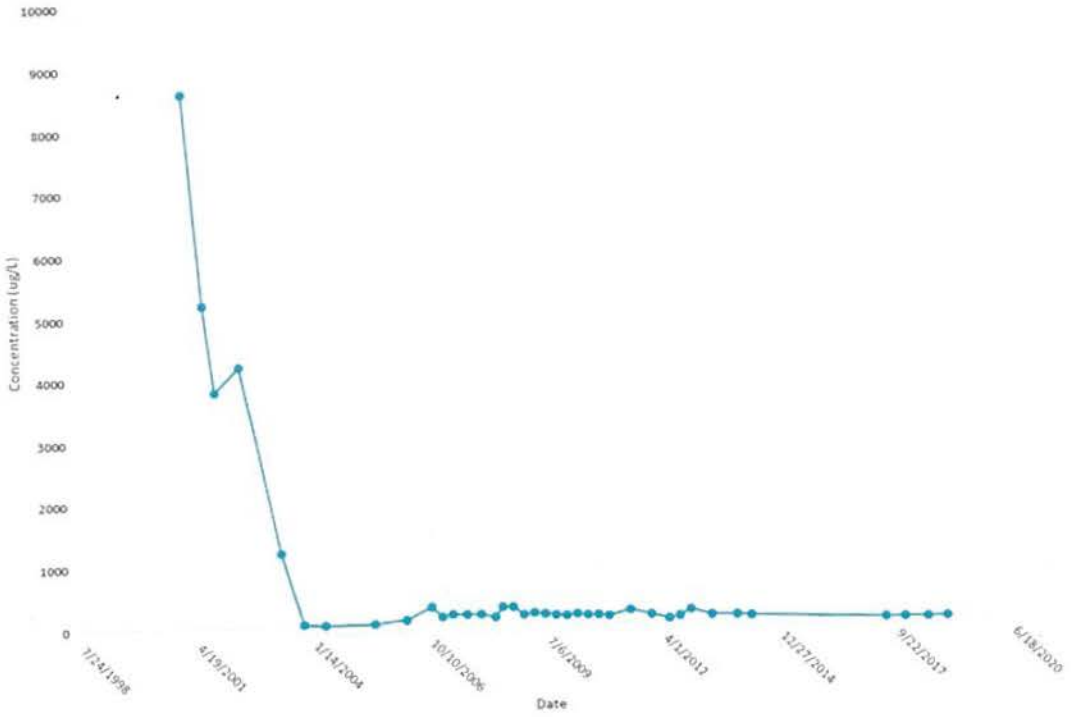
View of Monitoring Wells

APPENDIX H – TIME SERIES GRAPHS – PCE CONCENTRATIONS

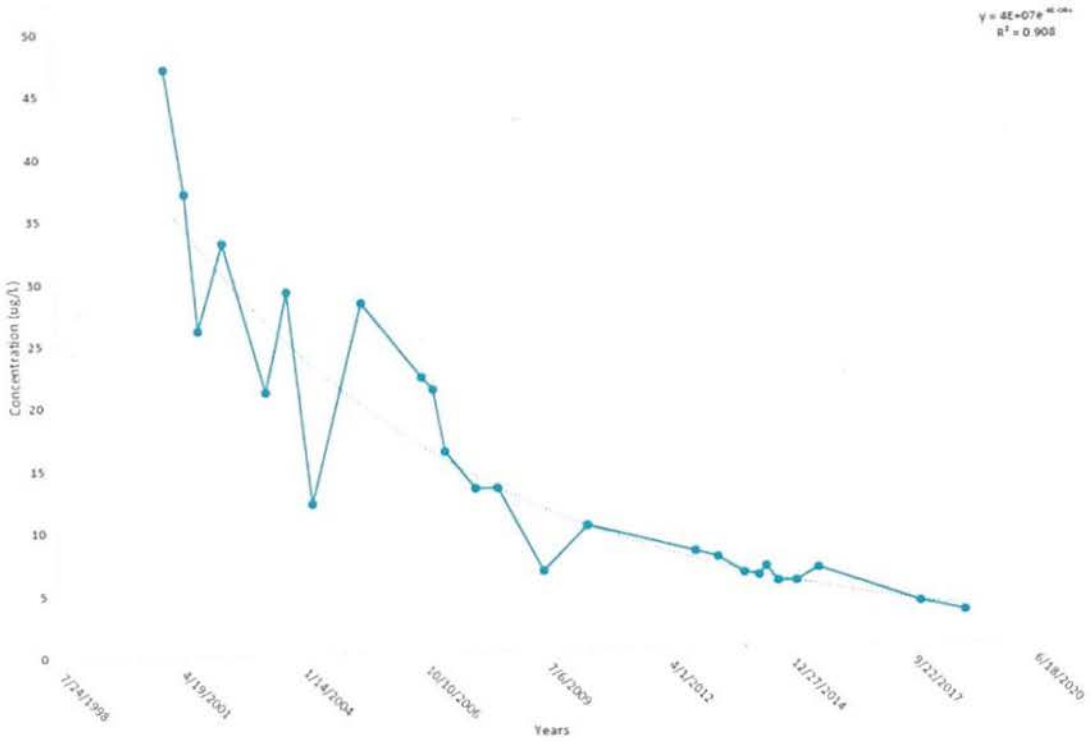




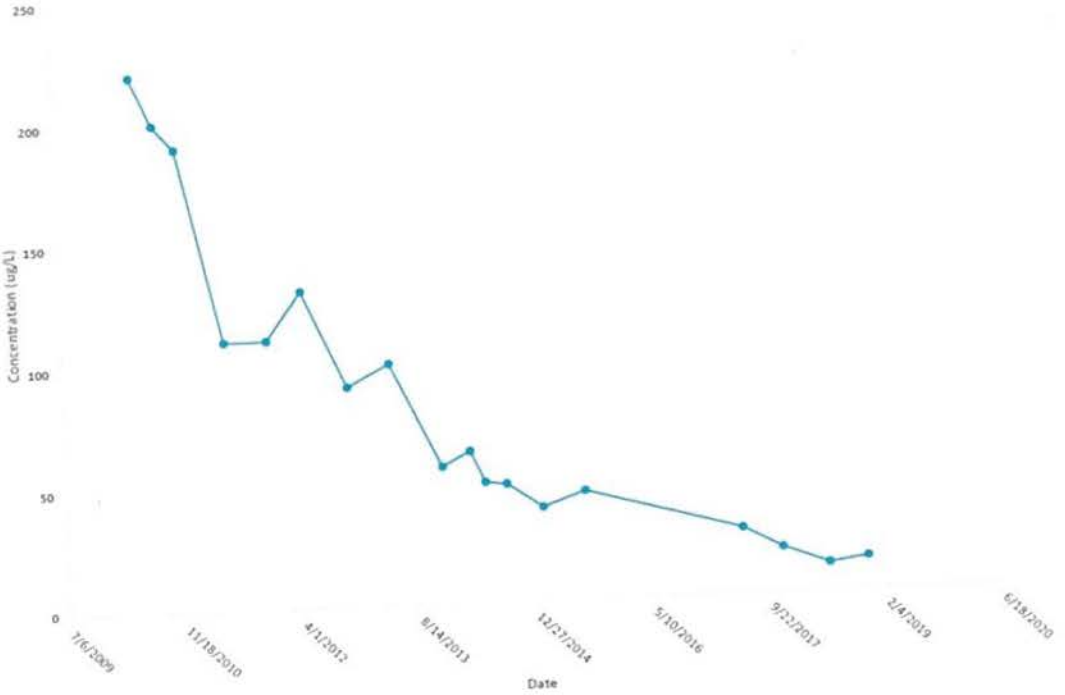
MW-05S


10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Concentration (ug/L)
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
Date

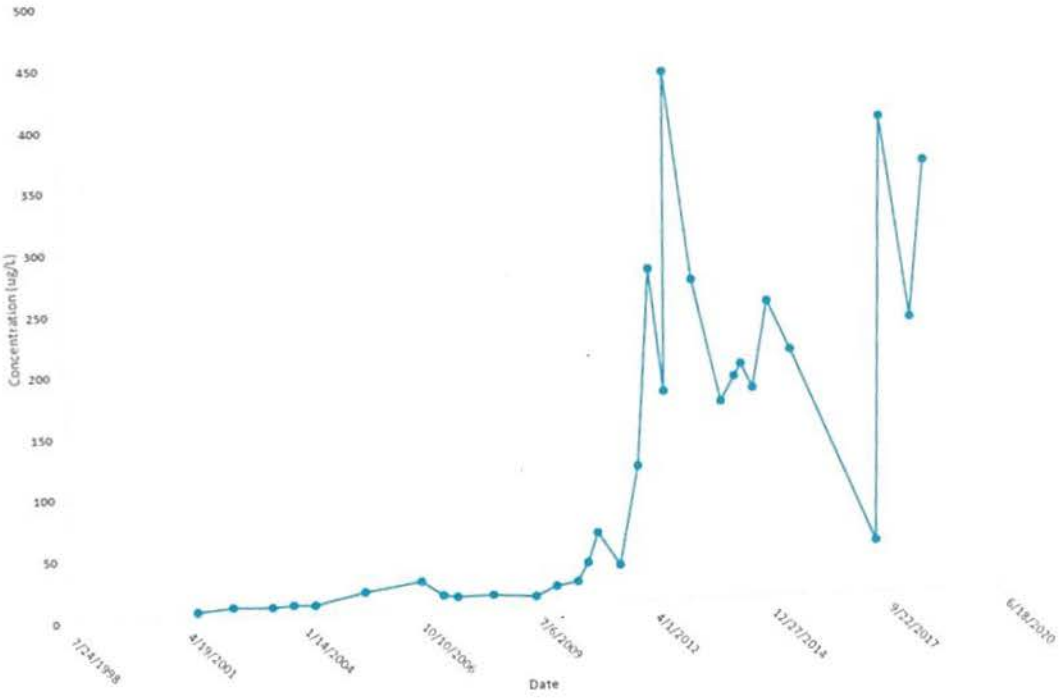
MW-07S


y = 4E+07e
R² = 0.908
50
45
40
35
30
25
20
15
10
5
0
Concentration (ug/L)
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
Years

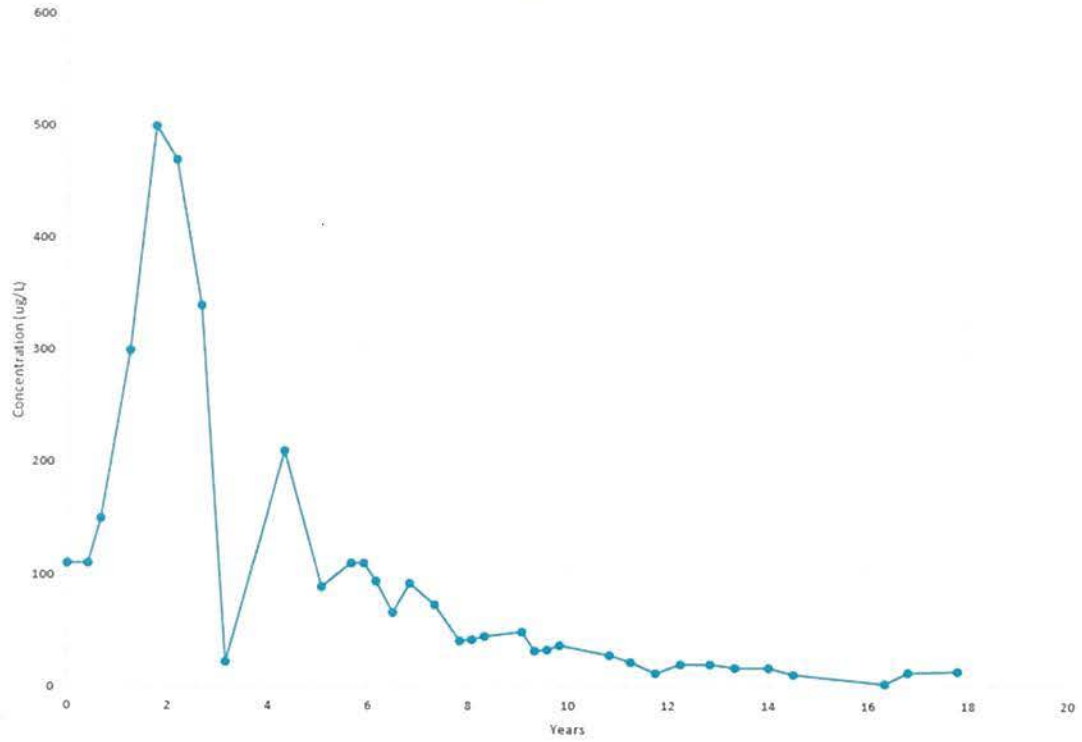
MW-08S


250
200
150
100
50
0
Concentration (ug/L)
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
Date

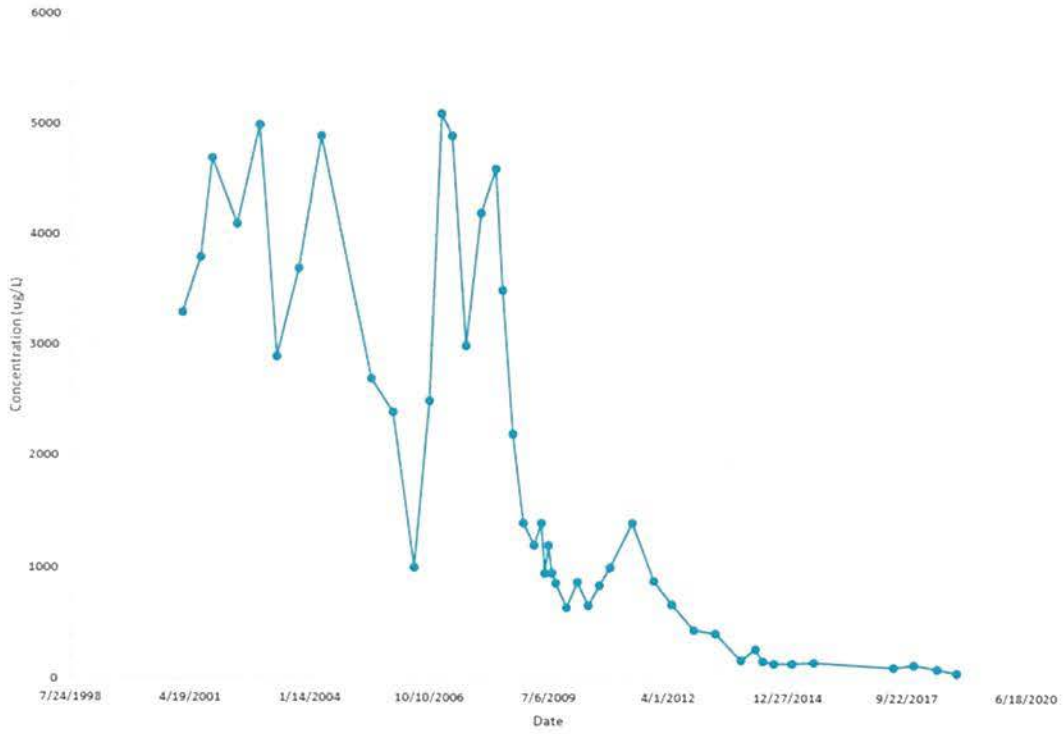
MW-10S

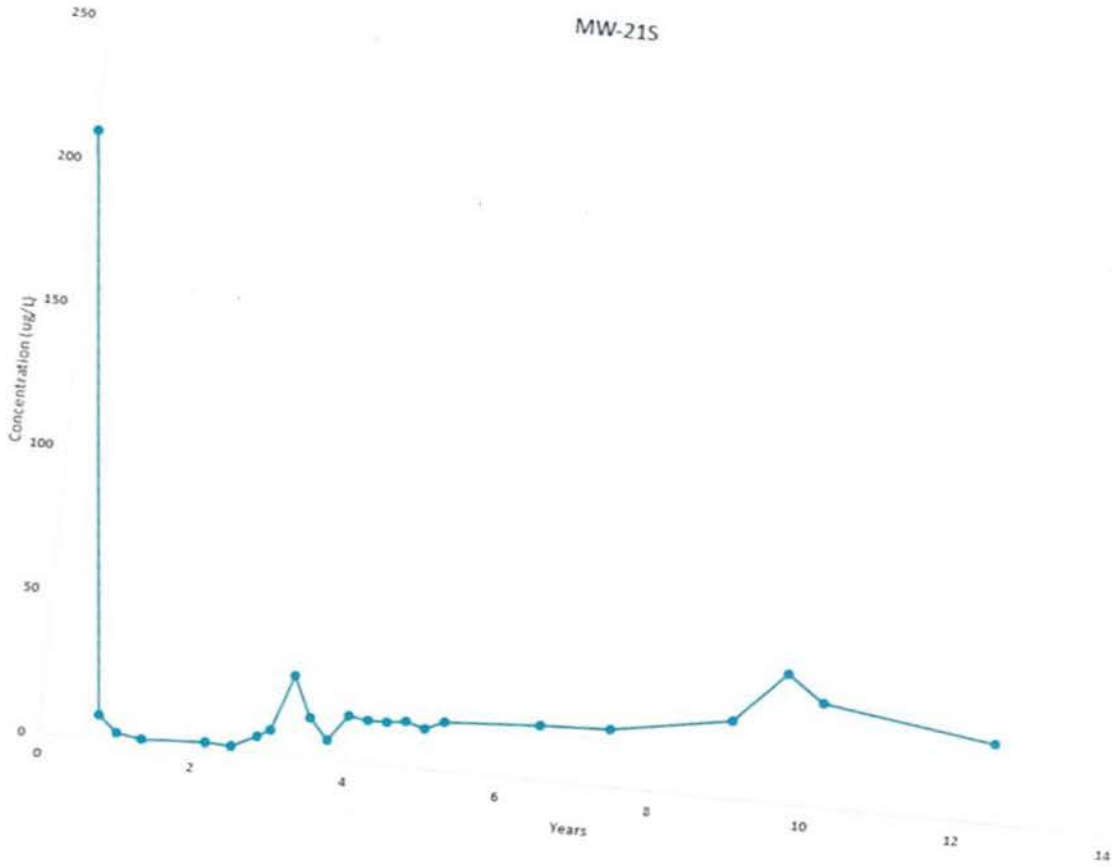

500
450
400
350
300
250
200
150
100
50
0
Concentration (ug/L)
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
Date

MW-12S


600
500
400
300
200
100
0
Concentration (ug/L)
0
2
4
6
8
10
12
14
16
18
20
Years

MW-11S


6000
5000
4000
3000
2000
1000
0
Concentration (ug/L)
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
Date


MW-21S
250
200
150
100
50
0
Concentration (ug/L)
0
2
4
6
8
10
12
14
Years

APPENDIX I – GROUNDWATER SAMPLING RESULTS 2017 TO 2018

Low-Flow Sampling							
Sample ID	Collection Date	Units	Tetrachloroethene	1,2-Dichloroethane	Methylene Chloride	Trichloroethene	Vinyl chloride
EPA MCL Value (µg/L)			5	7		5	2
MW-3S	11/14/2018	µg/L	4.8	NA	<1.00	NA	1.7
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	2.2	NA	NA	NA	NA
MW-4S	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	13.9	NA	NA	NA	NA
MW-4I	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	<1.00	NA	NA	NA	NA
MW-05SR	11/14/2018	µg/L	5.4	NA	<1.00	NA	NA
	5/30/2018	µg/L	1.0	NA	<1.00	NA	NA
	11/14/2017	µg/L	4.8	NA	<1.00	NA	NA
	5/31/2017	µg/L	5.6	<1.00	<1.00	<1.00	<1.00
MW-05SR-MS	5/31/2017	µg/L	5.6	<1.00	<1.00	<1.00	<1.00
MW-05SR-MSD	5/31/2017	µg/L	5.6	<1.00	<1.00	<1.00	<1.00
MW-05SR-Duplicate	5/31/2017	µg/L	5.5	<1.00	<1.00	<1.00	<1.00
MW-05I	11/14/2018	µg/L	0.68 J	NA	NA	NA	<1.00
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	<1.00	NA	NA	NA	NA
MW-7S	11/14/2018	µg/L	2.6	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	3.4	NA	NA	NA	NA
MW-08S	11/14/2018	µg/L	12.9	NA	<1.00	<1.00	<1.00
	5/31/2018	µg/L	10.7	NA	<1.00	<1.00	<1.00
	11/15/2017	µg/L	17.9	<1.00	<1.00	<1.00	<1.00
	5/31/2017	µg/L	26.4	<1.00	<1.00	<1.00	<1.00
MW-08S-MS	5/31/2018	µg/L	23.8	NA	14.5	13.3	29.2
MW-08S-MSD	5/31/2018	µg/L	26.1	NA	18.8	16.0	26.3
MW-08S-Duplicate	5/31/2018	µg/L	10.3	NA	<1.00	<1.00	<1.00
MW-08I	11/14/2018	µg/L	<1.00	NA	NA	NA	<1.00
	5/31/2018	µg/L	<1.00	NA	<1.00	NA	<1.00
	11/15/2017	µg/L	<1.00	<1.00	<1.00	NA	<1.00
	5/31/2017	µg/L	<1.00	<1.00	<1.00	<1.00	<1.00
MW-8D	11/14/2018	µg/L	<1.00	NA	NA	NA	<1.00
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017*	µg/L	<1.00	NA	NA	NA	<1.00
MW-8D Duplicate	11/15/2017*	µg/L	<1.00	NA	NA	NA	<1.00
MW-10S	11/13/2018	µg/L	350	NA	<1.00	NA	NA
	5/31/2018	µg/L	223	NA	<5.00	NA	NA
	11/16/2017	µg/L	387	NA	<1.00	NA	NA
	5/30/2017	µg/L	42.0	<1.00	<1.00	<1.00	<1.00
MW-10I	11/13/2018	µg/L	42.2	NA	<1.00	NA	NA
	5/31/2018	µg/L	25.3	NA	<1.00	NA	NA
	11/16/2017	µg/L	49.1	NA	<1.00	NA	NA
	5/30/2017	µg/L	218	<1.00	<1.00	<1.00	<1.00
MW-10D	11/13/2018	µg/L	<1.00	NST	NST	NST	NST
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017	µg/L	<1.00	NA	NA	NA	NA
MW-11S	11/13/2018	µg/L	55.7	NA	<1.00	<1.00	<1.00
	5/31/2018	µg/L	91.1	NA	<1.00	<1.00	<1.00
	11/16/2017	µg/L	130	NA	<1.00	<1.00	<1.00
	5/31/2017	µg/L	105	<1.00	<1.00	<1.00	<1.00
MW-11I	11/13/2018	µg/L	2.0	NA	<1.00	<1.00	<1.00
	5/31/2018	µg/L	1.8	NA	<1.00	<1.00	<1.00
	11/15/2017	µg/L	5.0	NA	<1.00	<1.00	NA
	5/31/2017	µg/L	6.7	<1.00	<1.00	<1.00	<1.00
MW-11I-MS	11/13/2018	µg/L	19.3	NA	16.4	19.3	18.5
MW-11I-MSD	11/13/2018	µg/L	21.4	NA	19.3	20.6	17.4
MW-11I-Duplicate	11/13/2018	µg/L	2.2	<1.00	<1.00	<1.00	<1.00
	5/31/2017	µg/L	6.4	<1.00	<1.00	<1.00	<1.00
MW-12S	11/13/2018	µg/L	14.2	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017	µg/L	12.9	NA	<1.00	NA	NA
	5/31/2017	µg/L	2.8	<1.00	<1.00	<1.00	<1.00
MW-12I	11/13/2018	µg/L	2.2	NA	<1.00	NA	NA
	5/31/2018	µg/L	1.7	NA	<1.00	NA	NA
	11/15/2017	µg/L	3.3	NA	<1.00	NA	NA
	5/31/2017	µg/L	11.8	<1.00	<1.00	<1.00	<1.00

Low-Flow Sampling							
Sample ID	Collection Date	Units	Tetrachloroethene	1,2-Dichloroethane	Methylene Chloride	Trichloroethene	Vinyl chloride
EPA MCL Value (µg/L)			5	7		5	2
MW-12D	11/13/2018	µg/L	1.3	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/16/2017	µg/L	<1.00	NA	NA	NA	NA
MW-13S	11/13/2018	µg/L	7.9	NA	<1.00	<1.00	<1.00
	5/31/2018	µg/L	6.3	NA	<1.00	<1.00	<1.00
	11/14/2017	µg/L	17.1	NA	<1.00	<1.00	NA
	5/31/2017	µg/L	16.9	<1.00	<1.00	<1.00	<1.00
MW-13I	11/13/2018	µg/L	1.8	NA	<1.00	NA	<1.00
	5/31/2018	µg/L	<1.00	NA	<1.00	NA	NA
	11/14/2017	µg/L	3.4	NA	<1.00	NA	<1.00
	5/31/2017	µg/L	2.5	<1.00	<1.00	<1.00	<1.00
MW-14S	11/15/2018	µg/L	3.8	15.9	<1.00	NA	NA
	5/30/2018	µg/L	0.55 J	19.9	<1.00	NA	NA
	11/16/2017	µg/L	<1.00	22.9	<1.00	NA	NA
	5/30/2017	µg/L	<1.00	5.00	<1.00	<1.00	<1.00
MW-14D	11/15/2018	µg/L	18.6	<1.00	<1.00	NA	NA
	5/30/2018	µg/L	7.8	NA	<1.00	NA	NA
	11/14/2017	µg/L	2.2	NA	<1.00	NA	NA
	5/30/2017	µg/L	1.1	<1.00	<1.00	<1.00	<1.00
MW-17S	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	1.6	NA	NA	NA	NA
MW-18S	11/15/2018	µg/L	<1.00	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/13/2017	µg/L	<1.00	NA	NA	NA	NA
MW-18I	11/15/2018	µg/L	<1.00	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/13/2017	µg/L	<1.00	NA	NA	NA	NA
MW-19S	11/14/2018	µg/L	20.5	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017	µg/L	19.9	NA	NA	NA	NA
MW-19I	11/14/2018	µg/L	19.8	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017	µg/L	22.3	NA	NA	NA	NA
MW-20S	11/14/2018	µg/L	7.6	NA	<1.00	NA	NA
	5/31/2018	µg/L	8.6	NA	<1.00	NA	NA
	11/15/2017	µg/L	11.4	NA	<1.00	NA	NA
	5/31/2017	µg/L	18.0	<1.00	<1.00	<1.00	<1.00
MW-20I	11/15/2018	µg/L	0.36 J	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017	µg/L	<1.00	NA	NA	NA	NA
MW-21S	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	27.6	NA	NA	NA	<1.00
MW-21I	11/14/2018	µg/L	<1.00	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	<1.00	NA	NA	NA	<1.00
MW-22S	11/14/2018	µg/L	<1.00	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	<1.00	NA	NA	NA	NA
MW-23S	11/14/2018	µg/L	0.67 J	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017	µg/L	<1.00	NA	NA	NA	NA
MW-23S Duplicate	11/15/2017	µg/L	<1.00	NA	NA	NA	NA
MW-23S-MS	11/15/2017	µg/L	18.4	NA	NA	NA	NA
MW-23S-MSD	11/15/2017	µg/L	18.3	NA	NA	NA	NA
MW-24S	11/14/2018	µg/L	27.6	NA	<1.00	NA	NA
	5/30/2018	µg/L	10.9	NA	<1.00	NA	NA
	11/16/2017	µg/L	28.2	NA	<1.00	NA	NA
	5/31/2017	µg/L	52.7	<1.00	<1.00	<1.00	<1.00
MW-25S	11/13/2018	µg/L	6.0	NA	<1.00	NA	NA
	5/31/2018	µg/L	4.0	NA	<1.00	NA	NA
	11/14/2017	µg/L	9.9	NA	<1.00	NA	NA
	5/31/2017	µg/L	11.8	<1.00	<1.00	<1.00	<1.00
MW-27S	11/13/2018	µg/L	429	NA	<1.00	NA	<1.00
	5/31/2018	µg/L	366	NA	<5.00	NA	<5.00
	11/16/2017	µg/L	424	NA	<1.00	NA	<1.00
	5/31/2017	µg/L	441	<1.00	<1.00	<1.00	<1.00

Low-Flow Sampling							
Sample ID	Collection Date	Units	Tetrachloroethene	1,2-Dichloroethane	Methylene Chloride	Trichloroethene	Vinyl chloride
EPA MCL Value (µg/L)			5	7		5	2
MW-28S	11/13/2018	µg/L	212	NA	<1.00	NA	NA
	5/31/2018	µg/L	91.0	NA	<1.00	NA	NA
	11/16/2017	µg/L	77.1	NA	<1.00	NA	NA
	5/30/2017	µg/L	140	<1.00	<1.00	<1.00	<1.00
MW-29S	11/13/2018	µg/L	10.6	NA	<1.00	NA	NA
	5/31/2018	µg/L	6.7	NA	<1.00	NA	NA
	11/16/2017	µg/L	9.2	NA	<1.00	NA	NA
	5/30/2017	µg/L	9.5	<1.00	<1.00	<1.00	<1.00
MW-30S	11/15/2018	µg/L	7.4	NA	<1.00	NA	NA
	5/30/2018	µg/L	7.1	NA	<1.00	NA	NA
	11/16/2017	µg/L	5.3	NA	<1.00	NA	NA
	5/30/2017	µg/L	20.8	<1.00	<1.00	<1.00	<1.00
MW-30S-MS	11/16/2017	µg/L	20.9	NA	14.6	NA	NA
MW-30S-MSD	11/16/2017	µg/L	20.1	NA	14.4	NA	NA
MW-30I	11/15/2018	µg/L	8.8	NA	<1.00	NA	NA
	5/30/2018	µg/L	11.3	NA	<1.00	NA	NA
	11/13/2017	µg/L	6.1	NA	<1.00	NA	NA
	5/30/2017	µg/L	18.5	<1.00	<1.00	<1.00	<1.00
MW-30I-MS	5/30/2018	µg/L	29.80	NA	19.1	NA	NA
	11/13/2017	µg/L	24.2	NA	19.2	NA	NA
MW-30I-MSD	5/30/2018	µg/L	26.5	NA	18.0	NA	NA
	11/13/2017	µg/L	26.1	NA	19.8	NA	NA
MW-30I-Duplicate	5/30/2018	µg/L	12.7	NA	<1.00	NA	NA
PW-JM2	11/15/2018	µg/L	9.8	NA	NA	NA	NA
	5/30/2018	µg/L	13.9	NA	<1.00	NA	NA
	11/13/2017	µg/L	10.2	NA	<1.00	NA	NA
	5/30/2017	µg/L	15.7	<1.00	<1.00	<1.00	<1.00
PW-JM2-MS	5/30/2017	µg/L	16.3	<1.00	<1.00	<1.00	<1.00
PW-JM2-MSD	5/30/2017	µg/L	15.5	<1.00	<1.00	<1.00	<1.00
PW-JM2-Duplicate	11/13/2017	µg/L	9.7	NA	<1.00	NA	NA
	5/30/2017	µg/L	15.8	<1.00	<1.00	<1.00	<1.00
PW-JM3	5/30/2018	µg/L	NST	NST	NST	NST	NST
	5/31/2017	µg/L	137	<1.00	<1.00	<1.00	<1.00
ERT-2	11/14/2018	µg/L	6.1	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/15/2017	µg/L	8.3	NA	NA	NA	NA
ERT-2-MS	11/14/2018	µg/L	24.7	18.0	18.3	20.2	17.9
ERT-2-MSD	11/14/2018	µg/L	25.0	19.0	19.8	20.8	19.1
ERT-2-Duplicate	11/14/2018	µg/L	5.1	NA	NA	NA	NA
ERT-3	11/14/2018	µg/L	<1.00	NA	NA	NA	NA
	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	<1.00	NA	NA	NA	NA
ERT-7	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/14/2017	µg/L	<1.00	NA	NA	NA	NA
ERT-7 Duplicate	11/14/2017	µg/L	<1.00	NA	NA	NA	NA
GC-1	5/30/2018	µg/L	NST	NST	NST	NST	NST
	11/16/2017	µg/L	<1.00	NA	NA	NA	NA

µg/L - Micrograms per Liter
J - Analyte Detected Below Laboratory Quantitation Limit
ND - Not Detected; NG - Not Gauged
NST - No Sample Taken; NA - Not Analyzed
Positive Laboratory Detections are Bold
Exceedances are Highlighted
* - Due to FedEx, Samples Received Above Temperature