HRS DOCUMENTATION RECORD--COVER SHEET

Name of Site:	Paden City Groundwater
EPA ID No.:	WVN000304985
Date Prepared:	September 2021
Contact Person	Lorie Baker U.S. Environmental Protection Agency Philadelphia, Pennsylvania (215) 814-3355 Baker.Lorie@epa.gov

Pathways, Components, or Threats Not Scored

The surface water migration pathway, soil exposure and subsurface intrusion pathway, and air migration pathways were not scored in this Hazard Ranking System (HRS) documentation record because the groundwater migration pathway is sufficient to qualify the site for the National Priorities List (NPL). Additionally, the surface water migration pathway, soil exposure component of the soil exposure and subsurface intrusion pathway, and the air migration pathways are not considered pathways of concern. The subsurface intrusion component of the soil exposure and subsurface intrusion pathway is of concern to the U.S. Environmental Protection Agency (EPA) and may be considered during a future evaluation.

Surface Water Migration Pathway: The Surface Water Migration Pathway was not scored because its inclusion would not significantly affect the site score (Ref. 1, Section 2.2.3). The Ohio River has a high flow rate and the primary contaminant of concern at the site, tetrachloroethylene (PCE), evaporates quickly from water into the air (**Sections 2.2 of this HRS documentation record;** Ref. 1, Table 4-13; Refs. 26, p. 1; 64, pp. 1, 2, 6); however, the Surface Water Migration Pathway is of concern to the U.S. Environmental Protection Agency (EPA) and may be considered during a future evaluation.

Soil Exposure and Subsurface Intrusion Pathway – Soil Exposure Component: The Soil Exposure Component of the Soil Exposure and Subsurface Intrusion Pathway was not scored because its inclusion would not significantly affect the site score (Ref. 1, Section 2.2.3). Contaminated soil is limited to the former dry cleaner property and at depths ranging from 1.9 feet below ground surface (bgs) to 47 feet bgs (**Figure 2 and Section 2.2, Table 1** of this HRS documentation record); however, the Soil Exposure Component of the Soil Exposure and Subsurface Intrusion Pathway is of concern to the U.S. Environmental Protection Agency (EPA) and may be considered during a future evaluation.

Soil Exposure and Subsurface Intrusion Pathway – Subsurface Intrusion Component: The Subsurface Intrusion component of the Soil Exposure and Subsurface Intrusion Pathway is a concern at the site due to high concentrations of tetrachloroethylene (PCE) detected in subsurface soil and groundwater in the area (**Sections 2.2 and 3.1.1** of this HRS documentation record). Additionally, soil gas samples collected in the immediate vicinity of the former Band Box Cleaners facility contained concentrations of PCE from 470 to 17,000 micrograms per cubic meter ($\mu g/m^3$) (Ref. 15, pp. 50, 51; 16, pp. 12-17). Soil gas samples collected from an adjacent residential property and right-of-way contained concentrations of PCE ranging from 4.4 to 220 $\mu g/m^3$ (Refs. 15, pp. 49, 51; 16, pp. 5, 6, 8, 9). Sub-slab soil gas samples collected beneath the adjacent residential property and commercial property contained concentrations of PCE at 120 $\mu g/m^3$ and 4,300 $\mu g/m^3$, respectively (Refs. 15, pp. 49, 51; 16, p. 7; 17, p. 7). Indoor air samples collected from the adjacent residential and commercial properties contained concentrations of PCE ranging from 0.44 to 0.67 and 1.1 µg/m^3, respectively (Refs. 15, p. 49, 51; 17, pp. 9-12).

Air Migration Pathway: The Air Migration Pathway was not scored because its inclusion would not significantly affect the site score (Ref. 1, Section 2.2.3). The source at the Site consists of PCE-contaminated soil ranging in depth from 1.9 feet bgs to 47 feet bgs (**Section 2.2, Table 1** of this HRS documentation record); however, the Air Migration Pathway is of concern to the U.S. Environmental Protection Agency (EPA) and may be considered during a future evaluation.

HRS DOCUMENTATION RECORD

Name of Site:	Paden City Groundwater	Date Prepared: September 2021
EPA ID No.:	WVN000304985	
EPA Region:	3	

Street Address of Site*:	223 North 4th Avenue**
County and State:	Paden City, Wetzel County, West Virginia 26159
General Location in the State:	Northern West Virginia
Topographic Map:	Paden City Quadrangle – West Virginia/Ohio (Ref. 4)
Latitude: 39.606140 North	Longitude: -80.930248 West

The reference point for the street address and site latitude/longitude coordinates above correspond to the location of soil sample SB05-01, as shown on **Figures 1 and 2** of this Hazard Ranking System (HRS) documentation record (References [Ref.] 3; 4; 5, p. 2).

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area where the Site is located. They represent one or more locations EPA considers to be part of the Site based on the screening information EPA used to evaluate the Site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, disposed, or placed, or has otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA). Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

** The address of 223 North 4th Avenue is the current correct address for the property formerly occupied by Band Box Cleaners. Band Box Cleaners also has a historic address of 233 North 4th Avenue (Refs. 11, p. 91; 13, pp. 25, 36, 40, 44, 50, 53; 14, p. 2). According to the Paden City Director of Public Works, Band Box Cleaners had always operated in the same building (Ref. 46, p. 1).

Pathway	**Pathway Score**
Groundwater[1] Pathway	100.00
Surface Water Pathway	Not Scored
Soil Exposure and Subsurface Intrusion Pathway	Not Scored
Air Pathway	Not Scored
HRS SITE SCORE	**50.00**

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[1] "Ground water" and "groundwater" are synonymous; the spelling is different due to "ground water" being codified as part of the HRS, while "groundwater" is the modern spelling.

WORKSHEET FOR COMPUTING HRS SITE SCORE
Paden City Groundwater

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	100.00	10,000
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	Not Scored	
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	Not Scored	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	Not Scored	
3a.	Soil Exposure Component (from Table 5-1, line 22)	Not Scored	
3b.	Subsurface Intrusion Component (from Table 5-11, line 12)	Not Scored	
3c.	Soil Exposure and Subsurface Intrusion Pathway Score (S_{sessi}) (from Table 5-11, line 13)	Not Scored	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	Not Scored	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_{sessi}^2 + S_a^2$	10,000	
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	50.00	

GROUND WATER MIGRATION PATHWAY SCORESHEET
Paden City Groundwater

GROUND WATER MIGRATION PATHWAY Factor Categories and Factors	**MAXIMUM VALUE**	**VALUE ASSIGNED**
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release		
2a. Containment	10	Not scored
2b. Net Precipitation	10	Not scored
2c. Depth to Aquifer	5	Not scored
2d. Travel Time	35	Not scored
2e. Potential to Release [lines 2a(2b+2c+2d)]	500	Not scored
3. Likelihood of Release	550	550
Waste Characteristics		
4. Toxicity/Mobility	*	1,000
5. Hazardous Waste Quantity	*	100
6. Waste Characteristics	100	18
Targets		
7. Nearest Well	50	50
8. Population		
8a. Level I Concentrations	**	22,640
8b. Level II Concentrations	**	0
8c. Potential Contamination	**	Not scored
8d. Population (lines 8a + 8b + 8c)	**	22,640
9. Resources	5	5
10. Wellhead Protection Area	20	20
11. Targets (lines 7 + 8d + 9 + 10)	**	22,715
12. Aquifer Score (lines 3 x 6 x 11 divided by 82,500)	100	100.00
13. Ground water Migration Pathway Score (S_{gw})	100	100.00

* Maximum value applies to waste characteristics category.

** Maximum value not applicable.

REFERENCES

Reference
Number Description of the Reference

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2. EPA. Superfund Chemical Data Matrix (SCDM) Query. Last Update, January 2021. A complete copy of SCDM is available at http://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm. Accessed on January 14, 2021. 9 Pages.

3. EPA. Superfund Site Information, Paden City Groundwater (EPA ID: WVN000304985): Site Information. Available online at: https://cumulis.epa.gov/supercpad/CurSites/csitinfo.cfm?id=0304985 Accessed on January 18, 2021. 1 Page.

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11. EDR®. The EDR Radius Map™ Report with GeoCheck®. Paden City GW Plume. Inquiry Number: 6027180.2s. March 31, 2020. 173 Pages.

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15.	Tetra Tech. Project Note to Paden City Groundwater Site File: Removal Program Sample Documentation, with attachments (Notes from Multiple Field Logbooks, Sample Summary Table, and Sampling Location Maps). October 9, 2020. 66 Pages.
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18.	Tetra Tech. Project Note to Paden City Groundwater Site File. Subject: June 2020 Sampling Documentation, with attachments (Logbook Notes, Sample Summary Table, and Sampling Location Maps; Soil Boring Logs). October 9, 2020. 130 Pages.
19.	TechLaw, Inc. Sampling QA/QC Work Plan-Final, Soil and Groundwater Sampling, Paden City Groundwater Plume. EPA Contract No. EP-S3-15-03, TDD No. T503-20-03-001, DCN: 83088-5-03-IN-1156. May 4, 2020. 46 Pages.
20.	Tetra Tech. Project Note to Paden City Groundwater Site File. Subject: EPA CLP Case 48006, SDG C0AA2 Form Is and Chains-of-Custodies, with attachments (Form Is and Chain-of-Custody Records). October 9, 2020. 70 Pages.
21.	Tetra Tech. Project Note to Paden City Groundwater Site File. Subject: Case #48006 SDG C0AA2 Electronic Data Deliverable, (excerpt). October 9, 2020. 2 Pages.
22.	EPA Contract Laboratory Program. Statement of Work for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.4. October 2016. 520 Pages.
23.	Warren Fortune, EPA, Region III ESAT RPO. Memorandum with attachment to Connor O’Loughlin, EPA, Hazardous Site Cleanup Division. Subject: Region III Data QA Review – Organic Data Validation Report for the Paden City Site Assessment – Case # 48922 (SDG # C0AF7). July 27, 2020. 40 Pages.

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34. Tetra Tech. Project Note to Paden City Groundwater Site File. Subject: Case #48982, SDG C0AH6 Electronic Data Deliverable, (excerpt). October 12, 2020. 2 Pages.

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57. Eric Graybill, EPA, Region III ESAT RPO. Memorandum with attachment to Connor O'Loughlin, EPA, Hazardous Site Cleanup Division. Subject: Region III Data QA Review – Organic Data Validation Report for the Paden City Groundwater Plume – Case # 49071 (SDG # C0AK9). October 28, 2020. 74 Pages.

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SITE SUMMARY

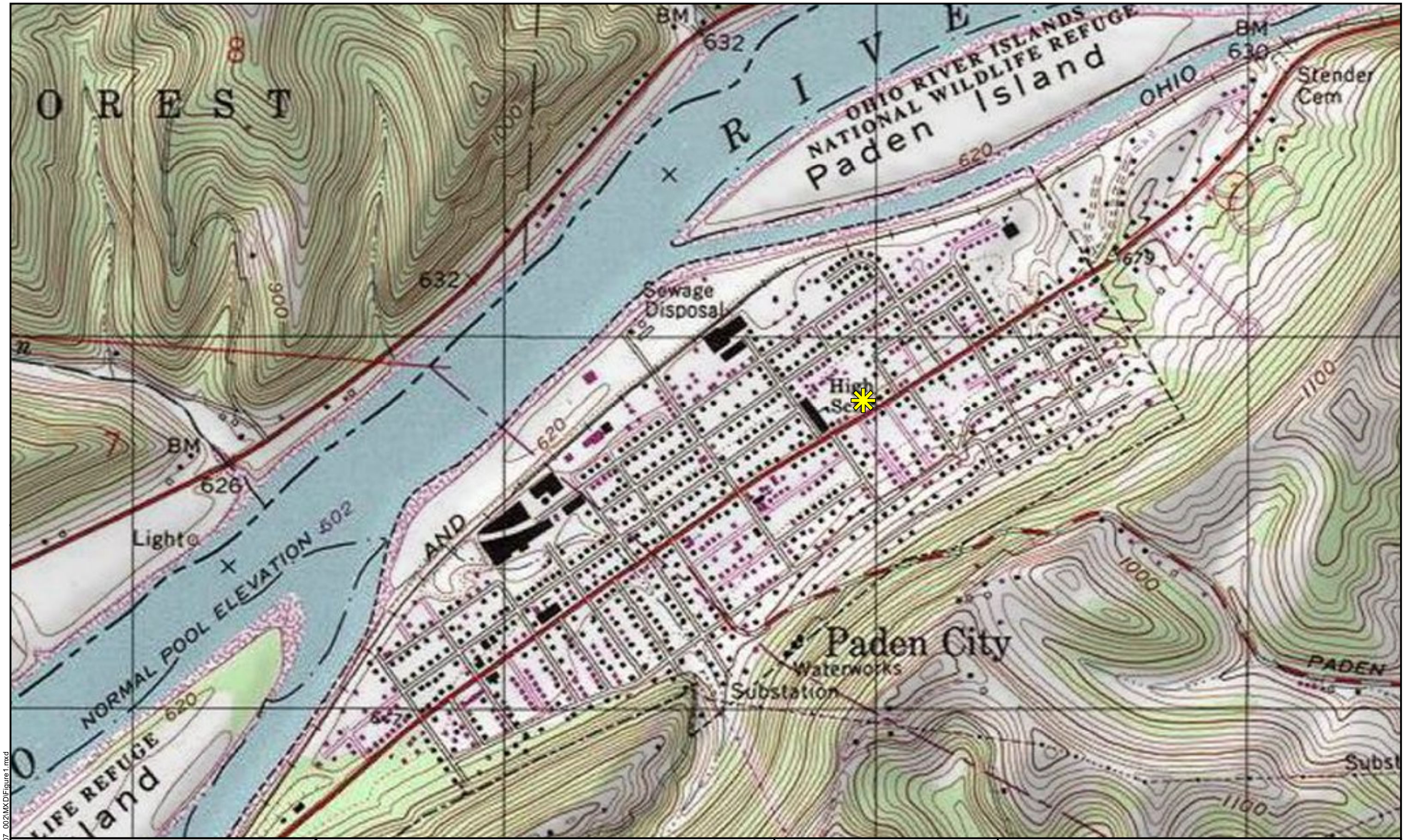
The Paden City Groundwater site is located in a primarily residential area near 223 North 4th Avenue in Paden City, Wetzel County, West Virginia, on the southeast side of the Ohio River (**Figure 1** in this HRS documentation record; Refs. 3 and 4). The Site, as scored for HRS purposes, consists of a tetrachloroethylene (PCE)-contaminated soil source (Source 1) and associated observed releases of PCE, trichloroethylene (TCE), and cis-1,2-dichlorotheylene (cis-1,2-DCE) to groundwater as documented in groundwater samples collected from both monitoring wells and public supply drinking water wells. The source of the groundwater contamination has been attributed, at least in part, to a release of PCE from the former Band Box Cleaners dry cleaners. A volume of PCE-contaminated soil, Source 1, has been documented on and near the property boundaries of the former dry cleaners (**Figure 2** and **Section 2.2** of this HRS documentation record). PCE breaks down into TCE, cis-1,2-DCE, vinyl chloride, and to a lesser extent trans-1,2-DCE in the environment (Ref. 47, pp. 2, 3). The City of Paden maintains three permanent groundwater wells (Well Nos. 3, 4, and 5) for source water for public supply that provides drinking water to approximately 2,985 persons and 411 students for a total target population of 3,396 persons (Refs. 6, pp. 2, 3, 4, 7; 7, p. 1; 50, pp. 2, 4). An observed release of PCE was documented in two of the wells (Well Nos. 3 and 5) located approximately 2,500 feet hydrologically downgradient of the dry cleaner business at concentrations greater than the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) of 5 micrograms per liter (µg/L) for PCE as set forth in the National Primary Drinking Water Regulations (as documented in **Sections 3.1.1 and 3.3** of this HRS documentation record). The drinking water wells are susceptible to contamination because the wells are completed in a shallow alluvial aquifer, a very permeable aquifer susceptible to any releases of hazardous substances or pollutants, which reacts to pumping as well as hydraulic influences of the Ohio River (Refs. 28, pp. 28, 29, 31; 37, p. 7). The extent of groundwater contamination is depicted on **Figure 4** based on groundwater sampling locations with detections of PCE that meet the criteria for an observed release (**Section 3.1.1** of this HRS documentation record).

In February 2010, a sample collected from the treated water at the City of Paden water treatment plant contained 5.6 µg/L PCE, above the MCL of 5 µg/L for PCE (Refs. 8, p. 7; 9, p. 13). In September 2013, a sample collected from the treated water at the City of Paden water treatment plant contained 9.92 µg/L PCE (Ref. 8, p. 7). In October 2013, samples were collected from three groundwater supply wells (Wells No. 1 [Well No. 1 is also referred to as Well No. 5], 2, and 3) and the treated water from the treatment plant (Refs. 6, pp. 3, 7; 8, p. 7). Analytical results showed the presence of PCE in Well No. 2 at 49.6 µg/L (Ref. 8 p. 7). Well No. 2 was initially shut down because of the concentrations of PCE; however, it was briefly brought back online in July 2016 when PCE levels dropped below the MCL (Ref. 6, pp. 2, 3). At that time, Well No. 5 was taken out of service for general maintenance. When Well No. 5 was returned to service, Well No. 2 was taken out of service as it was determined that the electrical lines to the well were out of code. At the present time, Paden City does not have a date set for repairs to Well No. 2 (Ref. 6, p. 2). Throughout 2014, 2015, and 2016, samples were collected from the groundwater supply wells and treated water (Ref. 8, p. 7). Analytical results for samples collected in 2014, 2015, and 2016 showed PCE was not detected or was detected at concentrations below the MCL (Ref. 8, p. 7; 9, p. 13). In June 2017, a sample collected from the system contained 7.6 µg/L (Ref. 8, p. 7). Throughout 2017, 2018 and 2019, samples of pre-treated groundwater contained concentrations of PCE ranging from 0.55 to 15.1 µg/L and samples collected post-treatment contained concentrations ranging from 0.38 to 8.2 µg/L (Ref. 8, p. 6).

In November 2018, EPA conducted a removal assessment in the vicinity of the former Band Box Cleaners facility (Ref. 10, pp. 6, 7). Band Box Cleaners is listed as a historical dry cleaner that operated from at least 1969 to 1997 (Ref. 11, p. 91). Band Box Cleaners is listed as a Resource Conservation and Recovery Act (RCRA) Small Quantity Generator (SQG) for chromium, lead, and PCE (Refs. 11, pp. 73, 74; 14, pp. 1-3). As part of the removal assessment, subsurface soil samples were collected in and near the former Band Box Cleaners property. The subsurface soil samples documented the presence of PCE at concentrations as high as 19,000,000 micrograms per kilogram (µg/kg) (Ref. 10, pp. 22, 26, 27, 31, 32; **Section 2.2** of this HRS documentation record). Additionally, shallow groundwater samples collected from installed monitoring wells hydraulically downgradient (northwest) of the former Band Box Cleaners property contained concentrations of PCE as high as 4,700 µg/L. The dry cleaner business is located near the southeast bank of the Ohio River (Refs. 10, pp. 24, 28, 29, 33; 28, pp. 28, 29, 46; 67, p. 3). Under natural conditions, groundwater flows from the adjacent hills towards the Ohio River (northwesterly) (**Figure 1**; Ref. 28, pp. 28 and 35). Groundwater flow has been documented to flow generally to the northwest (**Figure 4**; Ref. 67, pp. 2, 3).

In April 2020, EPA Removal Program collected soil gas samples and sub-slab soil gas samples in the vicinity of the former Band Box Cleaners and surrounding buildings (Ref. 15, pp. 28-42, 49, 50, 51). Soil gas samples collected in the immediate vicinity of the former cleaners contained concentrations of PCE from 470 to 17,000 micrograms per cubic meter (µg/m^3) (Ref. 15, pp. 50, 51; 16, pp. 12-17). Soil gas samples collected from an adjacent residential property and right-of-way contained concentrations of PCE ranging from 4.4 to 220 µg/m^3 (Refs. 15, pp. 49, 51; 16, pp. 5, 6, 8, 9). Sub-slab soil gas samples collected beneath an adjacent residential property and commercial property contained concentrations of PCE at 120 µg/m^3 to 4,300 µg/m^3 (Refs. 15, pp. 49, 51; 16, p. 7; 17, p. 7). Indoor air samples collected from the adjacent residential and commercial properties contained concentrations of PCE ranging from 0.44 to 1.1 µg/m^3 (Refs. 15, p. 49, 51; 17, pp. 9-12). The Subsurface Intrusion component of the Soil Exposure and Subsurface Intrusion Pathway from the groundwater contamination is also of concern to EPA. A limited subsurface vapor intrusion investigation was conducted in November 2020 at the high school and one residence near Paden City municipal well MW#3 (Ref. 55, pp. 49-62, 67, 68).

In April 2020, EPA Removal Program collected groundwater samples from the existing monitoring wells hydraulically downgradient (north-northwest) of the former Band Box Cleaners property installed in 2018, and from an industrial supply well at a glass company located in Paden City (Ref. 15, pp. 42-45, 54). In June 2020, EPA Site Assessment installed additional monitoring wells and collected groundwater samples from the newly installed monitoring wells and from the public supply wells (Well Nos. 3, 4, and 5) (Ref. 18, pp. 7-130). In September and October 2020, EPA Site Assessment installed additional soil borings and monitoring wells to further evaluate the extent of contamination in the groundwater and to investigate additional possible source areas not related to Band Box Cleaners (Ref. 55, pp. 4-47, 63-66, 69, 70). Analytical results of samples from these events meeting the criteria for an observed release are presented in **Section 3.1.1** of this HRS documentation record.



Legend

✳ Site Reference Point

Reference 5, p. 3

Imagery: ESRI Mapping Service
The source of the map image is ESRI, used by the EPA with ESRI's permission.

N

0 1,000 2,000
Feet

Paden City Groundwater
Paden City, Wetzel County, WV

Figure 1
Site Location Map

TETRA TECH

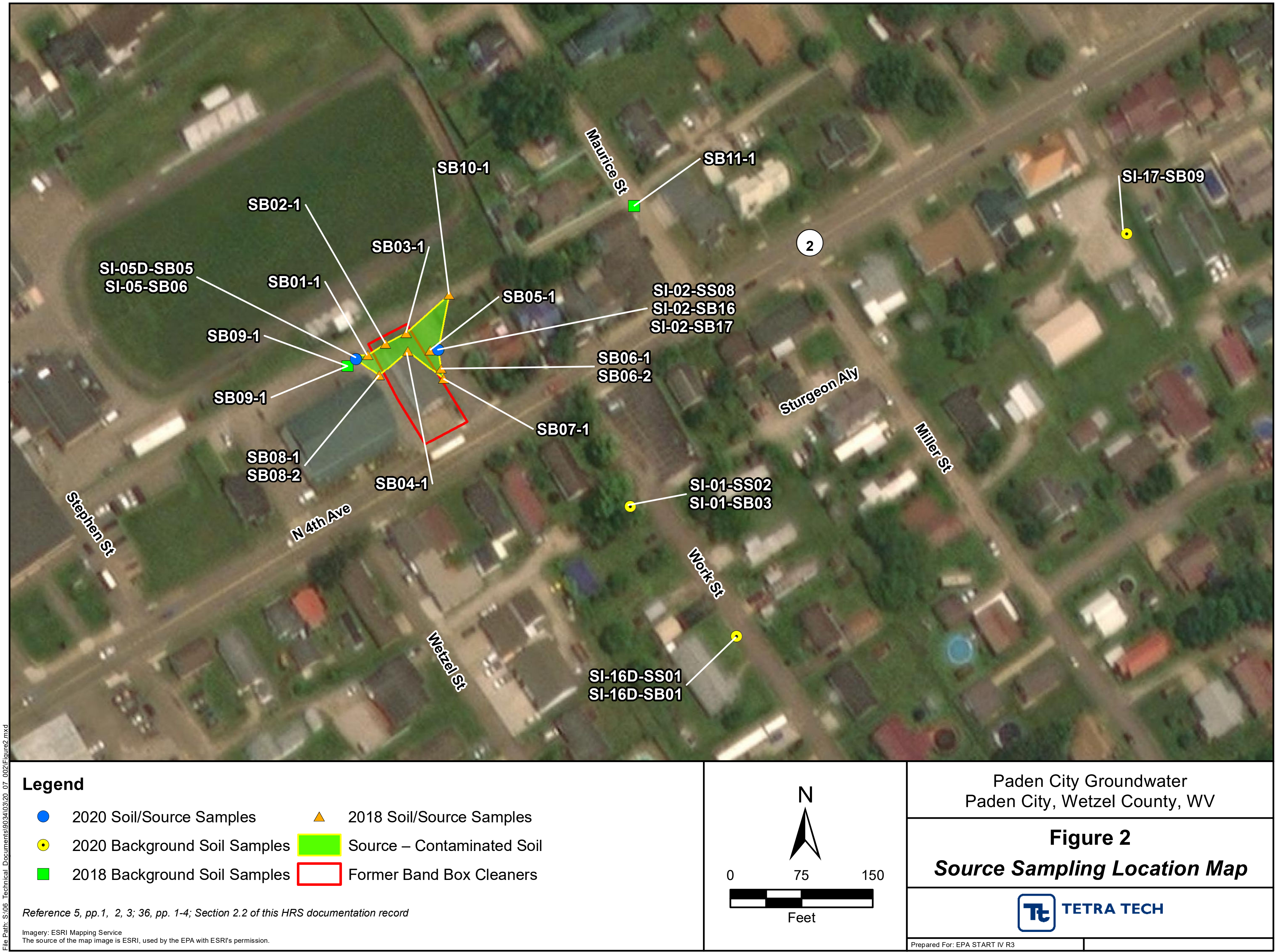
Prepared For: EPA START IV R3

File Path: C:\Users\megan.kelly\Desktop\GIS_Data\003\20_07_002\MXD\Figure1.mxd

Date Saved: 11/16/2020

EPA Contract No: 68HE0320D0003 TDD No: T603-20-07-002

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere



Paden City Groundwater
Paden City, Wetzel County, WV

Figure 2
Source Sampling Location Map

Legend

●	2020 Soil/Source Samples	▲	2018 Soil/Source Samples
⊙	2020 Background Soil Samples	🟩	Source – Contaminated Soil
■	2018 Background Soil Samples	🟥	Former Band Box Cleaners

Reference 5, pp.1, 2, 3; 36, pp. 1-4; Section 2.2 of this HRS documentation record

Imagery: ESRI Mapping Service
The source of the map image is ESRI, used by the EPA with ESRI's permission.

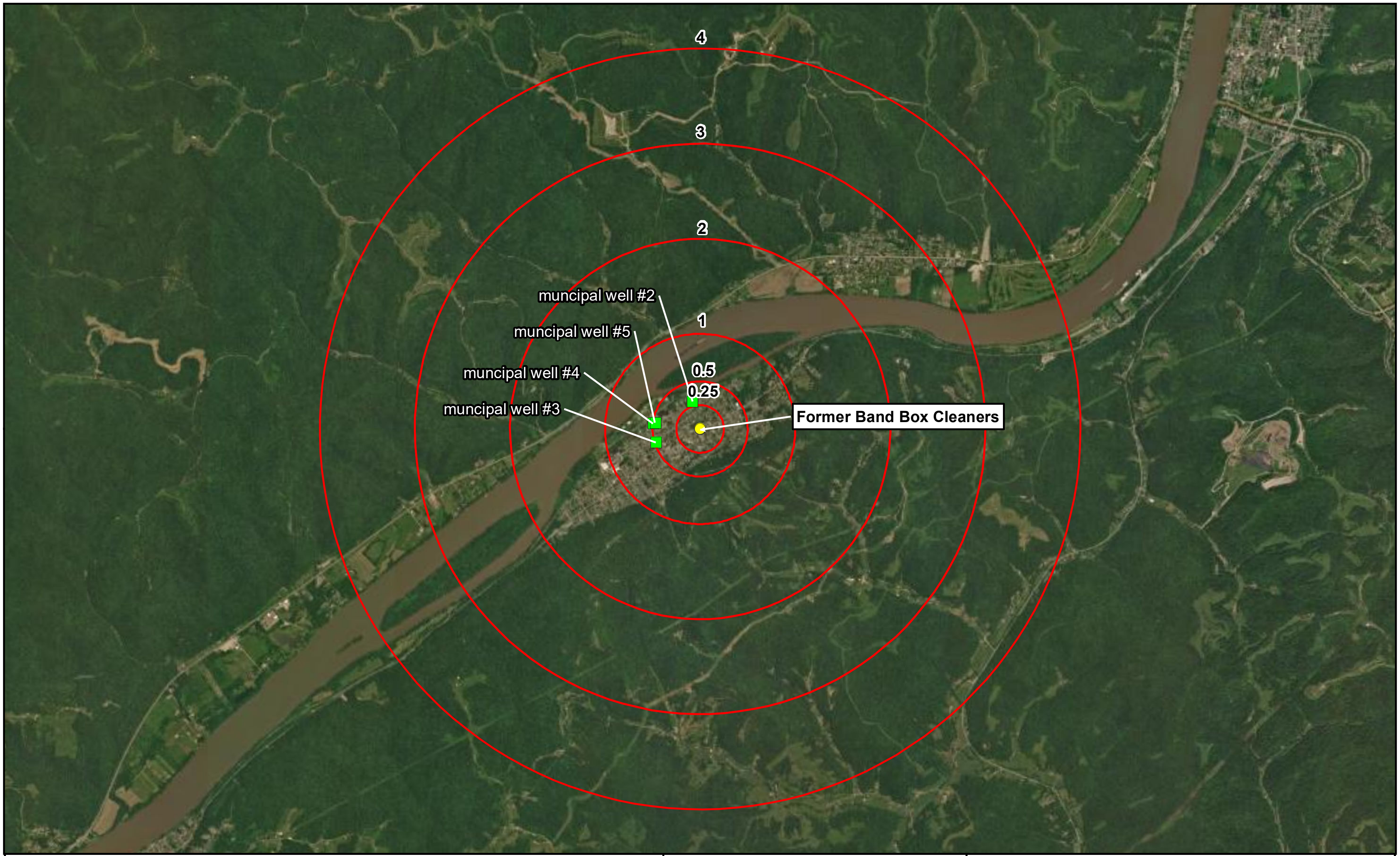
TETRA TECH

Prepared For: EPA START IV R3

File Path: S:\06 Technical Documents\9034\03\20 07 002\Figure2.mxd

Date Saved: 7/28/2021 EPA Contract No: 68HE0320D0003 TDD No: T603-20-07-002

Coordinate System: NAD 1983 2011 StatePlane West Virginia North FIPS 4701 FtUS



Legend

○ 4-Mile Target Distance Limit Ring

🟩 Municipal well

● SB-05

Refs. 5, p. 3; 35, p. 1

Imagery: ESRI Mapping Service
The source of this map image is Esri, used by the EPA with Esri's permission

Data Sources
Imagery: ESRI Service Layer

Coordinate System:
State Plane West Virginia North
Linear Unit: Foot US

Datum: D North American 1983 (NAD 83)

N

0 1,300 2,600 5,200
Feet

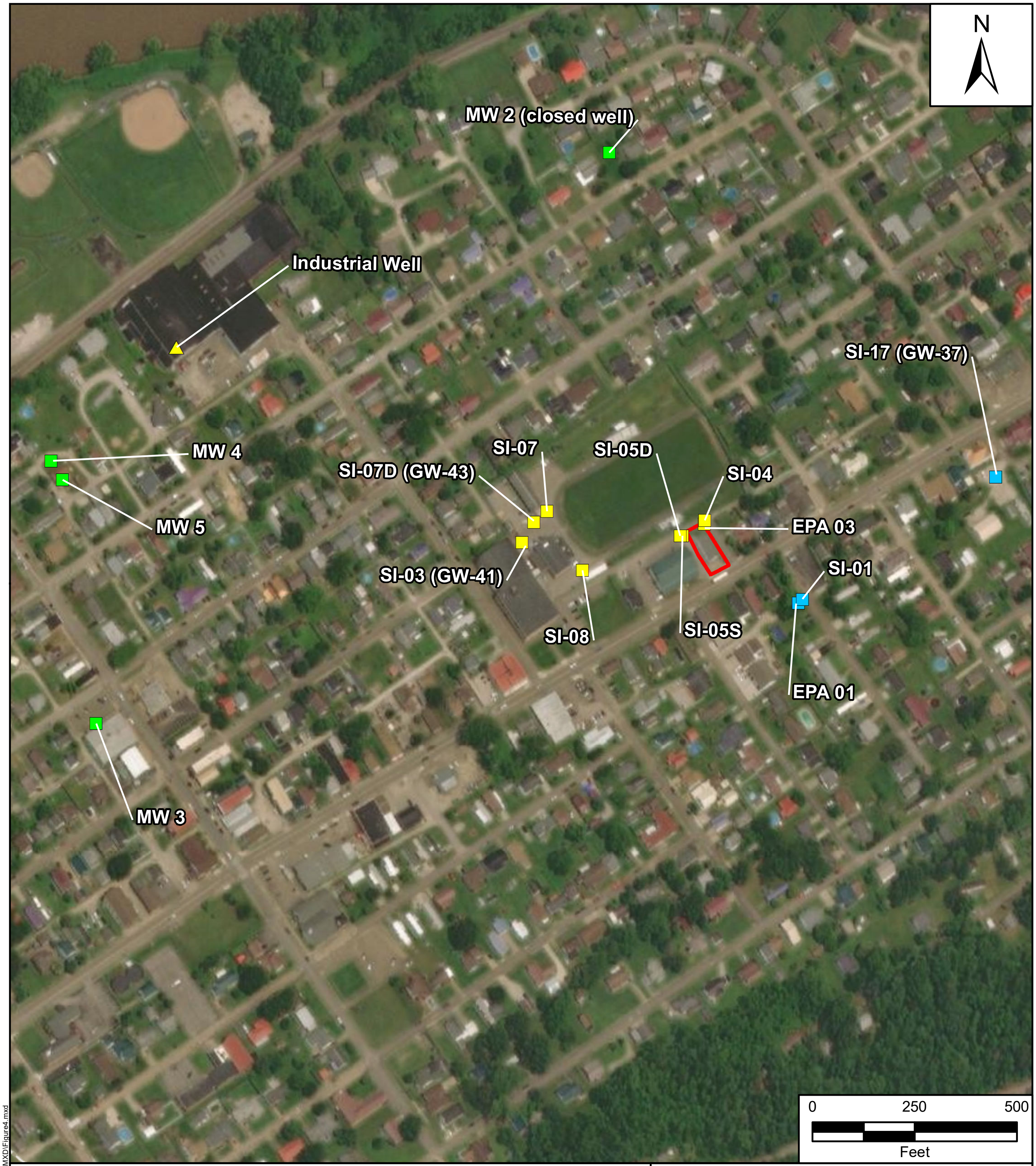
Paden City Groundwater
Paden City, Wetzel County,West Virginia

Figure 3

4-Mile Radius Target Distance Limit Map

TD No.: T603-20-07-002
Contract: 68-HE-0320-D0003
Prepared: 12/22/20

TETRA TECH



Legend

△ Industrial Well
🟩 Paden City Municipal Supply Well
🟦 Background Monitoring Wells
🟨 Monitoring Wells
▭ Former Band Box Cleaners

Refs. 3, p. 1; 35, p. 1; 36, p. 1; Section 3.1.1 of this HRS documentation record

Imagery: ESRI Mapping Service
The source of the map image is ESRI, used by the EPA with ESRI's permission.

Paden City Groundwater Plume
Paden City, Wetzel County, WV

Figure 4

Groundwater Sampling Location Map

TETRA TECH

Prepared For: EPA START IV R3

File Path: S:\06 Technical Documents\9034\03\20 07 002\MXD\Figure4.mxd

Date Saved: 02/03/21 EPA Contract No: 68HE0320D0003 TD No: T603-20-07-002 Coordinate System: NAD 1983 2011 StatePlane West Virginia North FIPS 4701 FtUS

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of Source: 1

Source Type: Contaminated Soil

Name of the Source: Contaminated Soil

Description and Location of Source (with reference to a map of Site):

Source 1 is an undefined volume of PCE-contaminated soil on the property that formerly contained Band Box Cleaners that has resulted from the migration, deposition, or spillage of hazardous substances associated with dry-cleaning activities conducted on the property (**Figure 2** of this HRS documentation record). Band Box Cleaners is listed as a historical dry cleaner that operated at this location from at least 1969 to 1997 (Ref. 11, p. 91). The address of 223 North 4th Avenue is the current correct address for the property formerly occupied by Band Box Cleaners. Band Box Cleaners also has a historic address of 233 North 4th Avenue (Refs. 11, p. 91; 13, pp. 25, 36, 40, 44, 50, 53; 14, p. 2). According to the Paden City Director of Public Works, Band Box Cleaners had always operated in the same building (Ref. 46, p. 1). PCE was used as the dry-cleaning solvent during Band Box Cleaners operations (Ref. 11, pp. 73, 74; 14, pp. 2, 3).

The specific waste handling practices of Band Box Cleaners is not known; however, general historic waste handling practices of dry cleaners included discharging PCE containing wastewater to sewer systems, which could lead to leakage to surrounding soil and groundwater, or discharging wastewater directly onto the ground surface (Refs. 44, pp. 8, 13, 14; 45, pp. 4, 5, 14, 15). If solvent wastes were discharged down floor drains plumbed with polyvinyl chloride (PVC) piping, PCE can soften and even dissolve the PVC. The elbow joints of drain lines are particularly susceptible to dissolution. Additionally, PCE vapors are denser than air, the vapors tend to settle to the floor. These vapors will migrate to low spots along the facility floor and floor drains, floor expansion joints and cracks in the floor slab are prime entry point for these vapors (Ref. 44, pp. 13, 14). Another standard practice was to place spent solvent filter cartridges outside in trash dumpsters or on the ground surface (Refs. 44, p. 9; 45, pp. 5, 6, 16). Spent solvent filter cartridges can contain up to a gallon of PCE that could then drain out onto the ground surface (Ref. 44, p. 9). Studies have shown that it does not take a lot of solvent to contaminate soil or groundwater. One tablespoon of PCE is enough to contaminate two Olympic-sized swimming pools and one gallon of PCE can cause a 200,000,000 gallon drinking water reservoir to exceed the drinking water standard of five parts per billion (ppb) (Ref. 45, p. 3).

In November 2018, EPA Removal Program conducted a subsurface investigation in the vicinity of the former Band Box Cleaners and along a nearby sanitary sewer line (Ref. 10, pp. 7, 8, 22). Analytical results for collected soil samples indicated the presence of PCE in the eight borings installed on the former dry cleaners property up to a maximum concentration of 19,000,000 µg/kg in a soil sample collected at between 14.3 and 14.6 feet bgs (Ref. 10, pp. 26, 31; **Tables 2 and 3** of this HRS documentation record).

In June 2020, EPA Site Assessment collected surface and subsurface soil samples from borings drilled during monitoring well installation conducted within the boundary of the former dry cleaners, as well as locations east and west of the facility (Ref. 18, pp. 7-16; **Figure 2**). The soil samples were collected to further characterize source area(s) and contaminant characteristics of source area in the vicinity of the former dry cleaners (Ref. 19, p. 5). Analytical results from two subsurface soil samples collected from a boring installed on the northwest corner of Band Box Cleaners property contained concentrations of PCE of 110,000 µg/kg at 28.6 to 29 feet bgs, and 31 µg/kg at 46.8 to 47 feet bgs (Refs. 18, pp. 20, 34, 37; 23, pp. 18, 19; **Tables 2 and 3** of this HRS documentation record).

In September 2020, EPA Site Assessment collected surface and subsurface soil samples from borings drilled during monitoring well installation conducted within the boundary of the former dry cleaners, as well as locations east and southwest of the facility (Ref. 55, pp. 7-13, 15-23, 33-43, 63, 64, 69, 70); **Figure 2**). The soil samples were collected to further characterize source area(s) and contaminant characteristics of source area in the vicinity of the former dry cleaners (Ref. 19, p. 5). Analytical results from three subsurface soil samples collected from a boring installed on the northeast corner of Band Box Cleaners property contained concentrations of PCE of 64 µg/kg at 1.9-2.0 feet bgs, 80 µg/kg at 5.5 to 6.0 feet bgs, and 9,600 µg/kg at 15.5 to 16 feet bgs (Refs. 55, pp. 43, 69, 73, 74, 76, pp. 18, 19; **Tables 2 and 3** of this HRS documentation record).

2.2.2 Hazardous Substances Associated with the Source

PCE is a man-made compound commonly used in commercial/industrial operations such as dry cleaning, metal degreasing, and manufacturing of other chemicals; it is also used in some consumer products (Ref. 26, p. 1). PCE breaks down into trichloroethene (TCE), cis-1,2-Dichloroethene (1,2-DCE), vinyl chloride, and to a lesser extent trans-1,2-DCE in the environment (Ref. 47, pp. 2, 3).

In November 2018, EPA conducted a subsurface investigation in the vicinity of the former Band Box Cleaners and along a nearby sanitary sewer line (Ref. 10, pp. 7, 8, 22). During this investigation, 11 soil borings were advanced using direct-push technology (DPT), and soil cores were collected with 4-foot macro core tubes with dedicated plastic sleeve liners (Ref. 10, pp. 7, 8). Soil cores were logged for lithology and screened using a photoionization detector (PID) for volatile organic compounds (VOC). The PID measurements were collected every 6 inches in the recovered cores. Information gathered by logging and screening the soil cores (e.g., PID, visual, odors) was used to determine discrete depth intervals with potential contamination for collecting soil samples. Soil samples were collected from intervals of suspected contamination, from the smallest discrete zone exhibiting the highest VOC PID reading. If no contamination was observed, the samples were collected from the capillary fringe zone if groundwater was encountered, or near the bottom of the borehole (Ref. 10, p. 8)

A total of 13 soil samples were collected from 11 borings; 8 borings on the property of the former Band Box Cleaners and 3 borings along the sanitary sewer line that runs perpendicular along the facility's western property boundary (Ref. 10, pp. 7, 8, 22; **Figure 2**). The eight boreholes installed on the former dry cleaners' property were advanced to 16 feet bgs, and the 3 boreholes along the sanitary sewer line were advanced to 12 feet bgs (Ref. 10, p. 9). PID recordings of soil cores from borings advanced along the eastern side of the dry cleaners building indicated VOC readings as high as 59 parts per million (ppm) at a depth of 14.5 feet bgs (Ref. 10, p. 8). The soil samples were collected using core samplers, with the exception of soil sample SB06-1, which was collected in 4-ounce glass jars with septa due to an excessive amount of gravel, and shipped daily to the assigned EPA Contract Laboratory Program (CLP) laboratory, Shealy Environmental Services in West Columbia, South Carolina, to be analyzed for CLP Target Analyte List (TAL) volatiles in accordance with EPA CLP Statement of Work (SOW) SOM02.4 under CLP Case No. 48006 (Ref. 10, pp. 8, 9). The data were validated by the EPA Environmental Services Assistance Team (ESAT) in accordance with the National Functional Guidelines for Organic Superfund Methods Data Review and applicable EPA Region 3 modifications (Ref. 10, p. 13). Analytical results for the soil samples collected indicated the presence of PCE in the eight borings installed in the vicinity of the former dry cleaners up to a maximum concentration of 19,000,000 µg/kg in a soil sample collected between 14.3 and 14.6 feet bgs (Ref. 10, pp. 26, 31; **Table 3** of this HRS documentation record). Two soil borings samples, SB09-1 and SB11-1, that were collected during this sampling event were nondetect for PCE and its breakdown products (**Table 2** of this HRS documentation record). Though background comparison samples are not required by the HRS for documenting source contamination, samples SB09-1 and SB11-1 are presented to demonstrate that PCE in soil is not ubiquitous. Background and source samples were collected during the same time period, submitted to the same laboratory, and analyzed in accordance with the same analytical method. Additionally, background and source samples consisted of similar matrices as noted in **Table 1** of this HRS documentation record. With the exception of sample SB09-1, the background samples were collected hydrologically up-or cross-gradient (generally east-southeast) of the source and contaminated groundwater as groundwater flows northwesterly westerly towards the Ohio River (**Figures 2 and 4**; Ref. 67, pp. 2, 3).

In June 2020, EPA Site Assessment collected 10 surface and subsurface soil samples from four borings drilled during monitoring well installation, including two boreholes installed on properties south of Band Box Cleaners beyond areas believed to have been impacted by past facility operations (Ref. 18, pp. 7-16, 34, 37). Sampling location SI-01 is located approximately 275 feet southeast of the former Band Box Cleaners facility and sampling location SI-16 is located approximately 460 feet southeast of the former dry cleaner (Ref. 18, p. 38). A search of regulatory databases did not identify any former dry cleaners or other businesses likely to have used PCE at or in the vicinity of these soil boring locations (Refs. 11, p. 23; 18, p. 38). One soil boring, SI-05D, was installed in the northwest corner of the Band Box Cleaners property to a depth of 80 feet bgs (Ref. 18, pp. 20, 34, 37, 96-112). PID readings of the soil boring indicated VOC readings as high as 235 ppm at 47 feet bgs (Ref. 18, pp. 96-112). Soil samples were collected with hermetically sealed hand-held coring devices and shipped daily to the assigned EPA CLP laboratory (ChemTech Consulting Group in Mountainside, New Jersey) to be analyzed for CLP TAL VOCs in accordance with EPA CLP SOW SOM02.4 under CLP Case No. 48922 (Refs. 19, pp. 12, 30; 20, pp. 2, 3, 4; 23, p. 2). The data were validated by the EPA ESAT in accordance with the National Functional Guidelines for Organic Superfund Methods Data Review and applicable USEPA Region 3 modifications (Ref. 23, p. 2). Though background comparison samples are not required by the HRS for documenting source contamination, soil samples collected from SI-01 and SI-16D are presented to demonstrate that PCE in soil is not ubiquitous. The background samples were collected hydrologically upgradient of the source and contaminated groundwater (see **Section 3.0** of this HRS documentation record for groundwater flow discussion and documentation; also **Figures 1 and 4**; Refs. 28, p. 28 and 35; 67, pp. 2, 3). Additionally, VOCs were not detected on the photo ionization detector screenings of the background soil borings (Refs. 10, pp. 70, 71, 74, 75, 76; 18, pp. 39-48, 82-96). Background and source samples were collected during the same time period, submitted to the same laboratory, and analyzed in accordance with the same analytical method. Although the background samples and two source samples collected as part of the June 2020 sampling event are not of comparable matrices or depths as presented in **Table 1** of this HRS documentation record, the data is presented to document the presence of PCE at the former dry cleaners, which is not detected at other areas, and that PCE and TCE are not ubiquitous.

In September 2020, EPA Site Assessment collected 15 surface and subsurface soil samples from seven borings located on the former Band Box Cleaners property and other locations throughout Paden City, including an additional borehole (SI-17) installed east of Band Box Cleaners in a location beyond areas believed to have been impacted by past facility operations (Ref. 55, pp. 7-23, 36-44, 63, 64, 69). A search of regulatory databases did not identify any former dry cleaners or other businesses likely to have used PCE at or in the vicinity of this soil boring location (Refs. 11, p. 23). One soil boring, SI-02, was installed on the east side of the Band Box Cleaners property to a depth of 20 feet bgs (Ref. 55, pp. 63, 69, 73-76). PID readings of the soil boring indicated VOC readings as high as 190 ppm at 16 feet bgs (Ref. 55, pp. 73-76). Soil samples were collected with hermetically sealed hand-held coring devices and shipped daily to the assigned EPA CLP laboratory (ChemTech Consulting Group in Mountainside, New Jersey) to be analyzed for CLP TAL VOCs in accordance with EPA CLP SOW SOM02.4 under CLP Case No.49071 (Refs. 56, p. 2; 57, p. 2; 58, p. 2). The data were validated by the EPA ESAT in accordance with the National Functional Guidelines for Organic Superfund Methods Data Review and applicable USEPA Region 3 modifications (Refs. 56, p. 2; 57, p. 2; 58, p. 2). Though background comparison samples are not required by the HRS for documenting source contamination, soil samples collected from SI-17 are presented to demonstrate that PCE in soil is not ubiquitous. The background sample was collected hydrologically upgradient of the source and contaminated groundwater (see **Section 3.0** of this HRS documentation record for groundwater flow discussion and documentation; also **Figures 1 and 4**; Refs. 28, p. 28 and 35; 67, pp. 2, 3). Background and source samples were collected during the same time period, submitted to the same laboratory, and analyzed in accordance with the same analytical method. Although the background samples and two of the source samples collected as part of the September 2020 sampling event are not of comparable matrices or depths as presented in **Table 1** of this HRS documentation record, the data is presented to document the presence of PCE at the former dry cleaners, which is not detected at other areas, and that PCE and TCE are not ubiquitous.

The table below provides a summary of the subsurface soil sample depth and matrix descriptions for the samples collected as part of the November 2018, June 2020, and September 2020 sampling events. The primary matrix of the subsurface soil samples is the same as the Alluvial Aquifer with contains sand and gravel (**Table 1** of this HRS documentation record; Ref. 28, p. 23). Therefore, the samples were collected from the same geologic unit with similar composition as well as origin. As documented in Table 1, none of the background or source samples contain organic material, solely alluvial deposits.

TABLE 1

BACKGROUND AND SOURCE 1 SOIL SAMPLE DEPTHS AND MATRIX DESCRIPTIONS 2018 AND 2020 SAMPLES

Sample ID	Sample Depth (ft. bgs)	Soil Matrix Description	Reference
November 2018			
SB-09-1	9.6-9.9	Grayish-brown coarse sand and gravel	10, p. 70
SB-11-1	9.2-9.4	Medium to coarse sand, little to no gravel	10, p. 76
SB-01-1	9.3 -9.5	Brownish-yellow sand and gravel, little to no silt	10, p. 38
SB-02-1	14.5-14.7	Yellow-brown sand and gravel, some fines	10, p. 43
SB-03-1	13.5-14.2	Brown sand, silt, and some gravel	10, p. 47
SB-04-1	15.3-15.5	Light brown medium grained sand, some silt	10, p. 51
SB-05-1	14.3-14.6	Light brown medium to coarse sand and gravel	10, p. 55
SB-06-1	4.0-8.0	Brown coarse sand and gravel, no fines	10, p. 57
SB06-2	13.0-13.3	Coarse sand and gravel	10, p. 59
SB-07-1	4.0-4.3	Sand and gravel, little silt	10, p. 61
SB-08-1	13.5-14.0	Grayish-brown coarse sand and gravel	10, p. 67
SB-08-2	13.5-14.0	Grayish-brown coarse sand and gravel	10, p. 67
SB-10-1	10.4-10.8	Dark brown silt with some sand and gravel	10, p. 73
June 2020			
SI-16D-SS01	1.5-2	Gray brown clay with medium grained sand and some silt	18, p. 39
SI-16D-SB01	5.5-6	Light brown silty clay	18, p. 40, 41
SI-01-SS02	1.5-2	Coarse sand and gravel	18, p. 82
SI-01-SB03	5.0-5.5	Gray clay some sand and gravel	18, p. 82, 83
SI-05D-SB05	28.6-29	Black medium to coarse grained sand, little to no gravel	18, p. 102
SI-05D-SB06	46.8-47	Reddish-brown medium to coarse grained sand, some gravel	18, p. 105, 106
September 2020			
SI-02-SS08	1.9-2.0	Dark brown medium coarse sand and silty clay with some gravel	55, p. 73
SI-02-SB16	5.5-6.0	Brown coarse sand and gravel some silt	55, pp. 73, 74
SI-02-SB17	15.5-16.0	Brown medium coarse sand little to no gravel	55, p. 76
SI-17-SB09	5.0-5.5	Dark-brown, gray sandy silty clay with some gravel	55, pp. 198-199

Note:
Bold indicates background/nondetect sample location.

TABLE 2

SOURCE NO. 1 – BACKGROUND SOIL SAMPLE CONCENTRATIONS

CLP Sample ID	Sample ID	Depth (ft. bgs)	Date	Hazardous Substance	Concentration (µg/kg)	Adjusted CRQL (µg/kg)	References
C0AA7	SB09-1	9.6-9.9	11/27/18	PCE	6.3U[1]	6.3	**Figure 2**; 10, pp. 22, 26, 70, 114-117, 134; 15, p. 8; 20, pp. 3, 42; 21, pp. 1-2
C0AB0	SB11-1	9.2-9.4	11/27/18	PCE	6.0U	6.0	**Figure 2**; 10, pp. 22, 27, 76, 114-117, 138; 15, p. 9; 20, pp. 3, 51; 21, pp. 1-2
C0AF7	SI-16D-SS01	1.5-2	06/01/20	PCE	5.3U	5.3	**Figure 2**; 18, pp. 7, 34, 37, 39; 23, pp. 1-6; 24, pp. 2, 7; 25, pp. 1-2
C0AF8	SI-16D-SB01	5.5-6	06/01/20	PCE	9.5U	9.5	**Figure 2**; 18, pp. 7, 34, 37, 40-41; 23, pp. 1-5, 7; 24, pp. 2, 11; 25, pp. 1-2
C0AG5	SI-01-SS02	1.5-2	06/04/20	PCE	5.1U	5.1	**Figure 2**; 18, pp. 16, 34, 37, 82; 23, pp. 1-5, 13; 24, pp. 3, 35; 25, pp. 1-2
C0AG6	SI-01-SB03	5-5.5	06/04/20	PCE	7.4U	7.4	**Figure 2**; 18, pp. 16, 34, 37, 83; 23, pp. 1-5, 14; 24, pp. 3, 39; 25, pp. 1-2
C0AK7	SI-17-SB09	5.0-5.5	09/08/20	PCE	6.1U	6.1	**Figure 2;** 55, pp. 7, 198-199; 56, pp. 1-4, 6, 18, 24; 59, pp. 1-2

Notes:

[1] The trip and rinsate blanks reported concentrations of acetone, 2-butanone and/or tetrachloroethene < the CRQL. Positive results for these analytes < the CRQL have been raised to the CRQL and qualified “U” (Refs. 10, pp. 102, 115, 134; 20, pp. 42, 69; 21, pp. 1-2).

The Adjusted CRQL is equivalent to the HRS-defined EPA CLP CRQL adjusted for sample weight, volume, dilution, and percent solids (Refs. 1, Section 1.1; 22, pp. 130-131, 504).

Mg/kg = micrograms per kilogram
bgs = Below ground surface
CLP = Contract Laboratory Program
CRQL = EPA Contract Laboratory Program Contract Required Quantitation Limit
ft. = feet
PCE = tetrachloroethylene
U = The analyte was analyzed for, but was not detected above the level of the reported CRQL adjusted for sample and method (Refs. 1, Table 2-3; 10, p. 117; 23, p. 5; 56, p. 4)

TABLE 3

SOURCE NO. 1 – SOURCE SOIL SAMPLE CONCENTRATIONS

CLP Sample ID	Sample ID	Depth (ft. bgs)	Date	Hazardous Substance	Concentration (µg/kg)	Adjusted CRQL (µg/kg)	References
C0AA0	SB01-1	9.3 -9.5	11/26/18	PCE	77	4.4	**Figure 2;** 10, pp. 26, 38, 114-118; 15, p. 5; 20, pp. 2, 6; 21, pp. 1-2
C0AA1	SB02-1	14.5-14.7	11/26/18	PCE	140	5.8	**Figure 2;** 10, pp. 26, 43, 114-117, 119; 15, p. 6; 20, pp. 2, 9; 21, pp. 1-2
C0AA2	SB03-1	13.5-14.2	11/26/18	PCE	12,000	690	**Figure 2;** 10, pp. 26, 47, 114-117, 123; 15, p. 6; 20, pp. 2, 15; 21, pp. 1-2
C0AA3	SB04-1	15.3-15.5	11/27/18	PCE	7,200	310	**Figure 2;** 10, pp. 26, 51, 114-117, 126; 15, p. 6; 20, pp. 3, 21; 21, pp. 1-2
C0AA4	SB05-1	14.3-14.6	11/27/18	PCE	19,000,000	580,000	**Figure 2;** 10, pp. 26. 55, 114-117, 127; 15, p. 7; 20, pp. 3, 24; 21, pp. 1-2
C0AA9	SB06-1	4.0-8.0	11/27/18	PCE	2,200	300	**Figure 2;** 10, pp. 26. 57, 114-117, 137; 15, p. 7; 20, pp. 3, 48; 21, pp. 1-2
C0AB8	SB06-2	13.0-13.3	11/27/18	PCE	180,000	13,000	**Figure 2;** 10, pp. 26, 59, 114-117, 142; 15, p. 8; 20, pp. 3, 60; 21, pp. 1-2
C0AA5	SB07-1	4.0-4.3	11/27/18	PCE	8,500	450	**Figure 2;** 10, pp. 26, 61, 114-117, 130; 15, p. 8; 20, pp. 3, 30; 21, pp. 1-2
C0AA6	SB08-1	13.5-14.0	11/27/18	PCE	510	300	**Figure 2;** 10, pp. 26, 67, 114-117, 133; 15, p. 8; 20, pp. 3, 36; 21, pp. 1-2
C0AB9	SB08-2	13.5-14.0	11/27/18	PCE	3,800	330	**Figure 2;** 10, pp. 26, 67, 114-117, 143; 15, p. 8; 20, pp. 4; 63; 21, pp. 1-2
C0AA8	SB10-1	10.4-10.8	11/27/18	PCE	2,200	310	**Figure 2;** 10, pp. 27, 73, 114-117, 136; 15, p. 8; 20, pp. 3, 45; 21, pp. 1-2
C0AG8	SI-05D-SB05	28.6-29	06/05/20	PCE	110,000	5,100	**Figure 2;** 18, pp. 20, 34, 38, 102; 23, pp. 1-5, 18; 24, pp. 4, 51; 25, pp. 1-2
C0AG9	SI-05D-SB06	46.8-47	06/05/20	PCE	31	6.7	**Figure 2;** 18, pp. 20, 34, 38, 106; 23, pp. 1-5, 19; 24, pp. 4, 59; 25, pp. 1-2
C0AM6	SI-02-SS08	1.9-2.0	09/29/20	PCE	64	5.1	**Figure 2;** 55, pp. 43, 73; 58, pp. 1-4, 16, 40, 74; 59, pp. 1-2
C0AM7	SI-02-SB16	5.5-6.0	09/29/20	PCE	80	5.2	**Figure 2;** 55, pp. 43, 73, 74; 58, pp. 1-4; 17, 40, 78; 59, pp. 1-2
C0AM8	SI-02-SB17	15.5-16.0	09/29/20	PCE	9,600	520	**Figure 2;** 55, pp. 43, 76; 58, pp. 1-4, 20, 40, 86; 59, pp. 1-2

Notes:
The Adjusted CRQL is equivalent to the HRS-defined EPA CLP CRQL adjusted for sample weight, volume, dilution, and percent solids (Refs. 1, Section 1.1; 22, pp. 130-131, 504).

µg/kg = micrograms per kilogram
bgs = Below ground surface
CLP = Contract Laboratory Program
CRQL = EPA Contract Laboratory Program Contract Required Quantitation Limit
ft. = feet
PCE = tetrachloroethylene

2.2.3 Hazardous Substances Available to Pathway

Soil samples collected from Source No. 1 document PCE contamination at depths ranging from 4 to 47 feet bgs (Refs. 10, pp. 26, 57, 61, 130, 137; 15, pp. 7, 8; 20, pp. 3, 30, 48; 21, pp. 1-2; 18, pp. 20, 34, 38, 106; 23, p. 19; 24, pp. 4, 59; 25, pp. 1-2; 58, pp. 16, 17, 20, 74, 78, 86; 59, pp. 1-2). During the November 2018, June 2020, and September 2020 sampling events, a liner was not observed during sampling activities (Refs. 10, pp. 36-76; 18, pp. 39-130; 55, pp. 73-76). Additionally, based on evidence of hazardous substance migration (contamination detected in groundwater samples collected from monitoring wells and public supply wells that meets the criteria for an observed release, as further presented in **Section 3.1.1** of this HRS documentation record), a containment factor of 10 is assigned (Ref. 1, Section 3.1.2.1, Table 3-2).

TABLE 4

SOURCE NO. 1 CONTAINMENT FACTORS

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to groundwater: No liner	10	1, Section 3.1.2.1, Table 3-2
Release via overland migration and/or flood	NS	NA

Notes:
NA = Not applicable
NS = Not scored

2.4.2 Hazardous Waste Quantity

Insufficient information exists to evaluate hazardous constituent quantity and hazardous wastestream quantity. Therefore, the hazardous waste quantity value is calculated using Tier C, Volume of the Contaminated Soil (Ref. 1, Section 2.4.2.1) for Source No. 1.

2.4.2.1.1 Hazardous Constituent Quantity (Tier A)

The hazardous constituent quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source, and releases from the source, are not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.1). There are insufficient historical and current data (manifests, Potentially Responsible Party [PRP] records, state records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous constituent quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, Hazardous Wastestream Quantity (Ref. 1, Section 2.4.2.1.1).

Hazardous Constituent Quantity (C) Value: Not scored

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The hazardous wastestream quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the mass of the hazardous wastestreams plus the mass of any additional CERCLA pollutants and contaminants in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.2). There are insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of the wastestream plus the mass of all CERCLA pollutants and contaminants in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier C, Volume of the Contaminated Soil (Ref. 1, Section 2.4.2.1.2).

Hazardous Wastestream Quantity (W) Value: Not scored

2.4.2.1.3 Volume (Tier C)

Based on sampling data, contaminated soil has been documented at the former Band Box Cleaners property. The vertical and horizontal extent of the area of contamination has not been thoroughly investigated. Documented depth of contamination ranges from 4 to 47 feet bgs in the soil borings (**Section 2.2.2** of this HRS documentation record). The information available on the vertical extent of the soil contamination is not sufficient to support an exact or reasonably accurate volume of the contaminated soil with reasonable confidence; therefore, it is not possible to calculate a volume (Tier C) for Source No. 1 (Ref. 1, Section 2.4.2.1.3). Therefore, for Source No. 1, a value of greater than 0 but exact amount unknown has been assigned for the source hazardous waste quantity value for volume (Ref. 1, Section 2.4.2.1.3). The source type is “contaminated soil;” therefore, the volume value is divided by 2,500 to obtain the assigned value, as shown below (Ref. 1, Section 2.4.2.1.3, Table 2-5).

Dimension of source in cubic yards (yd^3): >0 yd^3
Volume (V) Assigned Value: (>0)/2,500 = >0

2.4.2.1.4 Area (Tier D)

The volume of the source has been determined; therefore, Tier D – Area, is assigned a hazardous waste quantity value of 0 (Ref. 1, Section 2.4.2.1.4, Table 2-5).

Area (A) Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source 1 is >0 for Tier C, Volume (Ref. 1, Section 2.4.2.1.5).

Source Hazardous Waste Quantity Value: >0

TABLE 5

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source Number	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete (Y/N)	Containment			
			Ground water	Surface Water	Air (Gas)	Air (Particulate)
1	>0	N	10	NS	NS	NS

Notes:
N = No
NS = Not scored
Y = Yes

<u>Description of Other Possible Sources</u>

No other possible sources have been identified.

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 General Considerations

Groundwater Migration Pathway Description

Regional Geology/Aquifer Description:

The site is situated in the Paden City Bottom of the Ohio River Valley in West Virginia and is underlain by Quaternary Age Alluvium (Refs. 30, p. 70; 48, p. 1). The alluvium consists of Pleistocene Age to recent deposits of sand and gravel interbedded with silt and clay (Ref. 29, pp. 9, 12, 13). The alluvium is limited primarily to the flood plain of the Ohio River, approximately 0.6 mile wide at its widest point, and ranges in thickness from 0 feet along the hillsides to more than 100 feet in some places near the river (Ref. 28, pp. 8, 9, 23). The lower part of the alluvial deposits consists of sand and gravel of glacial outwash origin and is overlain by a layer of clay and silt of fluvial origin (Ref. 28, p. 23). The recent floodplain deposits consist of a layer of clay and silt that ranges from a few feet thick up to 40 feet thick with an average thickness of 10 feet (Ref. 30, p. 11). The layer was deposited by flood waters of the Ohio in repeated inundations of the floodplain (Ref. 30, p. 11). Alluvial fill of the Ohio River Valley displays a large-scale heterogeneity and lenticular character such that it is not uncommon to find gravel lenses in contact with fine sand or silt (Ref. 30, p. 12).

The permeability of the water-bearing materials along the Ohio River varies considerably, due to the percentages of clay, silt, sand, and gravel in the alluvium changing abruptly, both horizontally and vertically (Ref. 30, p. 16). Groundwater in the alluvium is generally in a water-table (unconfined) condition. In some localities where the gravel is relatively thin and the overlying clay-silt layer is relatively thick, semiconfined conditions may exist. Perched water has also been reported in fill overlying the alluvium (Ref. 28, p. 23). Groundwater in the alluvium is recharged by precipitation that falls on the surface of the alluvium, as well as some of the overland flow from the bedrock highlands, that percolates through the clay-silt layer to recharge the sand and gravel deposits of the alluvium. Although the clay-silt layer overlying the sand and gravel was originally believed to be nearly impermeable, water-quality data indicate that water does percolate through this layer into the more permeable sand and gravel zone. The clay-silt layer is not uniform in thickness and composition; thus, the amount and rate of percolation are variable. Further evidence of percolation through the clay-silt layer is indicated by the abnormally high concentration of sulfate in groundwater beneath or near areas containing fill. Under natural conditions, groundwater flows from the adjacent hills toward the Ohio River (Ref. 28, p. 28). Inflow into the alluvium occurs through fractures in the bedrock under the hillsides. Tributary streams flowing onto the alluvium from the hills can percolate through gravel deltas at the edges of the Ohio River valley to the gravel under the clay-silt layer. Recharge to the alluvium from the Ohio River may also occur when the aquifer close to the river is pumped heavily and the groundwater level is drawn below the river level. This recharge however is limited to the alluvial area between the river and pumped well. However, under natural conditions the water level in the aquifer is above the river in most places (Ref. 28, p. 29).

The saturated thickness of the alluvium ranged from 19 to 56 feet (ft) with a mean of 36 ft and a median of 34 ft. Estimated transmissivities ranged from 1,100 to 17,000 square feet per day (ft^2/d) with a mean of 6,300 ft^2/d and a median of 5,100 ft^2/d (Ref. 28, p. 31). The hydraulic conductivity ranged from 27 to 460 ft/d with a mean of 170 ft/d and median of 140 (ft/d). The hydraulic conductivity can be used to compute the specific discharge if the hydraulic gradient is known. Groundwater movement is in the direction of the hydraulic gradient. Under natural conditions, the hydraulic gradient dips gently from the hills to the Ohio River (Ref. 28, p. 35). The Alluvial Aquifer generally ranges from 25 to 100 feet below ground surface and may exceed 140 feet in some places (Ref. 29, p. 13).

Underlying the alluvium, is the early Pennsylvanian or Permian Age Dunkard Group, a sedimentary bedrock aquifer, which is a nearly horizontal, predominantly shale with sandstone, siltstone, coal, and limestone formation almost entirely of fresh-water or terrestrial origin (Refs. 29, pp. 12, 13, 14; 48, p. 1; 49, p. 56). The Dunkard Series are the youngest consolidated rocks in the Ohio River Valley and outcrop over an area of 8,000 square miles in West Virginia (Ref. 49, p. 56). The thickness of Dunkard strata varies based on the effects of erosion and consequent height of the hills and the depth of burial of the strata, either in deeper synclines or in the Dunkard Basin as a whole. The thickest sections, and consequently the youngest strata, are found in Wetzel and Marshall Counties, where the Dunkard Series is almost 1,200 feet thick (Ref. 49, p. 56).

The yield of water from wells that tap the consolidated rock units is typically low, ranging from less than 1 to as much as 300 gal/min. The median yield is about 6 gal/min. The mean specific capacity of wells drilled in the consolidated rocks is about 0.5 (gal/min)/ft of drawdown. Most of the ground water withdrawn from the consolidated sedimentary rocks is derived from secondary permeability features such as bedding-plane partings and fractures (Ref. 28, p. 22). The sedimentary bedrock aquifer can range from 50 to 300 feet below ground surface and may exceed 400 feet in some places (Ref. 29, p. 13). Studies indicate that the underlying bedrock is hydraulically connected to the overlying alluvium (Ref. 28, p. 28).

Site Geology/Aquifer Description:

- Aquifer/Stratum 1 (uppermost): Alluvial Aquifer (Quaternary)

Description

The Site is underlain by the Ohio River Alluvial Aquifer (Ref. 29, p. 9). Soil borings/monitoring wells installed in June 2020 and September 2020 by EPA within the Paden City Bottom show that in general the subsurface material consists of medium to coarse sand with gravel and pebble the entire core length with interbedded silty clay material (Refs. 18, pp. 34, 35, 38-130; 55, pp. 69, 71-210; **Figures 2 and 4**). This material is indicative of the Alluvial Aquifer which consist of Pleistocene to recent deposits of sand and gravel interbedded with silt and clay (Ref. 29, pp. 12, 13).

The alluvium ranges in thickness from 0 feet along the hillsides to more than 100 feet in some places near the river up to 140 feet maximum (Refs. 28, p. 23; 29, pp, 9, 12, 13). Paden City maintains three supply wells (MW#3, MW#4, and MW#5) located near the Ohio River and range in depth from 75.5 ft bgs (elevation of 574.1 ft [MW#3]) to 85 ft bgs (elevation of 560.69 ft [MW#4]), and are interpreted as being constructed within the Alluvial Aquifer (**Figures 3 and 4**; Refs. 6, pp. 2, 3, 4, 7; 35, pp. 1, 2, 3; 37, p. 7).

- Aquifer/Stratum 2: Bedrock Aquifer (Dunkard Group)

Description

The Dunkard Group is mapped as underlying the Alluvial Aquifer at Paden City (Ref. 29, p. 13; 30, p. 8; 48, p. 1; 49, p. 56). This aquifer is not evaluated as part of this HRS documentation record. No target wells within this formation have been identified.

3.0.1.1 Target Distance Limit

The target distance limit defines the maximum distance from the source(s) at the site over which targets are evaluated. In accordance with the HRS, the targets associated with the groundwater migration pathway are evaluated within a 4-mile radius from the source(s) at the site. **Figure 3** of this HRS documentation record depicts the 4-mile radius target distance limit.

3.0.1.2 Aquifer Boundaries

3.0.1.2.1 Aquifer Interconnections

The primary aquifer underlying the Site is the Alluvial Aquifer (Ref. 29, pp. 8, 9; **Figure 1**). The migration of non-naturally-occurring contaminants through the fine-grained sediments and the subsequent presence of contamination throughout the aquifer to a depth of at least 85 feet bgs (elevation of 560 feet) demonstrates that the interbedded silty clay layers do not impede local groundwater movement throughout the Alluvial Aquifer. As presented in **Section 3.1.1** of this HRS documentation record, wells completed and screened at depths ranging from 17 feet bgs (elevation of 644 feet) to 85 feet bgs (elevation of 560 feet) show PCE contamination (**Tables 7, 8, 9, and 10** of this HRS documentation record). The Dunkard Group and Alluvial Aquifer are hydraulically connected based on hydrograph studies that indicated an instantaneous response of both alluvial wells and bedrock wells to river-stage fluctuations (Ref. 28, p. 66). However, because no targets are associated with the Dunkard Group, the aquifer was not evaluated.

3.0.1.2.2 Aquifer Discontinuities

An aquifer discontinuity occurs for scoring purposes only when a geologic, topographic, or other structure or feature entirely transects an aquifer within the 4-mile target distance limit, thereby creating a continuous boundary to groundwater flow within this limit (Ref. 1, Section 3.0.1.2.2).

Paden City is situated along the eastern bank of the Ohio River (**Figure 1**). The Ohio River would be considered an aquifer discontinuity as groundwater within the Alluvial Aquifer discharge at the riverbed and riverbank from both the saturated and unsaturated zones (Ref. 28, p. 29). Groundwater from the saturated zone of the alluvium, which consists mostly of sand and gravel, enters the river through its bed. Discharge from the unsaturated zone occurs at the riverbank where water emerges from the thin sand layers in the upper clayey part of the alluvium (Ref. 28, p. 29).

For the purpose of the HRS scoring, the aquifer being evaluated is the Alluvial Aquifer. There is no aquifer discontinuity between the source being evaluated for the Site (see **Section 2.2**) and the wells used to document an observed release to groundwater (see **Section 3.1.1**), all of which are located on the east side of the Ohio River within the Paden City Bottom Alluvial Fill of the Ohio River Valley (**Figures 3 and 4**; Refs. 30, pp. 70, 71; 48, p. 1).

TABLE 6

SUMMARY OF AQUIFER(S) BEING EVALUATED

Aquifer No.	Aquifer Name	Is Aquifer Interconnected with Upper Aquifer within 2 miles? (Y/N/NA)	Is Aquifer Continuous within 4-mile TDL? (Y/N)	Is Aquifer Karst? (Y/N)
1	Alluvial Aquifer	NA	N	N

Notes:
N = No
NA = Not applicable
TDL = Target distance limit
Y = Yes

3.1 LIKELIHOOD OF RELEASE

Groundwater samples collected in April, June, and October 2020 document the contamination and demonstrate the observed releases to groundwater, as described below.

As presented in **Section 2.2** of this HRS documentation record, PCE was detected in the source samples. However, PCE readily breaks down in the environment to TCE and cis-1,2-DCE and to a lesser extent trans-1,2-DCE (Ref. 47, pp. 2, 3). Therefore, analytical results that meet the criteria for an observed release in groundwater samples for PCE breakdown products are also presented to document an observed release by chemical analysis.

3.1.1 Observed Release

Aquifer Being Evaluated: Alluvial Aquifer

Chemical Analysis

An observed release by chemical analysis is established by demonstrating that the hazardous substance in release samples is significantly greater in concentration than in the background samples and by documenting that at least part of the significant increase is due to a release from the Site being evaluated. The significant increase can be documented in one of two ways for HRS purposes. If the background concentration is not detected, an observed release is established when the sample measurement in a similar sample equals or exceeds the appropriate quantitation limit. If the background sample concentration equals or exceeds the detection limit, an observed release is established when the sample measurement in a similar sample is three times or more the background concentration and above the appropriate quantitation limit (Ref. 1, Section 2.3, Table 2-3). All hazardous substances in the groundwater observed release tables meet these criteria.

As presented in **Section 3.0.1** of this HRS documentation record, under natural conditions, groundwater flows from the adjacent hills towards the Ohio River (northwesterly) (**Figure 1**; Ref. 28, pp. 28 and 35). Additionally, groundwater flow has been documented to flow generally to the northwest (**Figure 4**; Ref. 67, pp. 2, 3). The alluvium thickens from almost nonexistent along the hillsides to more than 100 feet in some places near the river (Ref. 28, p. 23). The Paden City public supply wells are located close to the Ohio River where the alluvium is expected to be thickest, north and west of Source 1 (Refs. 28, p. 17; 29, p. 9; 37, p. 7; **Figure 4**). To document an observed release by chemical analysis, background wells were installed hydraulically upgradient of the source (i.e., east/southeast) (**Figure 4)**.

Tables 8 and 10 of this HRS documentation record provide the hazardous substances concentrations and additional sample information for the contaminated groundwater samples used to establish observed releases. The extent of the contaminated groundwater depicted on **Figure 4** is based on analytical data for the groundwater samples collected in April, June, and October 2020 from public supply wells, an industrial well, and monitoring wells that meet the criteria for an observed release (**Section 3.1.1** of this HRS documentation record).

Background Samples

To document background groundwater conditions hydraulically upgradient of the source, EPA has installed three permanent monitoring wells completed/screened in the Alluvial Aquifer east/southeast of the documented source, EPA01, SI-01, and SI-17, at depths of 21 feet bgs (elevation of 638.52 ft , 66.5 feet bgs (elevation of 593.13 ft), and 56 feet bgs (elevation of 600.25 ft), respectively (**Figure 4**; **Table 7**; Refs. 35, pp. 1, 2, 3, 4; 36, pp. 2, 4; 41, p. 1; 42, p. 4; 66, p. 9). EPA's Superfund Technical Assessment Response Team (START) contractor collected background groundwater samples from EPA01 in April 2020 as part of an EPA Removal Assessment, from SI-01 in June 2020 as part of the EPA Site Investigation, and from SI-01 and SI-17 in October 2020 as part of the EPA Site Investigation (Refs. 15, pp. 43, 45; 18, p. 31; 55, pp. 45, 46, 47). The collected background samples were submitted to an EPA CLP laboratory for trace VOC analysis in accordance with EPA SOW SOM02.4, and were validated in accordance with the National Functional Guidelines for Organic Superfund Methods Data Review and applicable EPA Region III modifications by EPA Region III ESAT (Refs. 31, p. 2; 33, p. 2; 60, p.2; 61, p. 2). PCE was detected in one background well at 0.62 μg/L. TCE and cis-1,2-DCE were not detected in the background wells (**Table 8**). Thus, a PCE background level of 0.62 μg/L (3x concentration of 1.86 μg/L) is used to evaluate an observed release of PCE. Since

TCE and cis-1,2-DCE were not detected above their quantitation limits of 0.5 µg/L, an observed release is established for TCE and cis-1,2-DCE when the observed release samples are at or above 0.5 µg/L TCE or cis-1,2-DCE (Ref. 1, Section 2.3, Table 2-3).

Contaminated Samples

To document an observed release to groundwater, EPA's START contactor collected groundwater samples from wells completed/screened within the Alluvial Aquifer of the Paden City public supply wells, an industrial well located in Paden City, and EPA-installed monitoring wells in April, June, and October 2020 (**Figure 4; Table 9**; Refs. 15, pp. 43-45; 18, pp. 28, 30- 33; 55, pp. 46, 47). The collected samples were submitted to an EPA CLP Laboratory for trace VOC analysis in accordance with EPA SOW SOM02.4 and validated in according to the National Functional Guidelines for Organic Superfund Methods Data Review and applicable EPA Region III modifications by EPA Region III ESAT (Refs. 31, p. 2; 33, p. 2; 60, p. 2; 61, p. 2). The April, June, and October 2020 analytical results confirmed the presence of PCE at observed release concentrations in two of the public supply wells (MW#3 and MW#5), in the industrial well (WGC-PCWV), and in eight monitoring wells (see **Table 10** of this HRS documentation record).

Note: MW#4 is not evaluated as an observed release well in this HRS documentation record (**Tables 9 and 10** of this HRS documentation record). Public supply well MW#4, a backup well, was not in operation on June 25, 2020, the day the other two municipal wells were sampled, or at any other time in June 2020. Paden City's water utility operates either MW#3 and MW#5 together or MW#4 alone (**Figure 4**; Refs. 6, pp. 8, 9, 65; 18, p. 30). The pump for MW#4 was turned on repeatedly over a period of approximately 15 minutes to obtain a sample; however, the pump kept turning itself off unexpectedly. MW#4's sample did show evidence of a low level of PCE, 0.5 µg/L, which does not meet observed release criteria (Refs. 18, p. 30; 33, pp. 7, 31, 42; 34, pp. 1-2). MW#4 was completed 85 feet bgs and is screened at the bottom (6, p. 2).

Sample Similarity

As discussed, and presented above, the background and observed release samples were analyzed and validated through the EPA CLP program in accordance with the CLP SOW and National Functional Guidelines for data review. Additionally, as presented in **Section 3.0.2 and Tables 7 and 9** of this HRS documentation record, background and observed release groundwater samples were collected within the Alluvial Aquifer.

TABLE 7

BACKGROUND WELLS

Sample ID	Elevation Feet[1]	Completed Well Depth feet bgs (elevation-feet)	Screened Interval feet bgs (elevation-feet)	Reference(s)
EPA01	659.52	21 (638.52)	11 to 21 (648.52 to 638.52)	**Figure 4**; 35, pp. 1, 3, 4; 41 p. 1
SI-01	659.63	66 (593.63)	56 to 66 (603.63 to 593.63)	**Figure 4**; 36, pp. 2, 4; 42, p. 4
SI-17	658.85	56 (602.85)	46 to 56 (612.85 to 602.85)	**Figure 4**; 36, pp. 2, 4; 66, p. 9

Notes:
[1]Elevation based on Top of Casing
Elevation based on NAVD88
bgs = Below ground surface
ID = Identifier

TABLE 8

BACKGROUND CONCENTRATIONS

Sampling Location	Sample ID	CLP Sample ID	Sample Date	Hazardous Substance	Concentration (µg/L)	Adjusted CRQL (µg/L)	Reference(s)
EPA01	GW016	C0AF0	4/23/20	PCE	0.5U	0.5	15, pp. 43, 45; 31, pp. 2-4, 7, 19, 29; 32, pp. 1-2
				Cis-1,2-DCE	0.5U	0.5	15, pp. 43, 45; 31, pp. 2-4, 7, 19, 28; 32, pp. 1-2
				TCE	0.5U	0.5	15, pp. 43, 45; 31, pp. 2-4, 7, 19, 28; 32, pp. 1-2
SI-01	GW025	C0AJ2	6/25/20	PCE	0.5U	0.5	18, p. 31; 33, pp. 2-5, 11, 31, 66; 34, p. 1-2
				Cis-1,2-DCE	0.5U	0.5	18, p. 31; 33, pp. 2-5, 11, 31, 65; 34, p. 1-2
				TCE	0.5U	0.5	18, p. 31; 33, pp. 2-5, 11, 31, 65; 34, p. 1-2
	GW048	C0AQ1	10/21/20	PCE	0.62J+	0.5	55, pp. 46, 47; 60, pp. 2-4, 7, 12, 30; 62, pp. 1-2; 63, p. 8
				Cis-1,2-DCE	0.5U	0.5	55, pp. 46, 47; 60, pp. 2-4, 7, 12, 29; 62, pp. 1-2
				TCE	0.5U	0.5	55, pp. 46, 47; 60, pp. 2-4, 7, 12, 29; 62, pp. 1-2
SI-17	GW033	C0AM9	10/19/20	PCE	0.5U	0.5	55, pp. 45, 46; 61, pp. 2-4, 6, 45, 48; 62, pp. 1-2
				TCE	0.5U	0.5	55, pp. 45, 46; 61, pp. 2-4, 6, 45, 47; 62, pp. 1-2

Notes:
The Adjusted CRQL is equivalent to the HRS-defined EPA CLP CRQL adjusted for sample weight, volume, dilution, and percent solids (Refs. 1, Section 1.1, Table 2-3; 22, pp. 129, 504).
Qualified data were used in accordance with EPA's fact sheet "Using Qualified Data to Document an Observed Release and Observed Contamination." No adjustment factor for J-qualified data was needed or used. (Ref. 63, p. 8)
µg/L = micrograms per liter
CLP = Contract Laboratory Program
Cis-1,2-DCE = cis-1,2-dichloeroethene
PCE = tetrachloroethylene
TCE = trichloroethene
J+ = The result is an estimated quantity, but the result may be biased high (Refs. 63, p. 5; 60, p. 4)
U = The analyte was analyzed for but was not detected at a level greater than or equal to the level of the CRQL adjusted for sample and method (Refs. 1, Table 2-3; 31, p. 4; 33, p. 5, 60, p. 4, 61, p. 4).

TABLE 9

CONTAMINATED WELLS

Well ID	Elevation Feet[1]	Completed Well Depth feet bgs (elevation-feet)	Screened Interval feet bgs (elevation-feet)	Reference(s)
SI-03	655.82	62 (593.82)	52 to 62 (603.82 to 593.82)	**Figure 4**; 36, pp. 2, 4; 66, p. 1
SI-05S	658	17 (641)	12 to 17 (646 to 641)	**Figure 4**; 36, pp. 2, 4; 42, p. 2
EPA03	658.51	21.5 (637.01)	11.5 to 21.5 (647.01 to 637.01)	**Figure 4**; 35, pp. 1-3, 4; 41, p. 3
SI-07	656.24	59 (597.24)	49 to 59 (607.24 to 597.24)	**Figure 4**; 36, pp. 2, 3; 42, p. 5
SI-07D	656.40	85 (571.4)	75 to 85 (581.4 to 571.4)	**Figure 4**; 36, pp. 2, 4; 66, p. 2
SI-04	658.58	60 (598.58)	50 to 60 (608.58 to 598.58)	**Figure 4**; 36, pp. 2, 4; 42, p. 1
SI-05D	657.96	65 (592.96)	55 to 65 (602.96 to 592.96)	**Figure 4**; 36, pp. 2, 4; 42, p. 3
SI-08	656.75	70 (586.75)	60 to 70 (596.75 to 586.75)	**Figure 4**; 36, pp. 2, 3; 42, p. 6
MW#3	649.91	75.5 (574.41)	Bottom	**Figure 4**; 6, p. 2; 35, pp. 1-3, 4
MW#5	645.98	79 (566.98)	Bottom	**Figure 4**; 6, p. 2; 35, pp. 1-3, 4
WGC-PCWV	Unknown	Unknown	Unknown	**Figure 4**

Notes:
[1] Elevation based on Top of Casing
Elevation based on NAVD88
bgs = Below ground surface
ID = Identifier
MW = Municipal well
SI = Site inspection
WGC = Industrial well

TABLE 10

CONTAMINATED WELLS CONCENTRATIONS

Sample Locations	Sample ID	CLP Sample ID	Sample Date	Hazardous Substance	Concentration (µg/L)	Adjusted CRQL (µg/L)	Reference(s)
SI-03	GW041	C0AP2	10/20/20	PCE	30J-	2.5	55. pp. 46, 47; 61, pp. 2-5, 30, 46, 104; 62, pp. 1-2; 63, p. 8
SI-05S	GW030	C0AJ7	6/26/20	PCE	13	0.5	18, p. 33; 33, pp. 2-5, 18, 32, 102; 34, pp. 1-2
	GW046	C0AP9	10/21/20	PCE	24	2	55, pp. 46, 47; 60, pp. 5, 12, 18; 61, pp. 1-2
EPA03	GW017	C0AF1	4/23/20	PCE	2,100	200	15, pp. 43, 45; 31, pp. 2-4, 8, 19, 37; 32, pp. 1-2
				Cis-1,2-DCE	7.6	0.5	15, pp. 43, 45; 31, pp. 2-4, 8, 19, 32; 32, pp. 1-2
				TCE	2.3	0.5	15, pp. 43, 45; 31, pp. 2-4, 8, 19, 32; 32, pp. 1-2
SI-07	GW026	C0AJ3	6/25/20	PCE	4.7	0.5	18, p. 31; 33, pp. 2-5, 13, 31, 70; 34, pp. 1-2
	GW042	C0AP3	10/20/20	PCE	21	1	55, pp. 46, 47; 61, pp. 2-5, 32, 46, 112; 62, pp. 1-2
SI-07D	GW043	C0AP4	10/20/20	PCE	420	20	55, pp. 46, 47; 61, pp. 2-5, 33, 46, 120; 62, pp. 1-2
SI-04	GW029	C0AJ6	6/25/20	PCE	2,100	100	18, p. 32; 33, pp. 2-5, 17, 31, 98; 34, pp. 1-2
				TCE	2.1	0.5	18, p. 32; 33, pp. 2-5, 17, 31, 93; 34, pp. 1-2
	GW047	C0AQ0	10/21/20	PCE	1,900	100	55, pp. 46, 47; 60, pp. 1-4, 6, 12, 26; 62, pp. 1-2
				TCE	1.2	0.5	55, pp. 46, 47; 60, pp. 1-4, 6, 12, 21; 62, pp. 1-2
SI-05D	GW028	C0AJ5	6/25/20	PCE	6,100	500	18, p. 32; 33, pp. 2-5, 16, 31, 90; 34, pp. 1-2
				TCE	4.7	0.5	18, p. 32; 33, pp. 2-5, 16, 31, 81; 34, pp. 1-2
	GW045	C0AP6	10/21/20	PCE	6,700	500	55, pp. 46, 47; 61, pp. 2-5, 35, 46, 136; 62, pp. 1-2
				TCE	5.7	0.5	55, pp. 46, 47; 61, pp. 2-5, 35, 46, 131; 62, pp. 1-2
SI-08	GW027	C0AJ4	6/25/20	PCE	2,100	100	18, p. 31; 33, pp. 2-5, 15, 31, 78; 34, pp. 1-2
				TCE	0.66	0.5	18, p. 31; 33, pp. 2-5, 15, 31, 73; 34, pp. 1-2
	GW044	C0AP5	10/21/20	PCE	2,000	500	55, pp. 46, 47; 61, pp. 2-5, 34, 46, 128; 62, pp. 1-2
MW#3	GW020	C0AH6	6/25/20	PCE	23	2	18, p. 30; 33, pp. 2-5, 6, 31, 38; 34, pp. 1-2
MW#3	GW031	C0AH8	6/25/20	PCE	22	2	18, p. 30; 33, pp. 2-5, 8, 31, 50; 34, pp. 1-2
MW#5	GW022	C0AH9	6/25/20	PCE	35	2.5	18, p. 30; 33, pp. 2-5, 9, 31, 58; 34, pp. 1-2
WGC-PCWV	GW019	C0AF6	4/23/20	PCE	24	2	15, pp. 43, 44; 31, pp. 2-4, 13, 19, 65; 32, pp. 1-2

Notes:
The Adjusted CRQL is equivalent to the HRS-defined EPA CLP CRQL adjusted for sample weight, volume, dilution, and percent solids (Refs. 1, Section 1.1, Table 2-3; 22, pp. 129, 504).
Qualified data were used in accordance with EPA’s fact sheet “Using Qualified Data to Document an Observed Release and Observed Contamination.” No adjustment factor for J-qualified data was needed or used. (Ref. 63, p. 8)
µg/L = micrograms per liter
CLP = Contract Laboratory Program
CRQL = EPA Contract Laboratory Program Contract Required Quantitation Limit
Cis-1,2-DCE = cis-1,2-dichloeroethene
PCE = tetrachloroethylene
TCE = trichloroethene
J- = The result is an estimated quantity, but the result may be biased low (Ref. 61, p. 5; 63, p. 5).

Attribution:

Based on the presence of PCE in soil (Source No. 1) in the area of a former dry cleaner at 223 North 4th Avenue indicates that the dry-cleaning operation using PCE as a cleaner released PCE to soil (see Table 3 of this HRS documentation record). The address of 223 North 4th Avenue is the current correct address for the property formerly occupied by Band Box Cleaners. Band Box Cleaners also has a historic address of 233 North 4th Avenue (Refs. 11, p. 91; 13, pp. 25, 36, 40, 44, 50, 53; 14, p. 2). According to the Paden City Director of Public Works, Band Box Cleaners had always operated in the same building (Ref. 46, p. 1). The dry-cleaning operations were conducted at the former Band Box Cleaners facility from approximately 1969 to 1997 (Ref. 11, p. 91). Band Box Cleaners is listed as Resource Conservation and Recovery Act (RCRA) Small Quantity Generators (SQG) for chromium, lead, and PCE (Ref. 11, pp. 73, 74; 14, pp. 2-3). Source No. 1, PCE contaminated soil, released PCE and associated breakdown products to the Alluvial Aquifer as documented in Table 10.

PCE is a man-made compound commonly used in commercial and industrial operations such as dry cleaning, metal degreasing, and manufacturing of other chemicals; it is also used in some consumer products (Ref. 26, p. 1). As stated in **Section 2.2** of this HRS documentation record, the specific waste handling practices of Band Box Cleaners is not known. However, general historic waste handling practices of dry cleaners included discharging PCE containing wastewater to sewer systems, which could lead to leakage to surrounding soil and groundwater, or discharging wastewater directly onto the ground surface (Refs. 44, pp. 8, 13; 45, pp. 4, 5, 14, 15). If solvent wastes were discharged down floor drains plumbed with polyvinyl chloride (PVC) piping, PCE can soften and even dissolve the PVC. The elbow joints of drain lines are particularly susceptible to dissolution. Additionally, PCE vapors are denser than air; the vapors tend to settle to the floor. These vapors will migrate to low spots along the facility floor and floor drains, floor expansion joints and cracks in the floor slab that are prime entry points for these vapors (Ref. 44, p. 13). Another standard practice was to place spent solvent filter cartridges outside in trash dumpsters or on the ground surface (Refs. 44, pp. 9; 45, pp. 5, 6, 16). Spent solvent filter cartridges can contain up to a gallon of PCE that could then drain out onto the ground surface (Ref. 44, p. 9).

Sampling and analysis by EPA in November 2018 and June 2020 document the presence of PCE in soil at the former Band Box Cleaners facility at concentrations significantly above background (**Section 2.2.2** of this HRS documentation record). Analysis of subsurface soil sample SB05-1 (depth: 14.3 to 14.6 feet bgs) showed the presence of PCE at a concentration of 19,000,000 µg/kg (**Figure 2;** Refs. 10, pp. 26. 55, 114-117, 127; 15, p. 7; 20, pp. 3, 24; 21, pp. 1-2). During the November 2018 and June 2020 sampling events, a liner was not observed during sampling activities (Refs. 10, pp. 36-76; 18, pp. 39-130). Analysis of soil samples used for background comparison, SI-16D-SB-01 and SI-01-SB-03 (depth: 5 to 6 feet bgs), collected from a location not expected to have been impacted by former operations at Band Box, reported non-detect values for PCE (**Figure 2**; Refs. 18, pp. 7, 16, 34, 37, 38, 41, 83; 23, pp. 1-5, 7, 14; 24, pp. 2, 3, 11, 39; 25, pp. 1-2).

As presented in **Section 2.2** of this HRS documentation record, PCE was detected in the source samples. However, PCE readily breaks down in the environment to TCE and cis-1,2-DCE and to a lesser extent trans-1,2-DCE (Ref. 47, pp. 2, 3). Therefore, analytical results that meet the criteria for an observed release in groundwater samples for PCE breakdown products are also presented to document an observed release by chemical analysis (see **Section 3.1.1** of this HRS documentation record).

The site is situated in the Paden City Bottom of the Ohio River Valley in West Virginia and is underlain by Quaternary Age Alluvium (Refs. 30, p. 70; 48, p. 1). The alluvium is limited primarily to the flood plain of the Ohio River, approximately 0.6 mile wide at its widest point, and ranges in thickness from 0 feet along the hillsides to more than 100 feet in some places near the river (Ref. 28, p. 8, 9, 23). The lower part of the alluvial deposits consists of sand and gravel of glacial outwash origin and is overlain by a layer of clay and silt of fluvial origin (Ref. 28, p. 23). Under natural conditions, the hydraulic gradient dips gently from the hills (southeast of the source) towards the Ohio River (northwest of the source) (Ref. 28, p. 35; **Figure 1**).

Paden City public water supply is obtained from three groundwater wells, MW#3, MW#4, and MW#5, located west/northwest (generally downgradient) of Source No. 1 (**Figures 1, 2 and 4**; Refs. 6, pp. 7-9; 28, p. 35; 67, pp. 2, 3). The Paden City supply wells range in depth from 75.5 feet bgs (elevation of 574.1 feet) to 85 feet bgs (elevation of 560.69 feet) and are completed within the Alluvial Aquifer (Refs. 6, p. 2; 35, pp. 3, 4; 37, p. 7).

Sampling and analysis by EPA in April, June, and October 2020 documents the presence of PCE in the Paden City public supply wells, an industrial well, and EPA-installed monitoring wells at concentration significantly above background (Ref. 1, Table 2-3, Section 3.1.1; **Section 3.1.1** of this HRS documentation record]. Analysis of ground water sample SI-05, collected from a monitoring well located in the northwest corner of the former Band Box Cleaners property in the vicinity of borehole SB05-1, showed the presence of PCE at a concentration of 6,100 µg/L (**Figure 4**; Refs. 18, p. 32; 33, pp. 2-5, 16, 31, 90; 34, pp. 1-2). Analysis of background ground water samples from monitoring wells EPA01 and SI-17, which are situated upgradient (east) of the source, reported non-detect values for PCE; low level of PCE was detected in monitoring well SI-01 (Refs. 15, pp. 43, 45; 31, pp. 2-4, 7, 19, 29; 32, pp. 1-2; 55, pp. 45, 47; 60, pp. 2-4, 7, 12, 30; 61, pp. 2-4, 6, 45, 48; 62, pp. 1-2; 63, p. 8;). Additionally, PCE was detected as high as 35 µg/L in public supply well MW#5 located approximately 0.3-mile northwest of former Band Box Cleaners property (**Figure 4**; Refs. 18, p. 30; 33, pp. 2-5, 9, 31, 58; 34, pp. 1-2)

Based on information provided to EPA from residents within Paden City, two additional dry cleaner facilities were formerly located in Paden City, approximately 0.19-mile and 0.32-mile southwest of the former Band Box facility, respectively, as well as 0.22-mi to 0.47-mi southwest (cross-gradient) of background wells SI-17 and SI-01 (Ref. 19, pp. 11, 38; 55, p. 70; 67, pp. 2, 3). One former dry cleaner operated on South 4th Avenue, approximately 0.34 miles southwest of the former Band Box facility, from at least 1965 through at least 1973; the property was reported vacant in 1977 (Refs. 13, pp. 51, 55 and 64; Ref. 19, p. 38). The exact location and time of operation of the second former dry cleaner is not known but was believed to have been located on or near North 4th Avenue, approximately 0.19 miles southwest of the former Band Box facility (Ref. 19, pp. 6, 38). That cleaner is not listed at any location within Paden City in a city directory dating back to 1965 (Ref. 13, pp. 1-65). Neither of these two cleaners were listed in the EDR environmental database search report of historical dry cleaners (Ref. 11, p. 19). Nor were they listed in EPA’s Envirofacts Database (Ref. 54, pp. 1-8). EPA conducted investigations at these locations to determine whether another possible source was present contributing to the PCE in groundwater. In April 2020, EPA Removal Program collected soil gas samples in the vicinity of these former dry cleaners (Ref. 15, pp. 40, 52, 53). Analytical results of the collected samples did not show the presence of PCE (Refs. 15, pp. 52, 53; 16, pp. 10, 11). In September and October 2020, EPA conducted further investigations at the former dry cleaners and installed soil borings and monitoring wells at these locations and collected subsurface soil samples and groundwater samples. Analytical results of the collected soil and groundwater samples did not show the presence of PCE (Refs. 55, pp. 46, 64, 66, 69, 70; 57, pp. 8, 10, 12, 13, 18, 19; 58, pp. 9, 10; 61, pp. 12, 14, 16, 20, 21, and 28). Therefore, these locations are not currently considered to be additional possible sources for the PCE in groundwater.

A review of information provided in the EDR report of environmental databases identifies an auto body repair shop located on North 5th Avenue approximately 0.11-mi southwest (cross-gradient) of the former Band Box facility as a conditionally exempt Very Small Quantity Generator for numerous compounds, including PCE (Ref. 11, pp. 4, 22, 23, 50-55; 68, p. 1; **Figure 4**). This facility is located approximately 0.13-mi and 0.24 mi southwest (cross-gradient) from the background wells and approximately 0.27 mi southeast (upgradient) of MW#5 (Ref. 11, p. 4, 22, 23; 55, p. 70; **Figure 4**). An investigation of the soil and groundwater at this facility has not been conducted by federal or state agencies to date.

With the exception of former Band Box Cleaners, remaining facilities listed in the EDR do not indicate these facilities used, handled, or managed PCE (Ref. 11, pp. 28-123).

PCE has been detected at concentrations significantly above background in soil samples collected from the former Band Box Cleaners property to depths of at least 48 feet bgs (see **Section 2.2.2** of this HRS documentation record) Additionally, PCE has been detected at concentrations significantly above background levels in groundwater collected from monitoring wells located on the former Band Box Cleaners property and immediately downgradient as well as in the Paden City municipal supply wells (see **Section 3.1.1** of this HRS documentation record). Therefore, the presence of PCE in groundwater within the Alluvial Aquifer can reasonably be at least partially attributed to the PCE-contaminated soil on the former Band Box Cleaners property.

Hazardous Substances Released:

PCE
cis-1,2-DCE
TCE

==

Groundwater Observed Release Factor Value: 550

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

TABLE 11

TOXICITY AND MOBILITY – WASTE CHARACTERISTICS

Hazardous Substance	**Source or Observed Release**	**Toxicity Factor Value**	**Mobility Factor Value[1]**	**Toxicity/ Mobility**	**References**
Tetrachloroethene	1, OR	100	1.0	100	1, Section 2.4.1.1; 2, p. 4
Cis-1,2-Dichloroethene	OR[2]	1,000	1.0	1,000	1, Section 2.4.1.1; 2, p. 1
Trichloroethene	OR[2]	1,000	1.0	1,000	1, Section 2.4.1.1; 2, p. 7

Notes:

[1] Hazardous substances meeting the criteria for an observed release by chemical analysis to an aquifer underlying a source are assigned a Mobility Factor Value of 1 (Ref. 1, Sections 2.4.1, 3.2.1.2).

[2] As presented in **Section 2.2** of this HRS documentation record, PCE was the only hazardous substance detected in the source samples. However, PCE readily breaks down in the environment to TCE and cis-1,2-DCE and to a lesser extent trans-1,2-DCE (Ref. 47, pp. 2, 3). Therefore, analytical results that meet the criteria for an observed release in groundwater samples for PCE breakdown products are also presented to document an observed release by chemical analysis.

OR = Observed Release

3.2.2 Hazardous Waste Quantity

TABLE 12

HAZARDOUS WASTE QUANTITY

Source Number	**Source Hazardous Waste Quantity (HWQ) Value** (Ref. 1 Section 2.4.2.1.5)	**Is source hazardous constituent quantity data complete? (yes/no)**
1	>0	No
Sum of Values:	>0, rounded to 1 (Ref. 1, Section 2.4.2.2)	

The sum corresponds to a Hazardous Waste Quantity Factor Value of 1 in Table 2-6 of the HRS (Ref. 1, Section 2.4.2.2). However, because the hazardous constituent quantity is not adequately determined (**Section 2.4.2.1.1** of this HRS documentation record) and targets are subject to Level I concentrations (**Section 3.3.2.3** of this HRS documentation record), a Pathway Hazardous Waste Quantity Factor Value of 100 is assigned if it is greater than the Hazardous Waste Quantity Factor Value from Table 2-6 (i.e., 1) (Ref. 1, Section 2.4.2.2). Therefore, a Hazardous Waste Quantity Factor Value of 100 is assigned for the groundwater migration pathway (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100

3.2.3 Waste Characteristics Factor Category Value

Cis-1,2-DCE and TCE corresponds to the Toxicity/Mobility Factor Value of 1,000, as shown previously (**Section 3.2.1** of this HRS documentation record).

Toxicity/Mobility Factor Value (1,000) x Hazardous
Waste Quantity Factor Value (100): 100,000

The product (100,000) corresponds to a Waste Characteristics Factor Category Value of 18 in Table 2-7 of the HRS (Ref. 1, Section 2.4.3.1).

==

Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 18

3.3 TARGETS

As discussed in **Section 3.0.1**, the site is situated in the Paden City Bottom of the Ohio River Valley, which is approximately 2 miles long by 0.5 mile wide and consists of alluvial fill that ranges in thickness from 0 feet along the hillsides to more than 100 feet in some places near the river (Ref. 28, pp. 8, 9, 23; 30, pp. 70, 71). Soil borings/monitoring wells installed in June 2020 and September 2020 by EPA within the Paden City Bottom show that in general the subsurface material consists of medium to coarse sand with gravel and pebble the entire length with interbedded silty clay material (Refs. 18, pp. 34, 35, 38-130; 55, pp. 69, 71-210). This material is indicative of the Ohio River Alluvial Aquifer (Ref. 29, pp. 9, 12, 13).

Paden City public water supply is obtained from three groundwater wells, MW#3, MW#4, and MW#5, located west-northwest of the source and closer to the Ohio River (**Figures 3 and 4**; Ref. 6, pp. 7-9). Paden City does not purchase or sell drinking water from or to other public water utilities (Ref. 65, p. 1). The Paden City supply wells range in depth from 75.5 feet bgs (elevation of 574.1 feet) to 85 feet bgs (elevation of 560.69 feet) (**Table 9**; Refs. 6, p. 2; 35, pp. 3, 4). Paden City supply wells are completed within the alluvial deposits (Ref. 37, p. 7). A fourth well, MW#2, is not in use. This well was initially shut down in 2014 due to high levels of PCE. It was brought back online in July 2016 when PCE concentrations dropped below the MCL. At this time MW#5 was taken offline for service. In August 2017, MW#2 was taken out of service again when it was determined that the electrical service to MW#2 was out of code. As of January 11, 2021, there are no plans to replace the electrical service to MW#2 (Ref. 6, pp. 2, 3, and 7).

The system is a single interconnected distribution system that supplies drinking water to approximately 2,985 persons and an additional 411 students, for a total population of 3,396 (Refs. 1, Section 3.3.2; 6, p. 7; 7, p. 1; 50, pp. 2, 4). The target population scored for this HRS documentation record is based on current conditions (i.e., pumping data for wells MW#3, MW#4, and MW#5 since MW#2 was taken offline in August 2017). Though MW#4 is indicated as being a backup well, based on pumping data, this well is used quite often; therefore, the population was calculated based on the usage of supply wells MW#3, MW#4, and MW#5 (Ref. 6, pp. 1, 3, 6, 7, 32-68).

The target population is apportioned as follows:

The population apportioned to each well is based on current conditions of the system (i.e., pumping data for wells MW#3, MW#4, and MW#5 since MW#2 was taken offline in August 2017). The total hours per month each well was pumped was multiplied by the pumping rate of the well (Well No. 1 (also referred to as Well No. 5) - 300 gallons per minute [gpm], Well No. 3 - 300 gpm, and Well No. 4 – 450 gpm, and then multiplied by 60 minutes/hour to obtain the total gallons each well was pumped per month) (Refs 6, pp. 3, 6, 7, 32-68). The total each well was pumped per month was totaled for over the time period being evaluated and then divided by the total pumped of all wells (Ref. 40, pp. 1, 2). **Note: Well No. 5 is a replacement well for Well No. 1, which was abandoned prior to 1999 to make room for construction of the water treatment plant. Well No. 5 is referred to within the city water department as Well No. 1 (Ref. 6, pp. 3, 7). Therefore, the pumping data in Reference 6 for Well No. 1 is really for Well No. 5; as previously stated, Well No. 1 no longer exists.*

Based on this calculation, over this time period:

Well No. 1 (also referred to as 5) contributed 33.14 % of the total supply,
Well No. 3 contributed 31.07%,
and Well No. 4 contributed 35.78%.

Because no one well contributed more than 40% of the total supply, the population was apportioned equally among the three wells (Refs. 1, Section 3.3.2; 7, p. 1; 40, pp. 1, 2):

3,396/3 = 1,132 persons apportioned to each well.

The following Paden City supply wells are subject to Level I and each is assigned a population as calculated above.

TABLE 13

TARGET WELLS

Well	Distance from Source (mi.)*	Population	Level I Conc. (Y/N)**	Level II Conc. (Y/N)**	Potential Contam. (Y/N)	Reference(s)
MW#3	0.3 (WNW)	1,132	Y	N	N	**Figure 4**; 2, p. 4; 7, p. 2; 33, pp. 6, 31, 38; 34, pp. 1, 2; 40, pp. 1, 2; 50, pp. 2, 4
MW#5	0.3 (NW)	1,132	Y	N	N	**Figure 4**; 2, p. 4; 7, p. 2; 33, pp. 9, 31, 58; 34, pp. 1, 2; 40, pp. 1, 2; 50, pp. 2; 4

Notes:
* Distances are measured from Source (**Figure 4**).
** Maximum Contaminant Level (MCL), Cancer Risk Screening Concentration (CRSC), and Non-Cancer Risk Screening Concentration (NCRSC) were used as benchmarks to evaluate the level of contamination (Refs. 1, Section 2.5.2, Table 3-10; 2, p. 4).
Conc. = concentration
Contam. = contamination
mi = mile
N = No
NA = Not applicable
NW = Northwest
WNW = West-northwest
Y = Yes

TABLE 14

BENCHMARKS

Substance	MCL (µg/L)	CRSC (µg/L)	NCRSC (µg/L)	Reference(s)
PCE	5	37.1	120	2, p. 4
Cis-1,2-DCE	70	NA	40	2, p. 1
TCE	5	1.19	10	2, p. 7

Cis-1,2-DCE = cis-1,2-dichloroethene
PCE = tetrachloroethylene
TCE = trichloroethene
MCL = Maximum Contaminant Level
CRSC = Cancer Risk Screening Concentration
NCRSC = Non-cancer Risk Screening Concentration

TABLE 15

LEVEL I CONCENTRATIONS

Well	Sample	Substance	Conc. (µg/L)	Benchmark (µg/L)	Reference(s)
MW#3	GW020	PCE	23	5 (MCL)	2, p. 4; 33, pp. 6, 8, 31, 38, 50; 34, pp. 1, 2
MW#5	GW022	PCE	35	5 (MCL)	2, p. 4; 33, pp. 9, 31, 58; 34, pp. 1, 2

µg/L = micrograms per liter
Conc. = concentration
MCL = EPA Maximum Contaminant Level. The PCE MCL is the lowest applicable HRS benchmark concentration for PCE (Ref. 1, Section 2.5.2; 2 p. 2).
PCE = tetrachloroethylene

3.3.1 Nearest Well

As identified in **Section 3.3** of this HRS documentation record, Paden City supply wells MW#3 and MW#5 are subject to Level I concentrations. Therefore, a Nearest Well Factor Value of 50 is assigned (Ref. 1, Section 3.3.1, Table 3-10, Table 3-11).

Nearest Well Factor Value: 50

3.3.2 Population

3.3.2.2 Level I Contamination

As identified in **Section 3.3** of this HRS documentation record, Paden City supply wells MW#3 and MW#5 are subject to Level I concentrations. The populations assigned to the wells are also explained in **Section 3.3** of this HRS documentation record.

TABLE 16

LEVEL I POPULATION TARGETS

Level I Well	**Population**	**Reference(s)**
MW#3	1,132	2, p. 4; 7, p. 1; 33, pp. 2-5, 6, 8, 31, 38, 50; 34, pp. 1, 2; 40, pp. 1, 2; 50, pp. 2, 4
MW#5	1,132	2, p. 4; 7, p. 1; 33, pp. 2-5, 9, 31, 58; 34, pp. 1, 2; 40, pp. 1, 2; 50, pp. 2, 4

The total population served by drinking water from points of withdrawal subject to Level I concentrations is 2,264 (Ref. 1, Section 3.3.2.1). This population is multiplied by 10 to determine the Level I Concentrations Factor Value, as shown below (Ref. 1, Section 3.3.2.2).

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Total Level I Population: 2,264
Level I Concentration Factor Value: 2,264 x 10 = 22,640
(Ref. 1, Section 3.3.2.2)

3.3.2.3 Level II Concentrations

Level II Concentrations factor is not evaluated.

3.3.2.4 Potential Contamination

Level I concentrations result in a maximum score of 100.00 for the groundwater migration pathway; therefore, the Potential Contamination Factor Value was not scored.

As noted in Section 3.0.1.2.2, the Ohio River is considered an aquifer discontinuity; therefore, groundwater west of the Ohio River is unlikely to be affected by contaminants associated with the site. Subsequently, persons in Ohio who rely on groundwater for drinking water are not considered potential targets for the purpose of this HRS documentation record.

Paden City well MW#4 is located within the 0.25 to 0.5 mile distance category from Source 1 (**Figures 3 and 4;** Ref. 40, pp. 1-2). MW#4 did show evidence of a low level of PCE, 0.5 µg/L, which does not meet observed release criteria (Refs. 18, p. 30; 33, pp. 7, 31, 42; 34, pp. 1-2). MW#4 was completed 85 feet bgs and is screened at the bottom (6, p. 2). The potential target population served by this well is not evaluated as it would not impact the overall site score.

No other public water suppliers who whose water source is groundwater were identified within the 4-mile TDL on the east side of the Ohio River (**Figure 3**; Refs. 51, pp. 1-4; 69, p. 1). While it is possible some private domestic wells may be located within the 4-mile TDL, the site is located in a rural area. The potential target population served by private domestic wells is anticipated to be extremely low and therefore would not impact the overall site score (**Figure 3**).

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Potential Contamination Factor Value: Not Evaluated

3.3.3 Resources

The City of Paden maintains a public swimming pool (Refs. 52, p. 1; 53, p. 1). A public swimming pool maintained by the local government is considered a groundwater resource as Designated Water Recreation Area; therefore, a Resource Factor Value of 5 is assigned (Ref. 1, Section 3.3.3).

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Resources Factor Value: 5

3.3.4 Wellhead Protection Area

The State of West Virginia has designated the Wellhead Protection Area for the Paden City supply wells in accordance with the federal Safe Drinking Water Act (Ref. 37, p. 41). Because the source has a Groundwater Containment Factor Value greater than 0 and lies completely within or above the designated Wellhead Protection Area, and because observed groundwater contamination attributable to the sources at the Site lies within the designated Wellhead Protection Area, a Wellhead Protection Area Factor Value of 20 is assigned (**Figures 1 and 2** of this HRS documentation record; Refs. 1, Section 3.3.4; 37, p. 41).

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Wellhead Protection Area Factor Value: 20