HAZARD RANKING SYSTEM (HRS) PACKAGE
PIONEER METAL FINISHING INC
FRANKLINVILLE, GLOUCESTER COUNTY, NJ

EPA ID No.: NJD002360188

EPA Contract No. EP-S13-08-01
TDD No. 0004/1910-03
Document Control No. W0745.1A.02150

September 2020

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Prepared by:
Weston Solutions, Inc.
Edison, New Jersey 08837

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HRS DOCUMENTATION RECORD-- COVER SHEET

Name of Site:	Pioneer Metal Finishing Inc
Date Prepared:	September 2020

Contact Persons

Site Investigation:
Weston Solutions, Inc.
Edison, NJ

Documentation Record:
James Desir (212) 637-4342
U.S. Environmental Protection Agency
New York, NY

Scott T. Snyder, CHMM
Weston Solutions, Inc.
Edison, NJ

Pathways, Components, or Threats Not Scored

The surface water migration pathway—drinking water threat, the surface water migration pathway—ground water to surface water component, the ground water migration pathway, the soil exposure and subsurface intrusion pathway, and the air migration pathway were not scored because the listing decision is not affected significantly by those pathways, components, or threats. The site score is sufficient to list the site based on the surface water migration pathway—human food chain threat and the surface water migration pathway—environmental threat. However, ground water migration, soil exposure and subsurface intrusion, and air migration are pathways of concern at the site, as discussed below.

- Ground Water Migration Pathway – Historical and recent groundwater sampling of associated monitoring and water-supply wells, conducted by both EPA and Pioneer, shows the presence of chromium, copper, nickel, and cyanide, as well as other inorganic analytes, in groundwater beneath the facility [Ref. 5, pp. 3, 7–9, 13-15, 24; 15, pp. 3, 7, 33; 17, pp. 4, 5, 9; 38, p. 1; 67, pp. 2, 6; 68, p. 17]. Sampling of wells conducted by EPA in August 2019 also shows the presence of perfluoro alkyl substances (PFAS) in groundwater beneath the facility—specifically, the PFAS compounds perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) were detected in a groundwater sample collected from a Pioneer facility monitoring well. PFAS are generally known to have been utilized in metal plating operations [Ref. 67, pp. 2, 6; 68, p. 20; 69, pp. 1, 5]. However, the available groundwater analytical data are insufficient to document an observed release to the aquifer that would be evaluated. There are approximately 96 domestic drinking water wells within ½ mile of the Pioneer facility [Ref. 20, pp. 120–166]. There are currently no off-site drinking water wells that are documented or suspected to be actually contaminated by hazardous substances attributable to the site.
- Soil Exposure and Subsurface Intrusion Pathway – Analytical results for surface soil samples collected by EPA in August 2019 document soil contamination at the site [see **Section 2.2** for soil samples]. In addition, EPA observed evidence of trespassing on the property in May 2019 [Ref. 14, p. 15]. Subsurface soil contamination at the site is characterized by inorganic analytes [see **Section 2.2]**; therefore, there is no known area of subsurface contamination (ASC) that would pose a threat in the Subsurface Intrusion component.
- Air Migration Pathway – The majority of the ground surface at the Pioneer facility is exposed soil consisting primarily of sand [**Figure 3**; Ref. 27, pp. 20–25]. Soil contamination has been documented at the facility characterized by inorganic analytes in surface soils [see **Section 2.2**]. Therefore, the possibility of a current release of contaminated fugitive dust exists at the site.

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HRS DOCUMENTATION RECORD

Name of Site:	Pioneer Metal Finishing Inc	Date Prepared:	September 2020
EPA ID No.:	NJD002360188		
EPA Region:	2		
Street Address of Site*:	2034 Coles Mill Road, Franklinville, NJ 08322		
County and State:	Gloucester County, New Jersey		
General Location in the State:	Western Atlantic coastal plain		
Topographic Map:	Newfield, NJ		
Latitude*:	39° 37′ 1.0884” North (39.616969°)		
Longitude*:	-75° 03′ 41.3064″ West (-75.061474°)		
Site Reference Point:	U.S. Environmental Protection Agency (EPA) contaminated soil sample location P001-SS013 (interior of Pioneer Metal Finishing facility)		

[**Figures 1** and **3**; Ref. 3, p. 1; 4, p. 1; 40, p. 3; 44, p. 2]

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area 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 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.

Scores

Ground Water[1] Pathway	Not Scored
Surface Water Pathway	95.99
Soil Exposure and Subsurface Intrusion Pathway	Not Scored
Air Pathway	Not Scored
HRS SITE SCORE	47.99

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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
PIONEER METAL FINISHING INC

	S	S^2
1. Ground Water Migration Pathway Score (S_{gw}) (from Table 2-1, line 13)	Not Scored	
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	95.99	9,214.08
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.	95.99	9,214.08
3a. Soil Exposure Component Score (S_{se}) (from Table 5-1, line 22)	Not Scored	
3b. Subsurface Intrusion Component Score (S_{ssi}) (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 $S_{gw}^2 + S_{sw}^2 + S_{sessi}^2 + S_a^2$	9,214.08	
6. **HRS Site Score** Divide the value on line 5 by 4 and take the square root	47.99	

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
PIONEER METAL FINISHING INC

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	not scored
2b. Runoff	25	not scored
2c. Distance to Surface Water	25	not scored
2d. Potential to Release by Overland Flow (lines 2a [2b + 2c])	500	not scored
3. Potential to Release by Flood		
3a. Containment (Flood)	10	not scored
3b. Flood Frequency	50	not scored
3c. Potential to Release by Flood (lines 3a x 3b)	500	not scored
4. Potential to Release (lines 2d + 3c)	500	not scored
5. Likelihood of Release (higher of lines 1 and 4)	550	550
Waste Characteristics		
6. Toxicity/Persistence	*	not scored
7. Hazardous Waste Quantity	*	not scored
8. Waste Characteristics	100	not scored
Targets		
9. Nearest Intake	50	not scored
10. Population		
10a. Level I Concentrations	**	not scored
10b. Level II Concentrations	**	not scored
10c. Potential Contamination	**	not scored
10d. Population (lines 10a + 10b + 10c)	**	not scored
11. Resources	5	not scored
12. Targets (lines 9 + 10d + 11)	**	not scored
13. DRINKING WATER THREAT SCORE ([lines 5 x 8 x 12]/82,500)	100	not scored

* Maximum value applies to waste characteristics category.

** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
PIONEER METAL FINISHING INC

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
14. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+08
16. Hazardous Waste Quantity	*	100
17. Waste Characteristics	1,000	320
Targets		
18. Food Chain Individual	50	20
19. Population		
19a. Level I Concentrations	**	0
19b. Level II Concentrations	**	0
19c. Potential Human Food Chain Contamination	**	0.00003
19d. Population (lines 19a + 19b + 19c)	**	0.00003
20. Targets (lines 18 + 19d)	**	20.00003
21. HUMAN FOOD CHAIN THREAT SCORE ([lines 14 x 17 x 20]/82,500)	100	42.66

* Maximum value applies to waste characteristics category.
** Maximum value not applicable

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
PIONEER METAL FINISHING INC

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
22. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/Bioaccumulation	*	5.00E+08
24. Hazardous Waste Quantity	*	100
25. Waste Characteristics	1,000	320
Targets		
26. Sensitive Environments		
26a. Level I Concentrations	**	0
26b. Level II Concentrations	**	25
26c. Potential Contamination	**	not scored
26d. Sensitive Environments (lines 26a + 26b + 26c)	**	25
27. Targets (line 26d)	**	25
28. ENVIRONMENTAL THREAT SCORE ([lines 22 x 25 x 27]/82,500)	60	53.33
29. WATERSHED SCORE (lines 13 + 21 + 28)	100	95.99
30. SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE (S_{of})	100	95.99
SURFACE WATER MIGRATION PATHWAY SCORE (S_{sw})	100	95.99

* Maximum value applies to waste characteristics category.

** Maximum value not applicable

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Reference
Number   Description of the Reference

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SITE DESCRIPTION

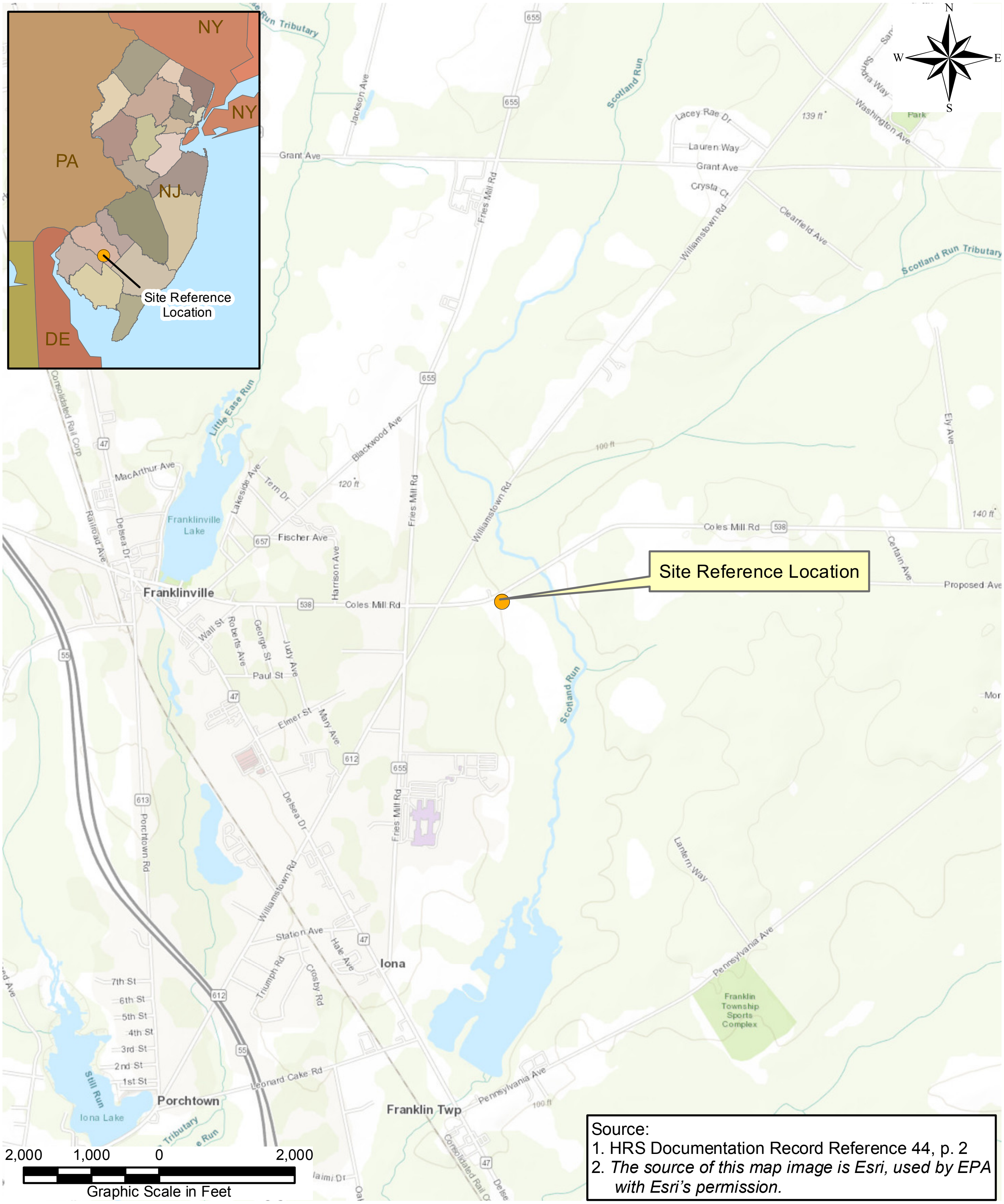
The Pioneer Metal Finishing Inc site as scored for HRS purposes consists of one source of hazardous substances at the Pioneer Metal Finishing Inc (Pioneer) facility in Franklinville, Gloucester County, New Jersey, as well as sediment contaminated with site-attributable hazardous substances (i.e., hazardous substances known to be associated with facility operations and/or present in the source at the site) as a result of a release from the site source. A Site Location Map is presented as **Figure 1**. The Pioneer facility is a former electroplating plant that began operations in the mid-1950s, performing plating and polishing of metals [Ref. 5, p. 5; 6, p. 1; 7, p. 5]. Pioneer utilized three plating solutions in its electroplating process: alkaline cyanide-copper, acid nickel, and trivalent chrome; hexavalent chrome plating was performed at the facility until 1977 [Ref. 5, p. 5; 6, pp. 1, 3; 7, p. 5; 8, p. 1].

Source 1 consists of the contaminated soil at the Pioneer facility as indicated by sampling activities performed by EPA in 1984 and 1994 and by Pioneer from 1994 to 2000, and as confirmed by EPA sampling and analysis in 2019 [see **Section 2.2**]. Sampling and analysis by EPA in 2019 confirmed the presence of inorganic constituents and polychlorinated biphenyls (PCBs) in site soils at concentrations significantly above background [see **Section 2.2**]. In addition, sampling and analysis by EPA in 2019 document the presence of site-attributable inorganic constituents in sediment at levels that meet the criteria for observed release by chemical analysis [see **Section 4.1.2.1**]. For the Pioneer site, EPA is evaluating the Surface Water Migration Pathway, overland/flood migration component—human food chain threat and the Surface Water Migration Pathway, overland/flood migration component—environmental threat. A downstream fishery is evaluated as being subject to potential contamination [see **Section 4.1.3.3**]. Wetland perimeter greater than 0.1 mile in length is evaluated as being subject to actual contamination [see **Section 4.1.4.3**]. The probable point of entry (PPE) to surface water is the wetland boundary adjacent to and downslope of Source 1 [see **Figures 2** and **4**]. The wetland is contiguous with Scotland Run, which flows into the Maurice River approximately 5.5 miles downstream of the PPE [see **Figures 2** and **4**; Ref. 27, p. 10]. The Maurice River comprises the remainder of the 15-mile target distance limit (TDL) [see **Figure 2**]. Timothy Lake, an impounded portion of Scotland Run approximately 1 mile downstream of the PPE, supports recreational activities, including swimming and fishing [**Figure 2**; Ref. 14, pp. 2, 16]. A 15-Mile Surface Water Pathway Map is presented as **Figure 2**.

A former possible on-site source of contamination consists of the metals-contaminated wastewater discharge from historical metal plating operations at Pioneer. Pioneer began operations in the mid-1950s and utilized three plating solutions: alkaline cyanide-copper, acid nickel, and chrome (hexavalent chrome until 1977, and trivalent chrome after 1977) [Ref. 5, p. 5; 6, pp. 1, 3; 7, p. 5; 8, p. 1]. According to information provided by Pioneer, the facility discharged untreated waste from 1955 to either 1975 or 1979 [Ref. 5, p. 5; 7, p. 5; 9, p. 1]. According to an undated letter from Pioneer, discharged wastes consisted only of metallic salts that were discharged from 1955 to 1979; however, correspondence from Pioneer in 1993 indicated that untreated effluent was discharged until 1975 [Ref. 7, p. 5; 9, p. 1]. A Remedial Investigation (RI) commissioned by Pioneer also indicated that untreated waste was discharged until 1975 and that wastestream constituents included process sludge, rinse water, cleaning solutions, and plating wastes that were discharged into an unlined trench leading to an adjacent wetland southeast of the plant [Ref. 5, p. 5].

Chromium, copper, and nickel, as well as hexavalent chromium and cyanide, were known to be constituents of Pioneer's wastewater discharge [45, pp. 2, 3]. Analysis of an effluent sample collected by EPA in September 1978 showed the presence of hexavalent chromium, total chromium, copper, total cyanide, and nickel at concentrations that exceeded daily maximum discharge limitations as set forth in the facility's National Pollutant Discharge Elimination System (NPDES) Permit [Ref. 45, pp. 2, 3]. The discharge area within the wetland was and is currently characterized by dead vegetation and discolored soil described by the New Jersey Department of Environmental Protection (NJDEP) as "resembling the color (greenish-blue) of chromium compounds used in the finishing process" [Ref. 10, p. 1; 14, p. 15]. Poor housekeeping practices, including storage of waste on the facility exterior without secondary containment, were observed at the Pioneer facility by EPA and NJDEP [Ref. 12, pp. 1, 2; 15, p. 3; 45, p. 3].

From August 2018 through August 2019, EPA conducted a Removal Action (RA) at the site [Ref, 72, pp. 1–125]. RA activities focused on characterization, consolidation, and removal of residual contamination and various liquid and solid wastes from within the interior of the Pioneer facility [Ref. 42, pp. 1–4; 72, pp. 1–125]. Materials removed from the site included cyanide- and chromium-contaminated debris; waste plating solutions containing cyanide and chromium; waste inorganic solid chemicals containing potassium and copper cyanide; corrosive liquids; oxidizing liquids; hydrogen peroxide; and oxidizing and toxic solids [Ref. 42, pp. 1–4]. A total of 21.06 tons of contaminated debris; 204,800 pounds of solid chemicals; and 9,660 gallons and 78,401 pounds of liquid wastes were removed from



Source:
1. HRS Documentation Record Reference 44, p. 2
2. *The source of this map image is Esri, used by EPA with Esri's permission.*

LEGEND:

● Site Reference Location Lat: 39.616969 Long: -75.061474

TITLE:

SITE LOCATION MAP
PIONEER METAL FINISHING SITE
FRANKLINVILLE, GLOUCESTER COUNTY, NEW JERSEY

PROJECT: TDD 0004/1903-08

CLIENT NAME: EPA

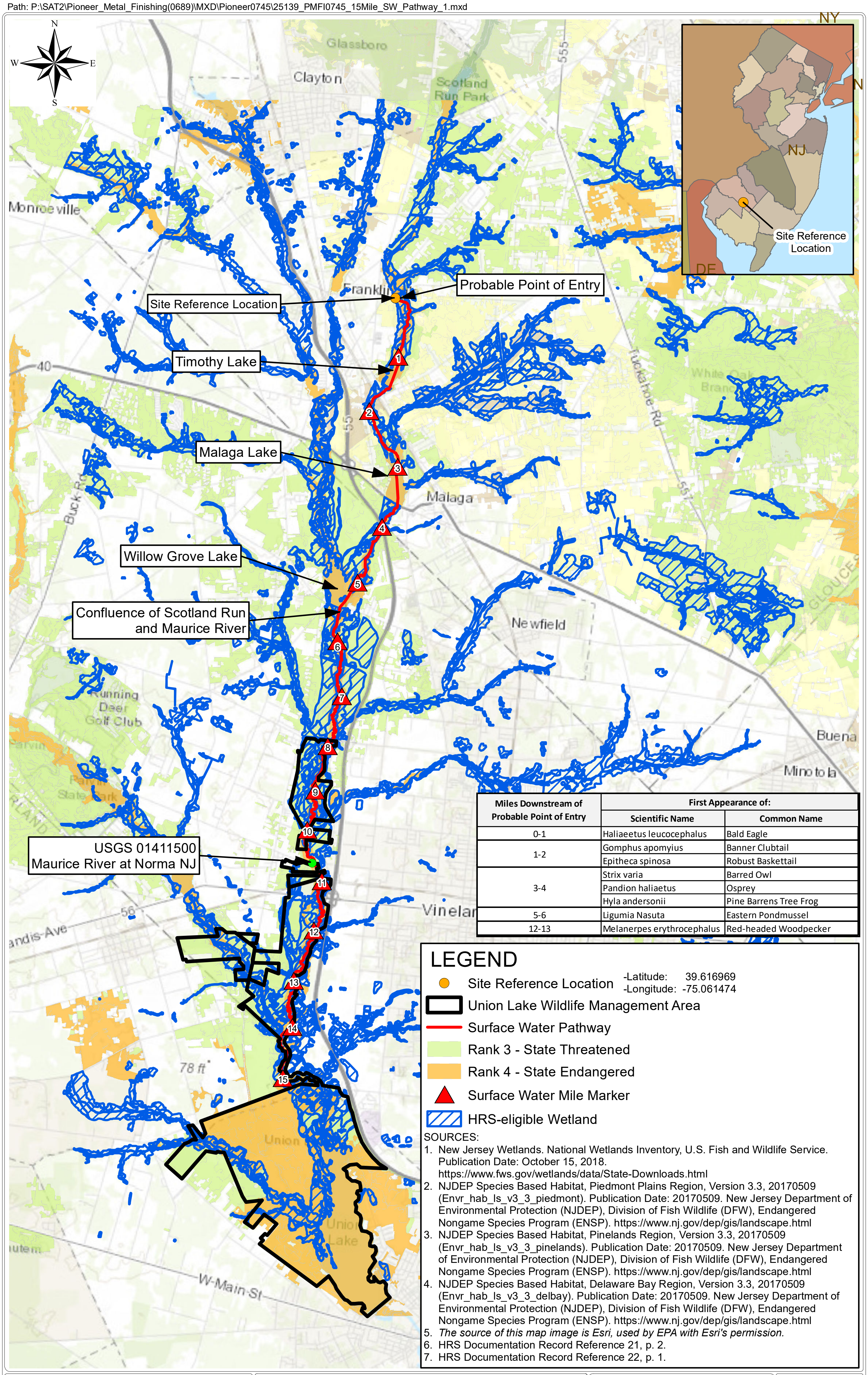
WESTON SOLUTIONS

DATE: June 2020

FIGURE #: 1

Path: P:\SAT2\Pioneer_Metal_Finishing(0689)\MXD\Pioneer0745\25138_Pioneer0745_Site_Location.mxd

Path: P:\SAT2\Pioneer_Metal_Finishing(0689)\MXD\Pioneer0745\25139_PMFI0745_15Mile_SW_Pathway_1.mxd



Miles Downstream of Probable Point of Entry	First Appearance of:	
	Scientific Name	Common Name
0-1	Haliaeetus leucocephalus	Bald Eagle
1-2	Gomphus apomyius	Banner Clubtail
	Epitheca spinosa	Robust Baskettail
3-4	Strix varia	Barred Owl
	Pandion haliaetus	Osprey
	Hyla andersonii	Pine Barrens Tree Frog
5-6	Ligumia Nasuta	Eastern Pondmussel
12-13	Melanerpes erythrocephalus	Red-headed Woodpecker

LEGEND

●	Site Reference Location	-Latitude: 39.616969 -Longitude: -75.061474
▭	Union Lake Wildlife Management Area	
—	Surface Water Pathway	
🟩	Rank 3 - State Threatened	
🟧	Rank 4 - State Endangered	
▲	Surface Water Mile Marker	
▨	HRS-eligible Wetland	

SOURCES:

1. New Jersey Wetlands. National Wetlands Inventory, U.S. Fish and Wildlife Service. Publication Date: October 15, 2018. https://www.fws.gov/wetlands/data/State-Downloads.html
2. NJDEP Species Based Habitat, Piedmont Plains Region, Version 3.3, 20170509 (Envr_hab_ls_v3_3_piedmont). Publication Date: 20170509. New Jersey Department of Environmental Protection (NJDEP), Division of Fish Wildlife (DFW), Endangered Nongame Species Program (ENSP). https://www.nj.gov/dep/gis/landscape.html
3. NJDEP Species Based Habitat, Pinelands Region, Version 3.3, 20170509 (Envr_hab_ls_v3_3_pinelands). Publication Date: 20170509. New Jersey Department of Environmental Protection (NJDEP), Division of Fish Wildlife (DFW), Endangered Nongame Species Program (ENSP). https://www.nj.gov/dep/gis/landscape.html
4. NJDEP Species Based Habitat, Delaware Bay Region, Version 3.3, 20170509 (Envr_hab_ls_v3_3_delbay). Publication Date: 20170509. New Jersey Department of Environmental Protection (NJDEP), Division of Fish Wildlife (DFW), Endangered Nongame Species Program (ENSP). https://www.nj.gov/dep/gis/landscape.html
5. *The source of this map image is Esri, used by EPA with Esri's permission.*
6. HRS Documentation Record Reference 21, p. 2.
7. HRS Documentation Record Reference 22, p. 1.

SCALE:
8,000 4,000 0 8,000
Graphic Scale in Feet

PROJECT: TDD No. 0004/1910-03

CLIENT NAME: EPA

TITLE:
15-MILE SURFACE WATER PATHWAY MAP
PIONEER METAL FINISHING, INC.
FRANKLINVILLE, NJ

WESTON SOLUTIONS

DRAWING NUMBER: 25139

FIGURE #: 2

DRAWN BY: J. Gardner

REVIEWED BY: S. Snyder

PROJECT MANAGER: S. Snyder

SCALE: 1" = 8,000'

DATE: June 2020

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY the facility [Ref. 42, pp. 1–4]. Waste materials were disposed of as hazardous waste at off-site disposal facilities [Ref. 42, p. 4; 72, pp. 107–112]. The EPA RA had no impact on what is being evaluated for HRS purposes as it was confined to waste materials from within the interior of the Pioneer facility and did not include removal of exterior contaminated soil (i.e., Source 1) or sediment from the adjacent wetland [Ref. 42, pp. 1–4; 72, pp. 1–125].

In July 2019, EPA collected a total of 42 soil samples from 15 soil borings and five test pits located throughout the upland portion of the Pioneer property [see **Section 2.2.2**]. Laboratory analytical results for soil samples collected by EPA in 2019 confirm the presence of chromium, copper, nickel, cyanide, hexavalent chromium, and PCBs at concentrations significantly above background levels in soil at the Pioneer facility [see **Section 2.2**]. In September 2019, EPA collected a total of 38 sediment samples from three roughly linear clusters within the subject wetland [see **Section 4.1.2.1**]. Sediment sampling results indicated that chromium, copper, or nickel were reported at concentrations significantly above background in samples collected from locations along all three clusters [see **Section 4.1.2.1**].

A zone of contamination has been delineated in the wetland and is defined by lines connecting sediment sample locations that meet the criteria for observed release by chemical analysis [see **Figure 4**]. This zone of contamination extends 1,702 feet south-southeast from the PPE to EPA sediment sample location P002-SD012 [see **Figure 4**]. An apparent drainage pattern through the wetland trending in a south-southeasterly direction, as evidenced by darkened areas of saturated sediment, is visible on aerial photos and shows that the zone of contamination trends in the same direction as the drainage through the wetland [**Figure 4**; Ref. 11, pp. 3–7; 27, pp. 4, 7]. The perimeter of the zone of contamination, a length of 0.78 mile, is evaluated as representing the perimeter of HRS-eligible wetland subject to Level II actual contamination [see **Figure 4** and **Sections 4.1.2.1 and 4.1.4.3**; Ref. 1, Section 4.1.4.3.1.2].

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: Source No. 1

Name and description of the source: Contaminated Soil

Source Type: Contaminated Soil

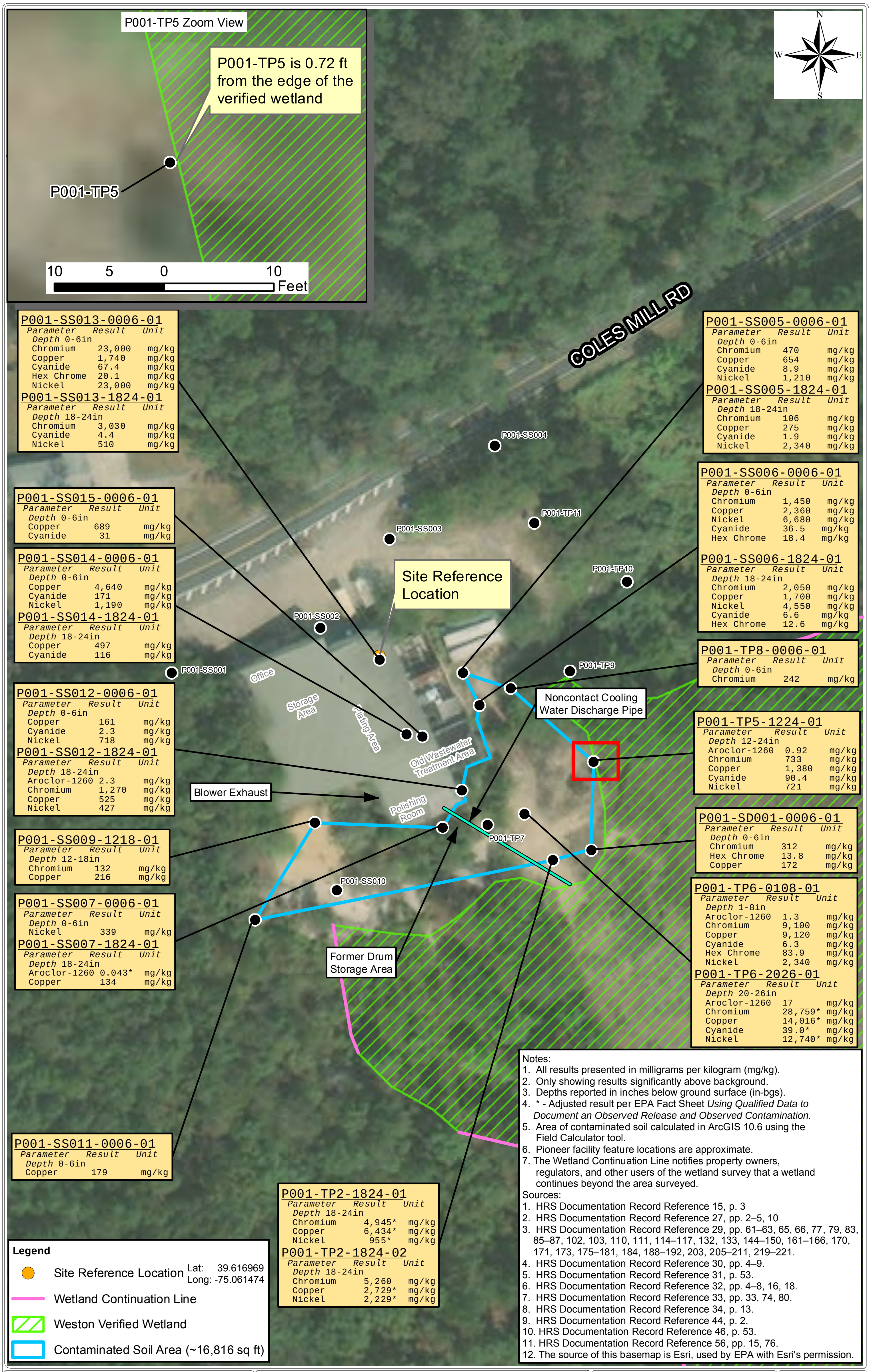
Source 1 consists of the contaminated soil at the Pioneer facility, as indicated by sampling activities performed by EPA in 1984 and 1994 and by Pioneer from 1994 to 2000, and as confirmed by EPA sampling and analysis in 2019 [**Figure 3**; **Tables 1** and **2**; Ref. 5, pp. 11, 13–16, 18–20, 22, 23, 44–107; 15, pp. 3, 5, 6, 8, 11–13, 22, 29, 31; 17, pp. 4–6, 9–11, 17; 30, pp. 4–9]. Pioneer utilized three plating solutions: alkaline cyanide-copper, acid nickel, and trivalent chrome; hexavalent chrome plating was performed at the facility until 1977 [Ref. 5, p. 5; 6, pp. 1, 3; 7, p. 5; 8, p. 1]. Sampling and analysis by EPA in 2019 confirmed the presence of these same inorganic constituents (i.e., chromium, copper, nickel, cyanide, and hexavalent chromium), as well as PCBs in the form of Aroclor-1260, in site soils at concentrations significantly above background [see **Figure 3**; **Tables 1** and **2**]. A Soil Sample Location Map is presented as **Figure 3**.

The soil contamination at the Pioneer facility (i.e., Source 1) is likely associated with poor housekeeping practices and ventilation of dust from the interior of the Pioneer facility [Ref. 6, p. 24; 10, p. 1; 12, pp. 1, 2; 45, p. 3]. In September 1978, EPA observed that Pioneer stored open vats containing nickel waste sludge and other pollutants outside the plant in “an area and manner which does not prevent pollutants from said materials from entering navigable waters” [Ref. 45, p. 3]. In March 1980, NJDEP observed that approximately 110 drums of plating sludge were being stored on the exterior of the facility in an unpaved, uncontained area east of the building [Ref. 12, p. 1]. NJDEP also observed that the metal polishing area was ventilated by a large fan that forced air and dust out to the rear of the building, and that the ground surface behind the plant (i.e., to the south) was covered by this dust [Ref. 12, p. 2]. The blower exhaust was located near the southwestern corner of the facility building [**Figure 3**; Ref. 6, p. 24; 15, p. 3]. In 1986, NJDEP noted that the containment channels under Pioneer’s plating tanks had an accumulation of grit and chemical residue [Ref. 10, p. 1]. During the 2019 sampling event, EPA observed that these trenches within the former plating room (i.e., the eastern portion of the building) consist of deteriorated concrete and exposed soil [**Figure 3**; Ref. 6, p. 21; Ref. 30, p. 8; 73, pp. 1–3].

PCBs in the form of Aroclor-1260 were detected in site soil ranging from 0.043 milligrams per kilogram (mg/kg) (adjusted concentration) to 17 mg/kg [see **Section 2.2, Table 2**]. PCBs are a group of man-made chemical compounds that were used in electrical equipment, such as transformers and capacitors, up to 1977 when manufacturing of PCBs ceased [Ref. 36, p. 1]. The Pioneer facility operated for approximately 22 years (i.e., 1955 to 1977) while such PCB-containing equipment was manufactured and widely used, and Pioneer has been the only known industrial occupant of the property [Ref. 7, p. 5; 36, p. 1]. Although specific uses of PCBs at the Pioneer facility are not discussed in the available documentation, according to the Agency for Toxic Substances and Disease Registry (ATSDR), PCBs are associated with electroplating and metal finishing operations [Ref. 78, p. 19]. Pioneer is located in a mostly residential area and there are no known off-site sources of PCBs in the vicinity of the facility [Ref. 5, p. 6; 20, pp. 4–12].

In 1984, EPA observed that drums were being stored outside along the southern end of the facility [Ref. 15, pp. 1, 3, 6]. Analysis of a composite soil sample (NJ70-14) collected by EPA next to the drums indicated the presence of chromium (17,500 mg/kg), copper (440 mg/kg), and nickel (1,200 mg/kg), as well as lead (11,300 mg/kg), and zinc (430 mg/kg) [Ref. 15, pp. 3, 6, 31]. In August 2018, EPA collected three dust samples from within the interior of the Pioneer facility [Ref. 13, pp. 1, 2, 7]. Analytical results of the dust samples showed the presence of chromium (776 to 13,900 mg/kg), copper (224 to 8,230 mg/kg), and nickel (123 to 15,700 mg/kg) [Ref. 13, pp. 1, 17, 22, 23, 24]. Hexavalent chromium was detected in the dust samples at concentrations ranging from 0.209 J (estimated concentration) mg/kg to 52.7 mg/kg [Ref. 13, pp. 27, 31, 35, 36].

PATH: P:\SAT2\Pioneer_Metal_Finishing(0689)\MXD\Pioneer0745\25543_PMFI0745_RST_July_2019_Soil_Results.mxd



P001-SS013-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	23,000	mg/kg
Copper	1,740	mg/kg
Cyanide	67.4	mg/kg
Hex Chrome	20.1	mg/kg
Nickel	23,000	mg/kg

P001-SS013-1824-01

Parameter	Result	Unit
Depth 18-24in		
Chromium	3,030	mg/kg
Cyanide	4.4	mg/kg
Nickel	510	mg/kg

P001-SS015-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	689	mg/kg
Cyanide	31	mg/kg

P001-SS014-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	4,640	mg/kg
Cyanide	171	mg/kg
Nickel	1,190	mg/kg

P001-SS014-1824-01

Parameter	Result	Unit
Depth 18-24in		
Copper	497	mg/kg
Cyanide	116	mg/kg

P001-SS012-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	161	mg/kg
Cyanide	2.3	mg/kg
Nickel	718	mg/kg

P001-SS012-1824-01

Parameter	Result	Unit
Depth 18-24in		
Aroclor-1260	2.3	mg/kg
Chromium	1,270	mg/kg
Copper	525	mg/kg
Nickel	427	mg/kg

P001-SS009-1218-01

Parameter	Result	Unit
Depth 12-18in		
Chromium	132	mg/kg
Copper	216	mg/kg

P001-SS007-0006-01

Parameter	Result	Unit
Depth 0-6in		
Nickel	339	mg/kg

P001-SS007-1824-01

Parameter	Result	Unit
Depth 18-24in		
Aroclor-1260	0.043*	mg/kg
Copper	134	mg/kg

P001-SS011-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	179	mg/kg

P001-TP2-1824-01

Parameter	Result	Unit
Depth 18-24in		
Chromium	4,945*	mg/kg
Copper	6,434*	mg/kg
Nickel	955*	mg/kg

P001-TP2-1824-02

Parameter	Result	Unit
Depth 18-24in		
Chromium	5,260	mg/kg
Copper	2,729*	mg/kg
Nickel	2,229*	mg/kg

P001-SS005-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	470	mg/kg
Copper	654	mg/kg
Cyanide	8.9	mg/kg
Nickel	1,210	mg/kg

P001-SS005-1824-01

Parameter	Result	Unit
Depth 18-24in		
Chromium	106	mg/kg
Copper	275	mg/kg
Cyanide	1.9	mg/kg
Nickel	2,340	mg/kg

P001-SS006-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	1,450	mg/kg
Copper	2,360	mg/kg
Nickel	6,680	mg/kg
Cyanide	36.5	mg/kg
Hex Chrome	18.4	mg/kg

P001-SS006-1824-01

Parameter	Result	Unit
Depth 18-24in		
Chromium	2,050	mg/kg
Copper	1,700	mg/kg
Nickel	4,550	mg/kg
Cyanide	6.6	mg/kg
Hex Chrome	12.6	mg/kg

P001-TP8-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	242	mg/kg

P001-TP5-1224-01

Parameter	Result	Unit
Depth 12-24in		
Aroclor-1260	0.92	mg/kg
Chromium	733	mg/kg
Copper	1,380	mg/kg
Cyanide	90.4	mg/kg
Nickel	721	mg/kg

P001-SD001-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	312	mg/kg
Hex Chrome	13.8	mg/kg
Copper	172	mg/kg

P001-TP6-0108-01

Parameter	Result	Unit
Depth 1-8in		
Aroclor-1260	1.3	mg/kg
Chromium	9,100	mg/kg
Copper	9,120	mg/kg
Cyanide	6.3	mg/kg
Hex Chrome	83.9	mg/kg
Nickel	2,340	mg/kg

P001-TP6-2026-01

Parameter	Result	Unit
Depth 20-26in		
Aroclor-1260	17	mg/kg
Chromium	28,759*	mg/kg
Copper	14,016*	mg/kg
Cyanide	39.0*	mg/kg
Nickel	12,740*	mg/kg

Legend

●	Site Reference Location Lat: 39.616969 Long: -75.061474
━	Wetland Continuation Line
▨	Weston Verified Wetland
▭	Contaminated Soil Area (~16,816 sq ft)

Notes:
1. All results presented in milligrams per kilogram (mg/kg).
2. Only showing results significantly above background.
3. Depths reported in inches below ground surface (in-bgs).
4. * - Adjusted result per EPA Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination.*
5. Area of contaminated soil calculated in ArcGIS 10.6 using the Field Calculator tool.
6. Pioneer facility feature locations are approximate.
7. The Wetland Continuation Line notifies property owners, regulators, and other users of the wetland survey that a wetland continues beyond the area surveyed.

Sources:
1. HRS Documentation Record Reference 15, p. 3
2. HRS Documentation Record Reference 27, pp. 2–5, 10
3. HRS Documentation Record Reference 29, pp. 61–63, 65, 66, 77, 79, 83, 85–87, 102, 103, 110, 111, 114–117, 132, 133, 144–150, 161–166, 170, 171, 173, 175–181, 184, 188–192, 203, 205–211, 219–221.
4. HRS Documentation Record Reference 30, pp. 4–9.
5. HRS Documentation Record Reference 31, p. 53.
6. HRS Documentation Record Reference 32, pp. 4–8, 16, 18.
7. HRS Documentation Record Reference 33, pp. 33, 74, 80.
8. HRS Documentation Record Reference 34, p. 13.
9. HRS Documentation Record Reference 44, p. 2.
10. HRS Documentation Record Reference 46, p. 53.
11. HRS Documentation Record Reference 56, pp. 15, 76.
12. The source of this basemap is Esri, used by EPA with Esri's permission.

LEGEND:
80 40 0 80
Graphic Scale in Feet

PROJECT:
TDD 0004/1903-08

CLIENT NAME:
EPA

TITLE:
REGION 2 START V SOIL SAMPLE LOCATION MAP
– JULY 30 AND 31, 2019
PIONEER METAL FINISHING SITE
FRANKLINVILLE, GLOUCESTER COUNTY, NEW JERSEY

WESTON SOLUTIONS

DRAWING NUMBER: 25543

FIGURE #: 3

DRAWN BY: J. Gardner
REVIEWED BY: S. Snyder
PROJECT MANAGER: S. Snyder
SCALE: 1 " = 80 '
DATE: June 2020

Soil samples collected by EPA in 2019 from location P001-SS007, which is near the approximate former drum area along the southern side of the facility, showed the presence of nickel (339 mg/kg) and copper (134 mg/kg) at concentrations significantly above background [**Figure 3**; Ref. 15, p. 3]. Analysis of EPA soil sample P001-SS009-1218-01, which was collected near the southwestern side of the facility near the location of the fan exhaust, indicated the presence of chromium (132 mg/kg) and copper (216 mg/kg) at concentrations significantly above background [**Figure 3**; **Tables 1** and **2**; Ref. 6, pp. 16, 24]. Analysis of EPA soil samples collected in areas of exposed soil within the former plating room trenches shows that these same hazardous substances (i.e., chromium, copper, and nickel) are present in the soil beneath the Pioneer facility **[Figure 3**; Ref. 30, p. 8; 73, pp. 1–3]. These hazardous substances were also present in the plating solutions utilized by Pioneer (i.e., alkaline cyanide-copper, acid nickel, trivalent chrome, and hexavalent chrome) [Ref. 5, p. 5; 6, pp. 1, 3; 7, p. 5; 8, p. 1].

Location of the source, with reference to a map of the site:

Source 1 (contaminated soil) is located within the upland portion of the Pioneer property southeast, south, southwest, and east of the Pioneer facility and extending downslope toward the wetland, as well as directly beneath the facility building. An area of contaminated soil is defined by a polygon bounded by and encompassing the following EPA contaminated soil sample locations (i.e., locations where samples show site-attributable hazardous substances at concentrations significantly above background): P001-SS009, P001-SS011, P001-TP2, P001-SD001 (evaluated as soil), P001-TP5, P001-TP8, P001-SS005, P001-SS012, P001-SS007, P001-SS006, and P001-TP6 [see **Figure 3**; **Table 2**], as shown on **Figure 3**. Soil contamination is also documented at sample locations P001-SS013, P001-SS014, and P001-SS015 beneath the Pioneer building [see **Figure 3**]. As the contamination beneath the building was likely the result of a different mode of deposition and because inference of contamination between these samples and the samples collected from the exterior of the building may not be reasonable, these locations are evaluated as separate points of soil contamination and are not included in the larger inferred area of contaminated soil [**Figure 3**; Ref. 1, Table 4-2]. The area of contaminated soil as documented according to HRS criteria is approximately 16,816 square feet (ft^2) [see **Figure 3**]. The area was determined using exterior sample locations recorded in the field with Global Positioning System (GPS) technology and subsequent calculation using Geographic Information System (GIS) software [see **Figure 3**].

The exterior sample locations listed above likely represent contaminated soil derived from multiple facility operations, waste depositional activities, airborne contamination from the metal polishing area ventilation fan, and poor housekeeping [Ref. 12, p. 2]. These historical activities all generated the same hazardous substances as those found in Source 1, they all occurred in the southern and southeastern portion of the property (i.e., in the Source 1 delineated area), and the full extent of their impact was not well-documented at the time of waste deposition or in subsequent years (see above). The Pioneer property slopes south-southeast and the area of contaminated soil extends in the same direction away from the Pioneer facility towards the wetland, suggesting that contaminated soil is at least partly derived from migration of contaminants away from the aforementioned operational areas [**Figure 3**; Ref. 4, p. 1; 12, p. 2]. Based on these considerations, both the exterior sampling locations and the inferred contaminated area lying between these locations are considered as the source for HRS scoring purposes [Ref. 1, Section 1.1].

Containment

Release to surface water via overland migration:

Topography at the Pioneer facility slopes gently south-southeast toward the adjacent wetland and Scotland Run [**Figure 3**; Ref. 4, p. 1; 5, p. 7]. The exterior contaminated soil identified at the site is located at the surface (i.e., 0 to 6 inches) and occupies the upland portion of the property 0.72 feet from and upslope of the wetland, and there are no containment features (e.g., run-on or runoff control measures) present that would prevent contaminated soil from being transported into the wetland [**Figure 3**; Ref. 4, p. 1; 5, pp. 117, 130; 27, pp. 10, 32–36; 60, p. 1]. Therefore, a surface water containment factor value for overland migration of 10 is assigned for the source [Ref. 1, Table 4-2].

2.2.2 Hazardous Substances

On July 30 and 31, 2019, EPA collected a total of 42 soil samples (including two environmental duplicate samples) from 15 soil borings and 5 test pits located throughout the Pioneer property from the upland portion at the facility building and extending southeastward toward the wetland [**Figure 3**; Ref. 30, pp. 4–9]. Three of the borings (P001-SS013, P001-SS014, and P001-SS015) were advanced in areas of exposed soil (i.e., trenches) within the former plating room of the Pioneer facility **[Figure 3**; Ref. 30, p. 8; 44, p. 2]. The trenches acted as containment for the plating bath area and consisted of deteriorated concrete exposing the soil underneath from which the samples were collected [Ref. 6, p. 21; 73, pp. 1–3]. In 1986, NJDEP noted that the containment channel under the plating tanks had an accumulation of grit and chemical residue [Ref. 10, p. 1].

The location and depths of test pit soil samples were based on visual observation (impacted soil and the presence of plating waste materials) and field screening using x-ray fluorescence (XRF) [Ref. 30, pp. 4, 5, 7]. Soil borings were advanced using decontaminated hand-augers and test pits were dug using an excavator [Ref. 30, p. 4]. Soil samples were collected using decontaminated stainless-steel scoops [Ref. 30, p. 3]. These sample collection methods are consistent with EPA standard operating procedure (SOP) [Ref. 35, pp. 3, 4, 5, 8, 12].

Laboratory analytical results for soil samples collected by EPA in 2019 confirm the presence of chromium, copper, nickel, cyanide, hexavalent chromium, and PCBs at concentrations significantly above background levels in soil at the Pioneer facility. Site-specific background levels were established through the collection and analysis of surface and subsurface soil samples in areas believed to be of little or no impact from the facility operations (i.e., northern portion of Pioneer property) [see **Figure 3**]. Although background samples were not specifically designated during the July 2019 EPA sampling activities, samples collected from the northern portion of the Pioneer property are evaluated as representing background conditions as they are the same soil type and are outside the influence of the facility activities that resulted in the soil contamination (the locations are closer to parking and office areas than they are to operational areas, and they are slightly upslope of the operational areas[see **Table 1** and **Figure 3**; Ref. 4, p. 1; 27, p. 20].

The following tables present the results that document contaminated samples exhibiting concentrations that are significantly above the associated site-specific background level (i.e., three times greater, or above the quantitation limit if not detected in background samples). Comparability of the background and contaminated source samples is evidenced by the following factors: All samples were collected during the same timeframe (July 30 and 31, 2019); all samples were collected from the upland portion of the property near the Pioneer facility at similar depth intervals and from the same mapped soil unit (i.e., Downer loamy sand); all samples were analyzed for the same parameters by the same laboratories; and all the samples were collected according to EPA guidance [**Figure 3**; Ref. 27, pp. 10, 20–25; 29, pp. 53, 54, 136, 137; 30, pp. 4–9; 31, p. 1; 33, p. 1; 34, p. 1; 35, pp. 2–5, 6, 8, 12]. The same EPA SW-846 analytical methods were used for analyses of all background and contaminated samples, including Target Analyte List (TAL) Metals by Method 6010D, Cyanide by Method 9012B, Hexavalent Chromium by 7196A, and Aroclors by EPA Contract Laboratory Program (CLP) Statement of Work (SOW) SOM02.4 [Ref. 29, pp. 53, 54, 136, 137; 37, p. 7; 46, p. 1; 53, p. 1]. All samples were shipped under chain-of custody (COC) and on ice, to the receiving laboratories [Ref. 29, pp. 54, 132, 133, 137, 219–221; 30, p. 9]. All sample results were validated according to EPA Region 2 data validation guidelines [Ref. 29, pp. 53–66, 136–150; 31, pp. 6–9; 33, pp. 7–10; 34, pp. 6–8; 46, p. 1].

Table 1 summarizes the site-specific background results for the July 2019 EPA soil sampling event. Soil sample locations P001-SS001, P001-SS002, P001-SS003, and P001-SS004 were located in the northern portion of the Pioneer property near Coles Mill Road, upslope from historical site operations; therefore, soil samples from these locations are evaluated as representing background conditions at the site. **Table 1** demonstrates the maximum overall site-specific background level for each hazardous substance attributable to historical site operations. The maximum background level for each hazardous substance is denoted by ***bold italics*** in the background table. All samples results are presented in mg/kg for consistency.

Background Samples

TABLE 1. BACKGROUND SAMPLES, SOURCE 1

Hazardous Substance	Sample ID	Depth (in.)	Sample Date	Result (mg/kg)	RL (mg/kg)	References
Chromium[1]	P001-SS001-0006-01	0–6	7/30/19	16.5	0.14	29, pp. 53–60, 63, 89, 133; 30, p. 6; 60, p. 1
	P001-SS001-1824-01	18–24	7/30/19	8.13	0.13	29, pp. 53–60, 63, 90, 133; 30, p. 6; 60, p. 1
	P001-SS002-0006-01	0–6	7/30/19	20.9	0.13	29, pp. 53–60, 64, 91, 133; 30, p. 6; 60, p. 1
	P001-SS002-1824-01	18–24	7/30/19	6.20	0.13	29, pp. 53–60, 64, 92, 133; 30, p. 6; 60, p. 1
	P001-SS003-0006-01	0–6	7/30/19	***27.1***	0.13	29, pp. 53–60, 64, 93, 133; 30, p. 6; 60, p. 1
	P001-SS003-1824-01	18–24	7/30/19	7.33	0.13	29, pp. 53–60, 64, 94, 133; 30, p. 6; 60, p. 1
	P001-SS004-0006-01	0–6	7/30/19	15.0	0.14	29, pp. 53–60, 64, 95, 133; 30, p. 6; 60, p. 1
	P001-SS004-1824-01	18–24	7/30/19	9.73	0.14	29, pp. 136–144, 160, 219; 30, p. 6; 60, p. 1
Copper[1]	P001-S001-0006-01	0–6	7/30/19	27.3	0.091	29, pp. 53–60, 63, 89, 133; 30, p. 6; 60, p. 1
	P001-S001-1824-01	18–24	7/30/19	21.8	0.088	29, pp. 53–60, 63, 90, 133; 30, p. 6; 60, p. 1
	P001-SS002-0006-01	0–6	7/30/19	39.4	0.086	29, pp. 53–60, 64, 91, 133; 30, p. 6; 60, p. 1
	P001-SS002-1824-01	18–24	7/30/19	8.29	0.087	29, pp. 53–60, 64, 92, 133; 30, p. 6; 60, p. 1
	P001-SS003-0006-01	0–6	7/30/19	***39.6***	0.086	29, pp. 53–60, 64, 93, 133; 30, p. 6; 60, p. 1
	P001-SS003-1824-01	18–24	7/30/19	14.3	0.087	29, pp. 53–60, 64, 94, 133; 30, p. 6; 60, p. 1
	P001-SS004-0006-01	0–6	7/30/19	23.0	0.093	29, pp. 53–60, 64, 95, 133; 30, p. 6; 60, p. 1
	P001-SS004-1824-01	18–24	7/30/19	16.4	0.093	29, pp. 136–144, 160, 219; 30, p. 6; 60, p. 1
Nickel[1]	P001-S001-0006-01	0–6	7/30/19	32.0	0.20	29, pp. 53–60, 63, 89, 133; 30, p. 6; 60, p. 1
	P001-S001-1824-01	18–24	7/30/19	21.6	0.19	29, pp. 53–60, 63, 90, 133; 30, p. 6; 60, p. 1
	P001-SS002-0006-01	0–6	7/30/19	97.4	0.19	29, pp. 53–60, 64, 91, 133; 30, p. 6; 60, p. 1
	P001-SS002-1824-01	18–24	7/30/19	16.8	0.19	29, pp. 53–60, 64, 92, 133; 30, p. 6; 60, p. 1
	P001-SS003-0006-01	0–6	7/30/19	***111***	0.19	29, pp. 53–60, 64, 93, 133; 30, p. 6; 60, p. 1
	P001-SS003-1824-01	18–24	7/30/19	23.6	0.19	29, pp. 53–60, 64, 94, 133; 30, p. 6; 60, p. 1
	P001-SS004-0006-01	0–6	7/30/19	21.4	0.20	29, pp. 53–60, 64, 95, 133; 30, p. 6; 60, p. 1
	P001-SS004-1824-01	18–24	7/30/19	15.5	0.20	29, pp. 136–144, 160, 219; 30, p. 6; 60, p. 1

TABLE 1. BACKGROUND SAMPLES, SOURCE 1						
Hazardous Substance	**Sample ID**	**Depth (in.)**	**Sample Date**	**Result (mg/kg)**	**RL (mg/kg)**	**References**
Cyanide[1]	P001-S001-0006-01	0–6	7/30/19	0.13 U	0.13	29, pp. 53–60, 66, 120, 133; 30, p. 6; 60, p. 1
	P001-S001-1824-01	18–24	7/30/19	***0.59***	0.13	29, pp. 53–60, 66, 121, 133; 30, p. 6; 60, p. 1
	P001-SS002-0006-01	0–6	7/30/19	0.13 U	0.13	29, pp. 53–60, 66, 122, 133; 30, p. 6; 60, p. 1
	P001-SS002-1824-01	18–24	7/30/19	0.13 U	0.13	29, pp. 53–60, 66, 123, 133; 30, p. 6; 60, p. 1
	P001-SS003-0006-01	0–6	7/30/19	0.13 U	0.13	29, pp. 53–60, 66, 124, 133; 30, p. 6; 60, p. 1
	P001-SS003-1824-01	18–24	7/30/19	0.14 U	0.14	29, pp. 53–60, 66, 125, 133; 30, p. 6; 60, p. 1
	P001-SS004-0006-01	0–6	7/30/19	0.57	0.14	29, pp. 53–60, 66, 126, 133; 30, p. 6; 60, p. 1
	P001-SS004-1824-01	18–24	7/30/19	0.14 U	0.14	29, pp. 136–143, 149, 187, 219; 30, p. 6; 60, p. 1
Hexavalent Chromium[1]	P001-S001-0006-01	0–6	7/30/19	0.19 U	0.19	29, pp. 53–60, 66, 120, 133; 30, p. 6; 60, p. 1
	P001-S001-1824-01	18–24	7/30/19	0.185 U	0.185	29, pp. 53–60, 66, 121, 133; 30, p. 6; 60, p. 1
	P001-SS002-0006-01	0–6	7/30/19	0.208 J x 10 (default adjustment factor) (***2.08***)	0.188	29, pp. 53–60, 66, 122, 133; 30, p. 6; 60, p. 1
	P001-SS002-1824-01	18–24	7/30/19	0.185 U	0.185	29, pp. 53–60, 66, 123, 133; 30, p. 6; 60, p. 1
	P001-SS003-0006-01	0–6	7/30/19	0.183 U	0.183	29, pp. 53–60, 66, 124, 133; 30, p. 6; 60, p. 1
	P001-SS003-1824-01	18–24	7/30/19	0.185 U	0.185	29, pp. 53–60, 66, 125, 133; 30, p. 6; 60, p. 1
	P001-SS004-0006-01	0–6	7/30/19	0.195 U	0.195	29, pp. 53–60, 66, 126, 133; 30, p. 6; 60, p. 1
	P001-SS004-1824-01	18–24	7/30/19	0.197 U	0.197	29, pp. 136–143, 149, 187, 219; 30, p. 6; 60, p. 1
PCBs (Aroclor-1260) [2]	P001-SS001-0006-01	0–6	7/30/19	0.036 U	0.036	30, p. 6; 31, pp. 6–9, 14, 107; 53, pp. 3, 1075; 60, p. 1
	P001-SS001-1824-01	18–24	7/30/19	***0.041 U***	0.041	30, p. 6; 31, pp. 6–9, 17, 107; 53, pp. 3, 1080; 60, p. 1
	P001-SS002-0006-01	0–6	7/30/19	0.0098 J	0.033	30, p. 6; 31, pp. 6–9, 20, 107; 53, pp. 3, 1085; 60, p. 1
	P001-SS002-1824-01	18–24	7/30/19	0.034 U	0.034	30, p. 6; 31, pp. 6–9, 23, 107; 53, pp. 3, 1090; 60, p. 1
	P001-SS003-0006-01	0–6	7/30/19	0.033 U	0.033	30, p. 6; 31, pp. 6–9, 26, 107; 53, pp. 3, 1095; 60, p. 1

TABLE 1. BACKGROUND SAMPLES, SOURCE 1						
Hazardous Substance	**Sample ID**	**Depth (in.)**	**Sample Date**	**Result (mg/kg)**	**RL (mg/kg)**	**References**
PCBs (Aroclor-1260) (continued)[2]	P001-SS003-1824-01	18–24	7/30/19	0.035 U	0.035	30, p. 6; 31, pp. 6–9, 29, 108; 53, pp. 3, 1100; 60, p. 1
	P001-SS004-0006-01	0–6	7/30/19	0.037 U	0.037	30, p. 6; 31, pp. 6–9, 32, 108; 53, pp. 3, 1105; 60, p. 1
	P001-SS004-1824-01	18–24	7/30/19	0.036 U	0.036	30, p. 6; 31, pp. 6–9, 35, 108; 53, pp. 3, 1110; 60, p. 1

[1] The Reporting Limit (RL) for each non-CLP result is the Method Detection Limit (MDL) adjusted for sample and method [Ref. 29, pp. 70, 72, 154–155]. Since the samples were analyzed by a non-CLP laboratory, the adjusted MDLs presented above are used in place of the HRS-defined sample quantitation limits (SQL) [Ref. 1, Sections 1.1 and 2.3].
[2] The RL for each CLP result is the Contract Required Quantitation Limit (CRQL) adjusted for sample and method [Ref. 37, p. 52; 62, p. 9]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].
J (CLP Organics) = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met), or the concentration of the analyte was below the CRQL [Ref. 31, p. 2].
J (non-CLP Inorganics) = Indicates the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL) [Ref. 29, p. 73].

These estimated results have been adjusted up to account for unknown bias per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. Although not required by the HRS or the fact sheet, qualified data are adjusted to demonstrate the relative increase in contamination over background. The adjustment factors are provided in the table and the adjusted results are shown in parentheses [Ref. 32, pp. 5–8, 16, 18]. The Aroclor result for P001-SS002-0006-01 is estimated because it is detected below the ACRQL, and associated with no bias; therefore, the result is not adjusted per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination.* [Ref. 31, pp. 20, 107; 32, pp. 5-8, 16, 18]

U (CLP organics) = The analyte was analyzed for, but was not detected above the level of the associated reported quantitation limit [Ref. 31, p. 2; 33, p. 2; 34, p. 2].
U (non-CLP inorganics) = The analyte was analyzed for, but was not detected [Ref. 29, p. 73].

Contaminated Samples

The results listed below are significantly above background levels (i.e., equal to three times or greater than the maximum background levels; or equal to or greater than the adjusted quantitation limit where the maximum background is non-detect) and are considered to represent the minimum extent of contaminated soil at the Pioneer facility. Although not required by the HRS, contaminated samples are compared to background samples to show the relative increase in site-related contamination over background levels.

TABLE 2. CONTAMINATED SAMPLES, SOURCE 1						
Hazardous Substance	**Sample ID**	**Depth (in.)**	**Sample Date**	**Result (mg/kg)**	**RL (mg/kg)**	**References**
Total Chromium[1]	P001-SS005-0006-01	0–6	7/30/19	470	1.81	29, pp. 136–144, 161, 219; 30, p. 6; 60, p. 1
	P001-SS005-1824-01	18–24	7/30/19	106	0.73	29, pp. 136–144, 162, 219; 30, p. 6; 60, p. 1
	P001-SS006-0006-01	0–6	7/30/19	1,450	3.22	29, pp. 136–144, 163, 219; 30, p. 6; 60, p. 1
	P001-SS006-1824-01	18–24	7/30/19	2,050	9.06	29, pp. 136–144, 164, 219; 30, p. 6; 60, p. 1

TABLE 2. CONTAMINATED SAMPLES, SOURCE 1

Hazardous Substance	**Sample ID**	**Depth (in.)**	**Sample Date**	**Result (mg/kg)**	**RL (mg/kg)**	**References**
Total Chromium (continued)[1]	P001-SS009-1218-01	12–18	7/30/19	132	1.38	29, pp. 136–143, 146, 170, 220; 30, p. 6; 60, p. 1
	P001-SS012-1824-01	18–24	7/30/19	1,270	3.41	29, pp. 136–143, 147, 176, 220; 30, p. 7; 60, p. 1
	P001-SS013-0006-01	0–6	7/31/19	23,000	64.5	29, pp. 136–143, 147, 177, 220; 30, pp. 8, 9; 60, p. 1
	P001-SS013-1824-01	18–24	7/31/19	3,030	6.91	29, pp. 136–143, 147, 178, 220; 30, pp. 8, 9; 60, p. 1
	P001-TP2-1824-01	18–24	7/31/19	6,380 J / 1.29 (4,945)	13.0	29, pp. 136–143, 148, 181, 221; 30, pp. 4, 9; 60, p. 1
	P001-TP2-1824-02	Duplicate of P001-TP2-1824-01		5,260	12.2	29, pp. 53–61, 79, 132; 30, pp. 4, 9; 60, p. 1
	P001-TP5-1224-01	12–24	7/31/19	733	1.91	29, pp. 53–60, 62, 83, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-0108-01	1–8	7/31/19	9,100	15.1	29, pp. 53–60, 62, 85, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-2026-01	20–26	7/31/19	37,100 J / 1.29 (28,759)	107	29, pp. 53–60, 63, 86, 133; 30, pp. 5, 9; 60, p. 1
	P001-TP8-0006-01	0–6	7/31/19	242	1.37	29, pp. 53–60, 63, 87, 133; 30, pp. 5, 9; 60, p. 1
	P001-SD001-0006-01*	0–6	9/23/19	312	1.0	16, p. 24; 30, p. 10; 56, pp. 3–6, 15, 76; 57, pp. 3, 16; 60, p. 1
Copper[1]	P001-SS005-0006-01	0–6	7/30/19	654	0.12	29, pp. 136–144, 161, 219; 30, p. 6; 60, p. 1
	P001-SS005-1824-01	18–24	7/30/19	275	0.095	29, pp. 136–144, 162, 219; 30, p. 6; 60, p. 1
	P001-SS006-0006-01	0–6	7/30/19	2,360	0.11	29, pp. 136–144, 163, 219; 30, p. 6; 60, p. 1
	P001-SS006-1824-01	18–24	7/30/19	1,700	0.12	29, pp. 136–144, 164, 219; 30, p. 6; 60, p. 1
	P001-SS007-1824-01	18–24	7/30/19	134	0.090	29, pp. 136–143, 145, 166, 219; 30, p. 6; 60, p. 1
	P001-SS009-1218-01	12–18	7/30/19	216	0.090	29, pp. 136–143, 146, 170, 220; 30, p. 6; 60, p. 1
	P001-SS011-0006-01	0–6	7/30/19	179	0.091	29, pp. 136–143, 146, 173, 220; 30, p. 6; 60, p. 1
	P001-SS012-0006-01	0–6	7/30/19	161	0.093	29, pp. 136–143, 147, 175, 220; 30, p. 7; 60, p. 1
	P001-SS012-1824-01	18–24	7/30/19	525	0.11	29, pp. 136–143, 147, 176, 220; 30, p. 7; 60, p. 1

TABLE 2. CONTAMINATED SAMPLES, SOURCE 1

Hazardous Substance	Sample ID	Depth (in.)	Sample Date	Result (mg/kg)	RL (mg/kg)	References
Copper (continued)[1]	P001-SS013-0006-01	0–6	7/31/19	1,740	1.05	29, pp. 136–143, 147, 177, 220; 30, pp. 8, 9; 60, p. 1
	P001-SS014-0006-01	0–6	7/31/19	4,640	0.090	29, pp. 136–143, 147, 179, 220; 30, pp. 8, 9; 60, p. 1
	P001-SS014-1824-01	18–24	7/31/19	497	0.090	29, pp. 136–143, 148, 180, 221; 30, pp. 8, 9; 60, p. 1
	P001-SS015-0006-01	0–6	7/31/19	689	0.099	29, pp. 53–61, 77, 132; 30, pp. 8, 9; 60, p. 1
	P001-TP2-1824-01	18–24	7/31/19	7,850 J / 1.22 (6,434)	0.17	29, pp. 136–143, 148, 181, 221; 30, pp. 4, 9; 60, p. 1
	P001-TP2-1824-02	Duplicate of P001-TP2-1824-01		3,330 J / 1.22 (2,729)	0.16	29, pp. 53–61, 79, 132; 30, pp. 4, 9; 60, p. 1
	P001-TP5-1224-01	12–24	7/31/19	1,380	0.13	29, pp. 53–60, 62, 83, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-0108-01	1–8	7/31/19	9,120	0.098	29, pp. 53–60, 62, 85, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-2026-01	20–26	7/31/19	17,100 J / 1.22 (14,016)	1.74	29, pp. 53–60, 63, 86, 133; 30, pp. 5, 9; 60, p. 1
	P001-SD001-0006-01*	0–6	9/23/19	172	2.6	16, p. 24; 30, p. 10; 56, pp. 3–6, 15, 76; 57, pp. 3, 16; 60, p. 1
Nickel[1]	P001-SS005-0006-01	0–6	7/30/19	1,210	0.26	29, pp. 136–144, 161, 219; 30, p. 6; 60, p. 1
	P001-SS005-1824-01	18–24	7/30/19	2,340	0.21	29, pp. 136–144, 162, 219; 30, p. 6; 60, p. 1
	P001-SS006-0006-01	0–6	7/30/19	6,680	4.58	29, pp. 136–144, 163, 219; 30, p. 6; 60, p. 1
	P001-SS006-1824-01	18–24	7/30/19	4,550	12.9	29, pp. 136–144, 164, 219; 30, p. 6; 60, p. 1
	P001-SS007-0006-01	0–6	7/30/19	339	0.19	29, pp. 136–143, 145, 165, 219; 30, p. 6; 60, p. 1
	P001-SS012-0006-01	0–6	7/30/19	718	0.20	29, pp. 136–143, 147, 175, 220; 30, p. 7; 60, p. 1
	P001-SS012-1824-01	18–24	7/30/19	427	0.24	29, pp. 136–143, 147, 176 220; 30, p. 7; 60, p. 1
	P001-SS013-0006-01	0–6	7/31/19	23,000	2.29	29, pp. 136–143, 147, 177, 220; 30, pp. 8, 9; 60, p. 1
	P001-SS013-1824-01	18–24	7/31/19	510	0.20	29, pp. 136–143, 147, 178, 220; 30, pp. 8, 9; 60, p. 1
	P001-SS014-0006-01	0–6	7/31/19	1,190	0.20	29, pp. 136–143, 147, 179, 220; 30, pp. 8, 9; 60, p. 1

TABLE 2. CONTAMINATED SAMPLES, SOURCE 1						
Hazardous Substance	**Sample ID**	**Depth (in.)**	**Sample Date**	**Result (mg/kg)**	**RL (mg/kg)**	**References**
Nickel (continued)[1]	P001-TP2-1824-01	18–24	7/31/19	1,290 J / 1.35 (955)	0.37	29, pp. 136–143, 148, 181, 221; 30, pp. 4, 9; 60, p. 1
	P001-TP2-1824-02	Duplicate of P001-TP2-1824-01		3,010 J / 1.35 (2,229)	0.36	29, pp. 53–61, 79, 132; 30, pp. 4, 9; 60, p. 1
	P001-TP5-1224-01	12–24	7/31/19	721	0.27	29, pp. 53–60, 62, 83, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-0108-01	1–8	7/31/19	2,340	0.21	29, pp. 53–60, 62, 85, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-2026-01	20–26	7/31/19	17,200 J / 1.35 (12,740)	3.80	29, pp. 53–60, 63, 86, 133; 30, pp. 5, 9; 60, p. 1
Hexavalent Chromium[1]	P001-SS006-0006-01	0–6	7/30/19	18.4	0.226	29, pp. 136–143, 149, 190, 219; 30, p. 6; 60, p. 1
	P001-SS006-1824-01	18–24	7/30/19	12.6	0.249	29, pp. 136–143, 149, 192, 220; 30, p. 6; 60, p. 1
	P001-SS013-0006-01	0–6	7/31/19	20.1	0.226	29, pp. 136–143, 150, 205, 219; 30, pp. 8, 9; 60, p. 1
	P001-TP6-0108-01	1–8	7/31/19	83.9	0.42	29, pp. 53–60, 65, 114, 115, 132; 30, pp. 5, 9; 60, p. 1
	P001-SD001-0006-01*	0–6	9/23/19	13.8	0.19	16, p. 18; 30, p. 10; 46, pp. 1–5, 53; 60, p. 1
Cyanide[1]	P001-SS005-0006-01	0–6	7/30/19	8.9	0.19	29, pp. 136–143, 149, 188, 219; 30, p. 6; 60, p. 1
	P001-SS005-1824-01	18–24	7/30/19	1.9	0.14	29, pp. 136–143, 149, 189, 219; 30, p. 6; 60, p. 1
	P001-SS006-0006-01	0–6	7/30/19	36.5	0.32	29, pp. 136–143, 149, 190, 191, 219; 30, p. 6; 60, p. 1
	P001-SS006-1824-01	18–24	7/30/19	6.6	0.17	29, pp. 136–143, 149, 192, 219; 30, p. 6; 60, p. 1
	P001-SS012-0006-01	0–6	7/30/19	2.3	0.14	29, pp. 136–143, 150, 203, 220; 30, p. 7; 60, p. 1
	P001-SS013-0006-01	0–6	7/31/19	67.4	0.81	29, pp. 136–143, 150, 205, 206, 220; 30, pp. 8, 9; 60, p. 1
	P001-SS013-1824-01	18–24	7/31/19	4.4	0.14	29, pp. 136–143, 150, 207, 220; 30, pp. 8, 9; 60, p. 1
	P001-SS014-0006-01	0–6	7/31/19	171	1.4	29, pp. 136–143, 150, 208, 209, 219; 30, pp. 8, 9; 60, p. 1

TABLE 2. CONTAMINATED SAMPLES, SOURCE 1						
Hazardous Substance	**Sample ID**	**Depth (in.)**	**Sample Date**	**Result (mg/kg)**	**RL (mg/kg)**	**References**
	P001-SS014-1824-01	18–24	7/31/19	116	1.3	29, pp. 136–143, 150, 210, 211, 221; 30, pp. 8, 9; 60, p. 1
Cyanide (Continued) [1]	P001-SS015-0006-01	0–6	7/31/19	31	0.3	29, pp. 53–60, 65, 102, 103, 132; 30, pp. 8, 9; 60, p. 1
	P001-TP5-1224-01	12–24	7/31/19	90.4	0.98	29, pp. 53–60, 65, 110, 111, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-0108-01	1–8	7/31/19	6.3	0.15	29, pp. 53–60, 65, 114, 132; 30, pp. 5, 9; 60, p. 1
	P001-TP6-2026-01	20–26	7/31/19	60.5 J / 1.55 (39.0)	0.52	29, pp. 53–60, 66, 116, 117, 133; 30, pp. 5, 9; 60, p. 1
PCBs (Aroclor-1260) [2]	P001-SS007-1824-01	18–24	7/30/19	0.430 J / 10 (0.043)	0.035	30, p. 6; 31, pp. 6–9, 53, 109; 53, pp. 5, 1140; 60, p. 1
	P001-SS012-1824-01	18–24	7/30/19	2.3	0.038	30, p. 7; 33, pp. 7–10, 33, 119; 54, pp. 4, 1364; 60, p. 1
	P001-TP5-1224-01	12–24	7/31/19	0.920	0.240	30, pp. 5, 9; 33, pp. 7–10, 74, 120; 54, pp. 7, 1445; 60, p. 1
	P001-TP6-0108-01	1–8	7/31/19	1.3	0.380	30, pp. 5, 9; 33, pp. 7–10, 80, 120; 54, pp. 7, 1465; 60, p. 1
	P001-TP6-2026-01	20–26	7/31/19	17	6.3	30, pp. 5, 9; 34, p. 6–8, 13, 37; 55, pp. 3, 522; 60, p. 1

[1] The RL for each non-CLP result is the MDL adjusted for sample and method [Ref. 29, pp. 70, 72, 154–155]. Since the samples were analyzed by a non-CLP laboratory, the adjusted MDLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

[2] The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 37, p. 52; 62, p. 9]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

J (CLP Organics) = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the CRQL [Ref. 31, p. 2; 34, p. 2].

J (non-CLP Inorganics) = Indicates the reported value was obtained from a reading that was less than the CRDL, but greater than or equal to the IDL [Ref. 29, p. 73].

> These estimated results have been adjusted down to account for unknown bias per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. Although not required by the HRS or the fact sheet, qualified data are adjusted to demonstrate the relative increase in contamination over background. The adjustment factors are provided in the table and the adjusted results are shown in parentheses [Ref. 32, pp. 5–8, 16, 18].

* Although sample P001-SD001-0006-01 was originally designated as a sediment sample, the location lies just outside of the wetland boundary verified by EPA in August 2019; therefore, it is evaluated as a soil sample [**Figure 3**; Ref. 27, pp. 4, 10, 32–36]

Sample locations P001-TP3 and P001-SS008 lie within the boundary of the subject wetland; therefore, samples from these locations are not evaluated as soil samples for Source 1 [**Figures 3** and **4**; Ref. 27, pp. 10, 32–36].

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Tier A – Hazardous Constituent Quantity

The hazardous constituent quantity for Source 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances in the source and releases from the source is not known and cannot be estimated with reasonable confidence [Ref. 1, Section 2.4.2.1.1]. 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 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 1 with reasonable confidence. As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of *Tier B*, Hazardous Wastestream Quantity [Ref 1, Section 2.4.2.1.1].

Hazardous Constituent Quantity (C) Value: NS

2.4.2.1.2 Tier B – Hazardous Wastestream Quantity

The hazardous wastestream quantity for Source 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all 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 mass or partial mass of the hazardous wastestreams 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 1 with reasonable confidence. Scoring proceeds to the evaluation of *Tier C*, Volume [Ref. 1, Section 2.4.2.1.2].

Hazardous Wastestream Quantity (W) Value: NS

2.4.2.1.3 Tier C – Volume

Sampling and analytical results show that soil at the Pioneer facility is contaminated with metals and PCBs (see **Sections 2.2.1 and 2.2.2**). However, the volume of contaminated soil is unknown. Therefore, the volume of the source is assigned a value of 0 [Ref. 1, Section 2.4.2.1.3].

Volume (V) Assigned Value: 0

2.4.2.1.4 Tier D – Area

Sampling and analytical results show that soil at the Pioneer facility is contaminated with metals and PCBs (see **Sections 2.2.1** and **2.2.2**). The area of contaminated soil is defined by a polygon bounded by and encompassing the following EPA contaminated soil sample locations (i.e., locations where samples showing site-related hazardous substances at concentrations significantly above background): P001-SS009, P001-SS011, P001-TP2, P001-SD001 (evaluated as soil), P001-TP5, P001-TP8, P001-SS005, P001-SS012, P001-SS007, P001-SS006, and P001-TP6 [see **Figure 3**; **Table 2**], as shown on **Figure 3**. The area of contaminated soil as documented according to HRS criteria is approximately 16,816 ft^2 as measured by sample locations exterior to the facility building using GIS software [see **Figure 3**]. This measurement does not include the contaminated soil underlying the facility building. No contaminated soil was removed during the 2018–2019 RA [Ref. 42, pp. 1–4; 72, pp. 1–125]. The source type is "Contaminated Soil", so the area value is divided by 34,000 to obtain the assigned value shown below [Ref. 1, Section 2.4.2.1.4].

Dimensions of source = 16,816 ft^2
Area (A) Assigned Value: 16,816/34,000 = 0.49

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source 1 is 0.49 for Tier D – Area [Ref. 1, Section 2.4.2.1.5].

Source Hazardous Waste Quantity Value: 0.49

SITE SUMMARY OF SOURCE DESCRIPTIONS

TABLE 3. HAZARDOUS WASTE QUANTITY AND CONTAINMENT					
Source Number	Source Hazardous Waste Quantity Value	Containment			
		Ground Water	Surface Water	Air	
				Gas	Particulate
1	0.49	NS	10	NS	NS

NS = Not Scored

Other Possible Sources

Historical Wastewater Discharge

A former possible on-site source of contamination consists of the metals-contaminated wastewater discharge from historical metal plating operations at Pioneer; the approximate location of the historical wastewater discharge point was southeast of the plant near the adjacent wetland [Ref. 9, p. 3]. Pioneer began operations in the mid-1950s and utilized three plating solutions: alkaline cyanide-copper, acid nickel, and chrome (hexavalent chrome until 1977, and trivalent chrome after 1977) [Ref. 5, p. 5; 6, pp. 1, 3; 7, p. 5; 8, p. 1]. According to information provided by Pioneer, the facility discharged untreated waste from 1955 to either 1975 or 1979 [Ref. 5, p. 5; 7, p. 5; 9, p. 1]. According to an undated letter from Pioneer, discharged wastes consisted only of metallic salts that were discharged from 1955 to 1979; however, correspondence from Pioneer in 1993 indicated that untreated effluent was discharged until 1975 [Ref. 7, p. 5; 9, p. 1]. The RI commissioned by Pioneer also indicated that untreated waste was discharged until 1975 and that wastestream constituents included process sludge, rinse water, cleaning solutions, and plating wastes that were discharged into an unlined trench leading to an adjacent wetland southeast of the plant [Ref. 5, p. 5]. Chromium, copper, and nickel, as well as hexavalent chromium and cyanide, were known to be constituents of Pioneer's wastewater discharge [Ref. 45, pp. 2, 3]. Analysis of an effluent sample collected by EPA in September 1978 showed the presence of hexavalent chromium, total chromium, copper, total cyanide, and nickel at concentrations that exceeded daily maximum discharge limitations as set forth in the facility's NPDES Permit [Ref. 45, pp. 2, 3].

Waste Depositional Area ("old township landfill area")

On June 29, 1994, Pioneer collected soil sample S7 from the southeastern portion of the Pioneer property; the sample location is described as being located 51.3 feet and 130° southeast from the outside corner of the plating area and 55.5 feet and 160° southeast from the outside corner of the old wastewater treatment area [Ref. 17, pp. 4, 6]. Analysis of soil sample S7 indicated the presence of chromium (2,530 mg/kg), copper (261 mg/kg), and nickel (376 mg/kg) [Ref 17, pp. 6, 12]. Although Pioneer described the S7 sample location as "the old township landfill area", information obtained by EPA indicates that waste materials in the area consisted of trash and likely plating materials deposited by Pioneer [Ref. 17, p. 6; 19, p. 1]. Test pits advanced in the area by EPA in 2019 indicated that there was an insufficient volume of waste present to suggest the area had actually been a municipal landfill [Ref. 19, p. 1].

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

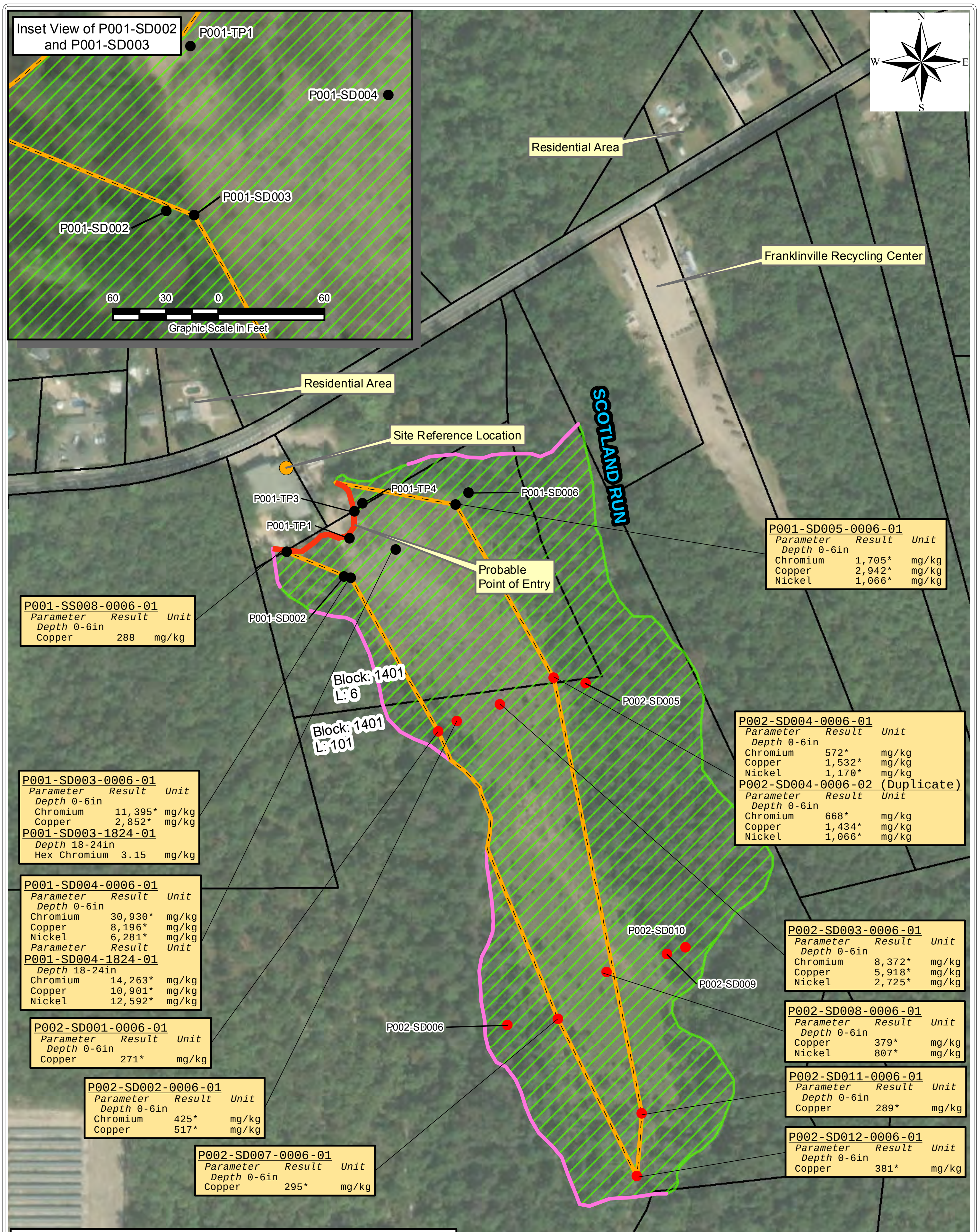
Based on topography at the Pioneer facility, the overland path to surface water is across the property following the south-southeast topographic gradient toward the wetland **[Figure 3**; Ref. 4, p. 1; 20, p. 83]. Based on the results of soil samples collected by EPA in July 2019, Source 1 extends along this topographic gradient south-southeast away from the Pioneer facility and toward the northwestern boundary of the wetland [see **Figure 3**]. As there are no discernable drainage channels routing surface runoff to one or more specific points, and site-attributable hazardous substances have been detected at multiple locations at or near the wetland boundary, the PPE is evaluated as being the wetland boundary downslope of Source 1; the shortest overland distance from Source 1 at location P001-TP5 to the PPE is 0.72 feet as measured by sample and wetland locations using GIS software [see **Figures 3** and **4**].

The nearest surface water is the wetland to the south-southeast of the Pioneer facility and Source 1, which is an HRS-eligible palustrine, emergent, persistent/palustrine, scrub-shrub, broad-leafed deciduous seasonally flooded/saturated (PEM1/SS1E) wetland that transitions to a palustrine, forested, broad-leaved deciduous, seasonally flooded/saturated (PFO1E) wetland and is contiguous with Scotland Run [**Figure 4**; Ref. 27, pp. 3, 4, 10, 32–36]. The PEM1/SSE1 portion of the wetland has been visibly impacted by historical discharges of untreated waste from the Pioneer facility, resulting in a large area of discolored soil and dead vegetation [Ref. 5, pp. 6, 151; 10, p. 1; 11, pp. 3–12; 14, p. 15]. The soils within the mapped wetland coincide with National Resource Conservation Service (NRCS) soil unit Manahawkin muck (MakAt), which is a hydric soil [Ref. 27, pp. 4, 10, 20, 32–36]. The composition of the wetland soils observed by EPA in September 2019 was predominantly moist to saturated dark gray sand and black peat, with minor amounts of silt [Ref. 48, p. 2]. Although approximately 45 years have elapsed since discharge of untreated waste had ceased, the wetland has not recovered and returned to its natural state prior to waste disposal activities [Ref. 5, pp. 6, 151; 7, p. 5; 9, pp. 1, 3; 11, pp. 3–17; 14, p. 15].

Scotland Run approaches the site from the north, flowing south along the property's eastern boundary [Ref. 4, p. 1; 40, p. 2]. Scotland Run flows south for approximately 5.5 miles where it discharges to the Maurice River at Willow Grove Lake. The Maurice River comprises the remainder of the 15-mile TDL [see **Figure 2**]. Scotland Run (11-Digit Hydrologic Unit [HUC11] ID: 02040206130) is a primary tributary of the Maurice River (HUC11 ID: 02040206140) and both are perennial freshwater bodies [Ref. 4, pp. 1, 4; 24, pp. 5, 78; 74, pp. 308, 309]. Based on available USGS discharge data, Scotland Run is evaluated as a minimal stream with an average discharge less than 10 cubic feet per second (cfs) near the wetland and the Pioneer facility [Ref. 1, Section 4.1.2.3, Table 4-13; 14, pp. 19, 20; 23, p. 2]. The USGS stream gauge in Scotland Run upstream of the Pioneer facility shows the minimal stream characteristic (i.e., average discharge of 8.66 cfs), there are no inputs to Scotland Run between the gauge and the facility that would significantly increase the discharge [Ref. 4, p. 1; 23, pp. 1–4; 64, p. 1]. Therefore, the upstream location is evaluated as having similar streamflow to that within the TDL. The Maurice River is a moderate to large stream with an average flow of 179.9 cfs within the TDL [Ref. 1, Section 4.1.2.3, Table 4-23; 22, p. 2]. Notable features along the 15-mile surface water pathway include impounded portions of Scotland Run, including Timothy Lake, Malaga Lake, and Willow Grove Lake, which are utilized for recreational boating and fishing [see **Figure 2**; Ref. 14, pp. 2, 5]. Timothy Lake is also utilized for primary contact recreation as a summer camp maintains a private swimming area on the lake [Ref. 14, pp. 2, 16]. Approximately 7.8 miles downstream of the PPE along the Maurice River is the Union Lake Wildlife Management Area (WMA), which supports a fishery [**Figure 2**; Ref. 21, pp. 1, 2; 58, p. 1].

An observed release to surface water is documented by chemical analysis. The observed release by chemical analysis is supported by sediment samples collected from the wetland by EPA in September 2019 [**Figure 4**; Ref. 16, pp. 24, 25, 27–31; 30, p. 10]. The samples were collected in three clusters running roughly southwest to northeast across the wetland [see **Figure 4**]. Sediment samples collected from a location (P001-SD004) in the northernmost sample cluster showed the highest concentrations of chromium, copper, and nickel [**Figure 4**; Ref. 16, p. 24; 30, p. 10; 56, pp. 3–6, 33, 36, 78; 57, pp. 3, 22, 23]. The presence of these hazardous substances were reported at concentrations significantly above background in samples collected from locations (P001-SD003, P001-SD004, P001-SD005, P002-SD001, P002-SD002, P002-SD003, P002-SD004, P002-SD007, P002-SD008, P002-SD011, and P002-SD012) within all three sample clusters [see **Figure 4** and **Table 5**]. The contaminated samples listed above form a polygon that delineates a zone of contamination along a south-southeasterly axis through the approximate center of the EPA-verified wetland to sediment sample location P002-SD012, which is 1,702 feet south-southeast of the PPE [**Figure 4**]. Both the sampling locations and the area lying between these locations are evaluated as being subject to Level II actual contamination [**Figure 4**; **Tables 4** and **5**; Ref. 1, Section 4.1.4.3.1.2]. The perimeter of the zone of contamination is 0.78 mile and was determined using sample locations recorded in the field using GPS technology and subsequent calculation using GIS software **[Figure 4**; 16, pp. 3, 4]. Based on aerial photographs of the wetland that show darkened, saturated soil, water flow through the wetland is generally south-southeast [Ref. 11, pp. 3–7; 27, pp. 4, 10]. The zone of contamination trends in the same south-southeasterly direction [see **Figure 4**]. Four of the five sediment sample locations closest to the wetland perimeter (i.e., P001-SD002, P001-SD006, P002-SD006, and P002-SD010), are evaluated as representing background conditions [see **Figure 4** and **Table 4**]. A Wetland Sediment Sample Location Map showing the zone of contamination is presented as **Figure 4**. A comparison of background and release concentrations is provided in **Tables 4** and **5**.

PATH: P:\SAT2\Pioneer_Metal_Finishing(0689)\MXD\Pioneer0745\25544_PMFI0745_RST_Sept_2019_Sediment.mxd



P001-SD005-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	1,705*	mg/kg
Copper	2,942*	mg/kg
Nickel	1,066*	mg/kg

P001-SS008-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	288	mg/kg

P002-SD004-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	572*	mg/kg
Copper	1,532*	mg/kg
Nickel	1,170*	mg/kg

P002-SD004-0006-02 (Duplicate)

Parameter	Result	Unit
Depth 0-6in		
Chromium	668*	mg/kg
Copper	1,434*	mg/kg
Nickel	1,066*	mg/kg

P001-SD003-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	11,395*	mg/kg
Copper	2,852*	mg/kg

P001-SD003-1824-01

Parameter	Result	Unit
Depth 18-24in		
Hex Chromium	3.15	mg/kg

P001-SD004-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	30,930*	mg/kg
Copper	8,196*	mg/kg
Nickel	6,281*	mg/kg

P001-SD004-1824-01

Parameter	Result	Unit
Depth 18-24in		
Chromium	14,263*	mg/kg
Copper	10,901*	mg/kg
Nickel	12,592*	mg/kg

P002-SD003-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	8,372*	mg/kg
Copper	5,918*	mg/kg
Nickel	2,725*	mg/kg

P002-SD001-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	271*	mg/kg

P002-SD008-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	379*	mg/kg
Nickel	807*	mg/kg

P002-SD002-0006-01

Parameter	Result	Unit
Depth 0-6in		
Chromium	425*	mg/kg
Copper	517*	mg/kg

P002-SD011-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	289*	mg/kg

P002-SD007-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	295*	mg/kg

P002-SD012-0006-01

Parameter	Result	Unit
Depth 0-6in		
Copper	381*	mg/kg

Note:

1. Wetland Perimeter Length Subject to Level II Concentrations: 4,140 feet, or 0.78 mile.
2. All results presented in milligrams per kilogram (mg/kg).
3. Only showing results significantly above background.
4. Depths reported in inches below sediment surface.
5. * Adjusted result per EPA Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination.*
6. Zone of Contamination perimeter calculated in ArcGIS 10.6 using the Field Calculator tool.
7. The Wetland Continuation Line notifies property owners, regulators, and other users of the wetland survey that a wetland continues beyond the area surveyed.

Sources:

1. HRS Documentation Record Reference 27, pp. 2-5, 10.
2. HRS Documentation Record Reference 29, p. 167.
3. HRS Documentation Record Reference 30, p. 10.
4. HRS Documentation Record Reference 32, pp. 5-8, 18.
5. HRS Documentation Record Reference 46, p. 58.
6. HRS Documentation Record Reference 49, pp. 58, 64, 70, 79.
7. HRS Documentation Record Reference 50, pp. 16, 39, 45, 63.
8. HRS Documentation Record Reference 56, pp. 27, 33, 36, 39.
9. National Wetlands Inventory, U.S. Fish and Wildlife Service, 2018.
10. MOD-IV NJ Parcels Data, NJ Information Warehouse.
11. *The source of this map image is Esri, used by EPA with Esri's permission.*

Legend

●	Site Reference Location Lat: 39.616969 Long: -75.061474
●	P001 Sediment Samples
●	P002 Sediment Samples
▬	Probable Point of Entry
▭	Zone of Contamination
▨	River (National Wetlands Inventory)
▬	Wetland Continuation Line
▨	Weston Verified Wetland
▭	Parcels

LEGEND:
300 150 0 300
Graphic Scale in Feet

TITLE:
REGION 2 START V WETLAND SEDIMENT SAMPLE LOCATION MAP – SEPTEMBER 23, 2019
PIONEER METAL FINISHING SITE
FRANKLINVILLE, GLOUCESTER COUNTY, NEW JERSEY

DRAWN BY: J. Gardner
REVIEWED BY: S. Snyder
PROJECT MANAGER: S. Snyder
SCALE: 1 " = 300 '
DATE: June 2020

PROJECT: TDD 0004/1903-08

CLIENT NAME: EPA

WESTON SOLUTIONS

DRAWING NUMBER: 25544

FIGURE #: 4

4.1.2.1 Likelihood of Release

4.1.2.1.1 Observed Release

An observed release to surface water is documented by chemical analysis. Available documentation suggests but does not establish observed release by direct observation.

Observed Release by Direct Observation Discussion

Although an observed release by direct observation cannot be established using the available documentation, evidence suggests that material containing hazardous substances attributable to the site was placed into and had been seen entering the wetland adjacent to the Pioneer facility and that there were adverse effects associated with the release. According to information provided by Pioneer, the facility discharged untreated waste from 1955 to either 1975 or 1979 [Ref. 5, p. 5; 7, p. 5; 9, p. 1]. According to an undated letter from Pioneer, discharged wastes consisted only of metallic salts that were discharged from 1955 to 1979; however, correspondence from Pioneer in 1993 indicated that untreated effluent was discharged until 1975 [Ref. 7, p. 5; 9, p. 1]. The RI commissioned by Pioneer also indicated that untreated waste was discharged until 1975 and that wastestream constituents included process sludge, rinse water, cleaning solutions, and plating wastes that were discharged into an unlined trench leading to an adjacent wetland southeast of the plant [Ref. 5, p. 5]. Information gathered during the RI commissioned by Pioneer indicated that this discharge area formerly supported a stand of white cedar, possibly undergoing succession to a reed grass marsh, and that approximately 4 acres of the wetland had lost its tree cover [Ref. 5, pp. 6, 151]. Based on a site visit conducted in January 1995 as part of the RI, a wetlands specialist speculated that the former metal plating discharges killed the cedar stand [Ref. 5, pp. 6, 151].

Observed Release by Chemical Analysis

Sediment samples collected by EPA from the wetland in September 2019 document that site-attributable hazardous substances (i.e., chromium [hexavalent and total], copper, and nickel) are present in sediment at levels that meet the criteria for observed release by chemical analysis [**Tables 4** and **5**; Ref. 1, Section 4.1.2.1.1]. On September 23-24, 2019, EPA collected a total of 45 sediment samples (including three environmental duplicate samples) from three clusters within the wetland; the sample locations embodied different stages of the wetland, including areas with no vegetation, grassy areas, and forested areas [**Figure 4**; Ref. 16, pp. 3, 5-9, 24, 25, 27–31; 30, p. 10]. The northernmost cluster lies within the visible discharge area within Pioneer property (Block 1401, Lot 6) and was designated as Property P001 in the sample nomenclature [see **Figure 4**; Ref. 40, p. 2]. The central and southern clusters lie within a separate property (Block 1401, Lot 101) bordering the Pioneer property to the south and was designated at Property P002 in the sample nomenclature [**Figure 4**; Ref. 40, p. 2]. Soil sample location P002-SD004 was intended to be located within the property to the south, but was advanced just within Pioneer's property [**Figure 4**; Ref. 40, p. 2].

The presence of these hazardous substances were reported at concentrations significantly above background in samples collected from locations (P001-SD003, P001-SD004, P001-SD005, P002-SD001, P002-SD002, P002-SD003, P002-SD004, P002-SD007, P002-SD008, P002-SD011, and P002-SD012) along all three clusters [see **Figure 4** and **Table 5**]. The contaminated samples listed above form a polygon that delineates a zone of contamination along a south-southeast axis through the approximate center of the EPA-verified wetland to sediment sample location P002-SD012, which is 1,702 feet south-southeast of the PPE [**Figure 4**; Ref. 27, pp. 3, 4, 10, 32–36]. Both the sampling locations and the area lying between these locations are evaluated as being subject to Level II actual contamination [Ref. 1, Section 4.1.4.3.1.2]. The perimeter of the zone of contamination is 0.78 mile and was determined using sample locations recorded in the field using GPS technology and subsequent calculation using GIS software **[Figure 4**; 16, pp. 3, 4].

As the Pioneer facility is located north and upslope of the northern boundary of the wetland, there is no portion of the wetland that lies upgradient of the facility that could be evaluated as representing background conditions [**Figure 4**]. Based on aerial photographs showing darkened saturated soil, water flow in the wetland is generally northwest to southeast and the zone of contamination identified at Pioneer trends in the same direction [**Figure 4**; Ref. 11, pp. 3–7]. Therefore, the easternmost and westernmost sediment sample locations along the first (i.e., P001-SD002 and P001-

SD006) and third (i.e., P002-SD006 and P002-SD010) clusters are evaluated as representing background conditions [see **Figure 4**].

In September 2019, EPA also collected sediment samples from Scotland Run [Ref. 14, pp. 7–11; 16, pp. 2, 3, 9, 10, 12, 17, 18, 26, 27]. Two of the Scotland Run sediment samples (0689-SED09 and 0689-SED10) were collected from the Scotland Run stream channel upstream of Pioneer and a pair of duplicate samples (0689-SED11/0689-SED12), were collected from Wilson Lake approximately 3 miles upstream of the facility [Ref. 14, pp. 10, 11, 21–23; 16, pp. 10, 12]. Laboratory analytical results of these sediment samples indicated maximum chromium and copper concentrations of 7.3 mg/kg and 7.4 mg/kg, respectively; nickel and hexavalent chromium analyses reported non-detect values [Ref. 46, pp. 17, 18, 51, 52; 49, pp. 46, 49, 52, 55]. As these samples were collected from different environments (i.e., stream channel and lake shoreline) than the wetland, they are not used in the evaluation of background conditions. However, these results do demonstrate that the significant detections of chromium, copper, and nickel reported for the wetland sediment samples did not come from an upstream source via overland flow or flooding from Scotland Run [see **Figure 4**]. Although not used to document an observed release to Scotland Run due to differences in sample physical characteristics between upstream and downstream sediment samples, results for sediment samples 0689-SED03 (Timothy Lake), 0689-SED04 (Scotland Run downstream of the wetland), and 0689-SED05 (Scotland Run adjacent to the wetland) indicate the presence of nickel at adjusted concentrations of 11.4 mg/kg, 8.3 mg/kg, and 7.1 mg/kg, respectively, suggesting that site-related nickel has migrated to Scotland Run adjacent to and downstream of the wetland [Ref. 14, p. 8; 16, pp. 9, 10, 12; 32, pp. 4–8, 18; 49, pp. 28, 31, 34; 66, pp. 8–10].

The Pioneer facility is bound to the north by Coles Mill Road and a wooded area and to the northeast and northwest by residential areas [see **Figure 4**]. There are no known sources of metals contamination north and upstream of the facility [Ref. 20, pp. 9, 10, 12].

The background and release sediment samples are considered comparable because all were collected using the same EPA SOP (i.e., stainless-steel hand-augers); from the same depths of 0 to 6 inches and 18 to 24 inches below the sediment surface; collected during the same time frame (i.e., September 23, 2019); analyzed by the same laboratories using the same methods (Hexavalent Chromium: SW-846 7196A and Inorganic TAL Metals (incl. Hg, CN): CLP SOW ISM02.4); validated according to EPA Region 2 guidelines; and were both collected from the same mapped wetland with similar sediment compositions [**Figure 4**; Ref. 16, pp. 1–9, 18–25, 27–31; 27, pp. 10, 32–36; 31, pp. 6–9; 33, pp. 7–10; 34, pp. 6–8; 35, pp. 5, 12; 43, pp. 3–7, 9–13; 46, p. 4; 48, p. 2; 49, pp. 3–6; 50, pp. 3–6; 51, pp. 11–13; 52, pp. 12–14; 56, pp. 3–6; 57, pp. 13–15; 59, pp. 3–6; 61, pp. 3–6; 63, pp. 3–6]. Background and release sediment samples were also analyzed for Total Organic Carbon (TOC) (EPA SOP C-88, Rev 2.8) and Grain Size (GS) (EPA SOP C136, Rev 1.0) by the EPA Region 2 Lab Services and Applied Sciences Division (LSASD) laboratory [Ref. 41, pp. 1–4; 66, pp. 7–31].

Sediment samples were also collected from three additional locations further downstream of the documented observed release and east of Scotland Run, which was designated as Property P003 [Ref. 16, pp. 8, 9, 14]. As the wetland type(s) was not verified in the field, the samples collected from this area are not evaluated as representing background conditions, although contaminant concentrations in this area were within the same range as those in the background samples used in the observed release evaluation [Ref. 16, p. 14; 27, p. 10; 46, pp. 44-47, 49, 60; 52, pp. 32-34; 56, pp. 58, 61, 64]. All sediment samples were submitted to EPA CLP laboratories for analyses of Organic TAL Aroclors and Inorganic TAL Metals (including mercury [Hg] and cyanide [CN]); and to a non-CLP laboratories for Hexavalent Chromium, TOC, and GS analyses [Ref. 14, p. 11; 16, pp. 1, 4, 17–33; 30, p. 10; 43, pp. 2–13].

CLP Inorganic TAL (including Hg and CN) analyses indicate the presence of chromium, copper, and/or nickel at concentrations significantly above background in samples collected from all three sample clusters [see **Figure 4**]. The maximum adjusted concentrations of these hazardous substances (30,930 mg/kg, 10,902 mg/kg, and 12,593 mg/kg, respectively) were detected in sediment samples collected from location P001-SD004 [see **Figure 4**; **Table 5**]. A significant concentration of copper (381 [adjusted concentration] mg/kg) was detected in sample P002-SD012-0006 (depth: 0 to 6 inches below the sediment surface), which was collected near the southern extent of the wetland area observed by EPA in August 2019 [see **Figure 4; Table 5**]. The maximum background concentrations for chromium, copper, and nickel were 110 mg/kg, 81.7 (adjusted concentration) mg/kg, and 243 (adjusted concentration) mg/kg, respectively [see **Figure 4**; **Table 4**].

The perimeter of the wetland area subject to actual contamination is 0.78 mile (4,140 feet) [**Figure 4**; Ref. 1, Section 4.1.4.3.1.2]. Based on historical electroplating activities conducted at the facility; poor housekeeping practices; and the acknowledgment by Pioneer of 20 years of untreated wastewater discharge to the wetland, the sampling and analysis discussed above document an observed release of chromium, copper, and nickel and actual contamination of an HRS-eligible wetland (PEM1/SS1E wetland and PFO1E wetland) [see **Figure 4**].

Release concentrations are compared to the maximum reported background concentration in the observed release evaluation. Estimated concentrations (flagged "J") used in the observed release evaluation were adjusted per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* to account for possible bias in the analytical results; estimated background results were multiplied by adjustment factors to account for possible low bias, and estimated release concentrations were divided by adjustment factors to account for possible high bias [**Tables 4** and **5**; Ref. 32, pp. 5–8, 16, 18]. The HRS significant increase criteria were verified in consideration of the projected adjustments, which are shown in parentheses after reported results in the background and observed release tables below.

TABLE 4. BACKGROUND SEDIMENT CONCENTRATIONS (mg/kg) – Page 1 of 2

Field Sample ID	CLP/Non-CLP Lab Sample ID	Sample Date	Chromium[1]		Copper[1]		Nickel[1]		Hexavalent Chromium[2]		References
			Result	RL	Result	RL	Result	RL	Result	RL	
P001-SD002-0006-01	MBFDR2/ K5075-05	9/23/19	13.1	1.2	17.0	3.1	11.1	5.0	0.23 U	0.23	16, pp. 18, 24; 30, p. 10; 46, pp. 1-5, 55; 56, pp. 3–6, 21, 77; 57, pp. 3, 18; 71, p. 3
P001-SD002-1824-01	MBDFR3/ K5075-06	9/23/19	***110***	1.2	57.5	2.9	4.2 J x 1.35 (5.6)	4.7	0.21 U	0.21	16, pp. 18, 24; 30, p. 10; 46, pp. 1-5, 56; 56, pp. 3–6, 24, 77; 57, pp. 3, 19; 71, p. 3
P001-SD006-0006-01	MBFDS0/ K5075-13	9/23/19	46.3 J x 1.29 (59.7)	1.0	67.0 J x 1.22 (***81.7***)	2.5	180 J x 1.35 (***243***)	4.0	---	---	16, pp. 19, 25; 30, p. 10; 56, pp. 3–6, 45, 79; 57, pp. 2, 26
P001-SD006-1824-01	MBFDS1/ K5075-14	9/23/19	3.0	1.3	3.2 U	3.2	20.1	5.1	0.26 U	***0.26***	16, pp. 19, 25; 30, p. 10; 46, pp. 1-6, 64; 56, pp. 3–6, 48, 79; 57, pp. 2, 27; 71, p. 4
P001-SD006-1824-02*	MBFDX9/ K5075-17	9/23/19	2.7	1.6	4.0 U	4.0	24.5	6.3	0.25 U	0.25	16, pp. 19, 25; 30, p. 10; 46, pp. 1-6, 65; 56, pp. 3–6, 67, 80, 81; 57, pp. 2, 31; 71, p. 4

[1] The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 62, p. 9; 75, p. 150]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

[2] The RL for each non-CLP result is the MDL adjusted for sample and method [Ref. 76, p. 5]. Since the samples were analyzed by a non-CLP laboratory, the adjusted MDLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample [Ref. 56, p. 2].

U = The analyte was analyzed for but was not detected above the level of the reported quantitation limit or sample method detection limit [Ref. 46, p. 1; 56, p. 2].

The J-qualified estimated results have been adjusted up to account for unknown bias per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. The adjustment factors are provided in the table and the adjusted results are shown in parentheses [Ref. 32, pp. 5–8, 18].

* Duplicate of P001-SD006-1824-01.

--- = Result not included in background evaluation as the reported value is qualified as UJ and therefore may not accurately represent the concentration necessary to positively detect the analyte in the sample [Ref. 32, pp. 4, 5; 46, p. 63].

Each sediment sample listed above was submitted for analyses under the EPA CLP and was assigned two CLP Sample IDs, one for Organic TAL Aroclor analysis and one for Inorganic TAL (incl. Hg, CN) analysis. As the results being presented are for metals, the Inorganic CLP Sample ID is used [Ref. 30, p. 10; 57, pp. 2, 3].

Bold/Italics = Highest background concentration or RL for the analyte.

TABLE 4. BACKGROUND SEDIMENT CONCENTRATIONS (mg/kg) – Page 2 of 2

Field Sample ID	CLP/Non-CLP Lab Sample ID	Sample Date	Chromium[1]		Copper[1]		Nickel[1]		Hexavalent Chromium[2]		References
			Result	RL	Result	RL	Result	RL	Result	RL	
P002-SD006-0006-01	MBFDT2	9/23/19	13.2 J x 1.29 (17.0)	2.8	21.8 J x 1.22 (26.5)	7.1	172 J x 1.35 (232)	11.3	---	---	16, pp. 21, 29; 30, p. 10; 50, pp. 3–6, 33, 88; 52, pp. 3, 18
P002-SD006-1824-01	MBFDT3/ K5073-15	9/23/19	2.5	1.1	2.8 U	2.8	4.5 U	4.5	0.22 U	0.22	16, pp. 21, 29; 30, p. 10; 46, pp. 1-6, 31; 50, pp. 3–6, 36, 88; 52, pp. 3, 19; 71, p. 6
P002-SD010-0006-01	MBFDW0	9/23/19	12.5 J x 1.29 (16.1)	1.0	24.1 J x 1.22 (29.4)	2.5	88.1 J x 1.35 (118)	4.0	---	---	16, pp. 21, 30; 30, p. 10; 50, pp. 3–6, 57, 90; 52, pp. 4, 26
P002-SD10-1824-01	MBFDW1	9/23/19	10.1 J x 1.29 (13.0)	1.0	11.1 J x 1.22 (13.5)	2.5	31.9 J x 1.35 (43.0)	4.0	---	---	16, pp. 22, 30; 30, p. 10; 50, pp. 3–6, 60, 91; 52, pp. 4, 27

[1] The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 75, p. 150]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3; 62, p. 9].

[2] The RL for each non-CLP result is the MDL adjusted for sample and method [Ref. 77, p. 5]. Since the samples were analyzed by a non-CLP laboratory, the adjusted MDLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample [Ref. 50, p. 2].

U = The analyte was analyzed for but was not detected above the level of the reported quantitation limit or sample method detection limit [Ref. 46, p. 1; 56, p. 2].

The J-qualified estimated results have been adjusted up to account for unknown bias per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. The adjustment factors are provided in the table and the adjusted results are shown in parentheses [Ref. 32, pp. 5–8, 18].

--- = Result not included in background evaluation as the reported value is qualified as UJ and therefore may not accurately represent the concentration necessary to positively detect the analyte in the sample [Ref. 32, pp. 4, 5; 46, pp. 30, 38, 39].

Each sediment sample listed above was submitted for analyses under the EPA CLP and was assigned two CLP Sample IDs, one for Organic TAL Aroclor analysis and one for Inorganic TAL (incl. Hg, CN) analysis. As the results being presented are for metals, the Inorganic CLP Sample ID is used [Ref. 30, p. 10; 52, pp. 3, 4].

Bold/Italics = Highest background concentration or RL for the analyte.

TABLE 5. OBSERVED RELEASE SEDIMENT CONCENTRATIONS (mg/kg) – Page 1 of 3

Field Sample ID	CLP/Non-CLP Lab Sample ID	Sample Date	Chromium[1]		Copper[1]		Nickel[1]		Hexavalent Chromium[2]		References
			Result	RL	Result	RL	Result	RL	Result	RL	
Maximum Background Level			***110***		***81.7***		***243***		***0.26 U***	0.26	16, pp. 19, 24, 25; 30, p. 10; 46, p. 64; 56, pp. 3–6, 24, 45, 77, 79; 57, pp. 2, 3, 19, 26
P001-SD003-0006-01	MBFDR4	9/23/19	14,700 J / 1.29 (11,395)	25.3	3,480 J / 1.22 (2,852)	63.3	---		---		16, p. 24; 30, p. 10; 56, pp. 3–6, 27, 77; 57, pp. 3, 20
P001-SD003-1824-01	K5075-08	9/23/19	---		---		---		3.15	0.23	16, pp. 20, 24; 30, p. 10; 46, pp. 1-5, 58; 71, p. 3
P001-SD004-0006-01	MBFDR6	9/23/19	39,900 J / 1.29 (30,930)	46.7	10,000 J / 1.22 (8,196)	117	8,480 J / 1.35 (6,281)	187	---		16, p. 24; 30, p. 10; 56, pp. 3–6, 33, 78; 57, pp. 3, 22
P001-SD004-1824-01	MBFDR7	9/23/19	18,400 J / 1.29 (14,263)	30.0	13,300 J / 1.22 (10,901)	75.1	17,000 J / 1.35 (12,592)	120	---		16, p. 24; 30, p. 10; 56, pp. 3–6, 36, 78; 57, pp. 3, 23
P001-SD005-0006-01	MBFDR8	9/23/19	2,200 J / 1.29 (1,705)	5.0	3,590 J / 1.22 (2,942)	12.5	1,440 J / 1.35 (1,066)	20.0	---		16, p. 24; 30, p. 10; 56, pp. 3–6, 39, 78; 57, pp. 3, 24
P002-SD001-0006-01	MBFDS2	9/23/19	---		331 J / 1.22 (271)	2.5	---		---		16, p. 27; 30, p. 10; 49, pp. 3–6, 58, 89; 51, pp. 3, 26
P002-SD002-0006-01	MBFDS4	9/23/19	549 J/1.29 (425)	0.99	631 J/1.22 (517)	2.5	---		---		16, p. 27; 30, p. 10; 49, pp. 3–6, 64, 90; 51, pp. 3, 28

[1] The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 75, p. 150]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3; 62, p. 9].

[2] The RL for each non-CLP result is the MDL adjusted for sample and method [Ref. 76, p. 5]. Since the samples were analyzed by a non-CLP laboratory, the adjusted MDLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3; 62, p. 9].

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample [Ref. 49, p. 2; 56, p. 2].

U = The analyte was analyzed for but was not detected above the level of the reported sample method detection limit [Ref. 46, p. 1].

The J-qualified estimated results have been adjusted down to account for unknown bias per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. The adjustment factors are provided in the table and the adjusted results are shown in parentheses [Ref. 32, pp. 5–8, 18].

--- = Sample does not meet observed release criteria.

Each sediment sample listed above was submitted for analyses under the EPA CLP and was assigned two CLP Sample IDs, one for Organic TAL Aroclor analysis and one for Inorganic TAL (incl. Hg, CN) analysis. As the results being presented are for metals, the Inorganic CLP Sample ID is used [Ref. 30, p. 10; 51, p. 3; 57, p. 3].

TABLE 5. OBSERVED RELEASE SEDIMENT CONCENTRATIONS (mg/kg) – Page 2 of 3

Field Sample ID	CLP/Non-CLP Lab Sample ID	Sample Date	Chromium[1]		Copper[1]		Nickel[1]		Hexavalent Chromium[2]		References
			Result		Result	RL	Result	RL	Result	RL	
Maximum Background Level			***110***		***81.7***		***243***		***0.26 U***	0.26	16, pp. 19, 24, 25; 30, p. 10; 46, p. 64; 56, pp. 3–6, 24, 45, 77, 79; 57, pp. 2, 3, 19, 26
P002-SD003-0006-01	MBFDS6	9/23/19	10,800 J/1.29 (8,372)	15.0	7,220 J/1.22 (5,918)	37.5	3,680 J/1.35 (2,725)	59.9	---		16, p. 27; 30, p. 10; 49, pp. 3–6, 70, 90; 51, pp. 3, 30
P002-SD004-0006-01	MBFDS8	9/23/19	739 J/1.29 (572)	1.0	1,870 J/1.22 (1,532)	7.5	1,580 J/1.35 (1,170)	12.0	---		16, p. 27; 30, p. 10; 50, pp. 3–6, 16, 87; 52, pp. 2, 15
P002-SD004-0006-02 (Duplicate of P002-SD004-0006-01)	MBFDX8	9/23/19	863 J/1.29 (668)	0.99	1,750 J/1.22 (1,434)	7.4	1,440 J/1.35 (1,066)	11.8	---		16, p. 28; 30, p. 10; 49, pp. 3–6, 79, 91; 51, pp. 4, 33
P002-SD007-0006-01	MBFDT4	9/23/19	---		361 J/1.22 (295)	2.5	---		---		16, p. 29; 30, p. 10; 50, pp. 3–6, 39, 88; 52, pp. 3, 20
P002-SD008-0006-01	MBFDT6	9/23/19	---		463 J/1.22 (379)	2.5	1,090 J/1.35 (807)	12.0	---		16, p. 29; 30, p. 10; 50, pp. 3–6, 45, 89; 52, pp. 3, 22
P002-SD011-0006-01	MBFDW2	9/23/19	---		353 J/1.22 (289)	6.7	---		---		16, p. 30; 30, p. 10; 50, pp. 3–6, 63, 91; 52, pp. 4, 28

[1] The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 75, p. 150]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3; 62, p. 9].

[2] The RL for each non-CLP result is the MDL adjusted for sample and method [Ref. 76, p. 5]. Since the samples were analyzed by a non-CLP laboratory, the adjusted MDLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3; 62, p. 9].

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample [Ref. 49, p. 2; 50, p. 2].

U = The analyte was analyzed for but was not detected above the level of the reported sample method detection limit [Ref. 46, p. 1].

The J-qualified estimated results have been adjusted down to account for unknown bias per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. The adjustment factors are provided in the table and the adjusted results are shown in parentheses [Ref. 32, pp. 5–8, 18].

--- = Sample does not meet observed release criteria.

Each sediment sample listed above was submitted for analyses under the EPA CLP and was assigned two CLP Sample IDs, one for Organic TAL Aroclor analysis and one for Inorganic TAL (incl. Hg, CN) analysis. As the results being presented are for metals, the Inorganic CLP Sample ID is used [Ref. 30, p. 10; 51, pp. 3, 4; 52, pp. 2–4].

TABLE 5. OBSERVED RELEASE SEDIMENT CONCENTRATIONS (mg/kg) – Page 3 of 3

Field Sample ID	**CLP/Non-CLP Lab Sample ID**	**Sample Date**	**Chromium[1]**		**Copper[1]**		**Nickel[1]**		**Hexavalent Chromium[2]**		**References**
			Result		**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	
Maximum Background Level			***110***		***81.7***		***243***		***0.26 U***	0.93	16, pp. 19, 24, 25; 30, p. 10; 46, p. 64; 56, pp. 3–6, 24, 45, 77, 79; 57, pp. 2, 3, 19, 26
P002-SD012-0006-01	MBFDW4	9/23/19	---		465 J/1.22 (381)	2.5	---		---		16, p. 30; 30, p. 10; 50, pp. 3–6, 69, 91; 52, pp. 4, 30
P001-SS008-0006-01*	K4141-08	7/30/19	---		288	0.091	---		---		29, pp. 145, 167, 219; 30, p. 9

[1] The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 75, p. 150]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3; 62, p. 9].

[2] The RL for each non-CLP result is the MDL adjusted for sample and method [Ref. 29, p. 156; 75, p. 5]. Since the samples were analyzed by a non-CLP laboratory, the adjusted MDLs presented above are used in place of the HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3; 62, p. 9].

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample [Ref. 50, p. 2].

U = The analyte was analyzed for but was not detected above the level of the reported sample method detection limit [Ref. 46, p. 1].

The J-qualified estimated results have been adjusted down to account for unknown bias per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. The adjustment factors are provided in the table and the adjusted results are shown in parentheses [Ref. 32, pp. 5–8, 18].

Each sediment sample listed above was submitted for analyses under the EPA CLP and was assigned two CLP Sample IDs, one for Organic TAL Aroclor analysis and one for Inorganic TAL (incl. Hg) analysis. As the results being presented are for metals, the Inorganic CLP Sample ID is used [Ref. 30, p. 10; 51, pp. 3, 4; 52, pp. 2–4; 57, p. 3].

* Although sample P001-SS008-0006-01 was originally designated as a soil sample, its location lies within the wetland boundary verified by EPA in August 2019; therefore, it is evaluated as a sediment sample [**Figure 4**; Ref. 27, pp. 10, 32–36].

--- = Sample does not meet observed release criteria.

Each sediment sample listed above was submitted for analyses under the EPA CLP and was assigned two CLP Sample IDs, one for Organic TAL Aroclor analysis and one for Inorganic TAL (incl. Hg, CN) analysis. As the results being presented are for metals, the Inorganic CLP Sample ID is used [Ref. 30, p. 10; 52, p. 4].

<u>Attribution</u>

Electroplating involves depositing a thin layer of metal onto an oppositely charged substrate by passing an electric current through a solution called an electrolyte [Ref. 25, p. 2]. When the electric current flows through the circuit, the electrolyte splits up and some of the metal atoms it contains are deposited in a thin layer on top of one of the electrodes [Ref. 25, p. 2]. Electroplating has several uses including enhancing appearance, applying a protective coating or special surface, and for engineering effect [Ref. 26, p. 2]. All the constituents of the plating baths contribute to the wastewater stream [Ref. 26, p. 3]. Electroplating baths may contain a variety of heavy metals, including copper, nickel, gold, zinc, chromium (including hexavalent chromium), selenium, lead, and iron; cyanide may also be present [Ref. 26, p. 3]. Pioneer utilized three plating solutions: alkaline cyanide-copper, acid nickel, and trivalent chrome; hexavalent chrome plating was performed at the facility until 1977 [Ref. 5, p. 5; 6, pp. 1, 3; 7, p. 5; 8, p. 1]. According to information provided by Pioneer, the facility discharged untreated waste from 1955 to either 1975 or 1979 [Ref. 5, p. 5; 7, p. 5; 9, p. 1]. According to an undated letter from Pioneer, discharged wastes consisted only of metallic salts that were discharged from 1955 to 1979; however, correspondence from Pioneer in 1993 indicated that untreated effluent was discharged until 1975 [Ref. 7, p. 5; 9, p. 1]. The RI commissioned by Pioneer also indicated that untreated waste was discharged until 1975 and that wastestream constituents included process sludge, rinse water, cleaning solutions, and plating wastes that were discharged into an unlined trench leading to an adjacent wetland southeast of the plant [Ref. 5, p. 5]. Information gathered during the RI indicated that this discharge area formerly supported a stand of white cedar, possibly undergoing succession to a reed grass marsh and that approximately 4 acres of the wetland had lost its tree cover [Ref. 5, pp. 6, 151]. Based on a site visit conducted in January 1995 as part of the RI, a wetlands specialist speculated that the former metal plating discharges killed the cedar stand [Ref. 5, pp. 6, 151]. Historical and recent sediment sampling within the adjacent wetland by Pioneer and EPA document the presence of site-attributable chromium, copper, and nickel at levels significantly above background [see **Sections 2.2 and 4.1.2.1**]. The continuing presence of these hazardous substances in the wetland is also evidenced by discolored soil and dead vegetation observed by EPA in May 2019 [Ref. 14, p. 15].

Chromium, copper, and nickel, as well as hexavalent chromium and cyanide, were known to be constituents of Pioneer's wastewater discharge [Ref. 5, p. 5; 45, p. 3]. Analysis of an effluent sample collected by EPA in September 1978 showed the presence of hexavalent chromium, total chromium, copper, total cyanide, and nickel at concentrations that exceeded daily maximum discharge limitations as set forth in the facility's NPDES Permit [Ref. 45, pp. 2, 3]. EPA observed that Pioneer stored open vats containing nickel waste sludge and other pollutants outside of the plant in "an area and manner which does not prevent pollutants from said materials from entering navigable waters" [Ref. 45, p. 3]. Discharge Monitoring Reports submitted by Pioneer for the periods of August through November 1978 and December 1978 to February 1979 indicated that Pioneer was in violation of the effluent limitations during those time periods [Ref. 45, p. 3].

In March 1980, the NJDEP conducted a Hazardous Waste Investigation at Pioneer in response to a complaint of dead vegetation in the area [Ref. 12, pp. 1, 2]. NJDEP observed that approximately 110 drums of plating sludge were being stored on the exterior of the facility in an unpaved, uncontained area of the east side of the building [Ref. 12, p. 1]. NJDEP also observed that the metal polishing area was ventilated by a large fan that forced air and dust out to the rear of the building and that the ground surface behind the plant was covered by this dust **[Figure 3**; Ref. 12, p. 2]. The dust was described by Pioneer as cotton fibers from buffing pads [Ref. 12, p. 2].

In 1984, EPA observed that drums were being stored outside along the southern end of the facility [Ref. 15, pp. 3, 6]. Analysis of a composite soil sample (NJ70-14) collected by EPA next to the drums indicated the presence of chromium (17,500 mg/kg), copper (440 mg/kg), and nickel (1,200 mg/kg), as well as lead (11,300 mg/kg), and zinc (430 mg/kg) [Ref. 15, pp. 3, 6, 31]. In August 2018, EPA collected three dust samples from within the interior of the Pioneer facility [Ref. 13, pp. 1, 2, 7]. Analytical results of the dust samples showed the presence of chromium (776 to 13,900 mg/kg), copper (224 to 8,230 mg/kg), and nickel (123 to 15,700 mg/kg) [Ref. 13, pp. 1, 17, 22, 23, 24]. Hexavalent chromium was detected at concentrations ranging from 0.209 J mg/kg to 52.7 mg/kg [Ref. 13, pp. 27, 31, 35, 36]. Soil samples collected by EPA in 2019 from location P001-SS007, which is near the approximate former drum area along the southern side of the facility, showed the presence of nickel (339 mg/kg) and copper (134 mg/kg) at concentrations significantly above background [**Figure 3**; **Table 2**; Ref. 15, p. 3]. Analysis of EPA soil sample P001-SS009-1218-01, which was collected near the southwestern side of the facility near the location of the fan exhaust, indicated the presence of chromium (132 mg/kg) and copper (216 mg/kg) at concentrations significantly above background [**Figure 3**; **Tables 1** and **2**; Ref. 6, pp. 16, 24].

In July 2019, EPA excavated 11 test pits in the eastern and southeastern portions of the Pioneer property. Visual observations made in Test Pits 3 and 6, at depths of approximately 10 to 12 inches below ground surface (bgs), indicated the presence of green and purple waste material consistent with waste materials observed in the interior of the Pioneer facility [**Figures 3** and **4**; Refs. 30, pp. 4, 5, 7, 8; 44, p. 2]. XRF screening results indicated the presence of copper and nickel at maximum concentrations of 60,000 parts per million (ppm) and 30,000 ppm, respectively, in Test Pit 3 at a depth of 12 inches bgs [Ref. 30, pp. 4, 5]. These readings corresponded to the green and purple waste embedded in the soil that were consistent with waste observed within the Pioneer facility [Ref. 30, pp. 4, 5].

Laboratory analytical results for soil samples collected by EPA in 2019 confirmed the presence of chromium, copper, nickel, cyanide, hexavalent chromium at concentrations significantly above background levels in soil at the Pioneer facility [see **Section 2.2, Tables 1** and **2**]. The contaminated soil source (i.e., Source 1) is located at the surface (i.e., 0 to 6 inches) and directly upslope of the wetland and there are no run-on or runoff control measures in place that would prevent contaminated soil from being transported into the wetland **[**see **Figures 3** and **4**; Ref. 4, p. 1; 5, pp. 117, 130; 60, p. 1].

There are no other known sources or releases of metals upstream of the site along Scotland Run or between background wetland sample locations and the locations that show observed release concentrations [**Figure 4**; Ref. 20, pp. 4, 9, 10, 12]. In September 2019, EPA collected sediment samples from Scotland Run [Ref. 14, pp. 7–11; 16, pp. 2, 3, 9, 10, 12, 17, 18, 26, 27]. Two of the Scotland Run sediment samples (0689-SED09 and 0689-SED10) were collected from the Scotland Run stream channel upstream of Pioneer and a pair of duplicate samples (0689-SED11/0689-SED12), were collected from Wilson Lake approximately 3 miles upstream of the facility [Ref. 14, pp. 10, 11, 21–23; 16, pp. 10, 12]. Laboratory analytical results of these sediment samples indicated maximum chromium and copper concentrations of 7.3 mg/kg and 7.4 mg/kg, respectively; nickel and hexavalent chromium analyses reported non-detect values [Ref. 46, pp. 17, 18, 51, 52; 49, pp. 46, 49, 52, 55]. As these samples were collected from different environments (i.e., stream channel and lake shoreline) than the wetland, they are not used in the observed release evaluation. However, these results do demonstrate that the significant detections of chromium, copper, and nickel reported for the wetland sediment samples did not come from an upstream source from Scotland Run [see **Figure 4**]. Although not used to document and observed release to Scotland Run due to differences in sample physical characteristics between upstream and downstream sediment samples, results for sediment samples 0689-SED03 (Timothy Lake), 0689-SED04 (Scotland Run downstream of the wetland), and 0689-SED05 (Scotland Run adjacent to the wetland) indicate the presence of nickel at adjusted concentrations of 11.4 mg/kg, 8.3 mg/kg, and 7.1 mg/kg, respectively suggesting that site-related nickel has migrated to Scotland Run adjacent to and downstream of the wetland [Ref. 14, p. 8; 16, pp. 9, 10, 12; 49, pp. 28, 31, 34; 32, pp. 4–8, 18; 66, pp. 8–10]. The Pioneer facility is bound to the north by Coles Mill Road and a wooded area and to the northeast and northwest by residential areas [see **Figure 4**]. There are no known sources of metals contamination north of the facility [Ref. 20, pp. 4, 9, 10, 12].

Other Possible Sites

Franklin Township Recycling Center

Franklin Township operates a municipal recycling and collection center approximately 0.2 mile east of Pioneer along Coles Mill Road, on the east side of Scotland Run [see **Figure 4**]. The recycling center acts as a collection point for various materials pending shipment off site and not as a processing facility [Ref. 14, p. 14]. The facility accepts vegetative waste, cardboard, clothing, trash, used oil, electronic waste, paper, plastic, and metal [Ref. 14, p. 14; 18, p. 2]. Metal waste is stored in a dumpster pending shipment to another facility and is not stored on the ground surface [Ref. 14, p. 14]. Township personnel do not recall the facility having flooded and stated that precipitation percolates into the ground and does not flow west toward Scotland Run. [Ref. 14, p. 14] A wooded area separates the recycling center from Scotland Run and, in August 2019, EPA observed that an earthen berm runs along the entire western boundary of the recycling center, thereby eliminating any visible runoff path to Scotland Run [Ref. 14, p. 5]. The recycling center has occupied the property for at least 20 years; the land was likely vacant prior to township recycling operations [Ref. 14, p. 14]. Although a release of metals-contaminated runoff from the recycling center to Scotland Run cannot be definitively ruled out, the discharge of untreated waste from the Pioneer facility, the discharge of reportedly treated waste that exceeded NPDES effluent limits, and the earliest detections of site-attributable hazardous substances in the wetland predate the municipal recycling operations; therefore, at least some portion of the observed release by chemical analysis is attributable to the Pioneer facility [Ref. 7, p. 5; 9, pp. 1, 3; 14, p. 14; 15, pp. 3, 6, 28, 30; 45, pp. 2, 3].

Hazardous Substances Released:

Chromium
Copper
Hexavalent Chromium
Nickel

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Observed Release Factor Value: 550

4.1.3.2 Human Food Chain Threat - Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

TABLE 6. HUMAN FOOD CHAIN TOXICITY/PERSISTENCE/BIOACCUMULATION						
Hazardous Substance	**Source Number**	**Toxicity Factor Value**	**River Persistence Factor Value ***	**Food Chain Bioaccumulation Factor Value**	**Toxicity/Persistence/ Bioaccumulation Factor Value (HRS Table 4-16)**	**Ref. 2 Page**
Aroclor-1260	1	10,000	1	50,000	5×10^8	17
Chromium	1, OR	10,000	1	5	5×10^4	2
Copper	1, OR	100	1	50,000	5×10^6	8
Cyanide	1	1,000	0.4	0.5	2×10^2	11
Nickel	1, OR	10,000	1	5	5×10^4	14
Hexavalent Chromium	1, OR	10,000	1	5	5×10^4	5

OR = Observed release.
* The predominant water category between the PPE and the nearest fishery is River; therefore, the river persistence factor value is assigned to each hazardous substance [Ref. 1, Sections 4.1.2.2.1.2 and 4.1.3.2.1.2].

4.1.3.2.2 Hazardous Waste Quantity

TABLE 7. HAZARDOUS WASTE QUANTITY		
Source Number	**Source Hazardous Waste Quantity (HWQ) Value (HRS Section 2.4.2.1.5)**	**Is source hazardous constituent quantity data complete? (yes/no)**
1	0.49	No
Sum of Values:	1 (rounded to nearest integer as specified in HRS Section 2.4.2.2)	

The hazardous waste quantity value corresponds to a hazardous waste quantity factor value of 1 in HRS Table 2-6 [Ref. 1, Section 2.4.2.2]. However, the HRS states that if any target is subject to Level I or Level II concentrations, assign either the value for Table 2-6 or a value of 100, whichever is greater, as the hazardous waste quantity factor value for that pathway [Ref. 1, Section 2.4.2.2]. As described in **Section 4.1.4.3.1.2**, wetlands are subject to Level II concentrations in the surface water migration pathway. Therefore, a hazardous waste quantity factor value of 100 is assigned for the surface water migration pathway.

4.1.3.2.3 Waste Characteristics Factor Category Value

PCB in the form of Aroclor-1260, which is associated with Source 1, has a surface water pathway containment factor values greater than 0 for the watershed, corresponds to a toxicity/persistence factor value of 10,000 and a bioaccumulation potential factor value of 50,000, as shown in the table above [Ref. 1, Section 4.1.3.2.1.4; 2, p. 17].

(Toxicity/Persistence Factor Value) x (Hazardous Waste Quantity Factor Value) =
$10{,}000 \times 100 = 1 \times 10^6$
(Subject to a maximum of 1×10^8)
[Ref. 1, Section 4.1.3.2.3]

(Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value) x
(Bioaccumulation Potential Factor Value) = $(1 \times 10^6) \times (50{,}000) = 5 \times 10^{10}$
(Subject to a maximum of 1×10^{12})
[Ref. 1, Section 4.1.3.2.3]

The resulting waste characteristics product of 5 x 10^{10} corresponds to a waste characteristics factor category value of 320 in Table 2-7 of the HRS [Ref. 1, Section 2.4.3.1].

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Toxicity/Persistence/Bioaccumulation Factor Value: 5 x 10^8
Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 320

4.1.3.3 Human Food Chain Threat - Targets

The Maurice River within the 15-mile TDL is used for fishing for human consumption [**Figure 2**; 58, p. 1]. There are fishing access locations to the river from public boat launches within the Union Lake Wildlife Management Area (WMA) [Ref. 21, pp. 1, 2; 47, p. 3]. Union Lake is an impounded portion of the Maurice River [Ref. 47, p. 3]. Species reported to exist in Union Lake include largemouth bass, chain pickerel, bluegill, pumpkinseed, yellow perch, and black crappie [Ref. 47, p. 4]. All sections of the river are utilized for consumption fishing [Ref. 21, p. 2; 58, p. 1]. The fishery is located downstream of the zone of contamination; therefore, the target fishery is evaluated for potential contamination [**Figure 2**; Ref. 1, Section 4.1.3.3]. Although a perennial stream, there is no documentation that Scotland Run near the PPE is a fishery and Timothy Lake is used for recreational fishing only; therefore, these water bodies are not evaluated as fisheries [Ref. 4, pp. 1, 4; 14, pp. 2, 20; 74, pp. 308, 309].

Sediment Samples for Observed Release

Note on the table below:

* Adjusted result per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* [see **Table 5**].

TABLE 8. SAMPLES FOR OBSERVED RELEASE

Sample ID	Surface Water Body	Distance from PPE (feet) [Figure 4]	Hazardous Substance	Concentration (mg/kg)	Reference(s)
P001-SD003-0006-01	wetland	115	Chromium Copper	11,395* 2,852*	16, p. 27; 30, p. 10; 56, pp. 3–6, 27, 77; 57, pp. 3, 20
P001-SD003-1824-01	wetland	115	Hexavalent Chromium	3.15	16, pp. 20, 27; 30, p. 10; 46, p. 58; 71, p. 3
P001-SD004-0006-01	wetland	65	Chromium Copper Nickel	30,930* 8,196* 6,281*	16, p. 27; 30, p. 10; 56, pp. 3–6, 33, 78; 57, pp. 3, 22
P001-SD004-1824-01	wetland	65	Chromium Copper Nickel	14,263* 10,901* 12,592*	16, p. 27; 30, p. 10; 56, pp. 3–6, 36, 78; 57, pp. 3, 23
P001-SD005-0006-01	wetland	215	Chromium Copper Nickel	1,705* 2,492* 1,066*	16, p. 29; 30, p. 10; 56, pp. 3–6, 39, 78; 57, pp. 3, 24
P002-SD001-0006-01	wetland	502	Copper	271*	16, p. 27; 30, p. 10; 49, pp. 3–6, 58, 89; 51, pp. 3, 26
P002-SD002-0006-01	wetland	495	Chromium Copper	425* 517*	16, p. 27; 30, p. 10; 49, pp. 3–6, 64, 90; 51, pp. 3, 28
P002-SD003-0006-01	wetland	513	Chromium Copper Nickel	8,372* 5,918* 2,725*	16, p. 27; 30, p. 10; 49, pp. 3–6, 70, 90; 51, pp. 3, 30
P002-SD004-0006-01	wetland	558	Chromium Copper Nickel	572* 1,532* 1,170*	16, p. 27; 30, p. 10; 50, pp. 3–6, 16, 87; 52, pp. 2, 15
P002-SD004-0006-02	wetland	558	Chromium Copper Nickel	668* 1434* 1066*	16, p. 28; 30, p. 10; 49, pp. 3–6, 79, 91; 51, pp. 4, 33
P002-SD007-0006-01	wetland	1,258	Copper	295*	16, p. 29; 30, p. 10; 50, pp. 3–6, 39, 88; 52, pp. 3, 20
P002-SD008-0006-01	wetland	1,203	Copper Nickel	379* 807*	16, p. 29; 30, p. 10; 50, pp. 3–6, 45, 89; 52, pp. 3, 22

TABLE 8. SAMPLES FOR OBSERVED RELEASE					
Sample ID	**Surface Water Body**	**Distance from PPE (feet) [Figure 4]**	**Hazardous Substance**	**Concentration (mg/kg)**	**Reference(s)**
P002-SD011-0006-01	wetland	1,549	Copper	289*	16, p. 30; 30, p. 10; 50, pp. 3–6, 63, 91; 52, pp. 4, 28
P002-SD012-0006-01	wetland	1,685	Copper	381*	16, p. 30; 30, p. 10; 50, pp. 3–6, 69, 91; 52, pp. 4, 30
P001-SS008-0006-01	wetland	214	Copper	288	29, pp. 145, 167, 219; 30, p. 9

4.1.3.3.1 Food Chain Individual

There is an observed release to surface water of a hazardous substance (copper) with a bioaccumulation potential factor value of 500 or greater in several samples identified below, and there is a fishery present within the 15-mile TDL [see **Sections 4.1.2.1.1**, **4.1.3.2.1.3**, and **4.1.3.3**]. Therefore, a food chain individual factor value of 20 is assigned [Ref. 1, Section 4.1.3.3.1].

Sample IDs:	P001-SD003-0006-01, P001-SD004-0006-01, P001-SD004-1824-01, P001-SD005-0006-01, P002-SD001-0006-01, P002-SD002-0006-01, P002-SD003-0006-01, P002-SD004-0006-01, P002-SD004-0006-02, P002-SD007-0006-01, P002-SD008-0006-01, P002-SD011-0006-01, P002-SD012-0006-01, and P001-SS008-0006-01

Hazardous Substances:	Copper
Bioaccumulation Potential:	50,000
References:	See **Section 4.1.2.1.1**.

TABLE 9. FISHERIES

Identity of Fishery	**Type of Surface Water Body**	**Dilution Weight**	**Reference(s)**
Maurice River	Moderate to large stream*	0.01	Ref. 1, Table 4-13; 22, p. 2; 58, p. 1

*USGS Streamflow Gauge 01411500 (Maurice River at Norma NJ) indicates the average discharge within subject fishery is 179.9 cubic feet per second (cfs) [**Figure 2**; Ref. 22, pp 1, 2, 4; 58, p. 1]. The gauge is located at Latitude 39° 29′ 14″, Longitude 75° 04′ 37″, which is approximately 10.5 miles downstream of the PPE [**Figure 2**; Ref. 22, p. 1].

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Food Chain Individual Factor Value: 20

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

The Level I concentrations factor value is 0 because there are no documented fisheries subject to Level I concentrations [Ref. 1, Section 4.1.3.3.2.1].

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Level I Concentrations Factor Value: 0

4.1.3.3.2.2 Level II Concentrations

The Level II concentrations factor value is 0 because there are no documented fisheries subject to Level II concentrations [Ref. 1, Section 4.1.3.3.2.2].

==

Level II Concentrations Factor Value: 0

4.1.3.3.2.3 Potential Human Food Chain Contamination

The Maurice River within the 15-mile TDL is used for consumption fishing [**Figure 2**; Ref. 58, p. 1]. There are fishing access locations to the river from public boat launches within the Union Lake WMA [Ref. 21, pp. 1, 2; 47, p. 3]. Union Lake is an impounded portion of the Maurice River [Ref. 47, p. 3]. Species reported to exist in Union Lake include largemouth bass, chain pickerel, bluegill, pumpkinseed, yellow perch, and black crappie [Ref. 47, p. 4]. All sections of the Maurice River are utilized for consumption fishing [Ref. 21, p. 2; 58, p. 1]. The fishery is located downstream of the zone of contamination; therefore, the target fishery is evaluated for potential contamination [**Figures 2**; Ref. 1, Section 4.1.3.3]. The fish consumption rate for the downstream fishery is not documented, so the fishery is assigned to the category "Greater than 0 to 100 pounds per year", which corresponds to the assigned human food chain production value of 0.03 in Table 4-18 of the HRS [Ref. 1, Section 4.1.3.3.2]. Although a perennial stream, there is currently no documentation that Scotland Run near the PPE is a fishery and anecdotal information indicates that Timothy Lake is used for recreational fishing only; therefore, these waterbodies are not evaluated as fisheries [Ref. 4, pp. 1, 4; 14, pp. 2, 20; 74, pp. 308, 309]. The Maurice River is evaluated as a fresh water, moderate to large stream; the average annual discharge is 179.9 cfs within the 15-mile TDL [**Figure 2**; Ref. 1, Table 4-13; 22, p. 2; 24, pp. 5, 78]. The potential human food chain contamination value is calculated below [Ref. 1, Section 4.1.3.3.2.3].

TABLE 10. POTENTIAL HUMAN FOOD CHAIN CONTAMINATION

Identity of Fishery	Annual Production (Pounds)	Type of Surface Water Body (Table 4-13)	Average Annual Flow (cfs)	Population Value (P_i) (Table 4-18)	Dilution Weight (D_i) (Table 4-13)	P_i x D_i
Maurice River	Greater than 0	Moderate to large stream	179.9	0.03	0.01	0.0003

Sum of Pi x Di: 0.0003
(Sum of Pi x Di)/10: 0.00003

==

Potential Human Food Chain Contamination Factor Value: 0.00003

4.1.4.2 Environmental Threat - Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

TABLE 11. ECOSYSTEM TOXICITY/PERSISTENCE/BIOACCUMULATION

Hazardous Substance	Source Number	Fresh Water Ecotoxicity Factor Value*	River Persistence Factor Value**	Fresh Water Ecosystem Bioaccumulation Factor Value*	Ecotoxicity/Persistence/ Bioaccumulation Factor Value (HRS Table 4-21)	Ref. 2 Page
Aroclor-1260	1	10,000	1	50,000	5×10^8	17
Chromium	1, OR	10,000	1	500	5×10^6	2
Copper	1, OR	1,000	1	50,000	5×10^7	8
Cyanide	1	1,000	0.4	0.5	2×10^2	11
Nickel	1, OR	100	1	50,000	5×10^6	14
Hexavalent Chromium	1, OR	100	1	5	5×10^2	5

OR = Observed release.

* The sensitive environments being evaluated are located in fresh water [**Figure 2**; Ref. 24, pp. 5, 48, 78]. Therefore, the fresh water environmental toxicity and bioaccumulation factor values are assigned to each hazardous substance [Ref. 1, Section 4.1.4.2.1.3].

** The predominant water category at the PPE and the nearest sensitive environment along the hazardous substance migration path for the watershed is River; therefore, the river persistence factor value is assigned to each hazardous substance [Ref. 1, Sections 4.1.2.2.1.2 and 4.1.4.2.1.2].

4.1.4.2.2 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	0.49	No
Sum of Values:	1 (rounded to nearest integer as specified in HRS Section 2.4.2.2)	

The hazardous waste quantity value corresponds to a hazardous waste quantity factor value of 1 in HRS Table 2-6 [Ref. 1, Section 2.4.2.2]. However, the HRS states that if any target is subject to Level I or Level II concentrations, assign either the value for Table 2-6 or a value of 100, whichever is greater, as the hazardous waste quantity factor value for that pathway [Ref. 1, Section 2.4.2.2]. As described in **Section 4.1.4.3.1.2**, wetlands are subject to Level II concentrations in the surface water migration pathway. Therefore, a hazardous waste quantity factor value of 100 is assigned for the surface water migration pathway.

4.1.4.2.3 Waste Characteristics Factor Category Value

PCBs in the form of Aroclor-1260, which is associated with Source 1 that has surface water pathway containment factor values greater than 0 for the watershed, correspond to an ecotoxicity/persistence factor value of 10,000 and bioaccumulation potential factor value of 50,000, as shown in the table above [Ref. 1, Section 4.1.4.2.1.4; 2, p. 17].

(Ecotoxicity/persistence factor value) x (hazardous waste quantity factor value) =
$10{,}000 \times 100 = 1 \times 10^6$
(Subject to a maximum of 1×10^8)
[Ref. 1, Section 4.1.4.2.3]

(Ecotoxicity/persistence factor value x hazardous waste quantity factor value) x
(bioaccumulation potential factor value) = $(1 \times 10^6) \times (50{,}000) = 5 \times 10^{10}$
(Subject to a maximum of 1×10^{12})
[Ref. 1, Section 4.1.4.2.3]

The resulting waste characteristics product of 5×10^{10} corresponds to a waste characteristics factor category value of 320 in Table 2-7 of the HRS [Ref. 1, Section 2.4.3.1].

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8
Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 320

4.1.4.3 Environmental Threat - Targets

The zone of contamination (i.e., the portion of the wetland where observed release by chemical analysis is documented at contaminated sediment sample locations and the area lying between them) along the surface water migration pathway downstream of the site source extends from the PPE to sediment sample location P002-SD012-0006, a length of 1,702 feet (0.32 mile) [see **Figure 4** and **Table 5**]. The zone of contamination comprises 0.78 mile of HRS-eligible wetland perimeter subject to Level II concentrations, as documented by EPA in August and September 2019 [**Figure 4**; Ref. 27, pp. 10, 32–36]. The wetland classifications include PEM1/SS1E wetland and PFO1E wetland that are contiguous with Scotland Run, which meet the 40 CFR 230.3 definition of a wetland and are HRS-eligible (i.e., positive indicators of hydric soils, wetland hydrology, and wetland vegetation were observed at all wetland locations) [**Figure 4**; Ref. 27, pp. 3, 4, 10, 32–36; 28, p. 6]. Observations made during the August 2019 wetland survey conducted by EPA indicated that the only portion of the survey area where hydrophytes are present, but not persistent, is within the visible impact zone [Ref. 27, p. 4; 39, p. 1]. The scarcity of hydrophytes in this area could be accounted for by past discharges and by overgrazing by deer [Ref. 5, pp. 6, 151; 39, p. 1]. Information gathered during the 2000 RI commissioned by Pioneer indicated that this area formerly supported a stand of white cedar, possibly undergoing succession to a reed grass marsh and that approximately 4 acres of the wetland had lost its tree cover [Ref. 5, pp. 6, 151]. Based on a site visit conducted in January 1995 as part of RI, a wetlands specialist speculated that the former metal plating discharges killed the cedar stand and that overgrazing by deer has kept cedars and other bog vegetation from reestablishing, favoring the encroachment of reed grass [Ref. 5, pp. 6, 151]. The impacted area is considered part of the wetland as the area previously supported persistent wetland vegetation and is currently characterized by sporadic patches of hydrophytes, as well as hydric soils and wetland hydrology [Ref. 5, pp. 6, 151; 27, pp. 4, 34; 39, p. 1].

These freshwater wetlands are located along the hazardous substance migration path in the area of Level II concentrations, and the total wetland perimeter considered as subject to actual contamination is 0.78 mile [**Figure 4**; Ref. 1, Section 4.1.4.3.1]. There are no media-specific benchmarks for sediment, so the target wetland is subject to Level II concentrations [Ref. 1, Sections 2.5 and 4.1.4.3; 2, pp. 3, 6, 9, 12, 15, 18].

Samples for Observed Release/Level II Concentrations

The sediment concentrations meet the criteria for Level II concentrations because they meet criteria for observed release, there are no media-specific benchmarks for sediment, and their locations are associated with an eligible HRS wetland [Ref. 1, Sections 2.5 and 4.1.4.3.1; 2, pp. 3, 9, 15]:

Note on the table below:

* Adjusted result per EPA Quick Reference Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* [see **Table 5**].

TABLE 13. SAMPLES FOR OBSERVED RELEASE/LEVEL II CONCENTRATIONS

Sample ID	Surface Water Body	Distance from PPE (feet) [Figure 4]	Hazardous Substance	Concentration (mg/kg)	Reference(s)
P001-SD003-0006-01	wetland	115	Chromium Copper	11,395* 2,852*	16, p. 27; 30, p. 10; 56, pp. 3–6, 27, 77; 57, pp. 3, 20
P001-SD003-1824-01	wetland	115	Hexavalent Chromium	3.15	16, pp. 20, 27; 30, p. 10; 46, p. 58; 71, p. 3
P001-SD004-0006-01	wetland	65	Chromium Copper Nickel	30,930* 8,196* 6,281*	16, p. 27; 30, p. 10; 56, pp. 3–6, 33, 78; 57, pp. 3, 22
P001-SD004-1824-01	wetland	65	Chromium Copper Nickel	14,263* 10,901* 12,592*	16, p. 27; 30, p. 10; 56, pp. 3–6, 36, 78; 57, pp. 3, 23

TABLE 13. SAMPLES FOR OBSERVED RELEASE/LEVEL II CONCENTRATIONS					
Sample ID	**Surface Water Body**	**Distance from PPE (feet) [Figure 4]**	**Hazardous Substance**	**Concentration (mg/kg)**	**Reference(s)**
P001-SD005-0006-01	wetland	215	Chromium Copper Nickel	1,705* 2,942* 1,066*	16, p. 29; 30, p. 10; 56, pp. 3–6, 39, 78; 57, pp. 3, 24
P002-SD001-0006-01	wetland	502	Copper	271*	16, p. 27; 30, p. 10; 49, pp. 3–6, 58, 89; 51, pp. 3, 26
P002-SD002-0006-01	wetland	495	Chromium Copper	425* 517*	16, p. 27; 30, p. 10; 49, pp. 3–6, 64, 90; 51, pp. 3, 28
P002-SD003-0006-01	wetland	513	Chromium Copper Nickel	8,372* 5,918* 2,725*	16, p. 27; 30, p. 10; 49, pp. 3–6, 70, 90; 51, pp. 3, 30
P002-SD004-0006-01	wetland	558	Chromium Copper Nickel	572* 1,532* 1,170*	16, p. 27; 30, p. 10; 50, pp. 3–6, 16, 87; 52, pp. 2, 15
P002-SD004-0006-02	wetland	558	Chromium Copper Nickel	668* 1434* 1066*	16, p. 28; 30, p. 10; 49, pp. 3–6, 79, 91; 51, pp. 4, 33
P002-SD007-0006-01	wetland	1,258	Copper	295*	16, p. 29; 30, p. 10; 50, pp. 3–6, 39, 88; 52, pp. 3, 20
P002-SD008-0006-01	wetland	1,203	Copper Nickel	379* 807*	16, p. 29; 30, p. 10; 50, pp. 3–6, 45, 89; 52, pp. 3, 22
P002-SD011-0006-01	wetland	1,549	Copper	289*	16, p. 30; 30, p. 10; 50, pp. 3–6, 63, 91; 52, pp. 4, 28
P002-SD012-0006-01	wetland	1,685	Copper	381*	16, p. 30; 30, p. 10; 50, pp. 3–6, 69, 91; 52, pp. 4, 30
P001-SS008-0006-01	wetland	214	Copper	288	29, pp. 145, 167, 219; 30, p. 9

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

The Level I concentrations factor value is 0 because there are no sensitive environments documented as subject to Level I concentrations [Ref. 1, Section 4.1.4.3.1.1].

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Level I Concentrations Factor Value: 0

4.1.4.3.1.2 Level II Concentrations

The target wetland is subject to Level II concentrations because it is located in a Level II zone of contamination delineated by samples meeting observed release criteria [**Figure 4**; Ref. 1, Sections 2.5 and 4.1.4.3].

Sensitive Environments

The sensitive environments value is 0 because there are no sensitive environments documented as subject to Level II concentrations [Ref. 1, Section 4.1.4.3.1.2]

Sensitive Environments Value: 0

Wetlands

There are HRS-eligible wetlands along the zone of contamination, and the total wetland frontage perimeter subject to actual contamination is 0.78 mile [**Figure 4**; 27, pp. 10, 32–36].

TABLE 14. LEVEL II CONCENTRATIONS – WETLANDS

Wetland	Wetland Perimeter	Wetlands Rating Value (HRS Table 4-24)	Reference
PEM1/SS1E wetland and PFO1E wetland that are contiguous with Scotland Run	0.78 mile*	25	**Figure 4**; Ref. 1, Section 4.1.4.3.1.2

PEM1/SS1E = palustrine, emergent, persistent/palustrine, scrub-shrub, broad-leafed deciduous seasonally flooded/saturated
PFO1E = palustrine, forested, broad-leaved deciduous, seasonally flooded/saturated
* EPA documented the wetland category observed in the field to confirm the HRS eligibility of wetlands within the Survey Area using an Arrow 100 GPS device, a mapping-grade unit capable of sub-meter accuracy [Ref. 27, pp. 2, 32–36; 65, p. 6]. During the 2019 sediment sampling, EPA logged sample locations electronically using GPS equipment and performed post-processing differential correction of the GPS data [Ref. 16, pp. 3, 4, 14]. The GPS points were plotted and the total length of the zone of contamination was determined using GIS software [see **Figure 4**].

Wetland Value: 25

Sum of Sensitive Environment Value + Wetland Value: 25

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Level II Concentrations Factor Value: 25

4.1.4.3.1.3 Potential Contamination

The potential contamination factor value is not scored because the site already receives a listing-eligible site score based on other factors.

Sensitive Environments

The sensitive environment value (S_j) is not scored.

Wetlands

The wetland frontage value (W_j) is not scored.

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Potential Contamination Factor Value: NS