

HAZARD RANKING SYSTEM (HRS) DOCUMENTATION RECORD COVER SHEET

Name of Site: Macon Naval Ordnance Plant

EPA ID No.: GAD003302676

Contact Persons

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Pathways, Components, or Threats Not Scored

The ground water migration, soil exposure, and air migration pathways, as well as the surface water pathway drinking water threat, were not scored in this Hazard Ranking System (HRS) documentation record. These pathways are of concern to EPA and may be considered during future evaluation. The human food chain and environmental threats for the surface water migration pathway are sufficient to qualify the site for the National Priorities List (NPL).

HAZARD RANKING SYSTEM (HRS) DOCUMENTATION RECORD

Name of Site: Macon Naval Ordnance Plant
EPA Region: 4
Date Prepared: March 2012
Street Address of Site*: 600 Guy Paine Road
City, County, State: Macon, Bibb County, Georgia, 31206
General Location in the State: Central Portion of the State
Topographic Map: Macon West, Georgia, 1985
Latitude: 32° 46' 39.57" North
Longitude: 83° 38' 22.83" West

The coordinates listed above for the former Macon Naval Ordnance Plant were measured from the approximate location of surface soil sample MNOP-04-SF, collected during the EPA June 2011 Supplemental Sampling Event (Ref. 4).

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

Pathway	Pathway Score
Ground Water Migration	Not Scored
Surface Water Migration	97.94
Soil Exposure	Not Scored
Air Migration	Not Scored
HRS SITE SCORE	48.97

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S Pathway	S² Pathway
Ground Water Migration Pathway Score (S_{gw})	Not Scored	Not Scored
Surface Water Migration Pathway Score (S_{sw})	97.94	9,592.2436
Soil Exposure Pathway Score (S_s)	Not Scored	Not Scored
Air Migration Pathway Score (S_a)	Not Scored	Not Scored
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		9,592.2436
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2) / 4$		2,398.0609
$\sqrt{(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2) / 4}$		48.97

Table 4-1 –Surface Water Overland/Flood Migration Component Scoresheet

Factor Categories and Factors		Maximum Value	Value Assigned	
Drinking Water Threat				
Likelihood of Release:				
1.	Observed Release	550	550	550
2.	Potential to Release by Overland Flow:			
	2a. Containment	10	NS	
	2b. Runoff	25	NS	
	2c. Distance to Surface Water	25	NS	
	2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	500	NS	
3.	Potential to Release by Flood:			
	3a. Containment (Flood)	10	NS	
	3b. Flood Frequency	50	NS	
	3c. Potential to Release by Flood (lines 3a x 3b)	500	NS	
4.	Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	NS	
5.	Likelihood of Release (higher of lines 1 and 4)	550		550
Waste Characteristics:				
6.	Toxicity/Persistence	(a)	10,000	
7.	Hazardous Waste Quantity	(a)	10,000	
8.	Waste Characteristics	100		NS
Targets:				
9.	Nearest Intake	50	NS	
10.	Population:			
	10a. Level I Concentrations	(b)	NS	
	10b. Level II Concentrations	(b)	NS	
	10c. Potential Contamination	(b)	NS	
	10d. Population (lines 10a + 10b + 10c)	(b)	NS	
11.	Resources	5	NS	
12.	Targets (lines 9 + 10d + 11)	(b)		NS
Drinking Water Threat Score:				
13.	Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a maximum of 100]	100		NS
Human Food Chain Threat				
Likelihood of Release:				
14.	Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:				
15.	Toxicity/Persistence/Bioaccumulation	(a)	500,000,000	
16.	Hazardous Waste Quantity	(a)	100	
17.	Waste Characteristics	1,000		320
Targets:				
18.	Food Chain Individual	50	20	

Table 4-1 –Surface Water Overland/Flood Migration Component Scoresheet (Continued)


Factor Categories and Factors		Maximum Value	Value Assigned
19. Population			
	19a. Level I Concentration	(b)	0
	19b. Level II Concentration	(b)	0
	19c. Potential Human Food Chain Contamination	(b)	0.0003
	19d. Population (lines 19a + 19b + 19c)	(b)	0.0003
20. Targets (lines 18 + 19d)		(b)	20.0003
Human Food Chain Threat Score:			
	21. Human Food Chain Threat Score [(lines 14x17x20)/82,500, subject to maximum of 100]	100	42.66
Environmental Threat			
Likelihood of Release:			
	22. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics:			
	23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	500,000,000
	24. Hazardous Waste Quantity	(a)	100
	25. Waste Characteristics	1,000	320
Targets:			
26. Sensitive Environments			
	26a. Level I Concentrations	(b)	0
	26b. Level II Concentrations	(b)	25
	26c. Potential Contamination	(b)	0.915
	26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	25.915
27. Targets (value from line 26d)		(b)	25.915
Environmental Threat Score:			
	28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a maximum of 60]	60	55.28
Surface Water Overland/Flood Migration Component Score for a Watershed			
	29. Watershed Score ^c (lines 13+21+28, subject to a maximum of 100)	100	97.94
Surface Water Overland/Flood Migration Component Score			
	30. Component Score (S _{of}) ^c (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100	97.94

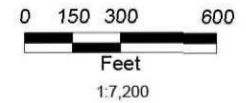
Notes:

- ^a Maximum value applies to waste characteristics category
- ^b Maximum value not applicable
- ^c Do not round to nearest integer
- NS Not scored



Legend

-  WWTB Discharge
-  Former Waste Water Treatment Plant
-  Former Macon Naval Ordnance Plant Structures
-  Former Macon Naval Ordnance Explosives Handling and Storage Areas
-  New Structures
-  Property Boundary



Note:
 Aerial Photograph: Bing Maps, 2009
 References 6; 8; 13, pp. 52, 54; 17, p. 25

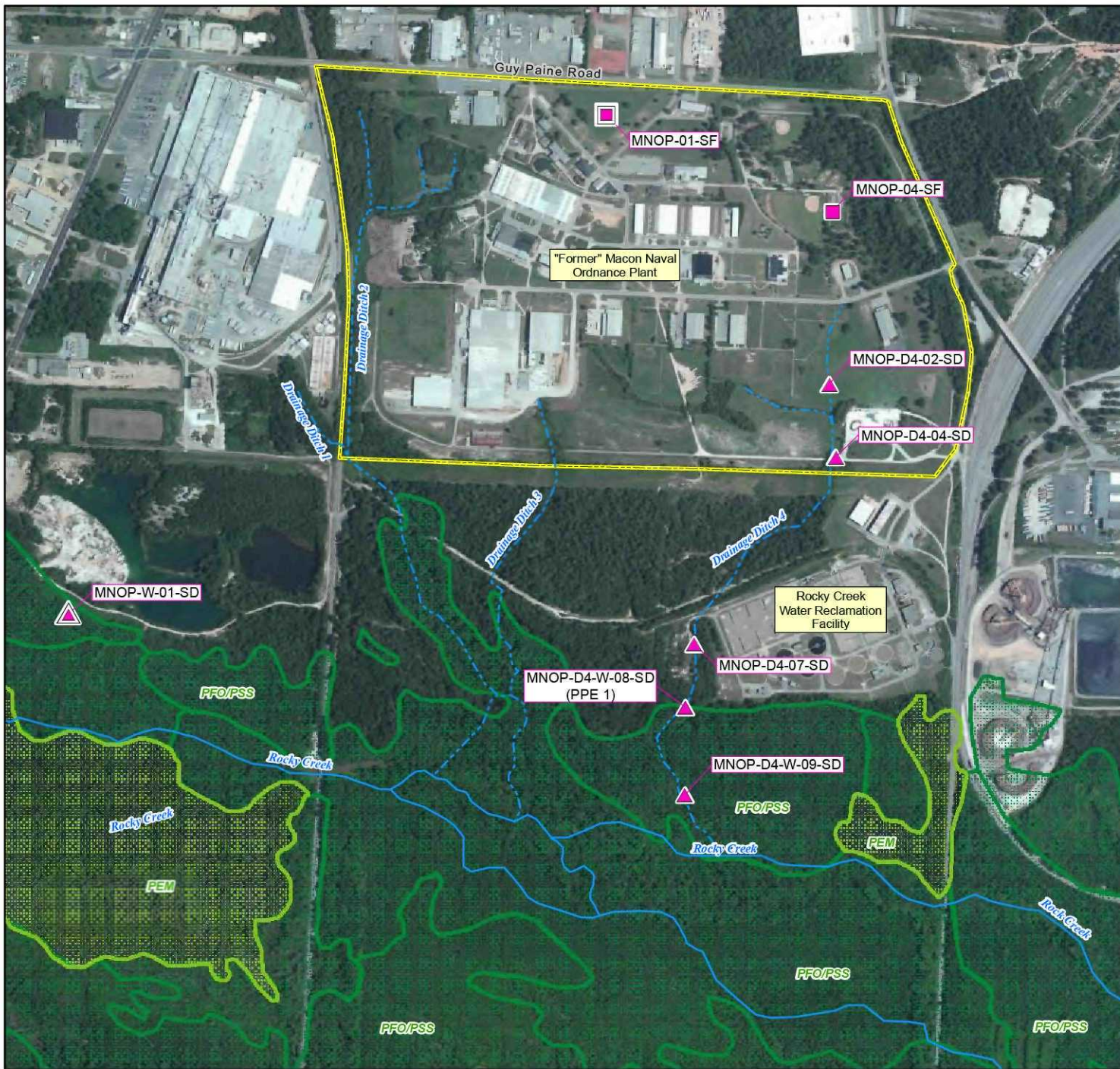


United States
 Environmental Protection Agency

MACON NAVAL ORDNANCE PLANT
 MACON,
 BIBB COUNTY,
 GEORGIA
 TDD No. TTEMI-05-003-0127

**FIGURE 2
 PROPERTY LAYOUT**





Legend

June 2011 Sample Locations

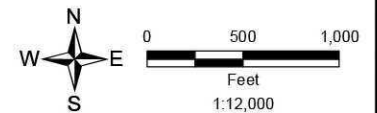
- Sediment Sample
- Soil Sample
- Background Wetland Sediment Sample
- Background Soil Sample

Map Features

- Creek
- Drainage Ditch
- "Former" Macon Naval Ordnance Plant

Wetland Areas

- Freshwater Palustrine Emergent Wetland
- Freshwater Palustrine Forested/Shrub Wetland



Map Source:
 Aerial Photograph - Bing Maps, 2009.
 Property Boundary - Macon-Bibb County Board of Tax Assessors.
 Wetlands - U.S. Fish and Wildlife Service National Wetlands Inventory Reference 9, pp. 1, 3

Notes:
 D - Drainage Ditch
 Hg - Mercury
 MNOP - Macon Naval Ordnance Plant
 PPE - Probable Point of Entry
 SD - Sediment Sample
 SF - Surface Soil Sample
 W - Wetland



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 MACON,
 BIBB COUNTY,
 GEORGIA
 TDD No. TTEMI-05-003-0127

FIGURE 3
SAMPLING LOCATIONS



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SITE DESCRIPTION

The former Macon Naval Ordnance Plant (MNOP) property, currently the Allied Industrial Park (AIP), covers about 433 acres in area and is located in an industrialized area in the southern portion of Macon, Bibb County, Georgia (Refs. 3; 7, p. 2; 8) (see Figure 1 of this Hazard Ranking System [HRS] documentation record). Specifically, the geographic coordinates for the MNOP property are latitude 32° 46' 39.57" north and longitude 83° 38' 22.83" west (as measured from the approximate location of surface soil sample MNOP-04-SF, collected during the EPA June 2011 Supplemental Sampling Event) (Ref. 4). The U.S. Environmental Protection Agency (EPA) identification number for the MNOP property, as recorded in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, is GAD003302676 (Ref. 5).

Land uses on the MNOP property are predominantly commercial and heavy industrial (Refs. 6, pp. 2, 5, 12, 13, 15, 21, 24, 25, 26, 27, 28, 29, 32, 33, 36, 41, 45, 47, 49, 51, 54, 57, 59, 60; 15). The MNOP property is bordered to the north by Guy Paine Road; to the east by Mead Road and the Norfolk Southern railroad tracks; to the southeast by Graphic Packaging; to the south by the Macon Water Authority (MWA) Rocky Creek Water Reclamation Facility and by the Armstrong World Industries (AWI) remote landfill, the former Macon Naval Ordnance Landfill (FMNOL), and Rocky Creek; and to the west by the AWI plant property (Refs. 3; 4, p. 2; 7, p. 2, Appendix A, p. A-2).

For HRS scoring, the site consists of one source and associated releases. Source No. 1 is contaminated soil on the eastern section of the MNOP property. Source No. 1 contains mercury (see Section 2.2 of this HRS documentation record). Mercury has also been detected at significant levels in sediments collected in wetlands that receive runoff from Source No. 1 via Drainage Ditch 4, indicating that a release has occurred to the surface water migration pathway (see Section 4.0 of this HRS documentation record) (also see Figures 2 and 3 of this HRS documentation record).

OPERATIONAL AND REGULATORY HISTORY

MNOP was constructed and operated by the Reynolds Corporation before World War II for production of ordnance (Refs. 12, p. 1-1; 14, p. 2-9). The Navy assumed operations in 1941 and continued to manufacture ordnance until 1965. Ordnance manufactured at the MNOP included flares, small primers, detonators, and other triggering mechanisms (Ref. 13, p. 2; 14, p. 2-9). The total area of the MNOP was approximately 433 acres, which extended from Guy Paine Road to the north, Mead Road to the east, Rocky Creek to the south, and the Central of Georgia Railroad tracks to the west (Refs. 8; 12, p. 2-9; 14, p. 2-9).

After it was declared surplus by the Navy, the property was sold in December 1965 to the Maxson Electronics Company (Maxson) of New York. Maxson continued to manufacture ordnance under contract with the Navy until it sold the property to Allied Chemical Corporation (Allied Chemical) in 1973. Allied Chemical manufactured automobile seat belts at the property and used all or nearly all of the buildings, underground storage tanks (UST) and aboveground storage tanks (AST), and utilities. Allied Chemical sold the property in 1980 to the Macon-Bibb County Industrial Authority (MBCIA), which renamed the property the Allied Industrial Park. MBCIA currently leases or sells buildings as office and warehouse space to various industrial and commercial businesses on the AIP property (Refs. 7, Appendix A, p. A-3; 13, pp. 1, 2, 3; 14, p. 2-9; 15).

During ordnance manufacturing operations, structures at the MNOP included numerous buildings, several miles of paved roads, fueling facilities, ASTs and USTs, solvent storage buildings, explosives storage magazines, a bunker area, a metals plating facility, and a sewage treatment plant (also referred to as a wastewater treatment plant [WWTP]), and the FMNOL (Refs. 8; 13, p. 2; 14, pp. 2-9, 2-10, 2-11, 2-12, Appendix A, pp. A-3 through A-8).

The MNOP WWTP was located near the western boundary of the property, was constructed in the early 1940s, and operated until the early 1970s. The WWTP was designed to handle only sewage generated by

the ordnance plant; however, chemicals used in the ordnance plant may have been disposed of in drains that connected to the WWTP (Ref. 13, pp. 10, 52) (see Figure 2 of this HRS documentation record).

The primary metal plating facility at MNOP was located in Building 5. The metal plating operation began in the 1940s and continued through Maxson's and Allied Chemical's operation of the facility until 1980. The metal plating facility used cyanide, solvents, acid baths, caustic baths, and hydraulic oil. Records indicate that the plating operation generated chrome sludge during Allied Chemical's use of the facility. It is not known how this sludge was managed or disposed of (Ref. 13, pp. 11, 52). Metal shavings were centrifuged to remove excess oils in the oil recovery area. These oils were reportedly allowed to drain onto the ground surface (Ref. 13, pp. 11, 52) (see Figure 2 of this HRS documentation record).

Explosive compounds were either handled or stored at many areas throughout the MNOP property, including numerous small dryer buildings, ordnance magazines, and blending and weighing houses (Ref. 13, pp. 11, 12, 54) (see Figure 2 of this HRS documentation record). According to a technical manual prepared by the Department of the Army, military explosives, such as those that were manufactured at the MNOP, contained mercury compounds as initiating agents, including mercury fulminate (Ref. 23, pp. 7-5, 7-8). Building 109, located in the eastern portion of the MNOP, was a primary explosives production site (Ref. 13, pp. 11, 12, 54) (see Figure 2 of this HRS documentation record). Soil samples collected from this area during the U.S. Army Corps of Engineers (USACE) 1996 site investigation contained mercury (Ref. 13, pp. 58, 83, 84).

FMNOL was reportedly used for disposal of solid wastes and ordnance throughout the operational history (1941 to 1974) of the MNOP facility, and intermittent dumping continued thereafter throughout the 1980s (Refs. 16, p. 3; 17, pp. 42, 43, 46, 47; 18, p. 2; 20, p. i). The landfill was also used for disposal of used parts and construction debris (Refs. 14, p. 2-11; 18, p. 2). A fenced explosives demolition area, located near the toe of the landfill, was used for testing and demolishing explosives, primarily detonators, flares, and primers manufactured at the MNOP. Flammable materials were reportedly burned in this area as well (Ref. 14, pp. 2-11, 3-9). The FMNOL is scored as part of the AWI site listed on the EPA NPL under CERCLIS ID No. GAN000410033 at docket number EPA-HQ-SFUND-2010-0640-0002 (Ref. 47).

PREVIOUS INVESTIGATIONS

Several investigations have been conducted at MNOP between 1989 and 2011. Table 1 lists the previous investigations at MNOP, including the hazardous substances detected in the samples collected.

Company/ Agency	Investigation	Date	Samples Collected	Hazardous Substances Detected	References
Beaver Engineering	Environmental Assessment	1989	Soil	Metals	13, p. 3
Environmental Science and Engineering	Confirmation Study of the Former Macon Naval Ordnance Plant	1990	Soil, ground water, and sediment	Arsenic Cadmium Chromium Lead TCE	14, pp. I, 2-1, 3-4, 3-6, 3-9, 3-11, 4-2, 4-3, 4- 11, 4-12
USACE, Savannah District	Site Investigation	1996	Soil, ground water, surface water, and sediment	Cadmium Chromium Lead Mercury	13, pp. vi, 1, 13, 20, 27, 28, 55 through 60, 63, 71 through 92, 94 through 104, 106, 107

TABLE 1: Summary of Previous Investigations

Company/ Agency	Investigation	Date	Samples Collected	Hazardous Substances Detected	References
USACE, Savannah District	Hazardous Site Response Act (HSRA) Compliance Status Report	1998 to 2000	Soil, ground water, surface water, and sediment	Arsenic Cadmium Chromium Lead Zinc TCE PCE Benzo(a)pyrene	12, pp. i, ii, 1-1, 1-10, 2-9, 2-19, 2-33, Appendix O, pp. O15 through O53
USACE, Savannah District	Post-Test Groundwater Sampling	2004	Ground water	DCE TCE PCE Vinyl Chloride	21, pp. 1, 2, 5, 11
EPA	Expanded Site Inspection	May 2009	Soil, ground water, surface water, and sediment	Cadmium Chromium Copper Lead Manganese Mercury Nickel PCBs Pesticides SVOCs VOCs	7, pp. 1, 6, 7, Appendix B, pp. B-12 through B-69, B-71 through B-75, B-77 through B-113
EPA	Supplemental Sampling Event	June 2011	Soil and sediment	Mercury	9, pp. 1, 3; 11, pp. 5, 8, 19, 21

Notes:

- DCE Dichloroethane
- EPA U.S. Environmental Protection Agency
- PCB Polychlorinated biphenyl
- PCE Tetrachloroethylene
- SVOC Semivolatile organic compound
- TCE Trichloroethylene
- USACE U.S. Army Corps of Engineers
- VOC Volatile organic compound

In June 2011, EPA conducted a supplemental sampling event at the MNOP property. The purpose of the supplemental sampling was to further delineate mercury contamination previously found in Drainage Ditch 4 that runs along the eastern portion of the property (Refs. 3; 7, Appendix A, p. A-4, Appendix B, p. B-95 (also see Figure 3 of this HRS documentation record). Six surface soil samples (0 to 6 inches below ground surface [bgs]) were collected (including one background and one duplicate) from the eastern portion of the MNOP, and 10 sediment samples (0 to 3 inches bgs) were collected (including one duplicate) from Drainage Ditch 4, which receives runoff from the eastern portion of MNOP and flows south to Rocky Creek (Refs. 9; 10, pp. 3, 4, Appendix B, p. B-1). All soil and sediment samples were analyzed for mercury (Refs. 9; 10, pp. 5, 10, Appendix B, p. B-3). Mercury was detected in surface soil sample MNOP-04-SF at a concentration of 0.40 milligrams per kilogram (mg/kg), in Drainage Ditch 4 sediment sample MNOP-D4-07-SD at a concentration of 0.46 mg/kg, and in Drainage Ditch 4 wetland sediment sample MNOP-D4-W-09-SD at a concentration of 1.1 mg/kg (Ref. 11, pp. 8, 19, 21).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 1

Name of source: Contaminated soil on the MNOP property

Source Type: Contaminated Soil

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

Source No. 1 consists of contaminated soil on the eastern portion of the MNOP property (Refs. 9, p. 3; 11, p. 8) (see Figure 3 of this HRS documentation record). MNOP operated as an ordnance manufacturing facility from before World War II until 1973 (Ref. 12, p. 1-1, 1-7). Ordnance manufactured at MNOP included flares, small primers, detonators, and other triggering mechanisms (Ref. 13, p. 2).

According to a technical manual prepared by the Department of the Army, military explosives, such as those that were manufactured at the MNOP, contained mercury compounds as initiating agents, including mercury fulminate (Ref. 23, pp. 7-5, 7-8). Explosive compounds were either handled or stored in many areas throughout the MNOP property, including numerous small dryer buildings, ordnance magazines, and blending and weighing houses. Specifically, Building 109, located in the eastern portion of the MNOP near Source No. 1, was a primary explosives production site (Ref. 13, pp. 11, 12, 54) (see Figures 2 and 3 of this HRS documentation record). Soil samples collected from this area during the U.S. Army Corps of Engineers (USACE) 1996 site investigation and the EPA June 2011 supplemental sampling event contained mercury (Refs. 9, p. 1; 11, p. 8; 13, pp. 58, 83, 84).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

EPA June 2011 Supplemental Sampling

Background and Source Samples

The background and source soil samples listed in Table 2 were collected during the EPA June 2011 supplemental sampling event (Refs. 9, pp. 1, 3, 7, 9; 11, p. 3). The background soil sample was collected from the north-central portion of the MNOP property where no site-related activities have been known to occur (Refs. 8; 9, pp. 1, 3; 17, pp. 11, 17, 21, 25, 29, 33, 37, 41, 45). The source soil sample was collected from the eastern portion of the MNOP property where mercury has been previously detected, near where facility operations were known to have occurred and where explosives were handled and stored (Refs. 7, Appendix A, p. A-4; 9, p. 3; 13, pp. 11, 12, 54). The background and source surface soil samples were collected at a depth of 0 to 6 inches bgs (Refs. 9, p. 1; 10, Appendix B, p. B-1).

Background and Source No. 1 surface soil samples were collected during the same sampling event, from the same type of soil (sandy loam), and in accordance with the same sampling procedures (Refs. 9, pp. 1, 6, 9; 10, p. 4; 30, pp. 1, 3). Surface soil samples were collected in accordance with the EPA Region 4 SESD Field Branch Quality System and Technical Procedures for Soil Sampling, SESDPROC-300-R1 (Refs. 9, p. 6; 10, p. 4; 24). The locations of the background and source soil samples are depicted in Reference 9, page 3 and are listed in Reference 10, Appendix B, page B-1 (see Figure 3 of this HRS documentation record). Chain-of-custody records are provided in Reference 26. Logbook notes are provided in Reference 9, Attachment 2.

TABLE 2: Background and Source Soil Sample Descriptions – June 2011

Sample ID	Sample Location	Depth (inches bgs)	Date Sampled	References
MNOP-01-SF	Background sample collected from the north-central portion of the MNOP property	0 to 6	06/29/2011	9, pp. 3, 7; 26, p. 1
MNOP-04-SF	Source sample collected from the eastern portion of the MNOP property where explosives were handled and stored	0 to 6	06/30/2011	9, pp. 3, 9; 13, p. 54; 26, p. 1

Notes:

bgs Below ground surface
 ID Identification number
 MNOP Macon Naval Ordnance Plant
 No. Number
 SF Surface sample

Background and Source Concentrations

Background and Source No. 1 samples listed in Table 3 were analyzed for mercury in accordance with EPA Method 245.5 and the EPA Region 4 Analytical Support Branch (ASB) Laboratory Operations and Quality Assurance Manual (LOQAM), January 2011 (Refs. 9, p. 1; 11, p. 1; 27). EPA Region 4 SEDS reviewed all data according to the contract statement of work (SOW) and EPA guidelines (Refs. 28; 11, p. 1). The minimum reporting limits (MRL) are listed on the analytical data sheets in Reference 11. Each MRL is sample-specific and corresponds to the lowest quantitative point on the calibration curve; it is adjusted for the amount of sample prepared and any dilutions performed, as well as for percent moisture. The MRLs are equivalent to sample quantitation limits (SQL) (Ref. 29).

TABLE 3: Analytical Results for Background and Source No. 1 Samples – June 2011

Sample Designation	Sample ID	Hazardous Substance	Hazardous Substance Concentration	MRL	References
Background	MNOP-01-SF	Mercury	0.073J (0.13) mg/kg	0.050 mg/kg	11, pp. 4, 5; 31
Source No. 1	MNOP-04-SF	Mercury	0.40 mg/kg	0.050 mg/kg	11, p. 8

Notes:

- () Concentrations shown in parentheses were adjusted in accordance with References 31 and 32.
- ID Identification number
- J The identification of the analyte is acceptable; the reported value is an estimate (Ref. 11, p. 4).
- mg/kg Milligram per kilogram
- MNOP Macon Naval Ordnance Plant
- MRL Minimum reporting limit
- No. Number
- SF Surface sample

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

The sample collected from Source No. 1 contains mercury (Refs. 9, p. 3; 11, p. 8) (also see Table 3 of this HRS documentation record). Source No. 1 consists of contaminated soil on the eastern portion of the MNOP property (Refs. 9, p. 3; 11, p. 8). The MNOP operated as an ordnance manufacturing facility from before World War II until 1973 (Ref. 12, pp. 1-1, 1-7). Ordnance manufactured at the MNOP included flares, small primers, detonators, and other triggering mechanisms (Ref. 13, p. 2). Military explosives, such as those that were manufactured at the MNOP, contained mercury compounds (mercury fulminate) as initiating agents (Ref. 23, pp. 7-1, 7-5, 7-8). Building 109, located in the eastern portion of the MNOP near Source No. 1, was a primary explosives production site (Ref. 13, pp. 11, 12, 54) (see Figure 2 of this HRS documentation record). Soil samples collected from this area during the USACE 1996 site investigation contained mercury (Ref. 13, pp. 58, 83, 84). Analytical results for sediment samples collected from Drainage Ditch 4 indicate overland migration of mercury from Source No. 1 (see *Additional Supporting Data* in Section 4.1.2.1.1 of this HRS documentation record). Analytical results for sediment samples collected from wetlands contiguous with Rocky Creek and downstream of Source No. 1 indicate that a release of hazardous substances has occurred to the surface water migration pathway, as documented in Section 4.0 of this HRS documentation record. No run-on or runoff control systems were observed during the EPA June 2011 supplemental sampling at MNOP, specifically in the area of Source No. 1 (Ref. 33). Drainage Ditch 4 drains the eastern portion of MNOP and directs runoff to Rocky Creek and adjacent wetlands (Refs. 7, Appendix A, p. A-4; 9, p. 3) (see Figure 3 of this HRS documentation record). Therefore, a containment factor value of 10, as noted in Table 4, was assigned for the surface water migration pathway (Ref. 1, Section 4.1.2.1.2.1.1).

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to ground water	NS	NA
Release via overland migration or flood: no run-on or runoff control system; runoff from Source No. 1 enters Rocky Creek via Drainage Ditch 4.	10	1, Section 4.1.2.1.2.1.1; 9, p. 3; 33; see Figure 3 of this HRS documentation record

Notes:

NA Not applicable
NS Not scored

2.4.2.1 SOURCE HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1. Available Source No. 1 data may not represent the extent of contamination associated with the source and are insufficient to determine constituent quantity.

Hazardous Constituent Quantity Assigned Value: NS

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2. Available Source No. 1 data may not represent the extent of the wastestream associated with the source.

Hazardous Wastestream Quantity Assigned Value: NS

2.4.2.1.3 Volume

The information available is not sufficient to evaluate Tier C, volume, as required by Reference 1, Section 2.4.2.1.3.

Volume Assigned Value: 0

2.4.2.1.4 Area

One soil sample was collected from Source No. 1 during the EPA June 2011 supplemental sampling event (Ref. 9, pp. 3, 9). As a result, it is not possible to determine a source area for Source No. 1. Therefore, the area of Source No. 1 is undetermined, but is greater than zero.

Sum (square feet [ft²]): >0

Equation for Assigning Value (Table 2-5): Area (A)/34,000

Area Assigned Value: >0

2.4.2.1.5 Calculation of Source Hazardous Waste Quantity Value

Source No. 1 is assigned a source HWQ value of greater than zero, but unknown (Ref. 1, Section 2.4.2.1.5).

Source HWQ Value: >0

SUMMARY OF SOURCE DESCRIPTIONS

TABLE 5: Summary of Source Descriptions						
Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Containment Factor Value by Pathway			
			Ground Water (Ref. 1, Table 3-2)	Surface Water Overland/ Flood (Ref. 1, Table 4-2)	Air	
					Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	>0	No	NS	10	NS	NS

Notes:

NS Not scored

Total Source Hazard Waste Quantity Value: >0

Other Possible Source:

Contaminated Soil on Western Portion of MNOP – During the EPA May 2009 expanded site inspection (ESI) conducted at the MNOP (currently known as AIP), soil samples were collected on the western portion of the MNOP property (Ref. 7, pp. 1, 6, Appendix A, p. A-4). Soil samples AIP-124-SB and AIP-134-SF contained mercury at concentrations of 0.88 mg/kg and 1.3 mg/kg (Ref. 34, pp. 120, 166). Soil sample AIP-124-SB was collected from the area where the Blending/Mixing Houses were located (Refs. 7, Appendix A, p. A-4; 13, p. 54). The Blending/Mixing Houses were where MNOP mixed the explosives (Ref. 13, pp. 11, 12). Military explosives, such as those that were manufactured at MNOP, contained mercury compounds (mercury fulminate) as initiating agents (Ref. 23, pp. 7-1, 7-5, 7-8). Soil sample AIP-134-SF was collected from the northwestern portion of the MNOP, in the area where the MNOP WWTP was formerly located (Refs. 7, Appendix A, p. A-4; 13, p. 52) (see Figure 2 of this HRS documentation record). These areas drain into Drainage Ditch 2, which flows south and merges with the AWI drainage easement, then flows into Rocky Creek (Ref. 7, Appendix A, p. A-4). Contaminated soil on the western portion of MNOP drains towards the AWI site to the west of MNOP and not towards the PPE and observed release scored in this HRS documentation record (see Figure 3); therefore, this other possible source is not scored in this HRS documentation record.

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT – Drainage Ditch 4

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

The hazardous substance migration pathway includes both the overland segment and the in-water segment that hazardous substances would take as they migrate away from sources. The overland segment begins at the source and proceeds downgradient to the probable point of entry (PPE) to surface water. The in-water segment at the PPE continues in the direction of flow (Ref. 1, Section 4.1.1.1).

Overland flow from Source No. 1 (contaminated soil in the eastern portion of the MNOP property) is directed to Drainage Ditch 4. Drainage Ditch 4 is an intermittent drainage route located upgradient of the PPE along the eastern boundary of the MNOP property (Ref. 9, pp. 1, 3). Surface water runoff from Source No. 1 flows overland about 625 feet and enters Drainage Ditch 4. Drainage Ditch 4 flows south for about 3,250 feet and enters HRS-eligible palustrine forested wetlands adjacent to Rocky Creek. The point where Drainage Ditch 4 enters the palustrine forested wetlands is PPE 1. Drainage Ditch 4 continues south within palustrine forested wetlands for about 1,250 feet and enters Rocky Creek (Refs. 3; 36, Map 1) (also see Figure 3 of this HRS documentation record).

Rocky Creek flows east-southeast for about 1 mile before it converges with Tobesofkee Creek. Tobesofkee Creek flows south-southeast for about 4 miles before it converges with the Ocmulgee River, which flows for more than 9.5 miles, thus completing the 15-mile surface water migration pathway target distance limit (TDL) east-southeast of Elberta, Georgia (Ref. 3).

The flow rate for Rocky Creek is estimated to be between 10 and 15 cubic feet per second (cfs) (Ref. 37). Rocky Creek has several branches. Specific stream channels are difficult to discern because of the extensive wetlands in the area (Refs. 3; 36). According to the U.S. Geological Survey, the mean flow rate for Tobesofkee Creek for water years 1937 to 2010 was 183 cfs, and the mean flow rate for the Ocmulgee River for water years 1911 to 2010 was 2,657 cfs (Ref. 38, pp. 3, 10).

The southern portion of Drainage Ditch 4 is located within wetlands and the 100-year floodplain of Rocky Creek. This area is prone to frequent flooding, resulting in the mixing of water in the surrounding area (Refs. 7, Appendix A, p. A-4; 36, Map 1; 44).

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 OBSERVED RELEASE – Chemical Analysis

EPA June 2011 Supplemental Sampling

Background and Contaminated Samples

During the EPA June 2011 supplemental sampling event, one background sediment sample, MNOP-W-01-SD, was collected from HRS-eligible palustrine forested wetlands west of and upgradient from Drainage Ditch 4. Contaminated sediment sample MNOP-D4-W-09-SD was collected from Drainage Ditch 4 within HRS-eligible palustrine forested wetlands downstream of the PPE. Background and contaminated sediment samples were collected from HRS-eligible palustrine forested wetlands at depths ranging from 0 to 3 inches bgs (Refs. 9, pp. 1, 3, 8, 9; 36, Map 1).

The sediment samples were collected in accordance with the EPA Region 4 SESD Field Branches Quality System and Technical Procedures for Sediment Sampling, SESDPROC-200-R2 (Refs. 9, pp. 1, 6; 10, p. 4; 25). The location of the background sediment sample is depicted on Figure 3 of this HRS documentation record. Chain-of-custody records are provided in Reference 26. Logbook notes are provided in Reference 9, pages 8 and 9.

The background and contaminated sediment samples were collected during the same sampling event, in accordance with the same sampling procedures, and from the same type of HRS-eligible wetland (palustrine forested) (Refs. 9, pp. 1, 3, 6; 36) (see Figure 3 of this HRS documentation record).

TABLE 6: Background and Contaminated Sediment Samples – June 2011

Sample ID	Sample Location	Distance from PPE 1	Depth (bgs)	Date Sampled	References
MNOP-W-01-SD	Background HRS-eligible palustrine forested wetlands west and upgradient of Drainage Ditch 4, upstream from site drainage	NA	0 to 3 inches	06/29/2011	9, p. 8; 26, p. 2; 36, Map 1; Figure 3 of this HRS documentation record
MNOP-D4-W-09-SD	Drainage Ditch 4, HRS-eligible palustrine forested wetlands	700 feet downstream	0 to 3 inches	06/30/2011	9, pp. 3, 9; 26, p. 2; 36, Map 1

Notes:

bgs Below ground surface
D Ditch
HRS Hazard Ranking System
ID Identification number
MNOP Macon Naval Ordnance Plant
NA Not applicable
PPE Probable point of entry
SD Sediment sample
W Wetland

Background and Contaminated Concentrations

The sediment samples listed in Table 7 were collected during the EPA June 2011 supplemental sampling event (Ref. 9, pp. 3, 8, 9). Sediment samples were analyzed for mercury in accordance with EPA Method 245.5 and the EPA Region 4 ASB LOQAM, January 2011 (Refs. 9, p. 1; 11, p. 1; 27). EPA Region 4 SESD reviewed all data according to the contract SOW and EPA guidelines (Refs. 28; 11, p. 1). The MRLs are listed on the analytical data sheets in Reference 11, pages 21 and 22. Each MRL is sample-specific and corresponds to the lowest quantitative point on the calibration curve; it is adjusted for the amount of sample prepared and any dilutions performed, as well as for percent moisture. The MRLs are equivalent to SQLs (Ref. 29).

Sample Description	Sample ID	Hazardous Substance	Concentration	MRL	References
Background	MNOP-W-01-SD	Mercury	0.16J (0.29) mg/kg	0.050 mg/kg	11, pp. 4, 22; 31; 32, pp. 8, 18
Release	MNOP-D4-W-09-SD	Mercury	1.1 mg/kg	0.050 mg/kg	11, p. 21

Notes:

- () Concentrations shown in parentheses were adjusted in accordance with References 31 and 32.
- D Ditch
- ID Identification number
- J The identification of the analyte is acceptable; the reported value is an estimate (Ref. 11, p. 4).
- mg/kg Milligram per kilogram
- MNOP Macon Naval Ordnance Plant
- MRL Minimum reporting limit
- SD Sediment sample
- W Wetland

Additional Supporting Data

The sediment samples listed in Table 8 below were collected from Drainage Ditch 4 during the June 2011 supplemental sampling event (Ref. 9, pp. 1, 3, 9). Sediment sample MNOP-D4-W-08-SD was collected at PPE 1. The samples presented below show the presence of mercury along the overland drainage route, Drainage Ditch 4, from Source No. 1 to PPE 1. Because Drainage Ditch 4 is an intermittent water body upgradient of PPE 1, these sediment samples were not included as part of the surface water pathway in-water segment discussion (Ref. 9, pp. 1, 3) (see Figure 3 of this HRS documentation record).

Sample ID	Hazardous Substance	Concentration	MRL	Reference
MNOP-D4-02-SD	Mercury	0.051J mg/kg	0.050 mg/kg	11, pp. 4, 13
MNOP-D4-04-SD	Mercury	0.083J mg/kg	0.050 mg/kg	11, pp. 4, 16
MNOP-D4-07-SD	Mercury	0.46 mg/kg	0.050 mg/kg	11, p. 19
MNOP-D4-W-08-SD	Mercury	0.19J mg/kg	0.050 mg/kg	11, pp. 4, 20

Notes:

- D4 Drainage Ditch 4
- ID Identification
- J The identification of the analyte is acceptable; the reported value is an estimate (Ref. 11, p. 4).
- mg/kg Milligrams per kilogram
- MNOP Macon Naval Ordnance Plant
- MRL Minimum reporting limit
- SD Sediment
- W Wetland

Attribution

The MNOP was constructed before World War II and was operated as an ordnance manufacturing facility until 1973 (Refs. 12, p. 1-1; 13, p. 2). Ordnance manufactured at the MNOP included flares, small primers, detonators, and other triggering mechanisms (Ref. 13, p. 2). The total area of the MNOP was approximately 433 acres, which extended from Guy Paine Road in the north to Rocky Creek in the south and Mead Road to the east and the Central of Georgia Railroad tracks to the west (Refs. 8; 18, p. 2; 22, pp. 1, 2).

Explosive compounds were either handled or stored in many areas throughout the MNOP property, including numerous small dryer buildings, ordnance magazines, and blending and mixing houses (Ref. 13, pp. 11, 12, 54). According to a technical manual prepared by the Department of the Army, military explosives, such as those that were manufactured at the MNOP, contained mercury compounds as initiating agents, including mercury fulminate (Ref. 23, pp. 7-1, 7-5, 7-8). Building 109, located in the eastern portion of the MNOP near Source No. 1, was a primary explosives production site (Ref. 13, pp. 11, 12, 54) (see Figures 2 and 3 of this HRS documentation record). Soil samples collected from this area during the USACE 1996 site investigation and EPA June 2011 supplemental sampling event contained mercury (Refs. 9, p. 3; 13, pp. 58, 83, 84).

Other facilities in the area include the MBCIA, which renamed the MNOP property the Allied Industrial Park and currently leases or sells buildings as office and warehouse space to various industrial and commercial businesses on the AIP property (Refs. 7, Appendix A, p. A-3; 13, pp. 1, 2, 3; 14, p. 2-9; 15). Politex U S Inc. (Politex) is the only manufacturing business that is currently located at the AIP. Politex is a textile manufacturing firm that produces roofing membranes, clothing and furniture padding, and building materials (Ref. 15). Politex is located on the western portion of the MNOP property (Refs. 6, pp. 42 through 49; 7, Appendix A, p. A-3). Runoff and drainage originating from Politex does not enter Drainage Ditch 4 (Ref. 7, Appendix A, pp. A-2, A-3) (see Figure 3 of this HRS documentation record). The property where Source No. 1 soil sample MNOP-04-SF was collected is owned by the City of Macon and is operated as a recreational park that includes baseball fields (Refs. 6, pp. 7, 8; 7, Appendix A, pp. A-2, A-3; 9, p. 3).

Possible off-site sources also include the FMNOL, AWI, and the Rocky Creek water reclamation facility (RC WRF). AWI and FMNOL are currently listed on the EPA NPL under CERCLIS ID No. GAN000410033 at docket number EPA-HQ-SFUND-2010-0640-0002 (Ref. 47). Runoff from FMNOL and AWI flows into Rocky Creek via a drainage easement. The drainage easement enters Rocky Creek west and upstream of Source No. 1 soil sample MNOP-04-SF and Drainage Ditch 4. Drainage Ditch 4 is located just west of the RC WRF (Ref. 7, Appendix A, p. A-2).

The FMNOL was reportedly used for disposal of solid wastes and ordnance throughout the operational history (1941 to 1974) of the MNOP (Refs. 8; 17, pp. 42, 43, 46, 47; 18, p. 2). The landfill was also used for disposal of used parts and construction debris (Refs. 14, p. 2-11; 18, p. 2). During the EPA May 2009 ESI, mercury was detected in soil samples collected from the FMNOL at concentrations ranging from 0.47 mg/kg (FML-303-SF) to 4.7 mg/kg (FML-304-SB) (Ref. 35, pp. 130, 132).

Since 1948, AWI has operated an acoustic ceiling tile manufacturing plant on 130 acres of land west of the MNOP property (Ref. 19, p. 3). In 1980, AWI notified the Georgia Environmental Protection Division (GAEPD) that it was a generator of hazardous waste and AWI was classified as a conditionally exempt small quantity generator under the Resource Conservation and Recovery Act (RCRA). PCBs are the primary hazardous substance of concern for this facility, not metals (Ref. 19, pp. 5, 6).

The RC WRF, located southeast of and downstream from MNOP, provides wastewater treatment for the southern and western portions of the City of Macon. Treated wastewater from this facility is discharged into the Ocmulgee River; however, RC WRF maintains a National Pollutant Discharge Elimination System (NPDES)-permitted discharge point at the southern property boundary (Refs. 9, p. 3; 45, pp. 2, 3; 46, pp. 1, 8). The NPDES permit requires RC WRF to monitor outfall discharges for biochemical oxygen

demand, total suspended solids, pH, chlorine, fecal coliform, nitrogen, dissolved oxygen, PCBs, and phosphorus (Ref. 46, pp. 6, 7). There are currently no documented releases of mercury at this location (Refs. 9, p. 3; 46, pp. 6, 7).

The source sample collected from Source No. 1 (contaminated soil on the eastern portion of MNOP) during the EPA June 2011 supplemental sampling event contained mercury (Refs. 9, p. 3; 11, p. 8) (see Table 3 in Section 2.2.2 for Source No. 1 of this HRS documentation record). Sediment samples collected from Drainage Ditch 4, which receives runoff from Source No. 1, also contained mercury. The presence of mercury in Drainage Ditch 4 documents the migration of releases from Source No. 1 at the MNOP (Refs. 9, p. 3; 11, pp. 13, 16, 19, 20, 21) (also see Tables 6 and 7 in Section 4.1.2.1.1, Observed Release, of this HRS documentation record). Furthermore, an observed release of mercury has been documented in HRS-eligible wetlands along Drainage Ditch 4 (Refs. 9, p. 3; 11, p. 21; 36).

Mercury has been documented in Source No. 1, in Drainage Ditch 4 and in palustrine forested wetlands indicating migration of hazardous substances from the MNOP property (see Table 3 in Section 2.2.2 for Source No. 1, and Table 7 in Section 4.1.2.1.1, Observed Release, of this HRS documentation record).

Hazardous Substance in the Release

Mercury

Surface Water Observed Release Factor Value: 550.00

4.1.2 DRINKING WATER THREAT

The drinking water threat was not scored because it is not expected to contribute significantly to the overall score.

4.1.3.2 HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

The toxicity, persistence, and bioaccumulation factor value for mercury detected in Source No. 1 with containment factor values of greater than 0 is summarized in Table 9. The combined toxicity, persistence, and bioaccumulation factor value is assigned in accordance with Reference 1, Section 4.1.3.2.1.

Hazardous Substance	Source No.	Toxicity Factor Value	Persistence Factor Value¹	Bioaccumulation Value²	Toxicity/Persistence/Bioaccumulation Factor Value (Ref. 1, Table 4-16)	Reference
Mercury	1	10,000	1	50,000	5×10^8	2, p. BI-8

Notes:

- ¹ Persistence factor value for rivers
- ² Bioaccumulation factor value for fresh water

Toxicity/Persistence/Bioaccumulation Factor Value: 500,000,000.00
(Ref. 1, Section 4.1.3.2.1.4)

4.1.3.2.2 HAZARDOUS WASTE QUANTITY

TABLE 10: Hazardous Waste Quantity		
Source No.	Source Type	Source Hazardous Waste Quantity
1	Contaminated soil	>0

Total Source Hazardous Waste Quantity: >0

One soil sample, MNOP-04-SF, was collected to represent Source No. 1 (Ref. 9, pp. 3, 9; see Table 3 in Section 2.2.2 for Source No. 1 of this HRS documentation record). As a result, it is not possible to calculate an area measurement for Source No. 1. Therefore, the area of Source No. 1 is undetermined, but is greater than zero. In addition, the hazardous waste quantity receives a minimum factor value of 100 for the surface water migration pathway because actual contamination at Level II concentrations is present in HRS-eligible palustrine forested wetlands and hazardous constituent quantity is not adequately determined (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6)

4.1.3.2.3 CALCULATION OF HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The waste characteristics factor category was obtained by multiplying the toxicity, persistence, and hazardous waste quantity (HWQ) factor values, subject to a maximum product of 1×10^8 . Then, this product was multiplied by the bioaccumulation potential factor value, subject to a maximum product of 1×10^{12} . Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 100

Toxicity/Persistence Factor Value \times
Hazardous Waste Quantity Factor Value: 1×10^6

Toxicity/Persistence Factor Value \times
Hazardous Waste Quantity Factor Value \times Bioaccumulation Factor Value (50,000): 5×10^{10}

Waste Characteristics Factor Category Value: 320
(Ref. 1, Table 2-7)

4.1.3.3 HUMAN FOOD CHAIN THREAT TARGETS

4.1.3.3.1 Food Chain Individual

An observed release of a hazardous substance having a bioaccumulation factor value of 500 or greater is documented in perennial surface water with a fishery downstream — specifically, an observed release to Drainage Ditch 4 within HRS-eligible palustrine forested wetlands (Refs. 9, p. 3; 11, pp. 21, 22; 36, Map 1) (see Figure 3 of this HRS documentation record). Drainage Ditch 4 flows south for about 1,250 feet within palustrine forested wetlands and joins Rocky Creek (Ref. 9, p. 3). Rocky Creek, Tobesofkee Creek, and the Ocmulgee River are designated as fisheries by the State of Georgia’s Ocmulgee River Watershed Management Plan (Refs. 39, p. 2; 40, Appendix A, pp. A-89, A-91; 41, p. 4-14). Rocky Creek is fished between Broadway and its confluence with Tobesofkee Creek within the site TDL where it is accessible to the public; fish are also harvested for consumption (Refs. 3; 37; 42, pp. 3, 10, 11). In 2007, GAEPD personnel observed people fishing in Rocky Creek east of Highway 41. The fishermen indicated to GAEPD personnel that they clean and eat the fish that they catch (Refs. 19, p. 9; 42, pp. 3, 10, 11). In addition, Tetra Tech observed fishing gear, including a fishing line and weight, along Rocky Creek during the EPA 2009 ESI sampling event (Ref. 7, Appendix D, p. D-14). Fish species caught for consumption in Rocky Creek include bream, blackfish, bass, redear sunfish, redbreast sunfish, bluegill, and brown bullhead catfish (Refs. 19, p. 9; 37; 42, p. 3). The State of Georgia has issued fish consumption guidelines for the Ocmulgee River as a result of mercury contamination (Refs. 9, p. 9; 43, p. 41).

Food Chain Individual Factor Value: 20
(Ref. 1, Section 4.1.3.3.1)

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

No Level I samples were collected.

4.1.3.3.2.2 Level II Concentrations

No Level II samples were collected.

4.1.3.3.2.3 Potential Human Food Chain Contamination

Drainage Ditch 4 flows south for about 1,250 feet within HRS-eligible palustrine forested wetlands and joins Rocky Creek (Ref. 9, p. 3). Rocky Creek is fished between Broadway and its confluence with Tobesofkee Creek within the site TDL where it is accessible to the public; fish are also harvested for consumption (Refs. 3; 37; 42, pp. 3, 10, 11). Information is not available on the annual production of fish caught in Rocky Creek; therefore, the annual production is undetermined but greater than 0.

Identity of Fishery	Annual Production (pounds)	Type of Surface Water Body	Average Annual Flow (cfs)	Population Value (P _i) (Ref. 1, Table 4-18)	Dilution Weight (D _i) (Ref. 1, Table 4-13)	P _i × D _i	References
Rocky Creek	>0	Small to Moderate Stream	10 to 15	0.03	0.1	0.003	37; 39, p. 2; 40, Appendix A, p. A-91; 41, p. 4-14

Notes:
cfs Cubic feet per second

For the potential human food chain contamination factor value, the sum of $P_i \times D_i$ is divided by 10.

Potential Human Food Chain Factor Value: 0.0003
(Ref. 1, Section 4.1.3.3.2.3)

4.1.4.2 ENVIRONMENTAL THREAT WASTE CHARACTERISTICS

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

The ecosystem toxicity, persistence, and bioaccumulation factor value for mercury detected in Source No. 1, with a containment factor value of greater than 0, is summarized in Table 12. The combined ecosystem toxicity, persistence, and bioaccumulation factor value is assigned in accordance with Reference 1, Section 4.1.4.2.1.

TABLE 12: Ecosystem Toxicity/Persistence/Bioaccumulation

Hazardous Substances	Source No.	Ecosystem Toxicity Factor Value¹	Persistence Factor Value²	Bioaccumulation Value³	Ecosystem/ Toxicity/ Bioaccumulation Factor Value (Ref. 1, Table 4-21)	Reference
Mercury	1	10,000	1	50,000	5×10^8	2, p. BI-8

Notes:

- ¹ Ecotoxicity for fresh water
- ² Persistence value for rivers
- ³ Bioaccumulation factor value for fresh water, environmental threat

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8
(Reference 1, Section 4.1.4.2.1.4)

4.1.4.2.2 HAZARDOUS WASTE QUANTITY

TABLE 13: Hazardous Waste Quantity		
Source No.	Source Type	Source Hazardous Waste Quantity
1	Contaminated soil	>0

Total Source Hazardous Waste Quantity: >0

One soil sample, MNOP-04-SF, was collected to represent Source No. 1 (Ref. 9, pp. 3, 9; see Table 3 in Section 2.2.2 for Source No. 1 of this HRS documentation record) (Ref. 9, pp. 3, 9). As a result, it is not possible to calculate an area measurement for Source No. 1. Therefore, the area of Source No. 1 is undetermined but is greater than zero. In addition, the hazardous waste quantity receives a minimum factor value of 100 for the surface water migration pathway because actual contamination at Level II concentrations is present in HRS-eligible palustrine forested wetlands, and hazardous constituent quantity is not adequately determined (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6)

4.1.4.2.3 CALCULATION OF ENVIRONMENTAL CHAIN THREAT WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The waste characteristics factor category was obtained by multiplying the ecosystem toxicity, persistence, and HWQ factor values, subject to a maximum product of 1×10^8 . Then, this product was multiplied by the bioaccumulation potential factor value, subject to a maximum product of 1×10^{12} . Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Ecosystem Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 100

Ecosystem Toxicity/Persistence Factor Value \times
Hazardous Waste Quantity Factor Value: 1×10^6

Ecosystem Toxicity/Persistence Factor Value \times
Hazardous Waste Quantity Factor Value \times Bioaccumulation Factor Value (50,000): 5×10^{10}

Waste Characteristics Factor Category Value: 320
(Ref. 1, Table 2-7)

4.1.4.3 Environmental Threat Targets

Level I Concentrations

No Level I concentrations have been documented.

Level II Concentrations

Actual contamination has been documented in wetland areas along Drainage Ditch 4 in Section 4.1.2.1.1 of this HRS documentation record. The sampling locations are shown in Reference 9, page 3. Wetland areas were identified from Reference 36, Wetlands Inventory Maps. The wetland areas evaluated are palustrine forested (Refs. 3; 9, p. 3; 36).

Most Distant Level II Sample

Investigation:	June 2011 Supplemental Sampling
Sample ID:	MNOP-D4-W-09-SD
Sample Medium:	Sediment
Hazardous Substance:	Mercury
Location:	Drainage Ditch 4, about 700 feet downstream from PPE 1
References:	3; 9, p. 3; 11, p. 21; 36 (also see Table 7 of this HRS documentation record)

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

Sensitive Environments

Sensitive environments other than wetlands have not been identified within the 15-mile surface water migration pathway TDL.

Wetlands

No Level I wetlands were scored.

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

Sensitive environments other than wetlands have not been identified within the 15-mile surface water migration pathway TDL.

Wetlands

The wetlands were identified from Reference 36, Wetlands Inventory Maps. The wetlands evaluated are palustrine forested (Refs. 3; 9, p. 3; 36). The southern portion of Drainage Ditch 4 is located within HRS-eligible wetlands (Refs. 3; 9, p. 3; 36). The sediment sample evaluated at a Level II concentration is located in palustrine forested wetlands along Drainage Ditch 4 (Refs. 3; 9, p. 3; 36). The total wetland frontage from PPE 1 to the most downstream sample that contained Level II concentrations (MNOP-D4-W-090SD) is about 1,400 feet, or 0.26 mile (Refs. 3; 9, p. 3; 36). Both sides of Drainage Ditch 4 within this segment contain HRS eligible wetlands, so both sides of Drainage Ditch 4 were included in the calculation of the wetland frontage (Refs. 3; 9, p. 3; 36).

TABLE 14: Level II Wetland Frontage			
Wetland	Water Body	Wetland Frontage	References
Palustrine forested	Drainage Ditch 4	1,400 feet or 0.26 mile	3; 9, p. 3; 36
Total Wetland Frontage		1,400 feet or 0.26 mile	3; 9, p. 3; 36

Total Wetland Frontage: 1,400 feet

The wetland ratings value for 0.26 mile is obtained from Reference 1, Table 4-24 and is 25.

Wetland Value: 25
(Ref. 1, Table 4-24)

For wetlands subject to Level II concentrations, the wetland value (25) is multiplied by 1 (Ref. 1, Section 4.1.4.3.1.1).

Wetland Value: 25×1
Level II Concentrations Factor Value: 25
(Ref. 1, Section 4.1.4.3.1.1)

4.1.4.3.1.3 Potential Contamination

Sensitive Environments

Potential sensitive environments were not evaluated because the presence of sensitive environments other than wetlands has not been identified.

Wetlands

The wetlands were identified from Reference 36, Wetlands Inventory Maps. The wetlands evaluated for potential contamination are palustrine forested (Refs. 3; 9, p. 3; 36). Wetlands were measured from the farthest downstream sediment sample (MNOP-D4-W-09-SD) collected on Drainage Ditch 4 to the completion of the 15-mile surface water migration pathway TDL. Wetland frontage from both sides of Drainage Ditch 4, Rocky Creek, Tobesofkee Creek, and the Ocmulgee River were measured (Refs. 3; 36). Wetlands that were evaluated as Level II were not included in the potential contamination wetland frontage. The flow rate for Rocky Creek is estimated to be between 10 and 15 cfs (Ref. 37). According to the U.S. Geological Survey, the mean flow rate for Tobesofkee Creek water years 1937 to 2010 was 183 cfs, and the mean flow rate for the Ocmulgee River water years 1911 to 2010 was 2,657 cfs (Ref. 38, pp. 3, 10).

Surface Water Body	Type of Surface Water Body	Wetland Frontage	Wetlands Value Based on Wetland Frontage	References
Rocky Creek	Small to Moderate Stream	About 2.5 miles	75	1, Tables 4-13, 4-24; 3; 36; 37
Tobesofkee Creek	Moderate to Large Stream	About 7.75 miles	150	1, Tables 4-13, 4-24; 3; 36; 38, p. 3
Ocmulgee River	Large Stream to River	About 7 miles	150	1, Tables 4-13, 4-24; 3; 36; 38, p. 10
Total Wetlands Value			375	1, Tables 4-13, 4-24; 3; 36

Surface Water Body	Sum of Sensitive Environments Values (S_i)	Wetlands Value (W_i) (Ref. 1, Table 4-24)	Dilution Weight (D_i) (Ref. 1, Table 4-13)	D_i (W_i + S_i) (Ref. 1, Section 4.1.4.3.3.3)	References
Rocky Creek	0	75	0.1	7.5	3; 36; 37
Tobesofkee Creek	0	150	0.01	1.5	3; 36; 38, p. 3
Ocmulgee River	0	150	0.001	0.15	3; 36; 38, p. 10

Total Potential Contamination Factor Value: 9.15

For wetlands subject to potential contamination, the wetland value (9.15) is multiplied by 0.1 (Ref. 1, Section 4.1.4.3.1.3).

Wetland Value: 9.15×0.1
 Potential Contamination Factor Value: 0.915
 (Ref. 1, Section 4.1.4.3.1.3)