HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Mississippi Phosphates Corporation

EPA ID No. MSN000403508

Contact Persons

Documentation Record:

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Pathways, Components, or Threats Not Scored

The ground water migration, drinking water and environmental threats of the surface water migration pathway, soil exposure and subsurface intrusion pathway, and air migration pathway were not scored in this Hazard Ranking System documentation record because the human food chain threat of the surface water migration pathway is sufficient to qualify the site for the NPL. These pathways are of concern to the U.S. Environmental Protection Agency (EPA) and may be considered during future evaluation. At the time of the listing, the site score is sufficient without the pathways mentioned above.

Ground Water Migration Pathway: From 2005 to 2012, numerous ground water sampling events were conducted at MPC downgradient of the West Stack, and in the vicinity of the diammonium phosphate plant (DAP) and sulfuric acid plants (SAP) (Refs. 9, pp. 9, 10, 11, 14, 15, 61, 62; 49, pp. 2, 3). During a 2012 ground water sampling event, samples contained arsenic (up to 2,100 micrograms per liter [μg/L]), cadmium (up to 2,600 μg/L), copper (up to 3,900 μg/L), lead (up to 220 μg/L), and ammonia (up to 1,500,000 μg/L), among others (Ref. 49, pp. 35 to 39). Therefore, the ground water migration pathway is of concern.

Drinking Water and Environmental Threats (Surface Water Migration Pathway): No drinking water intakes are located within the 15-mile target distance limit and the listing of the site would not be changed by scoring the environmental threat of the surface water migration pathway.

Air Migration and Soil Exposure and Subsurface Intrusion Pathways: The listing of the site would not be changed by scoring these pathways.

HAZARD RANKING SYSTEM DOCUMENTATION RECORD

Name of Site:	Mississippi Phosphates Corporation
Date Prepared:	July 2017
EPA Region:	4
Street Address of Site*:	601 Industrial Road
City, County, State, Zip:	Pascagoula, Jackson County, Mississippi 39581
General Location in the State:	Southeastern portion of state
Topographic Map:	Pascagoula South and Grand Bay Southwest, Mississippi 1977
Latitude:	30° 22' 19.57" North
Longitude:	88° 29' 27.62" West

The coordinates above for Mississippi Phosphates Corporation (MPC) were measured from waste sample MPC-WA-08 collected from the East Stack (Source No. 2) (Refs. 4; 27, Enclosure 1, p. E1-2) (see Figure 4 of this HRS documentation record).

* 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 the U.S. Environmental Protection Agency (EPA) considers to be 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, 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 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 as to where the contamination has come to be located.

Pathway	Pathway Score
Ground Water Migration	NS
Surface Water Migration	100.00
Soil Exposure and Subsurface Intrusion	NS
Air Migration	NS
HRS SITE SCORE	**50.00**

Note:

NS Not scored

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S Pathway	**S^2 Pathway**
Ground Water Migration Pathway Score (S_{gw})	NS	NS
Surface Water Migration Pathway Score (S_{sw})	100	10,000
Soil Exposure and Subsurface Intrusion Pathway Score (S_{sessi})	NS	NS
Air Migration Pathway Score (S_a)	NS	NS
$S^2_{gw} + S^2_{sw} + S^2_{sessi} + S^2_a$		10,000
$(S^2_{gw} + S^2_{sw} + S^2_{sessi} + S^2_a) / 4$		2,500
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_{sessi} + S^2_a) / 4}$		**50.00**

Note:

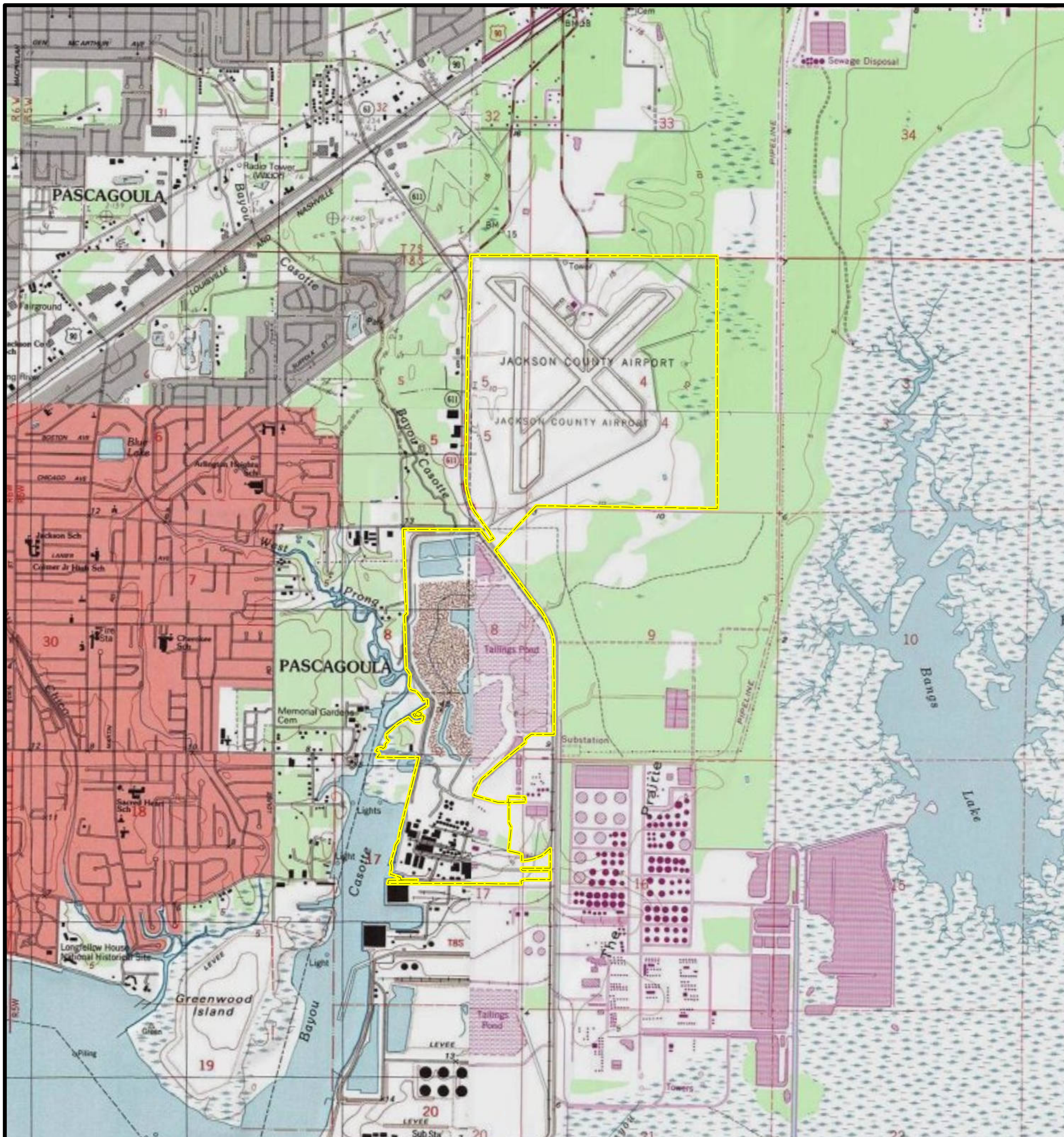
NS Not scored

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	
2. Potential to Release by Overland Flow:			
2a. Containment	10	NS	
2b. Runoff	10	NS	
2c. Distance to Surface Water	5	NS	
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	150	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)	NS	
7. Hazardous Waste Quantity	(a)	NS	
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]	100.00		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)	5×10^8	
16. Hazardous Waste Quantity	(a)	1×10^6	
17. Waste Characteristics	1,000		1,000
Targets:			
18. Food Chain Individual	50	20	

Table 4-1 –Surface Water Overland/Flood Migration Component Scoresheet			
Factor Categories and Factors	**Maximum Value**	**Value Assigned**	
19. Population			
19a. Level I Concentrations	(b)	0	
19b. Level II Concentrations	(b)	0	
19c. Potential Human Food Chain Contamination	(b)	0.0000003	
19d. Population (lines 19a + 19b + 19c)	(b)	0.0000003	
20. Targets (lines 18 + 19d)	(b)		20.0000003
Human Food Chain Threat Score:			
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to maximum of 100]	100.00		100.00
Environmental Threat			
Likelihood of Release:			
22. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:			
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	NS	
24. Hazardous Waste Quantity	(a)	NS	
25. Waste Characteristics	1,000		NS
Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)	NS	
26b. Level II Concentrations	(b)	NS	
26c. Potential Contamination	(b)	NS	
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	NS	
27. Targets (value from line 26d)	(b)		NS
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a maximum of 60]	60.00		NS
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score[c] (lines 13+21+28, subject to a maximum of 100)	100.00		100.00
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated; subject to a maximum of 100)	100.00		100.00

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

Property Boundary

The Jackson County Airport closed in 1990 when the Trent Lott International Airport began operations (Refs. 55, p. 32; 58, p. 1).

The East Stack was built on the former Jackson County Airport (Refs. 9, p. 49; 55, pp. 26 to 35). The East Stack began receiving phosphogypsum in 2002 (Ref. 11, p. 8)

N W E S

0 1,500 3,000
Feet

Map Source:
USGS 7.5 Minute Topographic Quadrangle Maps:
Grand Bay SW, MS 1984; Kreole, MS 1984; Pascagoula North, MS 1982; Pascagoula South, MS, 1982.

United States Environmental Protection Agency
Region 4

FIGURE 1

Property Location

Mississippi Phosphates Corporation

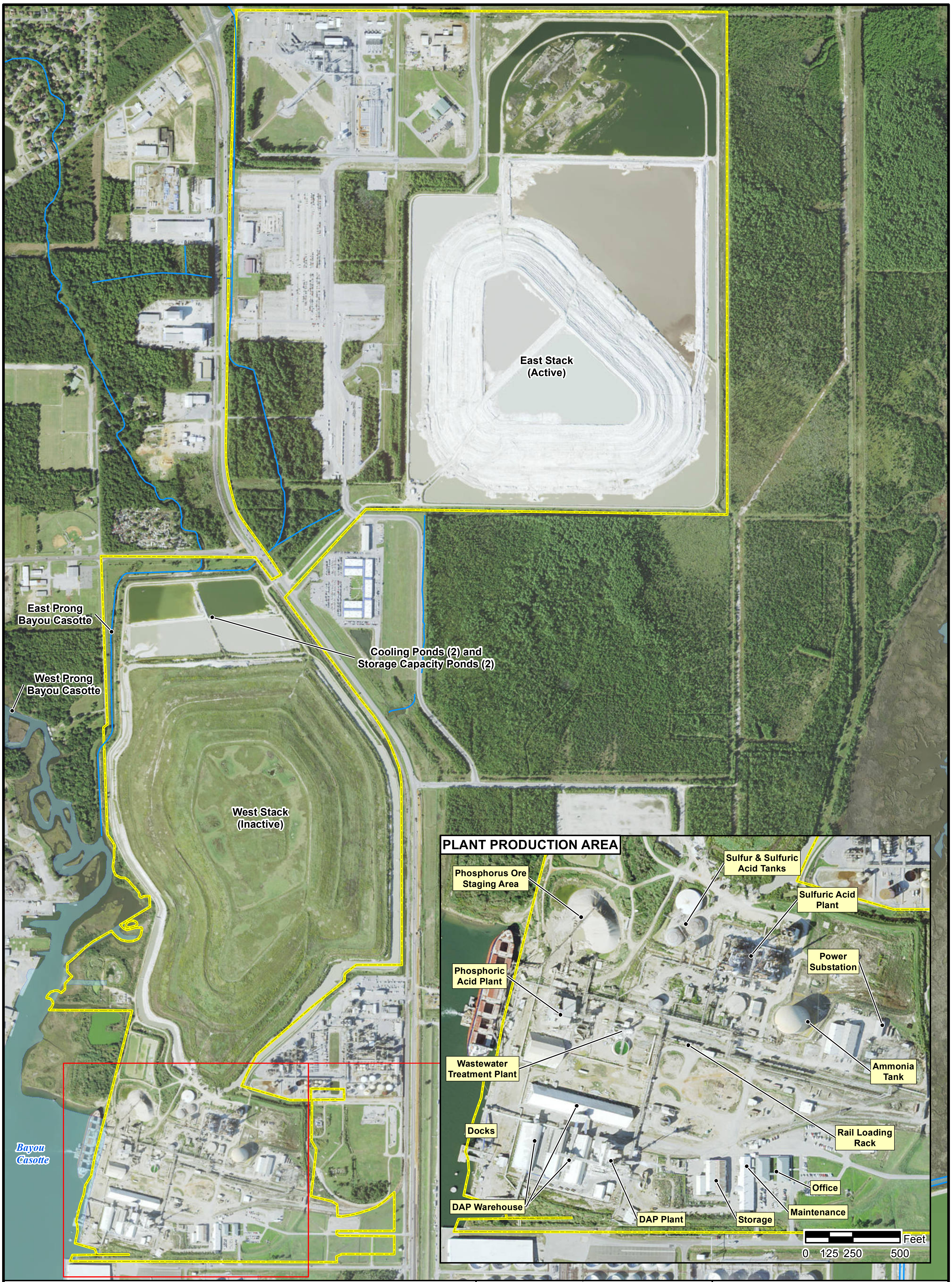
TDD No.: TT-05-017

City:	County:	State:
Pascagoula	Jackson	Mississippi

TETRA TECH

Date: 8/2/2016
Analyst: helen.mayoral

File: C:\X\TT-05-017_Mississippi_Phosphate_Corporation\GIS\mxd\Doc_Record\Fig1_Site_Location.mxd



Legend

- Water Feature
- Property Boundary
- Bayou Casotte

Notes:
DAP Diammonium phosphate

References – 10, p. 45; 24, Appendix A, p. A-3; 28, pp. 43, 44.

Map Source: ESRI Aerial Imagery, 2011-2012. The source of this map imagery is ESRI, used by the EPA with ESRI's permission.

N
W E
S

0 500 1,000
Feet

United States
Environmental Protection Agency
Region 4

FIGURE 2

Property Layout

Mississippi Phosphates Corporation

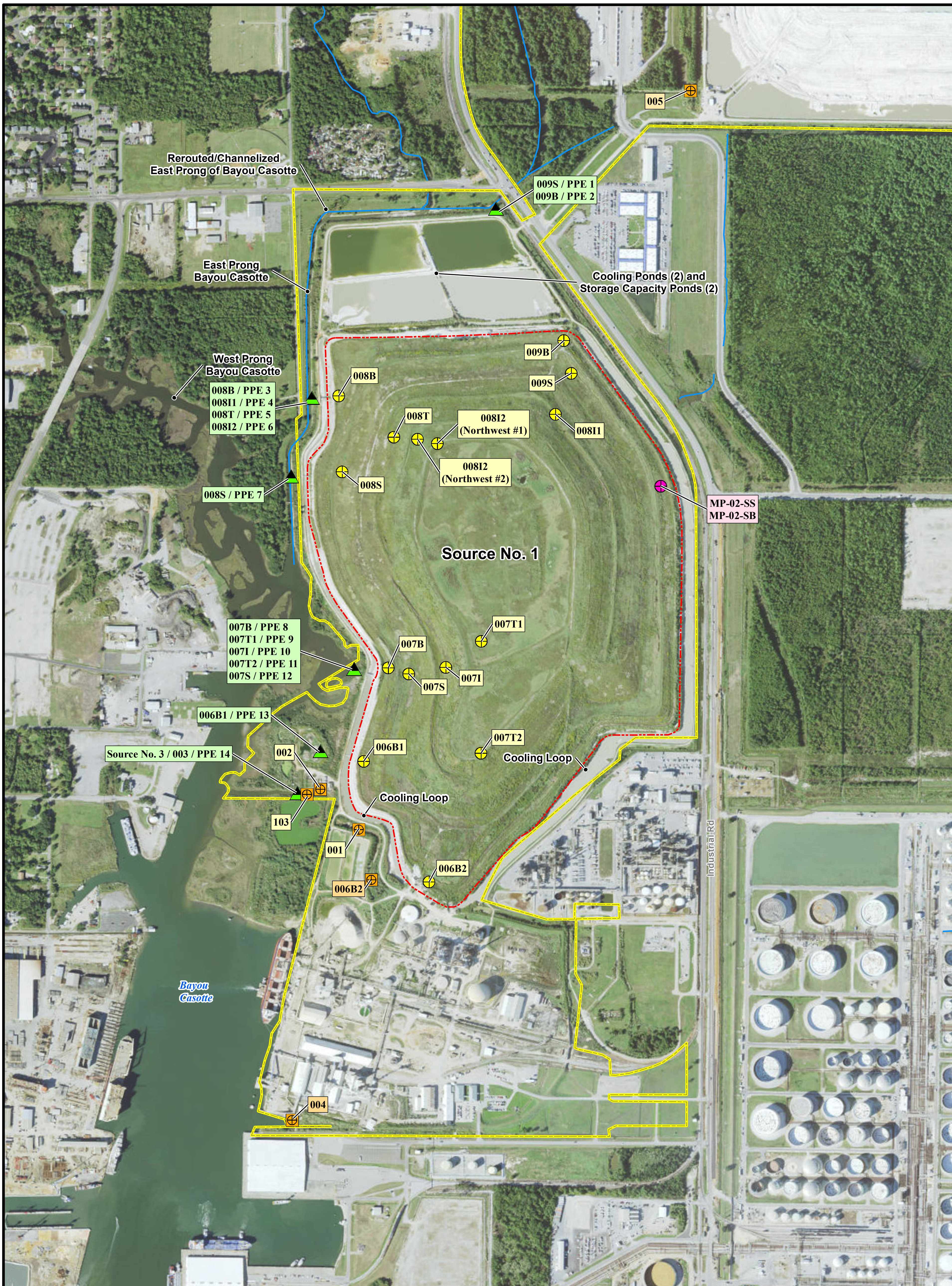
TDD No.: TT-05-017

City:	County:	State:
Pascagoula	Jackson	Mississippi

TETRA TECH

Date: 8/2/2016
Analyst: helen.mayoral

File: C:\X\TT-05-017_Mississippi_Phosphate_Corporation\GIS\mxd\Doc_Record\Fig2_Property_Layout_11x17.mxd



Legend

- Catch Basin/Drain
- Waste Sample Location
- NPDES Outfall/PPE Location
- NPDES Outfall
- Water Feature
- Disposal Boundary
- Property Boundary

Notes:

MP	Mississippi Phosphate
NPDES	National Pollutant Discharge Elimination System
PPE	Probable Point of Entry
SB	Subsurface Soil
SS	Surface Soil

N W E S

0 375 750

Feet

References – 10, p. 45; 18, p. 34; 24, Appendix A, pp. A-2, A-3, A-5; 28, pp. 43, 44; 45.
Map Source: ESRI Aerial Imagery, 2011-2012. The source of this map image is ESRI, used by the EPA with ESRI's permission.

United States
Environmental Protection Agency
Region 4

FIGURE 3

Source Nos. 1 and 3

Mississippi Phosphates Corporation

TDD No.: TT-05-017

City: Pascagoula **County:** Jackson **State:** Mississippi

TETRA TECH

Date: 8/2/2016

Analyst: helen.mayoral

File: C:\X\TT-05-017_Mississippi_Phosphate_Corporation\GIS\mxd\Doc_Record\Fig3_Source_No1_11x17.mxd

Legend

- NPDES Outfall
- Waste Sample Location
- Water Feature
- Disposal Boundary
- Property Boundary

Notes:

MPC	Mississippi Phosphate Corporation
NPDES	National Pollutant Discharge Elimination System
D	Duplicate
WA	Waste

References 17, p. 4; 24, Appendix A, p. A-3; 27, Enclosure 1, p. E1-2; 47, p. 36

Map Source: ESRI Aerial, 2012-2013. The source of this map is ESRI, used by the EPA with ESRI's permission.

N W E S

0 250 500
Feet

United States Environmental Protection Agency Region 4

FIGURE 4

Source No. 2

Mississippi Phosphates Corporation

TDD No.: TT-05-017

City:	County:	State:
Pascagoula	Jackson	Mississippi

TETRA TECH

Date: 8/2/2016

Analyst: helen.mayoral

File: C:\X\TT-05-017_Mississippi_Phosphate_Corporation\GIS\mxd\Doc_Record\Fig4_Source_No2_11x17.mxd

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SITE DESCRIPTION

For HRS scoring purposes, the Mississippi Phosphates Corporation (MPC) site includes two phosphogypsum waste pile sources, one National Pollutant Discharge Elimination System (NPDES) Outfall source, and associated surface water observed releases in Bayou Casotte. Source No. 1 is an approximately 219.29-acre inactive West Stack, and Source No. 2 is an approximately 119.69-acre active East Stack, both evaluated as waste piles (Ref. 14, pp. 1, 2, 3). Source No. 3 is NPDES Outfall 003, a designated process related waste stream (Ref. 23, p. i; 38, p. 28). Hazardous substances including ammonia as nitrogen, arsenic, cadmium, chromium, copper, lead, nickel, and zinc have been detected in Source Nos. 1, 2, and 3 (see Section 2.2.1, Source Nos. 1, 2, and 3 and Figure 3 of this HRS documentation record). An observed release to surface water by direct observation has been documented (see Section 4.1.2.1.1 of this HRS documentation record). Discharge monitoring reports (DMRs) from 2005 to 2014 indicate violations of NPDES permit number MS0003115 as well as releases of hazardous substances at Outfall 003 (Ref. 22, pp. i, ii, 40 through 45). Outfall 003 discharges into a channel that flows directly into Bayou Casotte, indicating that a release has occurred to the surface water migration pathway (Ref. 12, pp. 1-1a, 3-3) (see Section 4.0 of this HRS documentation record). Bayou Casotte and Mississippi Sound are fished for consumption (Ref. 51).

The MPC facility is located on Bayou Casotte at 601 Industrial Road in Pascagoula, Jackson County, Mississippi (Refs. 5, p. 1; 6, p. 4) (see Figures 1 and 2 of this HRS documentation record). The geographic coordinates of the site as measured from waste sample MPC-WA-08 collected from the East Stack (Source No. 2) are latitude 30º 22' 19.57" north and longitude 88º 29' 27.62" west (Refs. 4; 27, Enclosure 1, p. E1-2). The EPA identification number as recorded in the Superfund Enterprise Management System (SEMS) database is MSN000403508 (Ref. 7). MPC is a former fertilizer production facility that produced diammonium phosphate (DAP) (Refs. 11, p. 2; 13, p. 3; 54). MPC occupies approximately 1,080 acres and consists of two sulfuric acid plants, a phosphoric acid plant, a DAP plant, two phosphogypsum storage piles (West Stack and East Stack) and support facilities (Refs. 5, p. 2; 12, p. 1-1). The East Stack is bordered to the northeast by industrial facilities including Amoco Production Company, Destine Pipeline LLC, and Knight Holding LLC, to the east and south by vacant land, and to the west by industrial facilities (Ref. 8, pp. 1 to 8) (see Figure 2 of this HRS documentation record). The West Stack and plant production area are bordered to the north by a salvage yard and the East Prong of Bayou Casotte, to the east by vacant land, to the southeast by Cheveron Pascagoula Refinery, to the south by First Chemical and the Port of Pascagoula, and to the west by the west prong of Bayou Casotte (Refs. 8, pp. 9, 10; 9, p. 4; 10, p. 46) (see Figures 1 and 2 of this HRS documentation record).

Structures located on the MPC property include two sulfuric acid plants, a phosphoric acid plant, a DAP plant, two phosphogypsum storage piles (East Stack and West Stack), DAP storage warehouses and supporting facilities including a double lime wastewater treatment plant, a rock slurry tank, a gypsum slurry tank, evaporators, scrubbers, and aboveground storage tanks that store molten sulfur, sulfuric acid, phosphoric acid, caustic solution, and ammonia (Refs. 12, pp. 1-1, 1-2; 13, p. 3; 16, pp. 1, 2). The East and West Stacks are referred to as gypsum piles, gypsum storage stacks, and gypstacks in historical documents (Refs. 5, p. 2; 6, p. 4; 9, p. 47; 12, p. 1-1; 16, p. 2). However, the East and West Stacks will be referred to as phosphogypsum storage piles, as documented in the MPC Best Management Practices, November 2008 (Ref. 12, p. 1-1). Additionally, the terms “phosphogypsum” and “gypsum” are used interchangeably in historical documents (Refs. 11, p. 8; 12, pp. 1-2, 2-1). For consistency in this HRS documentation record, the term “phosphogypsum” will be used. Fertilizer manufacturing activities at the MPC facility ceased in December 2014 (Ref. 54). Therefore, phosphogypsum is no longer being stockpiled within the East Stack. For consistency with historical documents, the East Stack is referred to as the active stack throughout this HRS documentation record.

OPERATIONAL HISTORY

MPC began operations in the late 1950s and was a subsidiary of Mississippi Chemical Corporation (MCC) from the early 1990s to 2004. On May 15, 2003, MCC petitioned for Chapter 11 bankruptcy. Under MCC's joint plan of reorganization, Terra Industries, Inc., acquired MCC, and MPC was spun off to be acquired by unsecured creditors. MPC emerged from bankruptcy in 2004 and is wholly owned by Phosphate Holdings, Inc., a publicly traded corporation (Refs. 11, p. 3; 46, pp. 1, 4).

MPC filed Chapter 11 bankruptcy for a second time in October 2014 (Ref. 46, p. 2). Fertilizer and sulfuric acid manufacturing activities ceased in December 2014 (Ref. 54). In July 2015, EPA and MDEQ entered into a court-approved Bankruptcy Settlement Agreement with the Debtor, Debtor's subsidiaries and holding company, and Debtor's pre-petition lenders (Refs. 19, p. 2; 54). The Settlement Agreement created two trusts: (1) a Liquidation Trust (LT) to market salable facility assets, and (2) an Environmental Trust (ET) to take title of the gypsum stacks and wastewater treatment plant and fund response actions to the extent of its assets (Refs. 19; 54). The salable facility assets acquired by the LT include the sulfuric acid plants, phosphoric acid plant, DAP plant, and all real property and all tangible personal property equipment and operations associated with the foregoing (Refs. 19, p. 1; 46, p. 15). In October, 2015, the two trusts took possession of the former MPC properties. Currently, the MPC ET is maintaining the East and West Stacks, operating the waste water treatment plant, and maintaining the water storage system (phosphogypsum ponds located on top of the East Stack, the water return ditch [WRD] surrounding the East Stack, and the cooling loop surrounding the West Stack). The MPC ET is also maintaining the cooling ponds and water storage ponds located on the northern end of the West Stack. The MPC LT is maintaining general site security and performing general site up-keep. Additionally, MPC LT is leasing ammonia tanks to Trans Ammonia. It is expected that Trans Ammonia will terminate the tank lease in late summer 2016 (Ref. 54).

MPC is a former fertilizer production plant that consists of two sulfuric acid plants, a phosphoric acid plant, a DAP plant, two phosphogypsum storage piles, and support facilities (Refs. 12, p. 1-1; 54). The facility produced DAP, a fertilizer used in the agricultural industry in the United States and abroad, in a multi-stage process that involved sulfuric acid, phosphoric acid, and ammonia (Refs. 11, p. 4; 13, p. 3).

The first step in the production of DAP was the manufacture of sulfuric acid (Ref. 11, p. 4). Sulfuric acid was produced in two sulfuric acid plants at MPC, each of which was permitted to produce 1,800 tons of sulfuric acid per day (Ref. 11, p. 4). MPC received a majority of sulfur, a crude oil impurity, from the neighboring Chevron refinery via a direct pipeline. Additional sulfur was purchased from other sources and was received via railcar (Ref. 9, p. 6).

After the manufacture of sulfuric acid, the next step in the production of DAP was manufacturing phosphoric acid. Phosphoric acid was produced by digesting phosphate rock with sulfuric acid (Ref. 11, p. 8). The reaction yielded phosphoric acid and a by-product, calcium sulfate dehydrate, commonly referred to as phosphogypsum. During the reaction, precipitated crystals of phosphogypsum were separated from the acid via filtration and rinsed to recover residual phosphoric acid (Ref. 11, p. 8). After it was rinsed to recover residual phosphoric acid, phosphogypsum was slurried with process wastewater and was pumped to a storage pond located on top of a large phosphogypsum stack. About 5 tons of phosphogypsum were produced for every 1 ton of phosphoric acid produced (Ref. 11, p. 8). The phosphate rock used to manufacture phosphoric acid was delivered to MPC by ship and was stored in a stack located on the northwest side of the plant production area (Ref. 13, p. 3).

The final step in the DAP production process involved neutralization of phosphoric acid with ammonia. The water content from the neutralization was reduced, and the resultant solid ammoniated product was granulated, dried, and cooled to form the final product, DAP (Ref. 11, p. 4). The DAP was stored in warehouses for subsequent distribution (Ref. 13, p. 3). MPC had the capacity to produce 900,000 tons of DAP a year (Ref. 16, p. 1).

Phosphogypsum generated during the phosphoric acid manufacturing process was stockpiled on the property (Ref. 12, p. 1-2). Specifically, the phosphogypsum was slurried with recycled water from the phosphogypsum ponds and pumped to the phosphogypsum pile. As the phosphogypsum settled, the water was decanted and conveyed back to the phosphoric acid plant for reuse (Ref. 12, p. 1-2). MPC managed two phosphogypsum storage piles (stacks) designated as East (active) and West (inactive). The West Stack was established in 1958. In 1994, the West Stack was approaching full capacity and a new East Stack was established to store phosphogypsum once the West Stack was full. The East Stack began receiving phosphogypsum in 2002 when the West Stack began undergoing closure (Refs. 11, p. 8; 16, p. 2). Closure of the West Stack was completed in 2005 (Ref. 11, p. 8). Closure of the West Stack included a study to evaluate the post-closure dewatering behavior of the stack, capping the slopes of the West Stack with geomembrane material, and placing vegetative material on top of the entire West Stack (Refs. 29, p. 7; 44; 54).

During operations, water inventory consisted of recirculated process water and accumulated rainfall stored in a water storage system (Refs. 12, p. 3-3; 17, p. 4). Water was recycled from the water storage system by interconnected piping systems for reuse in plant scrubbers in the DAP and phosphoric acid plants and to slurry and transport phosphogypsum produced in the phosphoric acid plant (Ref. 12, p. 3-3). The scrubber waters were discharged to the cooling loop surrounding the West Stack (Ref. 12, p. 3-3). The slurried phosphogypsum was pumped to the phosphogypsum storage ponds located on top of the East Stack, where the phosphogypsum solids settled out. Water was decanted from the phosphogypsum ponds into the WRD surrounding the East Stack. Transfer pumps then returned the water to the plant for reuse via the phosphoric acid cooling ditch (Ref. 12, p. 3-3). MPC circulated between 16,000 and 20,000 gallons per minute of process water to and from the phosphoric acid plant to the cooling loop and 15,000 gallons per minute to the East Stack (Ref. 17, p. 4).

The water storage system is still present on the property and is being maintained by the MPC ET (Ref. 54). The system includes phosphogypsum storage ponds located on top of the East Stack, the WRD surrounding the East Stack, and the 35-acre cooling loop surrounding the West Stack (Refs. 12, p. 3-3; 17, p. 4). The cooling loop includes two cooling ponds located at the northern end of the West Stack. Two additional ponds located adjacent to the cooling ponds are available for surge storage but are not a part of the cooling loop (Ref. 12, p. 3-3).

Phosphogypsum is primarily composed of calcium sulfate, silicon, phosphate, and fluoride (Ref. 30, p. 370). In 1995, MPC collected five samples of phosphogypsum (Ref. 31, p. 1). Sample #5 contained arsenic, cadmium, chromium, lead, nickel, and zinc (Ref. 31, p. 9). Phosphate process water at MPC contains arsenic (1,000 micrograms per liter [μg/L]), cadmium (700 μg/L), chromium (1,200 μg/L), copper (580 μg/L), lead (40 μg/L), nickel (870 μg/L), and zinc (7,500 μg/L) (Ref. 32, p. 101).

REGULATORY HISTORY

MPC has a long history of regulatory compliance issues. The paragraphs that follow only provide a brief synopsis of the MPC history.

In January 2005, EPA and the Mississippi Department of Environmental Quality (MDEQ) conducted a multimedia compliance evaluation inspection (CEI). In March 2005, EPA, as a follow up to the January 2005 CEI, collected ground water and surface water samples upgradient and downgradient of the West Stack. The results indicated that the downgradient ground water and surface water samples contained constituents of concern (arsenic, cadmium, and lead) justifying additional studies to further characterize the conditions at the facility (Refs. 6, pp. 5, 6, 7; 18, p. 1).

On June 8, 2007, MPC and EPA Region 4 entered into a 3013(a) Resource Conservation and Recovery Act (RCRA) Administrative Order on Consent (AOC) (Ref. 6, pp. i, 3, 4, 25, 26). The AOC was issued based on the 2005 EPA and MDEQ sampling of process water, surface water, and ground water downgradient of the adjacent West Stack that revealed arsenic, cadmium, and lead (Ref. 9, pp. 39, 44, 45, 48, 61, 63, 64; 10, p. 1). The 3013(a) RCRA AOC required additional studies be conducted to further characterize existing surface water and sediment conditions within Bayou Casotte adjacent to the West Stack and downgradient of the of NPDES outfalls (Refs. 6, pp. 9, 10; 10, p. 1; 18, p. 1; 48, p. 1). Four surface water and sediment sampling events have occurred along Bayou Casotte including ground water sampling, both vertically and horizontally, surrounding the West Stack, as well as an additional round of surface water and sediment sampling as required by the AOC (Refs. 18, pp. 1, 2; 48, p. 1).

In July 2009, EPA and MDEQ conducted an inspection of MPC as a part of a nationwide assessment of phosphate based fertilizer facilities. During the inspection, EPA and MDEQ noted evidence of past releases of sulfuric acid to soil and ground water (Refs. 5, p. 2; 9, p. 2). In August 2009, EPA collected ground water samples in the vicinity of the sulfuric acid plants and the DAP plant (Ref. 9, pp. 9, 10, 11, 14, 15). Ground water samples contained arsenic, cadmium, chromium, and lead at concentrations exceeding their respective maximum contaminant levels (MCL) (Ref. 9, pp. 9, 10, 11, 14, 15). These substances were also found in Source Nos. 1, 2 and/or 3 at the site (see Section 2.2 of this HRS documentation record). Additionally, the concentration of chromium (59 milligrams per liter [mg/L]) detected in the temporary monitoring well installed adjacent to the sulfuric acid plant exceeded its toxicity characteristic leaching procedure (TCLP) limit of 5.0 mg/L. EPA stated that the high concentrations of chromium detected in the ground water confirms that MPC has disposed of hazardous waste in sufficient quantity/duration to cause chromium contamination of ground water (Ref. 9, pp. 9, 10, 11, 14, 15).

Subsequently, in September 2009, EPA and MPC entered into an Administrative Order (AOC) under Section 7003(a) of RCRA (Ref. 59, pp. 1, 28). The AOC required MPC to address handling, storage, treatment, transportation and/or disposal of solid and/or hazardous wastes at the facility which may present an imminent and substantial endangerment to human health or the environment (Ref. 59, p. 2). MPC was ordered to address issues pertaining to the sulfuric acid plants, DAP plant, and construction area southwest of the sulfuric acid plants (Ref. 59, pp. 15, 16, 17).

In February 2012, EPA and MPC entered into another 7003(a) RCRA AOC (Ref. 11, pp. 1, 3, 36, 38). The AOC required MPC to develop and implement a plan and timetable to conduct work in several areas of the facility to mitigate the risks posed by the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste that may present an imminent and substantial endangerment to human health and the environment (Ref. 11, pp. 3, 16 through 19). Numerous sampling events have been conducted in accordance with the 7003(a) RCRA AOC and resulting reports include a site characterization report (November 2010), a remedial action plan (January 2011), a ground water monitoring report (July 2012), and an ammonia soil source investigation report (October 2012), among others (Refs. 5; 13; 15; 49).

MPC has 20 permitted NPDES outfalls under Permit Number MS0003115 (Refs. 18, p. 34; 23, pp. i, ii; 44; 45) (see Figure 3 of this HRS documentation record). The outfalls manage contaminated non-process wastewater; treated wastewater; stormwater runoff from non-process areas, shops, offices, roads, railroads, and lawns; and stormwater runoff from the East and West Stacks (Ref. 23, pp. i, ii). All of MPC's 20 NPDES outfalls discharge directly or indirectly into Bayou Casotte (Refs. 9, pp. 15, 16; 23, pp. i, ii; 38, p. 28; 44).

MPC has received several Administrative Orders (AO) and notices of violations from 1989 to 2014 regarding its NPDES permit (Refs. 10, pp. 23, 24; 22, pp. i, ii, 1 through 39). In 1989, MPC received AO 1631-89 for reported exceedances of permit limits, resulting in inadequately treated wastewater being discharged to waters of the state. DMRs from January to July 1989 indicate chronic permit violations of total phosphorus and infrequent discharges that exceed permit limitations for pH, ammonia as nitrogen, and total suspended solids (Ref. 10, pp. 23, 24). In 1995, AO 3061-95 was issued for the release of wastewater from the DAP cooling water ditch to state waters. The release caused toxic conditions to aquatic life in state waters (Ref. 10, p. 24).

Of the NPDES outfalls maintained by MPC, Outfall 003 is the only outfall where permit requirements are established for, and the discharge was monitored for, copper, lead, nickel, and zinc (Refs. 22, pp. i, ii, 1 through 39; 23, pp. 5, 6, 7). Outfall 003 is also monitored and permit levels are established for ammonia as nitrogen (Ref. 23, p. 5).

DMRs from 2005 to 2014 indicate chronic permit violations at Outfall 003 of ammonia as nitrogen (monthly average and daily maximum); copper (monthly average and daily maximum); nickel (monthly average); and zinc (daily maximum) (Ref. 22, pp. i, ii, 1 through 39). In addition to these violations, DMR reports note detectable concentrations of arsenic (up to 0.14 milligrams per liter [mg/L]), cadmium (up to a daily maximum of 0.026 mg/L), chromium (up to a daily maximum of 0.086 mg/L), and lead (up to a daily maximum of 0.011 mg/L) (Ref. 22, pp. 1 through 39).

PREVIOUS INVESTIGATIONS

Multiple investigations have been conducted by MPC beginning in 1998 before the 3013(a) and 7003(a) RCRA AOCs were established. These investigations included sampling ground water, surface water, and sediment (Ref. 50, pp. 1, 2). Additionally, as a result of the 3013(a) and 7003(a) RCRA AOCs, numerous investigations have been conducted at MPC and included collection of ground water, surface water, sediment, and soil samples (Refs. 5, pp. 17, 18, 21, 22, 23; 15, pp. 7, 8; 18, p. 3; 48, pp. 2, 3; 49, p. 1). The paragraphs that follow include information that is most relevant to the scoring in this HRS documentation record.

In 2005, EPA conducted a site inspection (SI) at MPC (Ref. 24, p. 1). During the SI, surface (0 to 12 inches below the surface of the stack [bss]) and subsurface (2 to 4 feet bss) waste samples were collected from an unlined portion of the east side of the West Stack (inactive) where phosphogypsum was exposed at the surface (Ref. 24, pp. 10, 11, 12, 18, 20, Appendix A, pp. A-4, A-5, Appendix D, p. D-12; 33, pp. 1, 8, 14). The samples contained barium, chromium, and lead (Ref. 24, Appendix C, pp. C-20, C-22).

In 2009, MPC provided an inventory and characterization of all influent streams into internal NPDES Outfall 001 pursuant to RCRA AOC 7003(a) (Ref. 43, pp. 1, 3). Samples collected from each influent stream (29 in total) contained arsenic (up to 0.009 mg/L), cadmium (up to 0.042 mg/L), chromium (up to 5.4 mg/L), copper (up to 0.292 mg/L), lead (up to 0.028 mg/L), and zinc (up to 1.29 mg/L) (Ref. 43, p. 3). Outfall 001 and Outfall 002 (both internal outfalls) combine to form Outfall 003, which discharges into a channel that flows directly into Bayou Casotte (Refs. 9, pp. 15, 16; 23, p. i).

In 2016, EPA collected five waste samples (including one duplicate) from the East Stack. The eastern side of the East Stack was inaccessible during the sampling event as a result of construction to increase the freeboard for the phosphogypsum storage ponds (Ref. 27, pp. 1, 2). The samples were collected from 1 to 2 feet bss and contained ammonia as nitrogen, arsenic, barium, cadmium, chromium, lead, vanadium, and zinc (Ref. 27, Enclosure 2, p. E2-1, Enclosure 4, pp. 4-3, 4-4).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 1

Name of source: West Stack (inactive)

Source Type: Pile

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

Source No. 1 is the approximate 219.29 acre unlined inactive West Stack evaluated as a pile (Refs. 9, p. 47; 14, pp. 1, 2) (see Figure 2 of this HRS documentation record). According to the Clean Air Act, a phosphogypsum stack is defined as, "… piles of waste resulting from wet acid phosphorus production, including phosphate mines or other sites that are used for the disposal of phosphogypsum." (Ref. 60). An inactive stack is defined as, "a stack to which no further routine additions of phosphogypsum will be made and which is no longer used for water management associated with the production of phosphogypsum" (Ref. 60).

The approximate West Stack disposal area was determined using the gypsum disposal area, "as built" per the figure provided in Reference 44 as well as the MPC site layout that depicts the features of MPC (Ref. 28, p. 44). The corresponding cooling loop, two cooling ponds, and two surge storage ponds are not included in the area calculation (Ref. 14, p. 1). The cooling loop, two cooling ponds, and two surge storage ponds are discussed in Description of Other Possible On-Site Sources following Table 6 of the HRS documentation record.

The West Stack is underlain by a surficial layer of silty to clayey fine sands that range in thickness from 2 to 10 feet (Refs. 9, p. 47; 29, p. 7). The West Stack was active from approximately 1958 until its closure in 2005 (Ref. 28, p. 2). Phosphogypsum generated during the phosphoric acid manufacturing process for the production of DAP, was stockpiled in the West Stack (Refs. 11, p. 8; 12, p. 1-2; 28, p. 2). Currently, the West Stack is maintained by the MPC ET (Ref. 54).

In 1999, 11 borings were advanced below the surface of the stack (Ref. 29, pp. 7, 12, 46). Borings B-100(99) and B-104(99) were completed to depths of 141.5 feet and 132.5 feet to sample in situ phosphogypsum (Ref. 29, pp. 12, 49, 81 to 85 and 90 to 93). Borings B-105(99) to B-105D(99), completed to depths of 16.5 to 56.5 feet bss, and borings B-101A(99) to B-101D(99), completed to depths of 19.5 to 21.5 bss, represented locations on the exterior surface of the phosphogypsum stack with different age phosphogypsum and phosphogypsum made as a by-product from different phosphate rock (Florida rock and Morocco rock) (Ref. 29, pp. 12, 46, 94). The locations of the borings are depicted on page 46 of Reference 29. Borings advanced from the northern and southern center of the stack contained phosphogypsum to the base of the stack, 135 feet bss and 130 feet bss, respectively (Ref. 29, pp. 46, 81 to 85 and 90 to 93). Borings advanced along the western and eastern slopes of the West Stack contained phosphogypsum to the depth at which the boring was terminated (16.5 feet to 25.5 feet bss) or to the base of the stack (19 feet to 49 feet bss) (Ref. 29, pp. 12, 46, 86 to 89, 94 to 99). The borings noted loose gypsum, loose to medium dense gypsum, medium dense gypsum, dense gypsum, and very dense gypsum. Boring logs are provided in Reference 29, pages 81 to 99.

Source No. 1 is a continuous waste pile that contains hazardous substances throughout its entire extent. The West Stack contains phosphogypsum waste; however, MPC also disposed of lime sludge and sulfur within the West Stack (Ref. 54). Soil was not contemporaneously placed over the phosphogypsum waste disposed of in Source No. 1 (Ref. 54). Only the slopes of the West Stack are capped with geomembrane material; therefore, the entire West Stack is not capped. Vegetative material was placed on top of the entire West Stack (Ref. 54). A figure depicting the final "as built" closed West Stack is contained in Reference 44.

During the 2005 EPA SI, phosphogypsum waste was exposed at the surface in the unlined portion of the West Stack (Refs. 24, pp. 11, 12, Appendix D, p. D-12; 33, p. 14; 44) (see Figure 3 of the HRS documentation record). EPA collected surface (0 to 3 inches bss) and subsurface (2 to 4 feet bss) waste samples from exposed phosphogypsum (Refs. 14, p. 1; 24, pp. 1, 10, 11, 12, 18, 20, Appendix A, pp. A-4, A-5, Appendix D, p. D-12; 33, p. 14; 44). The picture taken at the West Stack sample location (MP-02-SS) depicts a white material similar in appearance to the phosphogypsum waste contained in the East Stack (Refs.24, Appendix D, p. D-12; 27, Enclosure 3, pp. E3-3 to E3-6). Additionally, as noted in the paragraph above, soil was not contemporaneously placed over the phosphogypsum waste disposed of in Source No. 1 (Ref. 54). The Source No. 1 samples contained chromium and lead (Refs. 24, Appendix C, pp. C-20, C-22; 33, pp. 1, 8, 14).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

2005 SI

Surface and subsurface phosphogypsum waste samples listed in Table 1 of this HRS documentation record were collected by EPA during the March 2005 SI (Refs. 14, p. 1; 24, pp. 1, 20; 60). The Source No. 1 samples were collected from a portion of the eastern side of the West Stack, where phosphogypsum was present at the surface (Refs. 24, pp. 20, Appendix D, p. D-12; 33, p. 14) (see Figure 2 of this HRS documentation record).

The Source No. 1 samples were collected in accordance with the EPA-approved abbreviated sampling plan, dated February 17, 2005 (Refs. 24, p. 9; 25). The samples were collected in accordance with the EPA Region 4 Science and Ecosystem Support Division (SESD) Environmental Investigation Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) (Refs. 24, p. 10; 34). The samples were analyzed (for total metals in accordance with EPA Method 200.2 (Refs. 26; 37, pp. 1, 4). All analytical data for the SI were reviewed, validated, and verified by the EPA SESD Quality Assurance Section using the National Functional Guidelines for Inorganic Data Review (October 2004), CLP SOW for Inorganics Analysis, Multi-Media, Multi-Concentration ILM 05.3, and the EPA Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (Refs. 34; 35; 36).

The sample adjusted minimum quantitation limits (MQL) are provided in Reference 37. The adjusted MQLs are adjusted for sample characteristics that may affect quantitation, such as dilutions and percent moisture. The adjusted MQLs are equivalent to sample quantitation limits (SQL) as defined by the HRS (Refs. 1, Section 1.1; 37, pp. 1, 2, 3).

The chain of custody record is provided in Reference 53. The locations of the Source No. 1 samples listed in Table 1 of this HRS documentation record are provided in Reference 24, Appendix A, pp. A-4, A-5 (see Figure 3 of this HRS documentation record).

TABLE 1: Analytical Results for Source No. 1 – March 2005

Sample ID	Hazardous Substance	Hazardous Substance Concentration	Adjusted MQL	Reference
MP02SS	Chromium	7.6A mg/kg	1 mg/kg	24, Appendix C, p. C-22; 37, pp. 1, 2, 3; 53
MP02SS	Lead	2.1A mg/kg	1 mg/kg	24, Appendix C, p. C-22; 37, pp. 1, 2, 3; 53
MP02SB	Chromium	7.2 mg/kg	1 mg/kg	24, Appendix C, p. C-20; 37, pp. 1, 2, 3; 53
MP02SB	Lead	2.4 mg/kg	1 mg/kg	24, Appendix C, p. C-20; 37, pp. 1, 2, 3; 53

Notes:

A The sample was analyzed twice (one laboratory sample analyzed twice). Reported value is "average" of replicates (Refs. 24, Appendix C, p. C-22; 37, pp. 4, 8).
ID Identification
mg/kg Milligrams per kilogram
MQL Minimum quantitation limit
MP Mississippi Phosphates Corporation
SS Surface
SB Subsurface

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Source No. 1 samples contained chromium and lead (see Table 1 of this HRS documentation record). Source No. 1 is a continuous waste pile that contains hazardous substances throughout its entire extent. The West Stack contains phosphogypsum waste; however, MPC also disposed of lime sludge and sulfur within Source No. 1 (Ref. 54).

The West Stack was active from approximately 1958 until 2005 (Ref. 28, p. 2). Only the slopes of the West Stack are capped with geomembrane material. The entire West Stack is not capped. Vegetative material was placed on top of the entire West Stack (Ref. 54).

Fifteen piped catch basins or drains are located on top of the West Stack. These piped catch basins or drains discharge storm water runoff from the West Stack into Bayou Casotte at 14 NPDES Outfall locations. These Outfalls include 006B1, 006B2, 007B, 007I, 007S, 007T1, 007T2, 008B, 008I1, 008I2, 008S, 008T, 009B, 009S. Reference No. 44 of this HRS documentation record depicts the locations of the catch basins or drains (also see Figure 3 of this HRS documentation record). Catch basins or drains related to Outfalls 008B, 008I1, 008I2, 008S, 008T, 009B, and 009S are located on the northern portion of the West Stack and discharge to the East Prong of Bayou Casotte (Refs. 9, p. 16; 23, pp. i, ii; 44) (see Figure 3 of this HRS documentation record). Catch basins or drains related to Outfalls 006B1, 006B2, 007B, 007I, 007S, 007T1, and 007T2 are located on the southern portion of the West Stack and discharge to Bayou Casotte or to internal Outfall 001, which eventually discharges into Bayou Casotte (Refs. 9, pp. 15, 16; 20, p. 10; 21, p. 1; 23, pp. i, ii; 44) (see Figure 3 of this HRS documentation record).

EPA Enforcement and Compliance History Online (ECHO) provides effluent charts for MPC's NPDES permit. Effluent charts are available for Outfalls 006, 007, 008, and 009. Effluent charts are not available for each NPDES Outfall associated with 006, 007, 008, and 009 (Outfalls 006B1, 006B2, 007B, 007I, 007S, 007T1, 007T2, 008B, 008I1, 008I2, 008S, 008T, 009B, and 009S) (Ref. 56, p. 1, 6 to 9). Instead, one composite sample is collected from each individual NPDES Outfall associated with Outfalls 006, 007, 008, and 009. For example, the composite sample for Outfall 007 is composed of water collected from each of the five individual pipes associated with NPDES Outfalls 007B, 007T1, 007I, 007T2, and 007S (Ref. 22, p. ii). The effluent charts downloaded from ECHO for 2013 to 2016 show ammonia was discharged through Outfalls 006, 007, 008, and 009 at concentrations up to 26.8 mg/L in 2014 (Ref. 56, pp. 1, 6 to 9). Ammonia as nitrogen was not analyzed for in samples collected from Source No. 1 (Ref. 24, p. 16). However, ECHO data from Outfall 007 demonstrates that ammonia as nitrogen has migrated from the source area (Ref. 56, pp. 1, 7).

NPDES Outfalls 007B, 007T1, 007I, 007T2, and 007S receive storm water runoff from the southern portion of Source No. 1 before discharging directly into Bayou Casotte (Refs. 9, p. 16; 23, pp. i, ii; 44) (see Figure 3 of this HRS documentation record). Outfall 007 is monitored for the classical nutrient total ammonia as nitrogen (Ref. 23, pp. i, 18 – 27). The effluent charts downloaded from ECHO for 2014 to 2016 show ammonia as nitrogen was discharged through Outfall 007 at concentrations up to 26.8 mg/L (Ref. 56, pp. 1, 7). Therefore, runoff from the source, which has partially exposed wastes and no engineered cover, is ultimately discharged directly into surface water providing evidence of migration via

Outfall 007. Thus, a containment factor of 10, as noted in Table 2 of this HRS documentation record, was assigned for the surface water migration pathway (Refs. 1, Section 4.1.2.1, Table 4-2; 54).

TABLE 2: Containment Factors for Source No. 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 to surface water: no continuous engineered cover and runoff from the source is discharged into surface water	10	9, pp. 15, 16; 23, p. i; 54

Notes:

NA Not applicable
NS Not scored

2.4.2.1 HAZARDOUS WASTE QUANTITY

Insufficient information exists to evaluate Hazardous Constituent Quantity, Hazardous Wastestream Quantity, and Volume. Therefore, the hazardous waste quantity value will be calculated using Tier D, the area of the pile (Ref. 1, Section 2.4.2.1).

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) – Not Evaluated

The Hazardous Constituent Quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all 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, potentially responsible party [PRP] records, state records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the Hazardous Constituent Quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, Hazardous Wastestream Quantity (Ref. 1, Section 2.4.2.1.2).

Hazardous Constituent Quantity Assigned Value: Not Evaluated
Are the data complete for hazardous constituent quantity for this area? No

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B) – Not Evaluated

The Hazardous Wastestream Quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the mass of the hazardous wastestreams plus the mass of any additional CERCLA pollutants and contaminants in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.2). There are insufficient historical and current data (manifests, PRP records, state records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of the wastestream plus the mass of all CERCLA pollutants and contaminants in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier C, Volume (Ref. 1, Section 2.4.2.1.3).

Hazardous Wastestream Quantity Assigned Value: Not Evaluated
Are the data complete for hazardous wastestream quantity for this area? No

2.4.2.1.3 Volume (Tier C)

The information available on the depth of Source No. 1 is not sufficiently specific to support an exact volume of the pile with reasonable confidence; therefore, it is not possible to assign a volume (Tier C) in cubic yards (yd^3) for Source No. 1 (Ref. 1, Section 2.4.2.1.3). Source No. 1 has been assigned a value of 0 for the volume measure (Ref. 1, Section 2.4.2.1.3). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier D, area (Ref. 1, Sec. 2.4.2.1.4).

Volume Assigned Value: 0
Are the data complete for volume quantity for this area? No

2.4.2.1.4 Area

The approximate area of Source No. 1 is 9,552,272.4 square feet (219.29 acres) (Ref. 14, p. 1) (see Figure 3 of this HRS documentation record) (Ref. 1, Section 2.4.2.1.4). The approximate West Stack disposal area was determined using the gypsum disposal area, "as built" per the figure provided in Reference 44, as well as the MPC site layout that depicts the features of MPC (Ref. 28, p. 44). To determine the size of the West Stack, aerial imagery was used to visually draw the area and calculate the acreage using mapping software (Ref. 14). The area of Source No. 1 is based on the area covered by the pile. Source No. 1 is a continuous waste pile that contains hazardous substances throughout its entire extent (Ref. 54). The associated cooling loop, two cooling ponds, and two surge storage ponds are not included in the area calculation (Ref. 14).

Sum (square feet): 9,552,272.4
Equation for Assigning Value (Table 2-5): Area (A)/13

Area Assigned Value: 734,790.18

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity (HWQ) value for Source No. 1 is 734,790.18 (Ref. 1, Section 2.4.2.1.5).

Source HWQ Value: 734,790.18

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 2

Name of source: East Stack

Source Type: Pile

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

Source No. 2 is the approximate 119.69-acre active East Stack evaluated as a pile (Ref. 14, pp. 1, 3) (see Figure 2 of this HRS documentation record). According to the Clean Air Act, a phosphogypsum stack is defined as, "… piles of waste resulting from wet acid phosphorus production, including phosphate mines or other sites that are used for the disposal of phosphogypsum." (Ref. 60).

The approximate East Stack disposal area was determined using the MPC site layout that depicts the features of MPC (Ref. 47, p. 36). The corresponding storage ponds located on top of the East Stack and the WRD that surrounds the East Stack are not included in the area calculation (Ref. 14, pp. 1, 3). The storage ponds and the WRD are discussed in Description of Other Possible On-Site Sources following Table 6 of this HRS documentation record.

Source No. 2 was built on the former Jackson County Airport. The airport was closed when the new Trent Lott International Airport opened in 1990 (Refs. 9, p. 49; 55, pp. 26 to 35; 58). The East Stack began receiving phosphogypsum in 2002 when the West Stack began undergoing closure (Refs. 11, p. 8; 16, p. 2). The East Stack has a natural clay subsurface barrier and a slurry wall to prevent lateral migration of process wastewater (Ref. 17, p. 4). The East Stack is permitted by the State of Mississippi as a Sub-Title D landfill and operates under Permit No. SW-0300040452, issued March 25, 1997 (Ref. 17, p. 4).

Fertilizer and sulfuric acid manufacturing activities at the MPC facility ceased in December 2014 (Ref. 54). Phosphogypsum is no longer being stockpiled within the East Stack and it is inactive at this time. On July 23, 2015, the EPA and the MDEQ entered into a court-approved Bankruptcy Settlement Agreement with the Debtor, Debtor's subsidiaries and holding company, and the Debtor's pre-petition lenders. The Settlement Agreement created two Trusts, which took possession of the former MPC properties October 16, 2015. Currently, one Trust is maintaining the East and West Stacks (Source Nos. 1 and 2) (Ref. 54).

Source No. 2 is a continuous waste pile that contains hazardous substances throughout its entire extent. Source No. 2 contains phosphogypsum waste and the waste is homogenous (Ref. 54). Soil was not contemporaneously placed over the phosphogypsum waste within Source No. 2. Source No. 2 does not contain a cover, phosphogypsum waste is present at the surface of the stack (Ref. 54). Currently, the MPC ET is maintaining Source No. 2 (Ref. 54).

In 2016, EPA, collected five waste samples (including one duplicate) from the East Stack. A portion of the East Stack was inaccessible during the sampling event as a result of construction to increase the freeboard for the phosphogypsum storage ponds (Ref. 27, p. 2). The waste samples were collected from 1 to 2 feet bss and contained ammonia as nitrogen, arsenic, cadmium, chromium, lead, and zinc (Ref. 27, Enclosure 2, Table 1, Enclosure 4, pp. E4-3, E4-4).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

January 2016 Source Sampling

Waste samples listed in Table 3 of this HRS documentation record were collected by EPA during the January 2016 source sampling event (Ref. 27, pp. 1, 2, Enclosure 2, Table 1, Enclosure 4, pp. E4-3, E4-4). The waste samples were collected at depths ranging from 1 to 2 feet bss (Ref. 27, p. 2, Enclosure 4, pp. E4-3, E4-4).

The Source No. 2 samples were collected in accordance with the EPA-approved quality assurance project plan (QAPP) (Refs. 27, p. 2; 39). The samples were analyzed by the EPA Region 4 SESD Analytical Support Branch (ASB) for total metals and ammonia using EPA Methods 200.8/6010/245.1/245.5/350.1 (Refs. 27, p. 1, Attachment 1, p. 15; 41, Chapter 6, Appendix 1, Appendix 2). The analysis was performed in accordance with the ASB Laboratory Operations and Quality Assurance Manual (LOQAM) (Refs. 35; 41, Appendices 1 and 2). The minimum reporting limits (MRL) are contained in Reference 27. 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. 42).

The chain of custody record is provided in Reference 40. The locations of the source samples listed in Table 3 of this HRS documentation record are provided in Reference 27, Enclosure 1, Figure 2 (see Figure 4 of this HRS documentation record).

TABLE 3: Analytical Results for Source No. 2 – January 2016

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MRL	Reference
MPC-WA-05	Cadmium	2.1 mg/kg	0.25 mg/kg	27, Attachment 1, p. 21; 40
MPC-WA-05	Lead	1.1 mg/kg	0.20 mg/kg	27, Attachment 1, p. 21; 40
MPC-WA-05D	Cadmium	2.0 mg/kg	0.099 mg/kg	27, Attachment 1, p. 22; 40
MPC-WA-05D	Lead	0.98 mg/kg	0.20 mg/kg	27, Attachment 1, p. 22; 40
MPC-WA-06	Ammonia as Nitrogen	11 mg/kg	2.5 mg/kg	27, Attachment 1, p. 9; 40
MPC-WA-06	Cadmium	2.2 mg/kg	0.097 mg/kg	27, Attachment 1, p. 23; 40
MPC-WA-06	Chromium	5.6 mg/kg	4.9 mg/kg	27, Attachment 1, p. 23; 40
MPC-WA-06	Lead	1.1 mg/kg	0.19 mg/kg	27, Attachment 1, p. 23; 40
MPC-WA-07	Cadmium	1.8 mg/kg	0.097 mg/kg	27, Attachment 1, p. 24; 40

TABLE 3: Analytical Results for Source No. 2 – January 2016				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MRL**	**Reference**
MPC-WA-07	Lead	1.1 mg/kg	0.19 mg/kg	27, Attachment 1, p. 24; 40
MPC-WA-08	Ammonia as Nitrogen	32 mg/kg	2.2 mg/kg	27, Attachment 1, p. 11; 40
MPC-WA-08	Arsenic	1.6J, QR-2 mg/kg	0.49 mg/kg	27, Attachment 1, p. 25; 40
MPC-WA-08	Cadmium	3.0 mg/kg	0.098 mg/kg	27, Attachment 1, p. 25; 40
MPC-WA-08	Chromium	18 mg/kg	4.9 mg/kg	27, Attachment 1, p. 25; 40
MPC-WA-08	Lead	1.7 mg/kg	0.20 mg/kg	27, Attachment 1, p. 25; 40
MPC-WA-08	Zinc	14 mg/kg	9.8 mg/kg	27, Attachment 1, p. 25; 40

Notes:

D	Duplicate
ID	Identification
J	The identification of the analyte is acceptable; the reported value is an estimate with a high bias (Refs. 27, Attachment 1, p. 18; 57).
mg/kg	Milligrams per kilogram
MRL	Minimum reporting limit
MPC	Mississippi Phosphates Corporation
QR-2	MRL verification recovery greater than upper control limits
WA	Waste

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Waste samples collected from Source No. 2 contained ammonia as nitrogen, arsenic, cadmium, chromium, lead, and zinc (see Table 3 of this HRS documentation record). Source No. 2 is a continuous waste pile that contains hazardous substances throughout its entire extent. Source No. 2 consists of phosphogypsum waste and the waste is homogeneous (Ref. 54). The East Stack began receiving phosphogypsum in 2002 (Ref. 9, p. 47).

NPDES Outfall 005 receives storm water runoff from Source No. 2 (Ref. 23, p. i). The outfall flows west from the East Stack, underneath Industrial Road (Highway 611), and joins Outfall 009 at the northeastern corner of the West Stack cooling and storage ponds (Refs. 9, pp. 15, 16; 23, p. i; 44) (see Figures 3 and 4 of this HRS documentation record). The combined flow from Outfalls 005 and 009 (associated Outfalls 009S and 009B) discharges directly to Bayou Casotte (Ref. 9, p. 16; 44). EPA ECHO provides effluent charts for MPC's NPDES permit (Ref. 56, p. 1). Outfall 005 is monitored for the classical nutrient total ammonia as nitrogen (Ref. 23, pp. i, 12, 13). The effluent charts downloaded from ECHO for 2014 to 2016 show ammonia as nitrogen was discharged through Outfall 005 at concentrations up to 0.43 mg/L (Ref. 56, pp. 1, 5). Ammonia as nitrogen has migrated from the source area; therefore, a containment factor value of 10, as noted in Table 4 of this HRS documentation record, was assigned for the surface water migration pathway (Ref. 1, Section 4.1.2.1, Table 4-2).

TABLE 4: Containment Factors for Source No. 2

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 to surface water via overland migration by direct observation; no engineered cover	10	54; 56, pp. 1, 5

Notes:

NA Not applicable
NS Not scored

2.4.2.1 HAZARDOUS WASTE QUANTITY

Insufficient information exists to evaluate Hazardous Constituent Quantity, Hazardous Wastestream Quantity, and Volume. Therefore, the hazardous waste quantity value will be calculated using Tier D, the area of the pile (Ref. 1, Section 2.4.2.1).

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) – Not Evaluated

The Hazardous Constituent Quantity for Source No. 2 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, potentially responsible party [PRP] records, state records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the Hazardous Constituent Quantity for Source No. 2 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, Hazardous Wastestream Quantity (Ref. 1, Section 2.4.2.1.2).

Hazardous Constituent Quantity Assigned Value: Not Evaluated
Are the data complete for hazardous constituent quantity for this area? No

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B) – Not Evaluated

The Hazardous Wastestream Quantity for Source No. 2 could not be adequately determined according to the HRS requirements; that is, the mass of the hazardous wastestreams plus the mass of any additional CERCLA pollutants and contaminants in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.2). There are insufficient historical and current data (manifests, PRP records, state records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of the wastestream plus the mass of all CERCLA pollutants and contaminants in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 2 with reasonable confidence. Scoring proceeds to the evaluation of Tier C, Volume (Ref. 1, Section 2.4.2.1.3).

Hazardous Wastestream Quantity Assigned Value: Not Evaluated
Are the data complete for hazardous wastestream quantity for this area? No

2.4.2.1.3 Volume (Tier C)

The information available on the depth of Source No. 2 is not sufficiently specific to support an exact volume of the pile with reasonable confidence; therefore, it is not possible to assign a volume (Tier C) in cubic yards (yd^3) for Source No. 2 (Ref. 1, Section 2.4.2.1.3). Source No. 2 has been assigned a value of 0 for the volume measure (Ref. 1, Section 2.4.2.1.3). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier D, area (Ref. 1, Sec. 2.4.2.1.4).

Volume Assigned Value: 0
Are the data complete for volume quantity for this area? No

2.4.2.1.4 Area

The area of Source No. 2 is approximately 5,213,696.4 square feet (119.69) acres (Ref. 14, pp. 1, 3) (see Figure 4 of this HRS documentation record) (Ref. 1, Section 2.4.2.1.4). The approximate East Stack disposal area was determined using the MPC site layout that depicts the features of MPC (Ref. 47, p. 36). To determine the size of the East Stack, aerial imagery was used to visually draw the area and calculate the acreage using mapping software (Ref. 14). The area of Source No. 2 is based on the area covered by the pile. Source No. 2 is a continuous waste pile that contains hazardous substances throughout its entire extent. Source No. 2 contains phosphogypsum waste and the waste is homogenous (Ref. 54). The corresponding storage ponds located on top of the East Stack and the WRD that surrounds the East Stack are not included in the area calculation (Ref. 14, pp. 1, 3).

Sum (square feet): 5,213,696.4
Equation for Assigning Value (Table 2-5): Area (A)/13

Area Assigned Value: 401,053.56

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 2 is 401,053.56 (Ref. 1, Section 2.4.2.1.5).

Source HWQ Value: 401,053.56

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 3

Name of source: NPDES Outfall 003

Source Type: Other

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

Source No. 3 is NPDES Outfall 003, a designated process related waste stream that receives effluent from NPDES internal Outfalls 001 and 002 (Ref. 23, p. i; 38, p. 28). Outfall 001 is located in a drainage ditch adjacent to the cooling loop along the southwestern corner of the West Stack. Outfall 002 is located about 455 feet downstream of Outfall 001. Outfalls 001 and 002 combine to form Outfall 003, about 135 feet downstream of Outfall 002. Outfall 003 is located within Bayou Casotte (Refs. 9, pp. 15, 16; 23, p. i; 45, pp. 1, 2, 3) (see Figure 3 of this HRS documentation record).

During operations, water inventory consisted of recirculated process water and accumulated rainfall that was maintained using a water storage system (Ref. 12, p. 3-3). When it was necessary to discharge process water from the water storage system, water was pumped from the phosphoric acid plant to the water treatment plant, where it was treated and then discharged through Outfall 002, which combines with Outfall 001 (Ref. 12, pp. 1-1a, 3-3).

Outfall 001 is an internal outfall for contaminated non-process wastewater from process areas, including industrial non-contact cooling water, pump seal water, cooling tower blowdown (containing chromium), boiler blowdown, steam condensate, plant storm water runoff, closed phosphogypsum stack storm water runoff from internal outfall 006-B2 (outfall for West Stack runoff), and demineralized backwash water (Refs. 20, p. 10; 21, p. 1; 23, p. i). This water is manually treated to adjust for pH and moves in an earthen channel upstream of Outfall 003 (Ref. 38, p. 28; 45, p. 2). Outfall 002 is an internal outfall for treated wastewater originating from the calcium sulfate storage pile (phosphogypsum stack) runoff (Ref. 23, p. i). Outfalls 001 and 002 combine to form Outfall 003 in an earthen ditch system that discharges into a channel that flows directly into Bayou Casotte (Refs. 9, pp. 15, 16; 23, p. i). Additionally, Outfall 003 is used to discharge overflow from internal Outfall 001(Ref. 23, pp. i, ii).

DMRs for 2005 to 2014 indicate hazardous substances including ammonia as nitrogen, arsenic, cadmium, chromium, copper, lead, nickel, and zinc have been discharged from Source No. 3 as documented in Section 4.1.2.1.1, Observed Release of this HRS documentation record. Additionally, NPDES permit violations have been documented for ammonia as nitrogen, copper, nickel, and zinc (see Table 7 of this HRS documentation record).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Hazardous substances including ammonia as nitrogen, arsenic, cadmium, chromium, copper, lead, nickel, and zinc have been discharged from Source No. 3. Additionally, NPDES permit violations of ammonia as nitrogen, copper, nickel, and zinc have been documented at Source No. 3 (see Table 7 of this HRS documentation record). For the presentation of analytical results documenting hazardous substances associated with Source No. 3, see Section 4.1.2.1.1 of this HRS documentation record and Figure 3 for sample locations.

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Source No. 3 receives contaminated non-process wastewater from process areas and treated wastewater originating from the calcium sulfate storage pile (phosphogypsum stack) runoff, which are pumped through Outfalls 001 and 002 and discharged into Bayou Casotte through Source No. 3 (Refs. 9, pp. 15, 16; 20, p. 10; 21, p. 1; 23, p. i; 38, p. 28; 45, p. 2).

DMRs from 2005 to 2014 indicate chronic permit violations at Source No. 3 of ammonia as nitrogen, copper, nickel, and zinc (Ref. 22, pp. i, ii, 1 through 39). Additionally, DMRs also indicate the presence of arsenic, cadmium, chromium, and lead at Source No. 3 (Ref. 22, pp. i, ii, 1 through 39). Source No. 3 discharges into a channel that flows directly into Bayou Casotte (Refs. 9, pp. 15, 16; 23, p. i). Therefore, a containment factor value of 10, as noted in Table 5 of this HRS documentation record, was assigned for the surface water migration pathway (Ref. 1, Section 4.1.2.1, Table 4-2).

TABLE 5: Containment Factors for Source No. 3

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 to surface water by direct observation	10	22, pp. i, ii, 1 through 39

Notes:

NA Not applicable
NS Not scored

2.4.2.1 HAZARDOUS WASTE QUANTITY

Insufficient information exists to evaluate Hazardous Constituent Quantity, Hazardous Wastestream Quantity, and Volume. Therefore, the hazardous waste quantity value will be calculated using Tier C, the volume of wastewater (Ref. 1, Section 2.4.2.1).

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) – Not Evaluated

The Hazardous Constituent Quantity for Source No. 3 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, potentially responsible party [PRP] records, state records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the Hazardous Constituent Quantity for Source No. 3 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, Hazardous Wastestream Quantity (Ref. 1, Section 2.4.2.1.2).

Hazardous Constituent Quantity Assigned Value: Not Evaluated
Are the data complete for hazardous constituent quantity for this area? No

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The source is assigned a value for hazardous wastestream quantity using the Tier B equation from Table 2-5 (Ref. 1, Section 2.4.2.1.2). EPA ECHO provides effluent data on MPC's NPDES permit (Ref. 56, p. 1). Data downloaded from EPA ECHO provides the monthly average effluent flow through Source No. 3 in 2015 and concentrations of ammonia discharged from January 2015 to January 2016 (Ref. 56, pp. 1, 2, 4). The definition of monthly average as provided in the NPDES Permit is as follows, "the average of 'daily discharges' over a calendar month, calculated as the sum of all 'daily discharges' measured during a calendar month divided by the number of 'daily discharges' measured during a month." The definition of daily discharge as provided in the NPDES Permit (Ref. 23) is as follows, "the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling…" (Ref. 23, p. 53).

To determine the total amount of effluent discharged through Outfall 003 in the months of January through December 2015, the number of days for each month was multiplied by the monthly average effluent flow through Source No. 3 (Ref. 56, pp. 1, 2, 3).

Total effluent quantity through Source No. 3 in 2015 – 986,370,000 gallons (Ref. 56, pp. 1, 2, 3)

Hazardous Wastestream Quantity (pounds): 986,370,000 gallons x 10 pounds/gallon = 9,863,700,000 pounds
Equation for Assigning Value (Ref. 1, Table 2-5): Hazardous Wastestream Quantity/5,000 = 1,972,740

Hazardous Wastestream Quantity Assigned Value: 1,972,740
Are the data complete for hazardous wastestream quantity for this area? No

2.4.2.1.3 Volume (Tier C)

The source is assigned a value for volume using the appropriate Tier C equation from Table 2-5 (Ref. 1, Section 2.2.4.2.3). EPA ECHO provides effluent data on MPC's NPDES permit (Ref. 56, p. 1). Data downloaded from EPA ECHO provides the monthly average effluent flow through Source No. 3 in 2015 and concentrations of ammonia discharged from January 2015 to January 2016 (Ref. 56, pp. 1, 2, 4). The definition of monthly average as provided in the NPDES Permit is as follows, "the average of 'daily discharges' over a calendar month, calculated as the sum of all 'daily discharges' measured during a calendar month divided by the number of 'daily discharges' measured during a month." The definition of daily discharge as provided in the NPDES Permit (Ref. 23 of this HRS documentation record) is as follows, "the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling…" (Ref. 23, p. 53).

To determine the total amount of effluent discharged through Outfall 003 in the months of January through December 2015, the number of days for each month was multiplied by the monthly average effluent flow through Source No. 3 (Ref. 56, pp. 1, 2, 3).

Total effluent quantity through Source No. 3 in 2015 – 986,370,000 gallons (Ref. 56, pp. 1, 2, 3)

Volume (cubic yards): 986,370,000 gallons ÷ 200 gallons/cubic yard = 4,931,850 cubic yards (Ref. 56, p. 1)
Equation for Assigning Value (Ref. 1, Table 2-5): Volume/2.5

Volume Assigned Value: 1,972,740
Are the data complete for volume quantity for this area? No

2.4.2.1.4 Area

The area measure (Tier D) is not evaluated for Source type "other" (Ref. 1, Table 2-5).

Area Assigned Value: 0
Are the data complete for area quantity for this area? No

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source No. 3 was evaluated based on hazardous wastestream quantity, Tier B. The volume of contaminated wastewater discharged to Source No. 3, NPDES Outfall 003, in 2015 is 986,370,000 gallons. MPC has discharged contaminated wastewater through Outfall 003 for greater than 1 year; however, Source No. 3 receives the maximum hazardous waste quantity factor value of 1,000,000 (see Table 8 of this HRS documentation record) based on DMR discharge records for 2015. Therefore, determining the amount of contaminated wastewater discharged through Outfall 003 during multiple years will not increase the hazardous waste quantity factor value. Therefore, the source hazardous waste quantity value for Source No. 3 is 1,972,740.

Source HWQ Value: 1,972,740

SUMMARY OF SOURCE DESCRIPTIONS

TABLE 6: Summary of Source Descriptions						
			Containment Factor Value by Pathway			
					Air	
Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Ground Water (Ref. 1, Table 3-2)	Surface Water Overland/ Flood (Ref. 1, Table 4-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	734,790.18	No	NS	10	NS	NS
2	401,053.56	No	NS	10	NS	NS
3	1,972,740	No	NS	10	NS	NS

Notes:

NS Not scored

Description of Other Possible On-Site Sources

Other possible on-site sources include contaminated soil located in the vicinity of the sulfuric acid plant, acid storage tank area, DAP area, construction area, and former ammonia plant (Refs. 5, pp. 17, 18, 54, 79 to 92; 15, pp. 7, 8, 15, 17).

In 2010, Eco-Systems, Inc. (Eco-Systems), conducted a site investigation at MPC on behalf of Butler, Snow, O'Mara, Stevens & Cannada, PLLC (Butler Snow) (Ref. 5, pp. 1, 17). The investigation was conducted to achieve compliance with the requirements of the 7003(a) RCRA AOC (Ref. 5, p. 4). Surface and subsurface soil samples were collected in the vicinity of the sulfuric acid plant, acid storage tank area, DAP area, and construction area (Ref. 5, pp. 17, 18, 54). The samples were analyzed for phosphorus, sulfate, arsenic, cadmium, chromium, lead, selenium, and thallium (Ref. 5, p. 18). The samples contained arsenic (up to 47 milligrams per kilogram [mg/kg]), cadmium (up to 190 mg/kg), chromium (up to 620 mg/kg), lead (up to 250 mg/kg), selenium (up to 2.5 mg/kg), and thallium (0.76 mg/kg) (Ref. 5, pp. 79 to 92).

In 2012, Eco-Systems conducted a source soil investigation at MPC on behalf of Butler Snow (Ref. 15, pp. 1, 7). The investigation was conducted to achieve compliance with the requirements of the 7003(a) RCRA AOC (Ref. 15, p. 3). During the investigation, shallow soil borings were advanced in the former ammonia plant area to investigate the potential ammonia impacts to soils (Ref. 15, pp. 7, 14, 15). Twenty four soil samples were collected at depths ranging from 2 to 6 feet below ground surface (bgs) and analyzed for ammonia as nitrogen (Ref. 15, pp. 7, 8, 17). The samples contained ammonia as nitrogen at concentrations ranging from 49.1 mg/kg to 728 mg/kg (Ref. 15, p. 17).

Additional Areas of Concern

The areas listed below are a concern for the EPA; however, sampling data are not available for each of these areas of concern. Additional information regarding these areas of concern are discussed in the Site Description, Operational History, and Regulatory History Sections of this HRS documentation record.

- Cooling loop that surrounds Source No. 1
- Cooling ponds that are at the northern extent of Source No. 1
- Storage ponds located adjacent to Source No. 1
- WRD that surrounds Source No. 2
- Storage ponds located on top of Source No. 2

In addition to the lack of sampling data, detailed information and current status for the areas of concern listed below is not available.

- Double lime wastewater treatment plant (Ref. 12, p. 1-1)
- Gypsum slurry tank (Ref. 16, p. 2)
- Scrubbers (Ref. 12, p. 1-1)
- Above ground storage tanks that store molten sulfur, sulfuric acid, phosphoric acid, caustic solution, and ammonia (Ref. 13, p. 3)

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT – Bayou Casotte

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 is maintained by 15 catch basins or drains located on top of Source No. 1 that discharge into Bayou Casotte at 14 individually piped NPDES Outfall locations (Ref. 44). These Outfalls include 006B1, 006B2, 007B, 007I, 007S, 007T1, 007T2, 008B, 008I1, 008I2, 008S, 008T, 009B, 009S. Reference 44 depicts the catch basins or drains and the corresponding NPDES outfall locations (also see Figure 3 of this HRS documentation record). Catch basins or drains related to Outfalls 008B, 008I1, 008I2, 008S, 008T, 009B, and 009S are located on the northern portion of Source No. 1 and discharge to the East Prong of Bayou Casotte (Refs. 9, p. 16; 23, pp. i, ii; 44) (see Figure 3 of this HRS documentation record). Catch basins or drains related to Outfalls 006B1, 006B2, 007B, 007I, 007S, 007T1, and 007T2 are located on the southern portion of Source No. 1 and discharge to Bayou Casotte or to internal Outfall 001, which eventually discharges to Bayou Casotte through Outfall 003 (Refs. 9, pp. 15, 16; 23, pp. i, ii; 38, p. 28; 44). The locations of these catch basins/drains and corresponding NPDES Outfalls are depicted in Reference 44 (see Figure 3 of this HRS documentation record).

Overland flow from Source No. 2 is maintained by NPDES Outfall 005 located at the southwestern corner of Source No. 2 (Refs. 23, p. i; 44) (see Figures 2 and 3 of this HRS documentation record). Outfall 005 flows west from Source No. 2, underneath Industrial Road (Highway 611), and joins Outfall 009 at the northeastern corner of the West Stack cooling and storage ponds (see Figure 3 of this HRS documentation record) (Refs. 9, p. 16; 23, p. i; 44).

Overland flow from Source No. 3 (NPDES Outfall 003) enters Bayou Casotte (Ref. 9, pp. 15, 16; 23, p. i; 38, p. 28).

In all cases the overland flow distance between a source and that source's PPEs is well within two miles. See Figure 3 of this HRS documentation record.

<u>PPEs Associated with Source No. 1</u>

PPEs associated with Source No. 1, beginning with the most upstream PPE, includes PPE 1 (Outfall 009S), PPE 2 (Outfall 009B), PPE 3 (Outfall 008B), PPE 4 (Outfall 008I1), PPE 5 (Outfall 008T), PPE 6 (Outfall 008I2), PPE 7 (Outfall 008S), PPE 8 (Outfall 007B), PPE 9 (Outfall 007T1), PPE 10 (Outfall 007I), PPE 11 (Outfall 007T2), PPE 12 (Outfall 007S), and PPE 13 (Outfall 006B1). The locations of the PPEs are depicted on Figure 3 of this HRS documentation record.

PPE 1 is located at Outfall 009S. PPE 2 is located at Outfall 009B (see Figure 3 of this HRS documentation record). Outfalls 009S and 009B receive storm water runoff from the northern portion of Source No. 1. PPE 1 (Outfall 009S) is about 10 feet upstream of PPE 2 (Outfall 009B) (Ref. 44). These PPEs are located within the East Prong of Bayou Casotte, near the northeastern corner of the West Stack cooling and storage ponds (Ref. 44). From these PPEs, surface water flows about 0.7 mile into the East Prong of Bayou Casotte (see Figure 3 of this HRS documentation record).

PPE 3 is located at Outfall 008B. PPE 4 is located at Outfall 008I1. PPE 5 is located at Outfall 008T. PPE 6 is located at Outfall 008I2. These outfalls receive storm water runoff from the northern portion of Source No. 1 and discharge into the East Prong of Bayou Casotte (Refs. 23, pp. i, ii; 44) (see Figure 3 of this HRS documentation record). As depicted in Reference 44, the distance between the most upstream PPE (Outfall 008B) and the most downstream PPE (Outfall 008I2) is about 30 feet. From these PPEs, surface water flows about 0.22 mile before reaching Bayou Casotte (Ref. 44) (see Figure 3 of this HRS documentation record).

PPE 7 is located at Outfall 008S. Outfall 008S receives storm water runoff from the northern portion of Source No. 1 and is located on the East Prong of Bayou Casotte (Refs. 9, p. 16; 23, p. i; 44) (see Figure 3 of this HRS documentation record). From PPE 7, surface water flows about 0.12 mile before reaching Bayou Casotte (Ref. 44) (see Figure 3 of this HRS documentation record).

PPE 8 is located at Outfall 007B. PPE 9 is located at Outfall 007T1. PPE 10 is located at 007I. PPE 11 is located at 007T2. PPE 12 is located at 007S. These outfalls receive storm water runoff from the southern portion of Source No. 1, and discharge into Bayou Casotte (Refs. 9, p. 16; 23, pp. i, ii; 44) (see Figure 3 of this HRS documentation record). As depicted in Reference 44, Outfall 007B is the most upstream outfall and Outfall 007S is the most downstream outfall. The distance between Outfalls 007B and 007S is about 30 feet.

PPE 13 is located at Outfall 006B1, receives surface water runoff from the southern portion of Source No. 1, and appears to discharge into a ditch which leads to Bayou Casotte (Ref. 44) (see Figure 3 of this HRS documentation record).

Surface water flow continues within Bayou Casotte for about 2.21 miles (beginning at PPE 13) to 2.4 miles (beginning at the point at which surface water runoff from PPEs 1 and 2 enter Bayou Casotte) before entering Mississippi Sound then into the Gulf of Mexico, completing the 15-mile surface water migration pathway TDL (Refs. 3; 52, p. 2-95) (see Figure 3 of this HRS documentation record).

PPEs Associated with Source No. 2

Overland flow from Source No. 2 is maintained by NPDES Outfall 005 located at the southwestern corner of Source No. 2 (Refs. 23, p. i; 44) (see Figures 2 and 3 of this HRS documentation record). Outfall 005 flows west from Source No. 2, underneath Industrial Road (Highway 611), and joins PPE 1 (Outfall 009S) and PPE 2 (009B) at the northeastern corner of the West Stack cooling and storage ponds (Refs. 9, p. 16; 23, p. i; 44).

PPE Associated with Source No. 3

PPE 14 begins at Outfall 003 located in Bayou Casotte, west of the southern portion of the West Stack (see Figure 3 of this HRS documentation record). From PPE 14 surface water flows about 2 miles before it enters Mississippi Sound then into the Gulf of Mexico, completing the 15-mile surface water migration pathway TDL (Ref. 3).

Bayou Casotte at Outfall 003 is a few hundred feet wide and approximately 15 feet deep. Just downstream of Outfall 003, Bayou Casotte becomes a wider shipping channel (Ref. 38, p. 28). Mississippi Sound is a shallow coastal lagoon that extends about 9 miles offshore and is bordered by the coastlines of Alabama, Mississippi, and eastern Louisiana to the north and a string of barrier islands and interspersed tidal passages to the south (Ref. 52, pp. 1-27, 2-41, 2-48, 2-95).

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 OBSERVED RELEASE – Direct Observation

NPDES Outfall 003 is the only outfall that is monitored for metals including arsenic, cadmium, chromium, copper, lead, nickel, and zinc. NPDES Outfall 003 is also monitored for the classical nutrient ammonia as nitrogen (Ref. 23, pp. i, ii, 1 to 41). Permit requirements are established for ammonia as nitrogen, copper, lead, nickel, and zinc (Refs. 22, pp. i, 1 through 39; 23, pp. 5, 6, 7). DMRs from 2005 to 2014 indicate chronic permit violations of ammonia as nitrogen (monthly average and daily maximum); copper (monthly average and daily maximum); nickel (monthly average); and zinc (daily maximum) (Ref. 22, pp. i, ii, 1 through 39).

MDEQ provided DMRs (Ref. 22, p. i, ii). Individual DMRs are available for April through December 2014; however, individual DMRs are not available for 2005 to 2013. The hard copy reports for this time frame were transferred to an on-line format and are no longer available in hard copy. Therefore, MDEQ provided a DMR data submittal report and a DMR violation report for 2005 to 2013 (Ref. 22, p. i, ii). Table 7 of this HRS documentation record provides violations of NPDES permit MS0003115 at Outfall 003 that are documented in individual DMRs and the DMR violation report. Additionally, Table 7 provides the reported values provided in the individual DMRs and the DMR data submittal report for arsenic, cadmium, chromium, and lead.

Based on the abundance of DMR violations between 2005 and 2014, the table below provides a record of daily maximum and monthly average discharges of ammonia as nitrogen, arsenic, cadmium, chromium, copper, lead, nickel, and zinc from Outfall 003 and certain permit violations of ammonia as nitrogen, copper, nickel, and zinc. A complete list of NPDES permit violations recorded in the individual DMRs and DMR data submittal report can be found in Reference 22.

TABLE 7: Observed Release by Direct Observation

Monitoring Period End Date	Param. Desc.	NPDES Limit Value	Desc.	DMR Value Type	DMR Value	Over NPDES Limit	References
4/30/2005	Ammonia as Nitrogen	1,048 lb/day	Monthly Average	Q1	3,158.1 lb/day	201%	22, pp. 14, 40
4/30/2005	Ammonia as Nitrogen	1,572 lb/day	Daily Maximum	Q2	11,136.3 lb/day	608%	22, pp. 14, 40
12/31/2005	Ammonia as nitrogen	1,048 lb/day	Monthly Average	Q1	2,362.3 lb/day	125%	22, pp. 15, 40
12/31/2005	Ammonia as nitrogen	1,572 lb/day	Daily Maximum	Q2	4,075.6 lb/day	159%	22, pp. 15, 40
2/29/2008	Ammonia as nitrogen	1,048 lb/day	Monthly Average	Q1	3,190.6 lb/day	204%	22, p. 40
2/29/2008	Ammonia as nitrogen	1,572 lb/day	Daily Maximum	Q2	9,803.8 lb/day	524%	22, p. 40
4/30/2009	Ammonia as nitrogen	1,048 lb/day	Monthly Average	Q1	3,736.9 lb/day	257%	22, pp. 15, 40
4/30/2009	Ammonia as nitrogen	1,572 lb/day	Daily Maximum	Q2	17,030 lb/day	983%	22, pp. 15, 40
12/31/2009	Ammonia as nitrogen	1,048 lb/day	Monthly Average	Q1	3,082.9 lb/day	194%	22, pp. 16, 40
12/31/2009	Ammonia as nitrogen	1,572 lb/day	Daily Maximum	Q2	13,409.4 lb/day	753%	22, pp. 16, 40
12/31/2009	Chromium	NE	Monthly Average	C2	0.04 mg/L	NA	22, p. 18
12/31/2009	Chromium	NE	Daily Maximum	C3	0.042 mg/L	NA	22, p. 18
12/31/2009	Lead	NE	Monthly Average	C2	0.003 mg/L	NA	22, p. 18
12/31/2009	Lead	NE	Daily Maximum	C3	0.003 mg/L	NA	22, p. 18

TABLE 7: Observed Release by Direct Observation							
Monitoring Period End Date	**Param. Desc.**	**NPDES Limit Value**	**Desc.**	**DMR Value Type**	**DMR Value**	**Over NPDES Limit**	**References**
1/31/2010	Ammonia as nitrogen	1,048 lb/day	Monthly Average	Q1	8,738.9 lb/day	734%	22, pp. 19, 40
1/31/2010	Ammonia as nitrogen	1,572 lb/day	Daily Maximum	Q2	18,115.3 lb/day	1,052%	22, pp. 19, 41
1/31/2010	Arsenic	NE	Monthly Average	C2	0.003 mg/L	NA	22, p. 20
1/31/2010	Arsenic	NE	Daily Maximum	C3	0.006 mg/L	NA	22, p. 20
1/31/2010	Chromium	NE	Monthly Average	C2	0.036 mg/L	NA	22, p. 21
1/31/2010	Chromium	NE	Daily Maximum	C3	0.037 mg/L	NA	22, p. 21
1/31/2010	Copper	0.225 lb/day	Monthly Average	Q1	0.719 lb/day	220%	22, pp. 21, 41
1/31/2010	Copper	0.425 lb/day	Daily Maximum	Q2	1.153 lb/day	171%	22, pp. 22, 41
1/31/2010	Lead	NE	Monthly Average	C2	0.002 mg/L	NA	22, p. 21
1/31/2010	Lead	NE	Daily Maximum	C3	0.003 mg/L	NA	22, p. 21
2/28/2010	Ammonia as nitrogen	1,048 lb/day	Monthly Average	Q1	10,312.3 lb/day	884%	22, pp. 22, 41
2/28/2010	Ammonia as nitrogen	1,572 lb/day	Daily Maximum	Q2	37,249.4 lb/day	2,270%	22, pp. 22, 41
2/28/2010	Arsenic	NE	Monthly Average	C2	0.001mg/L	NA	22, p. 23
2/28/2010	Arsenic	NE	Daily Maximum	C3	0.001 mg/L	NA	22, p. 23
2/28/2010	Cadmium	NE	Monthly Average	C2	0.013 mg/L	NA	22, p. 24
2/28/2010	Cadmium	NE	Daily Maximum	C3	0.026 mg/L	NA	22, p. 24
2/28/2010	Chromium	NE	Monthly Average	C2	0.053 mg/L	NA	22, p. 24
2/28/2010	Chromium	NE	Daily Maximum	C3	0.086 mg/L	NA	22, p. 24
2/28/2010	Copper	0.225 lb/day	Monthly Average	Q1	0.411 lb/day	83%	22, pp. 24, 41
2/28/2010	Copper	0.425 lb/day	Daily Maximum	Q2	0.822 lb/day	93%	22, pp. 24, 41
2/28/2010	Lead	NE	Monthly Average	C2	0.002 mg/L	NA	22, p. 24
2/28/2010	Lead	NE	Daily Maximum	C3	0.003 mg/L	NA	22, p. 24
7/31/2012	Chromium	NE	Monthly Average	C2	0.034 mg/L	NA	22, p. 27
7/31/2012	Chromium	NE	Daily Maximum	C3	0.046 mg/L	NA	22, p. 27

TABLE 7: Observed Release by Direct Observation							
Monitoring Period End Date	**Param. Desc.**	**NPDES Limit Value**	**Desc.**	**DMR Value Type**	**DMR Value**	**Over NPDES Limit**	**References**
7/31/2012	Copper	0.225 lb/day	Monthly Average	Q1	0.272 lb/day	21%	22, pp. 27, 41
7/31/2012	Copper	0.425 lb/day	Daily Maximum	Q2	0.592 lb/day	39%	22, pp. 27, 41
7/31/2012	Lead	NE	Monthly Average	C2	0.002 mg/L	NA	22, p. 27
7/31/2012	Lead	NE	Daily Maximum	C3	0.003 mg/L	NA	22, p. 27
9/30/2012	Ammonia as nitrogen	1,572 lb/day	Daily Maximum	Q2	6,288 lb/day	300%	22, pp. 28, 41
9/30/2012	Chromium	NE	Monthly Average	C2	0.033 mg/L	NA	22, p. 30
9/30/2012	Chromium	NE	Daily Maximum	C3	0.053 mg/L	NA	22, p. 30
11/30/2012	Ammonia as nitrogen	41.03 lb/day	Monthly Average	Q1	871.8 lb/day	2,025%	22, pp. 31, 41
11/30/2012	Ammonia as nitrogen	167.51 lb/day	Daily Maximum	Q2	1,116 lb/day	566%	22, pp. 31, 41
11/30/2012	Arsenic	NE	Monthly Average	C2	0.016 mg/L	NA	22, p. 32
11/30/2012	Arsenic	NE	Daily Maximum	C3	0.032 mg/L	NA	22, p. 32
11/30/2012	Chromium	NE	Monthly Average	C2	0.015 mg/L	NA	22, p. 33
11/30/2012	Chromium	NE	Daily Maximum	C3	0.018 mg/L	NA	22, p. 33
3/31/2013	Ammonia as nitrogen	41.03 lb/day	Monthly Average	Q1	859.4 lb/day	1,995%	22, pp. 34, 42
3/31/2013	Ammonia as nitrogen	167.51 lb/day	Daily Maximum	Q2	1,222 lb/day	630%	22, pp. 34, 42
3/31/2013	Arsenic	NE	Monthly Average	C2	0.006 mg/L	NA	22, p. 35
3/31/2013	Arsenic	NE	Daily Maximum	C3	0.012 mg/L	NA	22, p. 35
3/31/2013	Chromium	NE	Monthly Average	C2	0.005 mg/L	NA	22, p. 36
3/31/2013	Chromium	NE	Daily Maximum	C3	0.01 mg/L	NA	22, p. 36
4/30/2013	Arsenic	NE	Monthly Average	C2	0.093 mg/L	NA	22, p. 37
4/30/2013	Arsenic	NE	Daily Maximum	C3	0.14 mg/L	NA	22, p. 38
4/30/2013	Chromium	NE	Monthly Average	C2	0.007 mg/L	NA	22, p. 39
4/30/2013	Chromium	NE	Daily Maximum	C3	0.014 mg/L	NA	22, p. 39
4/30/2014	Ammonia as nitrogen	1,601 lb/day	Monthly Average	Q1	4,303 lb/day	169%	22, pp. 1, 43

TABLE 7: Observed Release by Direct Observation							
Monitoring Period End Date	**Param. Desc.**	**NPDES Limit Value**	**Desc.**	**DMR Value Type**	**DMR Value**	**Over NPDES Limit**	**References**
4/30/2014	Ammonia as nitrogen	2,875 lb/day	Daily Maximum	Q2	13,071 lb/day	355%	22, pp. 1, 43
4/30/2014	Ammonia as nitrogen	48 mg/L	Monthly Average	C2	75 mg/L	56%	22, pp. 1, 43
4/30/2014	Ammonia as nitrogen	86.2 mg/L	Daily Maximum	C3	173.4 mg/L	101%	22, pp. 1, 43
4/30/2014	Cadmium	NE	Monthly Average	NL	0.009 mg/L	NA	22, p. 2
4/30/2014	Cadmium	NE	Daily Maximum	NL	0.017 mg/L	NA	22, p. 2
4/30/2014	Chromium	NE	Monthly Average	NL	0.049 mg/L	NA	22, p. 2
4/30/2014	Chromium	NE	Daily Maximum	NL	0.084 mg/L	NA	22, p. 2
4/30/2014	Lead	0.204 mg/L	Monthly Average	NL	0.001 mg/L	NA	22, p. 2
4/30/2014	Lead	NE	Daily Maximum	NL	0.003 mg/L	NA	22, p. 2
4/30/2014	Nickel	6.978 lb/day	Monthly Average	Q1	19.715 lb/day	183%	22, pp. 1, 43
4/30/2014	Nickel	0.209 mg/L	Monthly Average	C2	0.335	60%	22, pp. 1, 43
4/30/2014	Zinc	75.7 lb/day	Daily Maximum	Q2	275.5 lb/day	264%	22, pp. 2, 43
4/30/2014	Zinc	3.87 mg/L	Daily Maximum	C3	3.87 mg/L	70%	22, pp. 2, 44
4/30/2014	Copper	2.6 lb/day	Monthly Average	Q1	6.4 lb/day	146%	22, pp. 2, 44
4/30/2014	Copper	4.04 lb/day	Daily Maximum	Q2	20.50 lb/day	407%	22, pp. 2, 44
4/30/2014	Copper	0.078 mg/L	Monthly Average	C2	0.116 mg/L	49%	22, pp. 2, 44
4/30/2014	Copper	0.121 mg/L	Daily Maximum	C3	0.281 mg/L	132%	22, pp. 2, 44
5/31/2014	Ammonia as nitrogen	1,601 lb/day	Monthly Average	Q1	6,397 lb/day	300%	22, pp. 4, 44
5/31/2014	Ammonia as nitrogen	2,875 lb/day	Daily Maximum	Q2	36,440 lb/day	1,167%	22, pp. 4, 44
5/31/2014	Cadmium	NE	Monthly Average	NL	0.01 mg/L	NA	22, p. 5
5/31/2014	Cadmium	NE	Daily Maximum	NL	0.01 mg/L	NA	22, p. 5
5/31/2014	Chromium	NE	Monthly Average	NL	0.02 mg/L	NA	22, p. 5
5/31/2014	Chromium	NE	Daily Maximum	NL	0.04 mg/L	NA	22, p. 5
5/31/2014	Copper	4.04 lb/day	Daily Maximum	Q2	49.46 lb/day	1,124%	22, pp. 5, 44

TABLE 7: Observed Release by Direct Observation							
Monitoring Period End Date	**Param. Desc.**	**NPDES Limit Value**	**Desc.**	**DMR Value Type**	**DMR Value**	**Over NPDES Limit**	**References**
5/31/2014	Copper	0.078 mg/L	Monthly Average	C2	0.191 mg/L	145%	22, pp. 5, 44
5/31/2014	Copper	0.121 mg/L	Daily Maximum	C3	0.790 mg/L	553%	22, pp. 5, 44
5/31/2014	Lead	0.204 mg/L	Monthly Average	NL	0.003 mg/L	NA	22, p. 5
5/31/2014	Lead	NE	Daily Maximum	NL	0.011 mg/L	NA	22, p. 5
6/30/2014	Ammonia as nitrogen	1,601 lb/day	Monthly Average	Q1	2,410 lb/day	51%	22, pp. 7, 44
6/30/2014	Ammonia as nitrogen	2,875 lb/day	Daily Maximum	Q2	10,584 lb/day	268%	22, pp. 7, 44
6/30/2014	Ammonia as nitrogen	48 mg/L	Monthly Average	C2	59 mg/L	23%	22, pp. 7, 44
6/30/2014	Ammonia as nitrogen	86.2 mg/L	Daily Maximum	C3	168.8 mg/L	96%	22, pp. 7, 44
6/30/2014	Arsenic	NE	Monthly Average	NL	0.01 mg/L	NA	22, p. 7
6/30/2014	Arsenic	NE	Daily Maximum	NL	0.02 mg/L	NA	22, p. 7
6/30/2014	Cadmium	NE	Monthly Average	NL	0.003 mg/L	NA	22, p. 8
6/30/2014	Cadmium	NE	Daily Maximum	NL	0.01 mg/L	NA	22, p. 8
6/30/2014	Chromium	NE	Monthly Average	NL	0.04 mg/L	NA	22, p. 8
6/30/2014	Chromium	NE	Daily Maximum	NL	0.05 mg/L	NA	22, p. 8
6/30/2014	Copper	0.121 mg/L	Daily Maximum	C3	0.361 mg/L	198%	22, pp. 8, 45
6/30/2014	Lead	0.204 mg/L	Monthly Average	NL	0.001 mg/L	NA	22, p. 8
6/30/2014	Lead	NE	Daily Maximum	NL	0.01 mg/L	NA	22, p. 8
12/31/2014	Ammonia as nitrogen	1,601 lb/day	Monthly Average	Q1	1,859 lb/day	16%	22, pp. 10, 45
12/31/2014	Ammonia as nitrogen	2,875 lb/day	Daily Maximum	Q2	4,869 lb/day	69%	22, pp. 10, 45
12/31/2014	Ammonia as nitrogen	48 mg/L	Monthly Average	C2	76 mg/L	58%	22, pp. 10, 45
12/31/2014	Ammonia as nitrogen	86.2 mg/L	Daily Maximum	C3	176.4 mg/L	105%	22, pp. 10, 45
12/31/2014	Arsenic	NE	Monthly Average	NL	0.015 mg/L	NA	22, p. 10
12/31/2014	Arsenic	NE	Daily Maximum	NL	0.019 mg/L	NA	22, p. 10
12/31/2014	Chromium	NE	Monthly Average	NL	0.05 mg/L	NA	22, p. 11

TABLE 7: Observed Release by Direct Observation							
Monitoring Period End Date	**Param. Desc.**	**NPDES Limit Value**	**Desc.**	**DMR Value Type**	**DMR Value**	**Over NPDES Limit**	**References**
12/31/2014	Chromium	NE	Daily Maximum	NL	0.010 mg/L	NA	22, p. 11
12/31/2014	Lead	0.204 mg/L	Monthly Average	NL	0.001 mg/L	NA	22, p. 11
12/31/2014	Lead	NE	Daily Maximum	NL	0.006 mg/L	NA	22, p. 11

Notes:

%	Percent
Arsenic	Total as arsenic
C2	Average concentration divided by pH value calculated
C3	Average concentration divided by pH value calculated
Cadmium	Cadmium, total recoverable
Chromium	Chromium, total recoverable
Copper	Copper, total recoverable
Desc.	Description
DMR	Discharge monitoring report
lb/day	Pounds per day
Lead	Lead, total recoverable
mg/L	Milligrams per liter
NA	Not applicable
NE	Not established
NL	Not listed
NPDES	National Pollutant Discharge Elimination System
Nickel	Nickel, total recoverable
Param.	Parameter
Q1	Average quantity divided by mass loading calculated
Q2	Maximum quantity divided by mass loading calculated
Zinc	Zinc, total recoverable

Attribution

Establishing attribution for an observed release by direct observation is not required by the HRS, and is presented only to further tie the substances in the release to site sources and/or facility operations.

MPC is a former fertilizer production facility (Ref. 54). The MPC property consists of two sulfuric acid plants, a phosphoric acid plant, a DAP plant, two phosphogypsum storage piles (Source Nos. 1 and 2), and support facilities (Ref. 12, p. 1-1). The facility produced DAP, a fertilizer used in the agricultural industry both in the United States and abroad, in a multi-stage process that involved sulfuric acid, phosphoric acid, and ammonia (Refs. 11, p. 4; 13, p. 3).

Phosphogypsum generated during the phosphoric acid manufacturing process was stockpiled on the property (Ref. 12, p. 1-2). Specifically, the phosphogypsum was slurried with recycled water from the phosphogypsum ponds and pumped to the phosphogypsum pile. As the phosphogypsum settled, the water was decanted and conveyed back to the phosphoric acid plant for reuse (Ref. 12, p. 1-2). MPC managed two phosphogypsum storage piles designated as East (active) and West (inactive). The West Stack was established in 1958. In 1994, the West Stack was approaching full capacity and a new East Stack was established to store phosphogypsum once the West Stack was full. The East Stack began receiving phosphogypsum in 2002, and the West Stack began undergoing closure (Refs. 11, p. 8; 16, p. 2). Closure of the West Stack was completed in 2005 (Ref. 11, p. 8).

Phosphogypsum is primarily composed of calcium sulfate, silicon, phosphate, and fluoride (Ref. 30, p. 370). In 1995, MPC collected five samples of phosphogypsum (Ref. 31, p. 1). Sample #5 contained arsenic, cadmium, chromium, lead, nickel, and zinc (Ref. 31, p. 9). Process water at MPC contains arsenic, cadmium, chromium, copper, lead, nickel, and zinc (Ref. 32, p. 101).

Waste samples collected from Source No. 1 (West Stack) in 2005 and Source No. 2 (East Stack) in 2016 contained ammonia as nitrogen, arsenic, cadmium, chromium, lead, and zinc (see Tables 1 and 3 of this HRS documentation record).

DMRs from 2005 to 2014 indicate the presence of hazardous substances including ammonia as nitrogen, arsenic, cadmium, chromium, copper, lead, nickel, and zinc have been discharged from Source No. 3 (see Table 7 of this HRS documentation record).

Source samples contain ammonia as nitrogen, arsenic, cadmium, chromium, copper, lead, nickel, and zinc (see Tables 1, 3, and 7 of this HRS documentation record). Of the constituents detected in source samples, NPDES permit violations have been cited for ammonia as nitrogen, copper, nickel, and zinc (see Table 7 of this HRS documentation record) (Ref. 22, pp. 40 through 45).

The hazardous substances listed below have been documented in Source Nos. 1, 2, and/or 3 and have been documented as observed releases by direct observation (see Tables 1 and 3 in Section 2.2.2, Source Nos. 1 and 2, Source No. 3 in Section 2.2.2, and Table 7 in Section 4.1.2.1, Observed Release of this HRS documentation record).

Hazardous Substances in the Release
Ammonia
Arsenic
Cadmium
Chromium
Copper
Lead
Nickel
Zinc

Surface Water Observed Release Factor Value: 550.00

4.1.2 DRINKING WATER THREAT WASTE CHARACTERISTICS

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

4.1.3.2 HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Table 8 lists toxicity, persistence, and bioaccumulation factor values for hazardous substances that were detected in the source samples and have containment factor values exceeding 0. The combined toxicity, persistence, and bioaccumulation factor values are assigned in accordance with Reference 1, Section 4.1.3.2.1, and Reference 1a, Section 2.4.1.1.

TABLE 8: Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Observed Release? (Yes/No)	Toxicity Factor Value	Persistence Factor Value[1]	Bioaccumulation Value[2]	Toxicity/ Persistence/ Bioaccumulation Factor Value (Ref. 1, Table 4-16)	Reference
Ammonia	2, 3	Yes	100	0.4	0.5	20	2, p. 2; 2a
Arsenic	2, 3	Yes	10,000	1	5	50,000	2, p. 7; 2a
Cadmium	2, 3	Yes	10,000	1	50,000	5E+8	2, p. 12; 2a
Chromium	1, 2, 3	Yes	10,000	1	5	50,000	2, p. 17; 2a
Copper	3	Yes	100	1	50,000	5E+6	2, p. 22; 2a
Lead	1, 2, 3	Yes	10,000	1	5,000	5E+7	2, p. 27; 2a
Nickel	3	Yes	10,000	1	5	50,000	2, p. 32; 2a
Zinc	2, 3	Yes	10	1	500	5,000	2, p. 37; 2a

Notes:
1 Persistence factor value for rivers
2 Bioaccumulation factor value for freshwater

Cadmium is the hazardous substance with the highest toxicity, persistence, and bioaccumulation factor value of 500,000,000.

Toxicity/Persistence/Bioaccumulation Factor Value: 5E+8
(Refs. 1, Section 4.1.3.2.1.4; 1a, Section 2.4.1.1)

4.1.3.2.2 HAZARDOUS WASTE QUANTITY

TABLE 9: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Waste Pile	734,790.18
2	Waste Pile	401,053.56
3	Other	1,972,740

Source No. 1 is a phosphogypsum waste pile (see Figure 3 of this HRS documentation record). Source No. 1 is a continuous waste pile that contains hazardous substances throughout its entire extent (Ref. 54). The source HWQ value for Source No. 1 is 734,790.18.

Source No. 2 is a phosphogypsum waste pile (see Figure 3 of this HRS documentation record). Source No. 2 is a continuous waste pile that contains hazardous substances throughout its entire extent and the waste is homogenous (Ref. 54). The source HWQ value for Source No. 2 is 401,053.56.

Source No. 3 is NPDES Outfall 003, a designated process related waste stream that receives effluent from NPDES internal Outfalls 001 and 002. Outfall 003 discharges into a channel that flows directly into Bayou Casotte (Refs. 9, pp. 15, 16; 23, p. i; 38, p. 28). The total effluent flow through Source No. 3 in 2015 was 986,370,000 gallons or 4,931,850 cubic yards (Ref. 56, pp. 1, 2, 3).

Sum of Source Hazardous Waste Quantity Values: 3,108,583.74
Hazardous Waste Quantity Factor Value: 1,000,000
(Ref. 1, Section 2.4.2.2)

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 HWQ factor values, subject to a maximum product of 1 x 10^8. Then, this product was multiplied by the bioaccumulation potential factor value, subject to a maximum product of 1 x 10^{12}. Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Toxicity/Persistence Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 1,000,000

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value: 1 x 10^8 (maximum value)

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value × Bioaccumulation Factor Value (50,000): 1 x 10^{12}
(maximum value)

Waste Characteristics Factor Category Value: 1,000
(Ref. 1, Table 2-7)

4.1.3.3 HUMAN FOOD CHAIN THREAT TARGETS

Level I Concentrations

No Level I concentrations have been documented.

Level II Concentrations

No Level II concentrations have been documented.

4.1.3.3.1 Food Chain Individual

As noted in Section 4.1.3.2.1, an observed release of hazardous substances having a bioaccumulation factor value of 500 or greater (cadmium, copper, lead, and zinc) is documented in perennial surface water with a fishery downstream (Bayou Casotte and Mississippi Sound). Specifically, an observed release has been documented in Bayou Casotte (see Table 7 and Figure 3 of this HRS documentation record). According to the owner of CC's Bait Shop located on Ladner Avenue along Bayou Casotte (about 0.3 mile downstream from PPE 14 [NPDES Outfall 003][see Figure 3 of this HRS documentation record]), the entire reach of Bayou Casotte is fished for consumption. Additionally, Mississippi Sound between Bayou Casotte and Horn Island and Petit Bois Island are fished for consumption (Refs. 3; 38, p. 28; 51).

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 concentrations have been documented.

4.1.3.3.2.2 Level II Concentrations

No Level I concentrations have been documented.

4.1.3.3.2.3 Potential Human Food Chain Contamination

According to the owner of a local bait shop, fishing for consumption occurs along the entire reach of Bayou Casotte as well as in Mississippi Sound between Bayou Casotte and Horn Island and Petit Bois Island. The type of fish caught and consumed include speckled trout, white trout, ground mullet, flounder, red fish, mangrove snapper, sheep head, and crabs (Ref. 51). The total annual production of fish caught in Bayou Casotte and Mississippi Sound is unknown, but greater than zero. Bayou Casotte and Mississippi Sound are tidally influenced and the Bayou rises and falls approximately 2 feet with the tide (Refs. 51; 52, pp. 2-41, 2-50).

TABLE 10: Potential Population Targets					
Identity of Fishery	**Annual Production (pounds)**	**Type of Surface Water Body (Ref. 1, Table 4-18)**	**Population Value (Pi) (Ref. 1, Table 4-18)**	**Dilution Weight (Di) (Ref. 1, Table 4-13)**	**Pi × Di**
Bayou Casotte and Mississippi Sound	>0	Coastal Tidal Waters	0.03	0.0001	0.000003

Sum of $P_i \times D_i$: 0.000003
(Sum of $P_i \times D_i$)/10: 0.0000003

Potential Human Food Chain Contamination Factor Value: 0.0000003

4.1.4.2 ENVIRONMENTAL THREAT WASTE CHARACTERISTICS

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