

HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: Chemetco

Contact Persons

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Pathways, Components, or Threats Not Scored

The ground water, soil exposure and air migration pathways are not scored as part of this Hazard Ranking System (HRS) evaluation. The ground water, soil exposure and air migration pathways were not included because a release to these media does not significantly affect the overall site score and because the surface water migration pathway produces an overall site score above the minimum required for the site to qualify for inclusion on the National Priorities List (NPL). These pathways may be of concern to EPA and may be evaluated during future investigations.

HRS DOCUMENTATION RECORD

Name of Site: Chemetco

CERCLIS ID: ILD048843809

EPA Region: 5 Date Prepared: September 2009

Street Address of Site: 3754 Chemetco Lane

City, County, State, Zip code: Hartford, Madison County, Illinois 62048

General Location in the State: Southwestern Illinois (Ref. 46, Figure 1)

Topographic Map: Wood River Quadrangle (Illinois-Missouri)

Latitude: N 38.799 Longitude: W 90.098 (Ref. 7; Ref. 46, Figure 1)

Site Reference Point: Southeast corner of Zinc Oxide Bunker

Congressional District: 12

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

Scores

<i>Air Pathway</i>	<i>Not Scored (NS)</i>
<i>Ground Water Pathway</i>	<i>NS</i>
<i>Soil Exposure Pathway</i>	<i>NS</i>
<i>Surface Water Pathway</i>	<i>60.00</i>
<i>HRS SITE SCORE</i>	<i>30.00</i>

WORKSHEET FOR COMPUTING HRS SITE SCORE

	<u>S</u>	<u>S²</u>
1. Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	NS	
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	60.00	3600.00
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	
2c. Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	60.00	3600.00
3. Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	
4. Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	
5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	3600.00	3600.00
6. HRS Site Score Divide the value on line 5 by 4 and take the square root	30.00	

**SCORESHEET TABLE 4-1
SURFACE WATER PATHWAY (OVERLAND/FLOOD MIGRATION
COMPONENT) SCORESHEET**

<u>Factor Categories and Factors</u>	<u>Maximum Value</u>	<u>Value Assigned</u>
DRINKING WATER THREAT		
<u>Likelihood of Release</u>		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	
2b. Runoff	25	
2c. Distance to Surface Water	25	
2d. Potential to Release by Overland Flow [lines 2a x (2b + 2c)]	500	
3. Potential to Release by Flood		
3a. Containment (Flood)	10	
3b. Flood Frequency	50	
3c. Potential to Release by Flood (lines 3a x 3b)	500	
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	
5. Likelihood of Release (higher of lines 1 and 4)	550	550
<u>Waste Characteristics</u>		
6. Toxicity/Persistence	(a)	NS
7. Hazardous Waste Quantity	(a)	NS
8. Waste Characteristics	100	NS
<u>Targets</u>		
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
<u>Drinking Water Threat Score</u>		
13. Drinking Water Threat Score ([lines 5 x 8 x 12] / 82,500, subject to a maximum of 100)	100	NS

Factor Categories and Factors	Maximum Value	Value Assigned
HUMAN FOOD CHAIN THREAT		
<u>Likelihood of Release</u>		
14. Likelihood of Release (same value as line 5)	550	550
<u>Waste Characteristics</u>		
15. Toxicity/Persistence/ Bioaccumulation	(a)	NS
16. Hazardous Waste Quantity	(a)	NS
17. Waste Characteristics	1,000	NS
<u>Targets</u>		
18. Food Chain Individual	50	NS
19. Population		
19a. Level I Concentrations	(b)	NS
19b. Level II Concentrations	(b)	NS
19c. Potential Human Food Chain Contamination	(b)	NS
19d. Population (lines 19a + 19b + 19c)	(b)	NS
20. Targets (lines 18 + 19d)	(b)	NS
<u>Human Food Chain Threat Score</u>		
19. Human Food Chain Threat Score ([lines 14 x 17 x 20] / 82,500, subject to a maximum of 100)	100	NS

Factor Categories and Factors	Maximum Value	Value Assigned
ENVIRONMENTAL THREAT		
<u>Likelihood of Release</u>		
22. Likelihood of Release (same value as line 5)	550	550
<u>Waste Characteristics</u>		
23. Ecosystem Toxicity/Persistence/ Bioaccumulation	(a)	5 x 10 ⁸
24. Hazardous Waste Quantity	(a)	10,000
25. Waste Characteristics	1,000	1,000
<u>Targets</u>		
26. Sensitive Environments		
26a. Level I Concentrations	(b)	0
26b. Level II Concentrations	(b)	100
26c. Potential Contamination	(b)	NS
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	100
27. Targets (value from line 26d)	(b)	100
<u>Environmental Threat Score</u>		
28. Environmental Threat Score ([lines 22 x 25 x 27] / 82,500, subject to a maximum of 60)	60.00	60.00

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	60.00
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	60.00

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c Do not round to nearest integer

NS Not Scored

LIST OF ACRONYMS AND ABBREVIATIONS

AALAC	Ambient Aquatic Life Advisory Concentrations
AWQC	Ambient Water Quality Criteria
Bgs	below ground surface
Cfs	cubic feet per second
Conc.	Concentration
CRQL	contract required quantitation limit
CRDL	contract required detection limit
EPA	U.S. Environmental Protection Agency
ESI	Expanded Site Investigation
HRS	Hazard Ranking System
MDL	method detection limit
Ug/kg	micrograms per kilogram, equivalent to parts per billion
Mg/kg	milligrams per kilogram, equivalent to parts per million
NA	not available
N/A	not applicable
NS	not scored
Ppb	parts per billion
Ppm	parts per million
SCDM	Superfund Chemical Data Matrix
TDL	Target Distance Limit
U	undetected
USGS	U.S. Geological Survey

REFERENCES

- | <u>Reference Number</u> | <u>Description of the Reference</u> |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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2.0 SITE SUMMARY

2.0.1 Site Description

Chemetco was a former secondary copper smelter operation positioned just south of the Village of Hartford, Madison County, Illinois, in the southwestern portion of the state (Refs. 7, p. 1; 13, p. 005). The former smelter property occupied over 230 acres of land, but operated on 41 acres located near the smelter operations (Ref. 31, p. 1). For the purposes of this documentation record the facility will be defined as the 41 acres where the company operated. The company has filed for Chapter 7 bankruptcy and is currently being managed by a court appointed trustee (Ref. 5). The property contains a foundry, tank house, dome building, DIS building, fines building, receiving building, laboratory, commercial offices, plant offices, the mobile shop, and some stacks which are in disrepair (Refs. 31, p. 1; 32, p. 2). The 41-acre property is currently fenced and is sealed by order of the Illinois EPA (Ref. 19).

While Chemetco had the capabilities for producing copper cathodes from copper oxide ores or precipitates, its major function was recycling or secondary processing of copper-bearing scrap and manufacturing residues (Ref. 14, p. 2). Much of the raw materials consisted of electrical devices or equipment or cable, but a certain percentage was composed of such items as skimmings, slags, turnings, grindings and other residues from foundries and factories, auto parts and building components (Ref. 15, p. 4). A premix consisting of the copper-bearing raw material and other ingredients was smelted in one of the furnaces in the first step of the process, producing black copper (containing small amounts of lead, tin and zinc) (Ref. 38, p. 73). The black copper was further refined in the same type furnace utilizing blown oxygen, producing copper along with zinc oxide and a refining slag that was rich in lead and tin and contained some nickel (Ref. 38, p. 75).

The zinc oxide was extracted from the furnace flue gases by a pollution control scrubber (Ref. 38, p. 75). The slag itself was then refined in one of the furnaces producing black copper that was fed back to the second-stage furnace plus lead and tin extracted as a wrought solder alloy (Ref. 38, p. 75). The resulting copper anodes were immersed in a chemical bath for purification purposes and the resulting copper cathodes were the primary product of Chemetco (Ref. 38, p. 75).

Leftover slag, transported in molten form to storage areas, was later graded and screened and used for thermal insulation, sandblasting aggregate, road bed fill and other applications (Ref. 38, p. 75). Other wastes produced included zinc oxide (Ref. 14, p. 3) and spent refractory brick (Ref. 39, p. 1).

There are three principal sources (slag piles, zinc oxide pile and slag parking lot) identified at the property (Ref. 24, pp. 20-23). As evidenced within this HRS documentation record, slag and zinc oxide material contained cadmium, copper, lead and zinc (Refs. 24, p. 20; 33, pp. 9, 10).

The first source, the slag piles, does not have a complete, maintained, engineered cover (Ref 24, p. 21). Run-off from the slag piles is allowed to drain to the west and south. Surface water draining to the west enters the cooling lagoons (Ref. 24, p. 8).

The surface water draining to the south enters a concrete lined ditch which diverts the surface water to a holding basin (Ref. 46, Figure 2, Building 16) (Ref. 35, pp. 9, 10, 12, 13, 14). During the April 1, 2008 reconnaissance (Ref. 35), the water holding basin was overflowing and surface water was draining into the wetlands adjacent to Long Lake.

The second source scored at the Chemetco facility is a pile of zinc oxide which is also known as scrubber sludge (Refs. 14, p. 5; 18, pp. 1, 2). An approximate 2.5-acre concrete bunker of zinc oxide is present along the north side of the facility. The bunker is best described as a solid material storage pile which is contained on four sides by free-standing reinforced concrete walls and set atop an eight-inch-thick reinforced concrete slab (Ref. 14, p. 47). Utilizing a three-dimensional modeling program, a total volume of 62,204 cubic yards (cy) of zinc oxide has been calculated for the bunker (Ref. 18, p. 2). Of the 62,204 cy quantity, approximately 15,440 cy extends above the bunker walls (approximate elevation of 445 feet) (Ref. 18, p. 2).

Samples collected from the zinc oxide pile document the presence of the following hazardous substances; cadmium, copper, lead and zinc (Refs. 24, p. 22; 25, p. 11).

The zinc oxide bunker does have retainer walls that surround the pile that have been designed to limit the flow of contamination from the pile, but the zinc oxide is piled higher than these wall, allowing materials from the pile to migrate over the walls on to the adjacent grounds. Run-off from the zinc oxide pile is allowed to drain to the west and south. Surface water draining to the west flows across the Chemetco facility and along the railroad ditch to the tributary of Long Lake and eventually to the western-most portion of Long Lake (Refs. 7; 35, pp. 1, 2, 3, 5, 6).

The third source, the truck parking lot, is located south of the southwest corner of the main facility property and is composed of slag material. The parking lot was built in 1980 and currently occupies approximately 3.3 acres just north of wetlands contiguous to Long Lake (Refs. 24, p. 6; 46, Figure 2). Samples collected from the parking lot during the 2008 Expanded Site Inspection document the presence of cadmium, copper, lead and zinc (Ref. 24, pp. 22, 23).

A discharge pipe was discovered during an inspection of Chemetco on September 18, 1996 (Refs. 26, p. 1; 29, p. 2). The pipe runs to the south, generally perpendicular to Oldenberg Road. The pipe appeared to be a 10-inch line and it was discharging to a drainage ditch, which also runs in a southerly direction. In the ditch below the outfall, several lengths of partially jointed PVC pipe were laid in the ditch bed. The ditch had a grayish bottom deposit, and these deposits fanned out into a low area approximately 200 feet below the outfall. From the dead vegetation, it appeared that this discharge had been going on for an extended period of time. The dead trees were not leafed out, so they had been dead prior to the previous growing season (Ref. 29, pp. 2, 3). Sediment samples collected from the outfall area revealed levels of cadmium, copper, lead and zinc (Ref. 29, p. 4). Sample

results confirmed the spilled material was zinc oxide (Ref. 13, p. 1). Chemetco subsequently retained a consultant to conduct remediation. During excavation activities layers of zinc oxide material were found to a depth of 6 feet in Long Lake indicating the area appeared to be impacted from historical management of zinc oxide (Ref. 13, p. 2).

The byproducts produced on the Chemetco property (zinc oxide and slag) and the sediments collected from the wetlands and Long Lake indicate that the waste products at Chemetco led to the contamination of the sediments in the wetlands and Long Lake with cadmium, copper, lead and zinc (Ref. 24, Tables 3 and 4).

Designated wetlands are present along Long Lake and its tributary. These wetlands can be viewed in Ref. 46, Figure 7. The wetlands found along Long Lake consist of Palustrine Emergent, Palustrine Forested, Palustrine Scrub-Shrub and Palustrine Unconsolidated Bottom (Ref. 6, p. 1).

2.0.2 Facility History

The Chemico Metals Corporation was established on June 9, 1969, and was merged into a Delaware corporation of the same name on March 23, 1970 (Ref. 14, p. 2; 38, p. 73). In March 1972, the company began production of copper in cathode form and in the next year changed its name to Chemetco (Refs. 14, p. 2; 38, p. 73).

Chemetco had the capabilities for producing high purity copper, anode copper, cathode copper, crude lead-tin solder, crude zinc oxide, and an iron silicate slag that could be used in highway or railway construction and other applications (Ref. 14, p. 2). Its major function was recycling or secondary processing, of copper-bearing scrap and manufacturing residues (Refs. 14, p. 2; 38, p. 73). The operation entailed purchasing raw materials from throughout the United States and Canada (Refs. 14, p. 2; 38, p. 73). Much of the raw materials consisted of electrical devices or equipment or cable, but a certain percentage was composed of such items as skimmings, slags, turnings, grindings and other residues from foundries and factories, auto parts and building components (Refs. 15, p. 4; 38, p. 73).

A premix consisting of the copper-bearing raw material and other ingredients was smelted in one of the furnaces in the first step of the process, producing black copper which contains small amounts of lead, tin and zinc (Ref. 38, p. 73). The black copper was further refined in the same type furnace utilizing blown oxygen, producing copper along with zinc oxide and a refining slag that was rich in lead and tin and contained some nickel (Ref. 38, pp. 73, 75).

The zinc oxide was extracted from the furnace flue gases by a pollution control scrubber (Ref. 38, p. 75). The slag itself was then refined in one of the furnaces producing black copper that was fed back to the second-stage furnace plus lead and tin extracted as a wrought solder alloy (Ref. 38, p. 75). The resulting copper anodes were immersed in a chemical bath for purification purposes and the resulting copper cathodes were the primary product of Chemetco (Ref. 38, p. 75). In a patented proprietary process, 99 per cent pure copper anodes were transformed into 99.98 per cent pure cathodes in Chemetco's electrolytic cell room (Ref. 38, p. 75).

Leftover slag from operations was transported in molten form to storage areas, and was later graded and screened and used for thermal insulation, sandblasting aggregate, road bed fill and other applications (Ref. 38, p. 75). Other wastes produced included zinc oxide (Ref. 14, p. 3) and spent refractory brick (Ref. 39, p. 1).

In 1996, it was discovered that Chemetco had installed a ten-inch discharge pipe which illegally discharged plant storm water into a drainage ditch located just south of the facility (Refs. 26, p. 1; 29, p. 2). This discharge contained zinc oxide slurry which contained lead, cadmium and zinc (Ref. 28, pp. 2, 6, 15). This illegal discharge area (entitled “zinc oxide spill”) was discovered by the Illinois EPA during a routine inspection on September 18, 1996 (Ref. 29, p. 2). When the discharge was discovered, Chemetco was required to conduct remediation of the areas impacted by the zinc oxide discharge (Ref. 13, p. 2). The cleanup plan is discussed in detail in Ref. 13, entitled “Zinc Oxide Spill Remediation Plan”. A limited remediation of sediments was conducted in Long Lake (Ref. 13, pp. 6, 9-12, 13-15), but that cleanup effort was never formally closed (Ref. 21, p. 5). This limited remediation consisted of creating an earthen berm around the entire perimeter of the spill area (Ref. 13, p. 5). After the construction of the earthen berm, water from Containment Area 3 (Long Lake) was transferred to Containment Area 2 (Ref. 13, p. 6). Visual criteria were used to determine the initial excavation depth (Ref. 13, p. 6). Visual inspection of the soil revealed the zinc oxide extended to a depth of approximately 6 feet indicating the area was impacted from historical management of zinc oxide (Ref. 13, p. 6). Additional sampling was not conducted downstream of the visually contaminated areas of zinc oxide at that time.

On October 31, 2001, the facility was shut down, and filed for Chapter 7 bankruptcy on November 13, 2001 (Refs. 5; 19, p. 1). At that time, the U.S. Bankruptcy Court for the Southern District of Illinois appointed a trustee to oversee the property (Ref. 5). On December 7, 2001 the Illinois EPA issued an order to seal the Chemetco site (Ref. 19, p. 1). The Seal order restricts public access to certain portions of the site, and prohibits entry by anyone except specified personnel in the performance of their duties (Ref. 19, p. 1). The property is currently abandoned with the exception of a small work crew which is being used to conduct operations to liquidate any assets that remain at the facility (Ref. 24, p. 14).

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the Source: Source 1

Name of Source: Slag piles

Source Type: Pile (slag)

Description and Location of Source:

Source 1 is comprised of slag piles located on the property (Figure 2 of Ref. 46). Source 1 is categorized as source type “pile”. Source 1 consists of waste slag material from the copper smelting operations at Chemetco (Ref. 38, p. 75). Numerous inorganic contaminants have been documented in the slag sampled on the surface within the property boundaries of Chemetco (Ref. 24, p. 21). Contaminants from each of the slag piles are similar in nature and have contributed to the surface water contamination within the area (Ref. 24, Tables 3 and 4). For the purposes of this documentation record all slag piles will be grouped under Source 1.

Chemetco facility personnel identified the slag as being present throughout the eastern portion of the property. The majority of this slag has been stockpiled in a large visible pile at the northeast corner of the site, with stockpiles of varying heights extending southward. Two smaller stockpiles are also present on site immediately south and southwest of the scrubber sludge bunker (Refs. 18, p. 5; 46, Fig. 2). Topographic surveys of the slag stockpile areas were conducted on March 20, 2007 (Ref. 18, p. 5). A three-dimensional modeling program has been used to determine volumes of the stockpile areas (Ref. 18, p. 5). A total slag volume of 452,245 cubic yards (cy) has been calculated (Ref. 18, p. 5).

Location

As shown on Ref. 46, Figure 2, Source 1 is located along the eastern boundary of the facility in the black hatching.

Containment

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: The ground water pathway was not scored; therefore, ground water containment was not evaluated.

Release via overland migration and/or flood: Source 1 is not covered (Ref. 35, pp. 8, 9, 10, 12, 13, 14). Run-off from the slag pile is allowed to drain on to the facility property to the west and south (Ref. 24, p. 8). If the surface water drains to the south, a concrete lined ditch would contain some of the runoff and divert the surface water to a holding basin (Figure 2 of Ref. 46, Building 16; Ref. 35, pp. 8, 9, 10, 12, 13, 14, 16). During the April 1, 2008 reconnaissance (Ref. 35), the water holding basin was overflowing and surface water was draining toward the wetlands contiguous to Long Lake (Ref. 35, pp. 14, 16).

2.2.2 Hazardous Substances Associated with the Source

The hazardous substances cadmium, copper, lead, and zinc were detected in four waste samples from Source 1, collected during the 2008 CERCLA Expanded Site Inspection (ESI) (Ref. 24, p. 21). Samples X306 – X309 were all obtained from the slag piles. Source sample locations are presented on Ref. 46, Figure 3. Waste samples were collected according to the Bureau of Land Sampling Procedures Guidance Manual for waste piles (Ref. 42, p. 5.6 – 5.7).

Cadmium, copper, lead and zinc were also detected in four waste samples collected during the 2002 ESI from the slag piles (Ref. 33, p. 9, Table 1). Sample locations are depicted in Reference 33, Figure 3.

Analysis of the 2008 samples from Source 1 was conducted using EPA Contract Laboratory Procedures (CLP) for total metals and results indicate the presence of cadmium, copper, lead, and zinc (Ref. 24, pp. 20, 42-45).

Table 1
Hazardous Substances Associated with Source 1

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration (mg/kg)	Adjusted CRQL (mg/kg)	References
X306 (ME00F4)	Waste (slag)	5/6/2008	Cadmium	12.0	0.51	4, p. 42; 16, p. 144; 25, pp. 2- 15, 44-50, 55, 56; 44, p. C-5
			Copper	8,910	10.1	
			Lead	10,100	4.05	
			Zinc	67,200	607	
X307 (ME00F5)	Waste (slag)	5/6/2008	Cadmium	32.2	0.51	4, p. 43; 16, p. 145; 25, pp. 2- 15, 44-50; 44, p. C-5
			Copper	4,140	5.14	
			Lead	11,300	4.11	
			Zinc	79,100	617	
X308 (ME00F6)	Waste	5/6/2008	Cadmium	42.9	0.52	4, p. 44; 16, p. 145;
			Copper	8,550	10.5	

			Lead	8,190	2.10	25, pp. 2-15, 44-50, 55, 56; 44, p. C-5
			Zinc	6,700	631	
X309 (ME00F7)	Waste (slag)	5/6/2008	Cadmium	441	0.51	4, p. 45; 16, p. 145; 25, pp. 2-15, 44-50; 44, p. C-5
			Copper	38,400	50.7	
			Lead	27,900	10.1	
			Zinc	81,400	609	

Notes:

CRQL = Contract-Required Quantitation Limit

-Concentrations reported on Form Is for samples X306 and X308 (Ref. 4, pp. 42, 44) were based on sample weights that were rounded incorrectly. Sample concentrations for these samples were recalculated based on the correct sample weights (Ref. 25, pp. 3, 55, 56).

-Adjusted CRQLs were calculated by the following formula:

$(\text{CRQL} \times \text{Dilution Factor}) / [(\text{weight in grams}) \times (\% \text{solids}/100)]$

-The CRQLs for these hazardous substances are provided in Ref. 45, p. C-5.

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1. Hazardous Constituent Quantity (Tier A) – Not Calculated

The hazardous constituent quantity is not available; therefore it is not possible to adequately determine a hazardous waste constituent quantity (Tier A) for Source 1 (Ref. 1, p. 51590). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, pp. 51590, 51591).

2.4.2.1.2. Hazardous Wastestream Quantity (Tier B) – Not Calculated

The hazardous wastestream quantity is not available; therefore it is not possible to adequately determine a hazardous wastestream quantity (Tier B) for Source 1 (Ref. 1, p. 51591). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier C, volume (Ref. 1, p. 51591).

2.4.2.1.3. Volume (Tier C)

Topographic surveys of the slag stockpile areas identified by Chemetco facility personnel were conducted on March 20, 2007 (Ref. 18, p. 5). Based on topographic surveys and density evaluations, a three-dimensional modeling program has been used to determine volumes of the stockpile areas (Ref. 18, p. 5). For the large stockpiles located along the eastern side of the facility, an average base grade elevation of 433 ft has been considered (Ref. 18, p. 5). In general, this elevation represents an average of the existing grades around the perimeter of the large stockpile area (Ref. 18, p. 5). Similarly, base grades of 433 ft and 432 ft have been considered for the smaller stockpiles to the west (Ref. 18, p. 5). A total slag volume of 452,245 cubic yards (cy) has been calculated (Ref. 18, p. 5).

The Hazardous Waste Quantity Factor Value was calculated by dividing the volume (452,245 cy) by 2.5 (Ref. 1, p. 51591, Table 2-5) for a pile.

Source Type	Units (cy)	Reference
Slag Pile	452,245	18, p. 5

Sum (cy): 452,245

Equation for Assigning Value (Ref. 1, p. 51591, Table 2-5):

Hazardous Waste Quantity = 452,245 cy/2.5

Volume Assigned Value = 180,898

2.4.2.1.4 Area (Tier D) – Not Evaluated

If the volume of the source can be determined, assign the area measure a value of 0 (Ref. 1, Section 2.4.2.1.3, p. 51591).

Area Assigned Value = 0

2.4.2.1.5. Source Hazardous Waste Quantity Value

According to the HRS, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity. Because volume (Tier C) was the only tier evaluated for Source 1, the volume will be assigned as the source hazardous waste quantity value for Source 1 (Ref. 1, p. 51591).

Source Hazardous Waste Quantity Value: 180,898

2.2.1 Source Identification

Number of the Source: Source 2

Name of Source: Zinc Oxide Pile

Source Type: Pile

Description and Location of Source:

Description

The second source scored at the Chemetco Facility is a pile of zinc oxide which is also known as scrubber sludge (Refs. 14, p. 5; 18, pp. 1, 2). The zinc oxide has been identified as being located in five separate areas, including a concrete bunker located at the north end of the facility, the DIS building, the dome building, a polishing pit, and within the shipping and receiving building (Ref. 18, p. 2). These areas were surveyed on March 6, 2007 (Ref. 18, p. 2). Only the concrete bunker was used to evaluate Source 2.

An approximate 2.5-acre concrete bunker is present along the north side of the facility. The bunker is best described as a solid material storage pile which is contained on four sides by free standing reinforced concrete walls and set atop an eight-inch-thick reinforced concrete slab (Refs. 14, p. 47; 18, p. 2). Apparent footers for the retaining walls were visible at various locations around the exterior base of the bunker (Ref. 18, p. 2). The interior base of the bunker is presumed to be at the same elevation as the elevation of the exposed footers (Ref. 18, p. 2). Utilizing a three-dimensional modeling program, a total volume of 62,204 cy has been calculated (Ref. 18, p. 2). Of the 62,204 cy quantity, approximately 15,440 cy extends above the bunker walls (approximate elevation of 445 ft) (Ref. 18, p. 2).

Samples from Source 2 were collected during the CERCLA Expanded Site Inspection of 2008 (Ref. 24, p. 22). Samples X303, X304 and X305 were all obtained from Source 2 (Refs. 16, p.144; 24, p. 22). Samples X303, X304 and X305 document the presence of the following hazardous substances; cadmium, copper, lead and zinc (Refs. 24, p. 22;. 25, p. 11). Waste samples were collected according to the Bureau of Land Sampling Procedures Guidance Manual for waste piles (Ref. 42, p. 5.6 – 5.7).

Location

As shown on Ref. 46, Figure 2, Source 2 is located on the northern central portion of the facility.

Containment

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: The ground water pathway was not scored; therefore, ground water containment was not evaluated.

Release via overland migration and/or flood: Source 2 does not have a complete, maintained, engineered cover (Ref. 24, p. 22). Source 2 does have retainer walls that surround the pile that have been designed to limit the flow of contamination from the pile, but the zinc oxide is piled higher than the walls, allowing materials from the pile to migrate over the walls on to the adjacent grounds. Of the 62,204 cy quantity, approximately 15,440 cy extends above the bunker walls (approximate elevation of 445) (Ref. 18, p. 2). Run-off from the zinc oxide pile is allowed to drain to the west and south. Surface water draining to the west flows across the Chemetco facility and along the railroad ditch and eventually to the western most portion of Long Lake (PPE 1) (Refs. 24, p. 7; 34; 35, pp. 1-3, 5, 6).

The surface water which flows to the south of the zinc oxide pile would be contained by the cooling lagoons. If these cooling lagoons were to overflow, water would flow to the south and be diverted by the run-off control system. The run-off control system consists of a concrete lined ditch which would contain some of the runoff and divert the surface water to a holding basin (Refs. 35, pp. 9, 10, 12, 13, 14; 46, Figure 2).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

The hazardous substances cadmium, copper, lead and zinc were detected in three samples obtained from Source 2 during the 2008 CERCLA ESI (Ref. 24, p. 22). Samples X303, X304 and X305 were all obtained from Source 2 (Ref. 24, p. 22). The analytical results included in Table 2 are evidence of the contamination associated with Source 2, the zinc oxide pile. Source sample locations are presented in Ref. 46, Figure 3. Analysis of the samples from Source 2 for total metals was conducted using EPA CLP laboratories and results indicate the presence of cadmium, copper, lead and zinc (Ref. 25, pp. 11, 43).

In addition, two samples were collected from the slag piles during the 2002 ESI at the Chemetco facility. Results from these samples also revealed the presence of cadmium, copper, lead and zinc (Refs. 33, p. 10, Figure 3; 40, pp. 69, 82, 95).

**Table 2
Hazardous Substances Associated with Source 2**

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration (mg/kg)	Adjusted CRQL (mg/kg)	References
X303 (ME00F1)	Waste	5/6/08	Cadmium	3,500	4.08	4, p. 39; 16, p. 144; 25, pp. 2- 16, 44-50, 55, 56; 45, p. C-5
			Copper	91,700	102	
			Lead	120,000	40.8	
			Zinc	214,000	1224	
X304 (ME00F2)	Waste	5/6/08	Cadmium	3,660	4.20	4, p. 40; 16, p. 144; 25, pp. 2- 16, 44-50; 45, p. C-5
			Copper	91,900	105	
			Lead	123,000	42.0	
			Zinc	223,000	1260	
X305 (ME00F3)	Waste	5/6/08	Cadmium	3,180	3.08	4, p. 41; 16, p. 144; 25, pp. 2- 16, 44-50; 45, p. C-5
			Copper	108,000	193	
			Lead	139,000	30.8	
			Zinc	247,000	1849	

Notes:

CRQL = Contract-Required Quantitation Limit

-Concentrations reported on Form Is for sample X303 (Ref. 4, p. 39) were based on sample weight that was rounded incorrectly. Sample concentrations for this sample were recalculated based on the correct sample weight (Ref. 25, pp. 3, 55, 56).

-Adjusted CRQLs were calculated by the following formula:

$(\text{CRQL} \times \text{Dilution Factor}) / [(\text{weight in grams}) \times (\% \text{solids}/100)]$

-The CRQLs for these hazardous substances are provided in Ref. 45, p. C-5.

2.4.2 Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity (Tier A) – Not Calculated

The hazardous constituent quantity is not available; therefore it is not possible to adequately determine a hazardous waste constituent quantity (Tier A) for Source 2 (Ref. 1, p. 51590).

As a result the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous waste stream quantity (Ref. 1, pp. 51590, 51591).

2.4.2.1.2. Hazardous Wastestream Quantity (Tier B) – Not Calculated

The hazardous wastestream quantity is not available; therefore it is not possible to adequately determine a hazardous wastestream quantity (Tier B) for Source 2 (Ref. 1, p.

51591). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier C, volume (Ref. 1, p. 51591).

2.4.2.1.3. Volume (Tier C)

An approximate 2.5-acre concrete bunker is present along the north side of the facility (Ref. 18, p. 2). Topographic surveys of the zinc oxide bunker and pile area were conducted on March 6, 2007 (Ref. 18, p. 2). Based on topographic surveys and density evaluations, a three-dimensional modeling program has been used to determine volume of the zinc oxide pile (Ref. 18, p. 2). The interior base of the bunker is presumed to be the same elevation as the elevation of the exposed footers (Ref. 18, p. 2). Accordingly, an elevation of 433 ft has been assigned as the base grade of the stockpiled zinc oxide sludge (Ref. 18, p. 2). Utilizing a three-dimensional modeling program, a total volume of 62,204 cy has been calculated for Source 2 (Ref. 18, p. 2). Of the 62,204 cy quantity, approximately 15,440 cy extends above the bunker walls (approximate elevation of 445 ft) (Ref. 18, p. 2).

Source Type	Units	Reference
Pile	62,204 cy	18, p. 2

Sum (cy): 62,204 cy

Equation for Assigning Value (Ref. 1, Table 2-5, p. 51591):

$$\text{Hazardous Waste Quantity} = 62,204 \text{ cy} / 2.5$$

$$\text{Volume Assigned Value} = 24,881.6$$

2.4.2.1.4 Area (Tier D) – Not Evaluated

If the volume of the source can be determined, assign the area measure a value of 0 (Ref. 1, Section 2.4.2.1.3, p. 51591).

$$\text{Area Assigned Value} = 0$$

2.4.2.1.5. Source Hazardous Waste Quantity Value

According to the HRS, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity. Because volume (Tier C) was the only tier evaluated for Source 2, the volume will be assigned as the source hazardous waste quantity value for Source 2 (Ref. 1, p. 51591).

$$\text{Source Hazardous Waste Quantity Value: } 24,881.6$$

2.2.1 Source Identification

Number of the Source: Source 3

Name of Source: Slag Parking Lot

Source Type: Pile

Description and Location of Source:

Description

The truck parking lot (Source 3) is located south of the southwest corner of the main facility property and is composed of slag material. The parking lot was built in 1980 and currently occupies approximately 3.3 acres or 143,748 square feet of land just north of and adjacent to Long Lake and contiguous wetlands. There is no cap or liner to help prevent the contaminants from being spread off site via the air, groundwater or surface water pathways (Ref. 33, p. 10). The depth of the slag material with which the parking lot was made is unknown. There is speculation of spent refractory brick being buried/backfilled under the slag parking lot (Ref. 24, p. 6).

Samples from Source 3 were collected during the CERCLA Expanded Site Inspection of 2008 (Ref. 24, p. 17). Samples X301 and X302 were obtained from Source 3 (Ref. 24, pp. 22, 23). Samples X301 and X302 document the presence of the following hazardous substances; cadmium, copper, lead and zinc (Refs. 4, pp. 37, 38; 24, pp. 22, 23). Waste samples were collected according to the Bureau of Land Sampling Procedures Guidance Manual for waste piles (Ref. 42, pp. 5.6 – 5.7).

Location

As shown on Ref. 46, Figure 3, Source 3 is located just to the southwest of the facility.

Containment

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: The ground water pathway was not scored; therefore, ground water containment was not evaluated.

Release via overland migration and/or flood: Source 3 does not have a complete, maintained, engineered cover or functioning maintained run-on or run-off control system. Source 3 does not have containment structures to limit the flow of contamination from the pile (Ref. 35, pp. 4, 5). This leads to an assigned value of 10 (Ref. 1, pg 51609, Table 4-2).

Run-off from the slag parking lot is allowed to drain to the southwest corner. Surface water draining to the southwest corner flows into the PEMCD wetland which is contiguous with Long Lake (Refs. 6; 35, pp. 4, 5).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

The hazardous substances cadmium, copper, lead and zinc were detected in two samples (X301, X302) obtained from Source 3 during the 2008 CERCLA Expanded Site Inspection (Ref. 24, pp. 22, 23, Tables 1, 3, 4, Figure 4). The analytical results included in Table 3 are evidence of the contamination associated with Source 3, the truck parking area. Source sample locations are presented in Ref. 46, Figure 3.

Analysis of the samples from Source 3 was conducted using EPA CLP for total metals (Ref. 25, p. 4) and results indicate the presence of cadmium, copper, lead and zinc (Ref. 25, p. 11).

In addition, three samples were collected from the slag parking lot during the 2002 ESI at the facility. Results from these samples also indicated the presence of cadmium, copper, lead and zinc (Ref. 33, p. 10, Table 1, Figure 3; 40, pp. 69, 74-76, 95).

**Table 3
Hazardous Substances Associated with Source 3**

Sample ID	Sample Type	Date	Hazardous Substance	Hazardous Substance Concentration (mg/kg)	Adjusted CRQL (mg/kg)	References
X301 (ME00E9)	Waste (slag parking lot)	5/6/08	Cadmium	208	0.55	4, p. 37; 16, p. 143; 25, pp. 2- 15, 44- 50;45, p. C-5
			Copper	33,100	55.4	
			Lead	11,500	4.4	
			Zinc	30,700	266	
X302 (ME00F0)	Waste (slag parking lot)	5/6/08	Cadmium	234	0.63	4, p. 38; 16, p. 144; 25, pp. 2- 15, 44-50; 45, p. C-5
			Copper	145,000	157	
			Lead	23,300	6.30	
			Zinc	56,500	378	

Notes:

CRQL = Contract-Required Quantitation Limit

-Adjusted CRQLs were calculated by the following formula:

$(\text{CRQL} \times \text{Dilution Factor}) / [(\text{weight in grams}) \times (\% \text{solids}/100)]$

-The CRQLs for these hazardous substances are provided in Ref. 45, p. C-5.

2.4.2 Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity (Tier A) – Not Calculated

The hazardous constituent quantity is not available; therefore it is not possible to adequately determine a hazardous waste constituent quantity (Tier A) for Source 3 (Ref. 1, p. 51590). As a result the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, pp. 51590, 51591).

2.4.2.1.2. Hazardous Wastestream Quantity (Tier B) – Not Calculated

The hazardous wastestream quantity is not available; therefore it is not possible to adequately determine a hazardous wastestream quantity (Tier B) for Source 3 (Ref. 1, p. 51591). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier C, volume (Ref. 1, p. 51591).

2.4.2.1.3. Volume (Tier C)

If the volume cannot be determined, assign the source a value of 0 for the volume measure and proceed to Area (Ref. 1, Section 2.4.2.1.4).

Volume Assigned Value = 0

2.4.2.1.4 Area (Tier D)

Evaluate the area measure using the area of the source (or the area of the area of observed contamination). Based on this area, assign a value to the area measure as follows; For the migration pathways assign the source a value for area using the appropriate Tier D equation from Ref. 1, Table 2-5.

Based on the results of the samples collected from the slag parking lot, hazardous substances are known to be present at a number of locations throughout this area. However, information is not sufficient at this time to delineate the area of the source. The hazardous waste quantity will be assigned as unknown, but greater than zero.

Area Assigned Value = >0

2.4.2.1.5. Source Hazardous Waste Quantity Value

According to the HRS, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity. Because area (Tier D) was the only tier evaluated for Source 3, the area will be assigned as the source hazardous waste quantity value for Source 3 (Ref. 1, p. 51591).

Source Hazardous Waste Quantity Value: >0

2.2.1 Other Possible Sources

During the preparation of the HRS package, other possible sources of contamination were identified at the Chemetco facility. These other possible sources include: the former acid pit (also known as the floor wash impoundment), acid spill area, cooling water canal, former zinc oxide pits, and the discharge pipe (Zinc Oxide Spill) (Ref. 46, Figure 2). However, due to lack of sufficient documentation, these other possible sources were not scored.

Former Acid Pit

The former acid pit (also known as the floor wash water impoundment) was a soil-lined impoundment that contained wastewater and an electrolyte solution composed of sulfuric acid, copper, nickel, calcium and silica. It was removed from service in 1980 and backfilled without prior excavation of contaminated sediments or soils (Ref. 14, pp. 14-16).

Acid Spill Area

During the 2008 ESI, six soil samples were collected from the acid spill area located on the south side of the facility. Inorganic constituents such as copper and nickel were detected at levels significantly above background in some of these samples (Ref. 14, pp. 18, 19).

Cooling Water Canal

The cooling water canal is an earth-lined trench approximately 3400 feet long. On an unknown number of occasions in the past, the canal received overflow from adjacent zinc oxide settling pits. Samples of the overflow indicated levels of lead, cadmium, arsenic, and nickel. Although the canal was excavated in 1985, available file material indicates that 2 canal sections remained open after excavation activities (Ref. 14, pp. 14, 17, 18).

Former Zinc Oxide Pits

The zinc oxide pits were 2 parallel soil-lined pits having a combined capacity of 890,000 gallons, located in the southeast corner of the facility. The pits were used to allow zinc oxide solids to settle out of scrubber slurry. Although the pits were reportedly clean-closed in 1985, they overflowed an unknown number of times during their years of operation. Samples of the overflow indicated levels of lead, cadmium, arsenic, and nickel (Ref. 14, pp. 16-17).

Discharge Pipe (Zinc Oxide Spill)

As described in the Facility History section of this HRS documentation record, the discharge pipe, discovered in September 1996, led to a drainage ditch in the southern portion of the facility. Sediment samples collected from the impacted area revealed levels of cadmium, copper, lead and zinc (Ref. 29, pp. 1-4). Excavation of impacted sediments in Long Lake was conducted (Ref. 13, pp. 6, 9-15), however, the cleanup effort was not formally closed. Additional sampling was not conducted downstream of the visually impacted areas at that time.

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Y/N)	Containment Factor Value by Pathway					
			Soil Exposure	Ground Water (GW) (Table 3-2)	Surface Water (SW)		Air	
					Overland/flood (Table 4-2)	GW to SW (Table 3-2)	Gas (Table 6-3)	Particulate (Table 6-9)
1	180,898	N	NS	NS	10	NS	NS	NS
2	24,881.6	N	NS	NS	10	NS	NS	NS
3	>0	N	NS	NS	10	NS	NS	NS

Notes: NS – Not Scored

4.0 SURFACE WATER MIGRATION PATHWAY

4.0.1 Migration Components

Overland/Flood Migration to Surface Water Component

According to the HRS, surface water threats that result from migration of hazardous substances from a source at the site to surface water via overland flow and flood include the drinking water, human food chain, and environmental threats (Ref. 1, Sec. 4.0.1). For the Chemetco site, the environmental threat is scored for the overland/flood migration component of the surface water migration pathway.

Ground Water to Surface Water Migration Component

The ground water to surface water migration component of the surface water migration pathway may exist at this site but was not scored.

4.0.2 Surface Water Categories

According to the HRS, rivers include: Perennially flowing waters from point of origin to the ocean or to coastal tidal waters, whichever comes first, and wetlands contiguous to these flowing waters (Ref. 1, Sec. 4.0.2). At the Chemetco site, Long Lake and contiguous wetlands are the primary focus of the surface water pathway analysis. Long Lake is located to the south of the Chemetco facility and, while “lake” is part of its name, it is actually a perennially flowing water body (Refs. 7; 34).

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

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

The hazardous substance migration path from the sources includes both the overland segment and the in-water segment (Ref. 1, Sec. 4.1.1.1).

Overland Segment

The overland segment is defined as the portion of the hazardous substance migration pathway beginning at a source and proceeding down-gradient to the probable point of entry (PPE) to surface water (Ref. 1, Sec. 4.1.1.1). Surface water is allowed to infiltrate the zinc oxide and slag piles and the truck parking area. Surface water was seen during the 2008 ESI which was ponded around the zinc oxide bunker and the truck parking area (Refs. 24, pp. 7, 8, 89; 35, pp. 5, 8).

Surface water flowing from the zinc oxide pile would flow south. A portion of the water would flow to the southeast to the cooling canals. Water draining from the western portion of the pile would flow south along the west side of the dome building. Water would then flow southwest across the asphalted surface of the Chemetco facility to the north side of the commercial offices, where the water was approximately 6 inches deep. The surface water would then continue to flow to the west to the ditch located on the west side of the facility

(Refs. 24, p. 7; 34). The overland flow draining from the Chemetco facility was witnessed during a reconnaissance visit on April 1, 2008 (Ref. 35). During the reconnaissance inspection on April 1, 2008, photos were taken of surface water leaving the property from the west side of the Chemetco facility (Ref. 35, p. 1). Water from the west side of the facility was flowing adjacent to the railroad tracks in a ditch (Ref. 35, p. 1-3). This ditch flowed south 0.16 miles (Ref. 37, p. 3) and was directed to a culvert which went under the railroad tracks and Chemetco Lane (Ref. 35, p. 3-4). The water then continued to flow south via the roadside ditch alongside Illinois Highway Route 3 (Ref. 35, pp. 3-4) for 0.22 miles where the surface water reaches another culvert which directs the runoff into wetlands adjacent to Long Lake (Ref. 7, Ref. 35, p. 5-6). This location is PPE1 due to the presence of Long Lake and adjacent wetlands (Ref. 6, Ref. 1, Sec. 4.0.2). This overland flow segment is shown in Ref. 46, Figure 5.

Surface water drainage from the large slag pile located in the northeast portion of the facility would drain to the cooling lagoons located on the west and south of this slag pile. The smaller slag piles located to the south of the lagoons would drain south to the concrete lined ditch and then continue east to the holding basin (Ref. 24, p. 8). The holding basin was seen to be overflowing during the reconnaissance and during the ESI. The overflowing water from the holding basin (Ref. 35, p. 14 - 15) was flowing south down the embankment into the tall grasses and phragmites (Ref. 35, p. 16). This surface water pathway became difficult to discern with the abundance of water in the area and the pathway through the abundant grasses and phragmites, but appeared to flow toward the wetlands and Long Lake (Ref. 35, pp. 14, 16). This overland flow segment is depicted in Ref. 46, Figure 5.

Surface water draining from the truck parking area located southwest of the fenced Chemetco facility empties into adjacent wetlands located at the southwest corner of the truck parking area (Ref. 35, p. 4 - 5). PPE 2 is designated in Ref. 46, Figure 5.

Probable Point of Entry

The probable point of entry (PPE) is the point at which the overland segment of a hazardous substance migration path intersects with surface water. The PPE is assigned as the point at which entry of the hazardous substances to surface water is most likely. There are three PPEs for this site (Ref. 24, pp. 27-30). All three PPEs are illustrated in Ref. 46, Figure 5. PPE1 is at the intersection of the overland segment through the ditches with the contiguous wetlands which border Long Lake. PPE2 is the point at which runoff from the truck parking area enters the wetlands adjacent to Long Lake. PPE 3 is located at the point at which the overland flow segment from the holding basin intersects with the wetlands adjacent to the surface water.

Surface Water Segment

The in-water segment begins at PPE 1 and continues in the direction of flow for the distance established by the target distance limit, 15 miles downstream of the most downstream PPE (Ref. 1, Sec. 4.1.1.2).

At the time of the ESI sampling event in May of 2008, the lake was shallow with most areas being less than two feet in depth. A portion of Long Lake is located alongside a residential neighborhood (Ref. 24, p. 29) (see Ref. 46, Figure 1). The remainder of the in-water segment is discussed in Section 4.1.1.2, below.

4.1.1.2 Target Distance Limit

The Target Distance Limit (TDL) defines the maximum distance over which targets are considered in evaluating the surface water pathway (Ref. 1, Sec. 4.1.1.2). According to the HRS, the TDL for the watershed extends 15 miles along the surface water or to the most distant sample point that meets the observed release criteria described in Section 4.1.3.1 below (Ref. 1, Sec. 4.1.1.2). The TDL for the Chemetco facility begins at PPE 1 in the wetlands contiguous with Long Lake.

The USGS Topographic Map of the Wood River, IL quadrangle indicates that Long Lake begins at Route 3. The National Wetlands Inventory Map indicates that designated wetlands are contiguous with Long Lake (Ref. 6, Ref. 7, Ref. 37, p. 3). The pathway then follows Long Lake for 3.65 miles to Long Lake's intersection with an unnamed drainage ditch or canal (Ref. 7). From this point the surface water pathway follows an unnamed drainage ditch or canal for 2.29 miles in a southwesterly direction to a point from which the water could flow west to Chouteau Slough (0.32 mile) or continue flowing south through a marshy area which is approximately 1.5 miles long (located east of the Chouteau Slough) (Refs. 8; 10).

For those surface waters that flow to Chouteau Slough, flow proceeds in a southwesterly direction for 0.57 mile to the overflow of the slough on the southern side of the slough, and then 1.17 miles to a fork where the surface water would flow southwest or flow south. The surface water which flows south would continue south for 0.65 mile to a perennial depression. The surface water which flows southwest would continue along the perennial waterway for 3.26 miles (from the fork) to a tributary of the Chain of Rocks Canal. Surface waters then flow to the west (0.23 mile) to the Chain of Rocks Canal. Once entering into the Chain of Rocks Canal, the water then flows for 0.79 mile to the Mississippi River. Once entering into the Mississippi River, the water flows for an additional 2.72 miles to the terminus of the 15 mile TDL, which is located near Brooklyn, Illinois (Refs. 7; 8; 9; 10; 46, Figure 6).

Targets within or contiguous to the hazardous substance migration path are subject to actual contamination if the target is located at or between the PPE and any sampling point that meets the criteria for an observed release (Ref. 1, Sec. 4.1.1.2). All targets located between PPE 1 and sediment sample X212 (Ref. 46, Figure 4) are subject to actual contamination (observed releases at these sample locations are described in Section 4.1.4.1 of this HRS documentation record). Sediment samples were collected according to the Bureau of Land Sampling Procedures Guidance Manual for sediments (Ref. 42, p. 10.7 – 10.8).

The distance from the PPE was calculated using Geographic Information System (GIS)

software. The distance was determined based on the locations of the sediment samples as logged into the Global Positioning System unit upon the time of collection, and then transferred to the GIS program. These locations were then placed on the digitized and rectified aerial photograph of the area. Then using the GIS program, the ruler option of the program allows users to find distances. Sample locations are depicted in Reference 24, Figure 4.

The USGS topographic maps of the area were downloaded from an Illinois State Geological Survey Web site (Ref. 12) and manipulated using GIS software (Ref. 37). The 15-mile TDL was found by using the ruler function in the GIS software and following the surface water pathway (Ref. 46, Figure 6).

4.1.4 Environmental Threat

4.1.4.1 Environmental Threat – Likelihood of Release

Environmental Threat - Observed Release

Establish an observed release to surface water for a watershed by demonstrating that the site has released a hazardous substance to the surface water in the watershed at levels significantly above the background level (Ref. 1, Section 2.3).

Observed Release by Chemical Analysis

Sediment samples collected from Long Lake (X212-X216, X219-X221, X223) all exceeded three times the background levels of the inorganics shown in Table 4-4 of this HRS documentation record (Ref. 24, Table 4). Sediment sample locations from the 2008 ESI sampling events are shown in Figure 5, Reference 24. Analytical data from the 2008 ESI sampling event supports an observed release by chemical analysis to Long Lake, which is presented below.

Background Samples

Illinois EPA collected a sediment sample during the 2008 ESI to document background sediment conditions (Ref. 24, p. 14 and Table 1). Sample X224 was collected from a perennial water body located west of Illinois Highway Route 3 and west of the Chemetco facility (Ref. 46, Figure 4). This perennial water body was expected to have been unimpacted from any potential historic releases from the facility and is hydraulically connected to Long Lake (Refs. 7; 41, p.3). The sample used to document background sediment conditions, X224, was collected from a depth of 0 – 6 inches below the surface of the sediment. X224 consisted of a silty clay mix which was brownish gray in color (Ref. 24, Table 1). The sample was collected from the northern portion of the water body in approximately 1 ft of water (Ref. 24, Table 1). The background sediment sample (X224) was of similar makeup and consistency as the other sediment samples collected from Long Lake (Ref. 24, p. 18 and Table 1). The background sample was collected during the same sampling event as the release samples, at approximately the same depth (0-6 inches), using the same sampling protocols (Refs. 16, pp. 140-143; 24, p. 16) and was analyzed for the

same sample parameters (target analyte list for inorganics in accordance with EPA CLP Statement of Work) (Contract No. EP-W-06-054) (Ref. 25, p. 16). The background sediment sample was analyzed for the target analyte list for inorganics by DataChem Laboratories Inc., located at 960 West LeVoy Drive, Salt Lake City, Utah, in accordance with EPA CLP Statement of Work using Methods CLP SOW ILM05.4 (Ref. 30, pp. 3, 15). EPA's Superfund Field Services Section validated the analytical results for the background sediment sample; analytical results for this data package are provided in Reference 30. Sediment samples were collected according to the Bureau of Land Sampling Procedures Guidance Manual for sediments (Ref. 42, p. 10.7 – 10.8).

Table 4-1 Background Sediment Sample Description

Sample ID	Sample Medium	Sample Location	Depth	Date	References
X224 (ME00G2)	Sediment	Water body west of Long Lake	0-6 inches	5/7/08	16, p. 147; 24, Table 1, Fig. 5; 30, p. 12

Background Concentration

The table below provides a summary of the concentrations of hazardous substances detected in the background sample collected from the water body west of Long Lake during the 2008 ESIs. The analytical data package and data validation report from the sampling event are provided in References 4 and 30. The HRS states that if the Sample Quantitation Limit is less than or equal to the sample measurement, then an observed release is established as follows: if the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds the sample quantitation limit. If the background concentration equals or exceeds the detection limit, an observed release is established when the sample measurement is 3 times or more above the background concentration (Ref. 1, p. 51589, Table 2-3).

**Table 4-2
Background Sediment Sample Concentrations**

Sample ID	Hazardous Substance	Sample Concentration (mg/kg)	Concentration Adjusted for Bias (mg/kg)	Adjusted CRQL(mg/kg)	References
X224 (ME00G2)	Cadmium	6.0 J	8.50	0.79	4, p. 35; 30, pp. 2-16, 34; 45, p. C-5
	Copper	37 J	37.0	3.94	
	Lead	50.4	N/A	1.57	
	Zinc	249	N/A	9.45	

Notes:

mg/kg milligrams per kilogram

J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

CRQL Contract-Required Quantitation Limit

N/A Not applicable

-Adjusted CRQLs were calculated by the following formula:

$(CRQL \times \text{Dilution Factor}) / [(\text{weight in grams}) \times (\% \text{solids}/100)]$

-The CRQLs for these hazardous substances are provided in Ref. 45, p. C-5.

-The concentration of cadmium in sample X224 was qualified "J" due to poor duplicate precision. This qualification resulted in an unknown bias and the concentration has been adjusted per EPA document *"Using Qualified Data to Document an Observed Release and Observed Contamination,"* (Refs, 3, pp. 8, 18; 30, pp. 2-16, 28).

-The concentration of copper in sample X224 was qualified "J" due to high recoveries in the matrix spike sample. This qualification resulted in a high bias and the concentration has been adjusted per EPA document *"Using Qualified Data to Document an Observed Release and Observed Contamination,"* (Refs. 3, pp. 8, 18;30, pp. 2-16, 26).

-Concentrations reported on Form Is for sample X224 (Ref. 4, p. 35) were based on a sample weight that was rounded incorrectly. Sample concentrations for this sample were recalculated based on the correct sample weight and no changes were made to the reported results. (Ref. 30, pp. 3, 11, 95)

Observed Release Samples:

All samples were analyzed for total metals, mercury and cyanide (Ref. 30, p. 45).

Cadmium, copper, lead and zinc were present in the sources associated with Chemetco and were also documented in the release samples, and consequently, have been selected and used in the HRS scoring process. Of the 20 sediment samples collected downstream of the facility and analyzed for inorganics, ten meet the criteria presented in HRS Table 2-3 for establishing an observed release by chemical analysis (Ref. 1, Table 2-3). The inorganic concentrations in these sediment samples are greater than three times the established appropriate background level. The established appropriate background level is 8.5 mg/kg for cadmium, 37 mg/kg for copper, 50.4 mg/kg for lead, and 249 mg/kg for zinc; taking into account bias based on the analytical data is necessary and applying the appropriate factors (Ref. 30, p. 7, 29) (for cadmium (biased low (Ref. 30, pp. 7, 29)) the adjusted value is 8.5 (Ref. 3, p. 18) and then multiply by three) the background level is 25.5 mg/kg for cadmium. Due to a high bias for copper (Ref. 30, pp. 6, 27), no action is required (Ref.

30, pp. 7, 29), multiply 37 times 3, which results in 111 mg/kg for copper and due to no bias for lead nor zinc, (3 times 50.4) 151.2 mg/kg for lead and (3 times 249) 747 mg/kg for zinc.

Summary descriptions of the observed release samples are included in Table 4-3. Analytical results from the observed release samples are included in Table 4-4.

Table 4-3 Observed Release Sediment Sample Descriptions

Sample ID	Sample Medium	Sample Location	Distance from PPE 1	Depth	Date	References
X222	Sediment	Long Lake	239 ft	0-4 inches	5/6/08	16, p. 142; 24, Table 1, Fig. 5
X221	Sediment	Long Lake	512 ft	0-4 inches	5/6/08	16, p. 142; 24, Table 1, Fig. 5
X220	Sediment	Long Lake	1040 ft	0-4 inches	5/6/08	16, p. 142; 24, Table 1, Fig. 5
X219	Sediment	Long Lake	1735 ft	0-4 inches	5/6/08	16, p. 141; 24, Table 1, Fig. 5
X223	Sediment	Long Lake	3213.7 ft	0-6 inches	5/6/08	16, p. 142; 24, Table 1, Fig. 5
X215	Sediment	Long Lake	3928 ft	0-4 inches	5/6/08	16, p. 141; 24, Table 1, Fig. 5
X216	Sediment	Long Lake	4846 ft	0-4 inches	5/6/08	16, p. 141; 24, Table 1, Fig. 5
X214	Sediment	Long Lake	6490 ft	0-4 inches	5/5/08	16, p. 140; 24, Table 1, Fig. 5
X213	Sediment	Long Lake	10630.4 ft	0-4 inches	5/5/08	16, p. 140; 24, Table 1, Fig. 5
X212	Sediment	Long Lake	11,442.7 ft	0-4 inches	5/5/08	16, p. 140; 24, Table 1, Fig. 5

Distances from PPE 1 were calculated using georeferenced aerial photos and GIS program (Ref. 37, p. 1).

**Table 4-4
Observed Release Sediment Sample Concentrations**

Sample ID	Hazardous Substance	Hazardous Substance Concentration ppm	Adjusted Concentration based on bias (Ref. 3)	Adjusted CRQL (mg/kg)	3 X Background (mg/kg)	References
X222 (ME00E3)	Cadmium	47.9 J	34.0	0.77	25.5	4, p. 25; 30, pp. 2-16, 34; 45, p. C-5
X221 (ME00E2)	Cadmium	53.8 J	38.2	1.40	25.5	4, p. 24; 30, pp. 2-16, 34; 45, p. C-5
	Copper	672 J	551	6.98	111	
	Lead	209	N/A	2.79	151.2	Refs. 4, p. 24; 30, pp. 2-16, 34; 45, p. C-5
	Zinc	1020	N/A	16.8	747	Refs. 4, p. 24; 30pp. 2-16, 34; 45, p. C-5
X220 (ME00E1)	Cadmium	3760 J	2667	3.03	25.5	4, p. 22; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	5870	N/A	7.57	111	
	Lead	9410 J+	6526	3.03	151.2	
	Zinc	18,500 J	12,333	90.48	747	
X219 (ME00E0)	Cadmium	715 J	507	1.74	25.5	4, p. 21; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	10,600	N/A	17.4	111	
	Lead	5700 J	3958	3.48	151.2	
	Zinc	4970 J	3313	41.8	747	
X223 (ME00E8)	Copper	3270 J	2713	5.07	111	4, p. 30; 30, pp. 2-16, 34; 45, p. C-5
	Lead	794	N/A	2.03	151.2	
	Zinc	1980	N/A	12.2	747	
X215 (ME00D6)	Cadmium	128 J	90.8	1.12	25.5	4, p. 17; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	527	N/A	5.59	111	
	Lead	339 J+	235	2.24	151.2	
X216 (ME00D7)	Cadmium	108 J	76.6	0.99	25.5	4, p. 18; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	971	N/A	4.94	111	
	Lead	448 J+	311	1.98	151.2	
	Zinc	1240 J	827	11.9	747	
X214 (ME00D5)	Cadmium	57.6 J	40.9	1.33	25.5	4, p. 16; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	724	N/A	6.67	111	
	Lead	496 J	344	2.67	151.2	
X213 (ME00D4)	Cadmium	37.9 J	26.9	0.95	25.5	4, p. 15; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	138	N/A	4.74	111	
X212 (ME00D3)	Cadmium	70 J	49.7	0.94	25.5	4, p. 14; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	178	N/A	4.68	111	

Notes:
CRQL Contract-Required Quantitation Limit

N/A Not applicable

- Adjusted CRQLs were calculated by the following formula:

$(\text{CRQL} \times \text{Dilution Factor}) / [(\text{weight in grams}) \times (\% \text{solids}/100)]$

-The CRQLs for these hazardous substances are provided in Ref. 45, p. C-5.

-The concentrations of cadmium in samples X212 – X216 and X219 - X223 were qualified “J” due to poor duplicate precision. This qualification resulted in an unknown bias and the concentration has been adjusted per EPA document “*Using Qualified Data to Document an Observed Release and Observed Contamination*” (Ref. 30, pp. 2-16, 28, 43-58, 74; Ref. 3, pp. 8, 18).

-The concentration of copper in samples X221, X222, and X223 were qualified “J” due to high recoveries in the matrix spike sample. This qualification resulted in a high bias and the concentration has been adjusted per EPA document “*Using Qualified Data to Document an Observed Release and Observed Contamination*” (Ref. 30, pp. 2-16, 26; Ref. 3, pp. 8, 18).

-The concentration of lead and zinc in samples X212 – X216, X219 and X220 were qualified “J” due to poor duplicate precision. This qualification resulted in an unknown bias and the concentration has been adjusted per EPA document “*Using Qualified Data to Document an Observed Release and Observed Contamination*” (Ref. 30, pp. 43-58, 74; Ref. 3, pp. 8, 18).

-Concentrations reported on Form Is for samples X222 and X223 (Ref. 4, pp. 24, 25, 30) were based on sample weights that were rounded incorrectly. Sample concentrations for these samples were recalculated based on the correct sample weight (Ref. 30, pp. 3, 9, 10, 95).

-Concentrations reported on Form I for samples X214 – X216, X219 and X220 (Ref. 4, pp. 16 – 18, 21, 22) were based on sample weights that were rounded incorrectly. Sample concentrations for these samples were recalculated based on the correct sample weight (Ref. 30, pp. 44, 52, 53, 98).

Attribution

The following documentation presents evidence that the contamination found in the sediments of Long Lake can be associated to all the sources at the Chemetco facility. Cadmium, copper, lead and zinc are associated with the three sources at the facility (see Section 2.2 of this HRS documentation record).

Chemetco was a major producer of high purity copper, and certain other metals and alloys derived for the most part from recyclable non-ferrous metal-bearing materials (Ref. 38, p. 73). In Chemetco’s smelting and other processes, Chemetco produced the following products: anode copper, cathode copper, crude lead-tin solder, crude zinc oxide and an iron silicate slag (Ref. 14, p. 2).

Sediment samples collected from Long Lake (Table 4-4 of this HRS documentation record) indicate that hazardous substances have migrated to Long Lake. Samples collected from the sources located on the Chemetco facility identify cadmium, copper, lead and zinc. Samples collected from the sediments of Long Lake reveal cadmium, copper, lead and zinc are present in the sediments in amounts that exceed background concentrations. Overland flow routes and drainage pathways from the facility are discussed in Section 4.1 of this HRS documentation record and document the overland flow routes of contaminants to Long Lake.

In order to determine whether the significant increase in cadmium, copper, lead and zinc

downstream of the Chemetco facility is the result of a source or sources other than the sources identified at the Chemetco facility, two online EPA databases (Enviromapper and TRI Explorer) were searched (Ref. 43). These databases revealed four facilities within one mile of the Chemetco facility (Ref. 44). These regulated facilities consist of Kinder Morgan Transmix Co., Inc., East Alton WTP, Roxana STP, and Chouteau Township. These facilities do not handle or discharge any contaminants associated with the Chemetco site (Refs. 20, pp. 1-2; 22, pp. 1-2; 23, pp. 1-2; 27, p. 1). The databases also revealed another facility (ConocoPhillips Co.) which handles contaminants similar to Chemetco. ConocoPhillips is located at 2150 S. Delmar Avenue, Hartford, IL, which is just over one mile to the north of Chemetco (Refs. 43, p. 1; 44). Lead and zinc have been identified at the ConocoPhillips Co., but are transferred to other companies for disposal and are not released to the land surface (Ref. 43, pp. 2, 4). There is no potential overland flow pathway between ConocoPhillips and Long Lake. The nearest water body down gradient (south) of the ConocoPhillips site is the Cahokia Diversion Channel. This is a perennial waterway which flows west into the Mississippi River (Ref. 7). The Cahokia Diversion Channel is located between the ConocoPhillips property and Chemetco. There are air emissions from this facility. According to the Multi-system Report generated by the referenced databases, air emissions are limited to volatile compounds, so any materials from the air emissions would not contain lead or zinc (Ref. 43, pp. 4, 5). Lead and zinc from ConocoPhillips are transferred to other facilities. Lead and zinc are documented as having 6.1 pounds and 255 pounds recovered or reused per year respectively (Ref. 43). Copper and cadmium which are not utilized at the ConocoPhillips facility are found in the sources associated with Chemetco and have also been documented as being present in the sediments of Long Lake (Ref. 43, pp. 1-7).

The byproducts produced on the Chemetco property (zinc oxide and slag) and the sediments collected from the wetlands and Long Lake indicate that the waste products at Chemetco led to the contamination of the sediments in the wetlands and Long Lake with cadmium, copper, lead and zinc (Ref. 24, Tables 3 and 4).

A likelihood of release factor category value of 550 is assigned for the surface water pathway – environmental threat based on the observed release to Long Lake (Ref. 1, Sec. 4.1.4.1 and 4.1.2.1.3).

Surface Water Environmental Threat Likelihood of Release Factor Category Value: 550

4.1.4.2 **Environmental Threat – Waste Characteristics**

4.1.4.2.1 **Ecosystem Toxicity/Persistence/Bioaccumulation**

The factors that compose the toxicity/persistence/bioaccumulation factor value are discussed in the following subsections; the factor values are presented in Table 4-6 of this HRS documentation record. Only those hazardous substances that are available to migrate from the sources at the site to surface water in the watershed via the overland/flood migration path are evaluated (Ref. 1, Sec. 4.1.4.2.1 and 4.1.2.2).

4.1.4.2.1.1 Ecosystem Toxicity

Upon selecting cadmium as the contaminant with the highest value, the corresponding Ecosystem Toxicity factor value is 10,000.

4.1.4.2.1.2 Persistence

The persistence factor values are based primarily on the half-life of the hazardous substances in surface water and secondarily on the sorption of the hazardous substances to sediments (Ref. 1, Sec. 4.1.2.2.1.2). See Table 4-5 of this HRS documentation record for the values assigned for Chemetco.

4.1.4.2.1.3 Ecosystem Bioaccumulation Potential

The ecosystem bioaccumulation potential evaluates the tendency for a substance to accumulate in the tissue of any aquatic organism, not just human food chain organisms, and forms one component of the ecosystem toxicity/persistence/bioaccumulation factors within the environmental threat-waste characteristics factor category (Ref. 1, Section 4.1.4.2.1.3).

4.1.4.2.1.4 Calculation of Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value

Each hazardous substance is assigned an ecosystem toxicity/persistence Factor Value from HRS Table 4-20, based on the values assigned to the hazardous substance for the ecosystem toxicity and persistence factors (Ref. 1, Sec. 4.1.4.2.1.4, p. 51622). Then assign each hazardous substance an ecosystem toxicity/persistence/bioaccumulation factor value from Table 4-21 (Ref. 1, p. 51623).

Table 4-5: Ecosystem Toxicity/Persistence/Bioaccumulation Factor Values

Hazardous Substance	Ecosystem Toxicity Factor Value	Persistence Factor Value*	Ecosystem Toxicity/Persistence Factor Value (HRS Table 4-12)	Bioaccumulation Environment Freshwater	Ecotox/Per/Bio Factor Values (HRS Table 4-16)	Reference
Cadmium	10,000	1	10,000	50,000	500,000,000	Ref. 2, p. BI-2
Copper	1,000	1	1,000	5,000	5,000,000	Ref. 2, p. BI-3
Lead	1,000	1	1,000	50,000	50,000,000	Ref. 2, p. BI-8
Zinc	10	1	10	50,000	500,000	Ref. 2, p. BI-12

* Based on the values for rivers

Use the hazardous substance with the highest ecosystem toxicity/persistence/bioaccumulation factor value for the watershed to assign the value to this factor.

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8

4.1.4.2.2 Hazardous Waste Quantity

The hazardous waste quantity values for all sources are summed (Ref. 1, p. 51591). Based on this value, select a hazardous waste quantity factor value for the pathway from HRS Table 2-6.

Source 1 + Source 2 + Source 3 = Sum of the Source Hazardous Waste Quantity Value
 $180,898 + 24,881.6 + >0 = 205,779.6 = 10,000$ (Ref. 1, Table 2-6)

For Chemetco's surface water pathway, a value of 10,000 is assigned to the hazardous waste quantity factor value (See Section 2.4.2 of this HRS documentation record).

Surface Water Pathway Hazardous Waste Quantity Factor Value: 10,000

4.1.4.2.3 Calculation of Environmental Threat –Waste Characteristics Factor Category Value

For the hazardous substance selected for the watershed (cadmium), use its ecosystem toxicity/persistence factor value (10,000) and bioaccumulation potential factor value (50,000) as follows to assign a value to the waste characteristics factor category. First

multiply the toxicity/persistence factor value and the hazardous waste quantity factor value for the watershed, subject to a maximum product of 1×10^8 .

Toxicity/Persistence factor value x hazardous waste quantity factor value:
 $10,000 \times 10,000 = 1 \times 10^8$

Then multiply this product by the bioaccumulation potential factor value for this hazardous substance, subject to a maximum product of 1×10^{12} .

$1 \times 10^8 \times 50,000 = 5 \times 10^{12}$ exceeds the maximum product of 1×10^{12} , so 1×10^{12} is the assigned value.

Based on this second product, assign a value from HRS, Table 2-7 (Section 2.4.3.1) to the environmental threat – waste characteristics. From HRS, Table 2-7, a waste characteristics factor value category value of 1,000 is assigned for the surface water environmental threat of the overland/flood migration component (Ref. 1, Table 2-7).

Waste Characteristics Factor Category Value: 1,000

4.1.4.3 Environmental Threat – Targets

According to the HRS, the sensitive environments factor is used to determine the environmental threat – targets factor category for each watershed. Sensitive environments are divided into two components: the sensitive environments listed in HRS Table 4-23 and wetlands (Ref. 1, Sections 4.1.4.3 and 4.1.4.3.1).

Level I Concentrations

Level I concentrations cannot be established because the observed release to surface water is based on sediment samples and there are currently no sediment benchmarks specified for the purposes of establishing Level I contamination (Ref. 1, Section 4.1.4.3.1, Table 4-22).

Level II Concentrations

The hazardous substances listed in Table 4-6 below meet the observed release criteria and therefore establish locations subject to actual contamination (Ref. 1, Section 4.1.1.2). These locations are subject to Level II contamination concentrations (Ref. 1, Section 4.1.4.3.1 and Section 4.1.4.3.1.2). See Ref. 46, Figure 4 for these sampling locations.

Table 4-6: Level II Contaminant Concentrations

Sample ID	Hazardous Substance	Hazardous Substance Concentration ppm	Adjusted Concentration based on bias (Ref. 3)	Adjusted CRQL (mg/kg)	3 X Background (mg/kg)	References
X222 (ME00E3)	Cadmium	47.9 J	34.0	0.77	25.5	4, p. 25; 30, pp. 2-16, 34; 45, p. C-5
X221 (ME00E2)	Cadmium	53.8 J	38.2	1.40	25.5	4, p. 24; 30, pp. 2-16, 34; 45, p. C-5
	Copper	672 J	551	6.98	111	4, p. 24; 30, pp. 2-16, 34; 45, p. C-5
	Lead	209	N/A	2.79	151.2	Refs. 4, p. 24; 30, pp. 2-16, 34; 45, p. C-5
	Zinc	1020	N/A	16.8	747	Refs. 4, p. 24; 30pp. 2-16, 34; 45, p. C-5
X220 (ME00E1)	Cadmium	3760 J	2667	3.03	25.5	4, p. 22; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	5870	N/A	7.57	111	4, p. 22; 30, pp. 43-58, 84-86; 45, p. C-5
	Lead	9410 J+	6526	3.03	151.2	4, p. 22; 30, pp. 43-58, 84-86; 45, p. C-5
	Zinc	18,500 J	12,333	90.48	747	4, p. 22; 30, pp. 43-58, 84-86; 45, p. C-5
X219 (ME00E0)	Cadmium	715 J	507	1.74	25.5	4, p. 21; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	10,600	N/A	17.4	111	4, p. 21; 30, pp. 43-58, 84-86; 45, p. C-5
	Lead	5700 J	3958	3.48	151.2	4, p. 21; 30, pp. 43-58, 84-86; 45, p. C-5
	Zinc	4970 J	3313	41.8	747	4, p. 21; 30, pp. 43-58, 84-86; 45, p. C-5
X223 (ME00E8)	Copper	3270 J	2713	5.07	111	4, p. 30; 30, pp. 2-16, 34; 45, p. C-5
	Lead	794	N/A	2.03	151.2	4, p. 30; 30, pp. 2-16, 34; 45, p. C-5
	Zinc	1980	N/A	12.2	747	4, p. 30; 30, pp. 2-16, 34; 45, p. C-5
X215 (ME00D6)	Cadmium	128 J	90.8	1.12	25.5	4, p. 17; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	527	N/A	5.59	111	4, p. 17; 30, pp. 43-58, 84-86; 45, p. C-5
	Lead	339 J+	235	2.24	151.2	4, p. 17; 30, pp. 43-58, 84-86; 45, p. C-5
X216 (ME00D7)	Cadmium	108 J	76.6	0.99	25.5	4, p. 18; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	971	N/A	4.94	111	4, p. 18; 30, pp. 43-58, 84-86; 45, p. C-5
	Lead	448 J+	311	1.98	151.2	4, p. 18; 30, pp. 43-58, 84-86; 45, p. C-5
	Zinc	1240 J	827	11.9	747	4, p. 18; 30, pp. 43-58, 84-86; 45, p. C-5
X214 (ME00D5)	Cadmium	57.6 J	40.9	1.33	25.5	4, p. 16; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	724	N/A	6.67	111	4, p. 16; 30, pp. 43-58, 84-86; 45, p. C-5
	Lead	496 J	344	2.67	151.2	4, p. 16; 30, pp. 43-58, 84-86; 45, p. C-5
X213 (ME00D4)	Cadmium	37.9 J	26.9	0.95	25.5	4, p. 15; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	138	N/A	4.74	111	4, p. 15; 30, pp. 43-58, 84-86; 45, p. C-5
X212 (ME00D3)	Cadmium	70 J	49.7	0.94	25.5	4, p. 14; 30, pp. 43-58, 84-86; 45, p. C-5
	Copper	178	N/A	4.68	111	4, p. 14; 30, pp. 43-58, 84-86; 45, p. C-5

Notes:

CRQL Contract-Required Quantitation Limit

N/A Not applicable

- Adjusted CRQLs were calculated by the following formula:

$(\text{CRQL} \times \text{Dilution Factor}) / [(\text{weight in grams}) \times (\% \text{solids}/100)]$

-The CRQLs for these hazardous substances are provided in Ref. 45, p. C-5.

-The concentrations of cadmium in samples X212 – X216 and X219 - X223 were qualified “J” due to poor duplicate precision. This qualification resulted in an unknown bias and the concentration has been adjusted per EPA document “*Using Qualified Data to Document an Observed Release and Observed Contamination*” (Ref. 30, pp. 2-16, 28, 43-58, 74; Ref. 3, pp. 8, 18).

-The concentration of copper in samples X221, X222, and X223 were qualified “J” due to high recoveries in the matrix spike sample. This qualification resulted in a high bias and the concentration has been adjusted per EPA document “*Using Qualified Data to Document an Observed Release and Observed Contamination*” (Ref. 30, pp. 2-16, 26; Ref. 3, pp. 8, 18).

-The concentration of lead and zinc in samples X212 – X216, X219 and X220 were qualified “J” due to poor duplicate precision. This qualification resulted in an unknown bias and the concentration has been adjusted per EPA document “*Using Qualified Data to Document an Observed Release and Observed Contamination*” (Ref. 30, pp. 43-58, 74; Ref. 3, pp. 8, 18).

-Concentrations reported on Form Is for samples X222 and X223 (Ref. 4, pp. 24, 25, 30) were based on sample weights that were rounded incorrectly. Sample concentrations for these samples were recalculated based on the correct sample weight (Ref. 30, pp. 3, 9, 10, 95).

-Concentrations reported on Form I for samples X214 – X216, X219 and X220 (Ref. 4, pp. 16 – 18, 21, 22) were based on sample weights that were rounded incorrectly. Sample concentrations for these samples were recalculated based on the correct sample weight (Ref. 30, pp. 44, 52, 53, 98).

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

Level I contaminant concentrations cannot be established because the observed release to surface water is based on sediment samples and there are currently no sediment benchmarks specified for the purposes of establishing Level I contamination (Refs. 1, Sec. 4.1.4.3.1, Table 4-22; 2).

4.1.4.3.1.2 Level II Concentrations

Most Distant Level II Sample

Sample ID: X212

Distance from the probable point of entry: 2.16 miles following Long Lake
Refs. 7; 24, Fig. 5; 37, pp. 1, 2; Table 4-3 of this HRS documentation record

Sensitive Environments

According to the Illinois Department of Natural Resources Ecological Compliance Assessment Tool (EcoCAT), the Chouteau Botanical Area Illinois Natural Areas Inventory Site may be in the vicinity of the project (Ref. 17, p. 1). This area was not used in the HRS documentation record for scoring purposes due to the lack of certainty regarding its location.

Wetlands

Level II concentrations occur within a 2.16 mile section of Long Lake (Ref. 37, p. 3). A wetland delineation was conducted using the National Wetlands Inventory (NWI) Map (Ref. 6) of the area using National Wetlands Inventory data downloaded and used in an ArcMap application. The NWI data was downloaded from the U.S. Fish and Wildlife Service's Wetlands Online Mapper (Ref. 11). Designated wetlands are present along Long Lake. These wetlands can be viewed in Ref. 46, Figure 7. These wetlands extend all the way to the unnamed canal (3.74 miles downstream from PPE1, Refs. 6; 11). The wetlands found along Long Lake consist of Palustrine Emergent, Palustrine Forested, Palustrine Scrub-Shrub and Palustrine Unconsolidated Bottom (Ref. 6). All of these types of wetlands except Unconsolidated Bottom meet the 40 CFR 230.3 definition of a wetland (Ref. 36). The Unconsolidated Bottom wetland may meet the 40 CFR 230.3 of a wetland if emergent hydrophytes are present, but was not utilized in calculating the HRS score.

Utilizing Geographic Information System software and the National Wetlands Inventory Maps and data downloaded from the U.S. Fish and Wildlife Service's Wetlands Online Mapper (Refs. 6; 11; 37; 46, Fig. 7), the wetland frontages located between the PPE1 and the furthest sediment sampling point with three times the background levels (X212) were calculated as being 3.71 miles of wetland length. (For wetlands where the PPE into the surface water body is the wetland, the perimeter of the wetland is used for wetland length rather than the frontage contiguous with the in-water segment of the hazardous substance migration path.) The remaining wetlands located between sediment sample X212 and the 15-mile target distance limit are subject to potential contamination (Ref. 24, p. 29), but are not scored, due to minimal impact on the site score. See Table 4-7 below for a summary of HRS-eligible wetlands subject to Level II concentrations.

Table 4-7: Wetland Frontage – Level II Contamination

Wetland Location	Wetland Class	Wetland frontage (feet)	References
Long Lake	Palustrine forested broad-leaved deciduous temporarily flooded (PFO1A)	7392	6; 11; 37, p. 2; 46, Fig. 7
Long Lake	Palustrine emergent seasonally flooded (PEMC)	8184	6; 11; 37, p. 2; 46, Fig. 7
Long Lake	Palustrine Scrub-shrub broad-leaved deciduous temporarily flooded (PSS1A)	845	6; 11; 37, p. 2; 46, Fig. 7
Long Lake	Palustrine forested broad-leaved deciduous seasonally flooded (PFO1C)	3168	6; 11; 37, p. 2; 46, Fig. 7
TOTAL		19,589 (3.71 miles)	

According to HRS Table 4-24, 3.71 miles of wetland frontage corresponds to an assigned wetlands value of 100. The calculation of the Level II concentration factor value entails adding the sum of the sensitive environment rating values (0) and the value assigned to the total length of wetland frontage along the area of Level II concentrations (100) (Ref. 1, Sec. 4.1.4.3.1.2).

Level II Concentration Factor Value: 100

4.1.4.3.1.3 Potential Contamination

The potential contamination factor was not scored for this HRS documentation record. Although potential contamination was not scored in this document, EPA is concerned about populations that may be potentially exposed to contaminant concentrations.

Potential Contamination Factor Value: Not Scored