

July 29, 2018

Project No. 1146-309-01-07

# **YEAR 2017 CAMU USE AND OPERATIONS AND MAINTENCE ANNUAL REPORT**

**UNITED STATES STEEL  
CORPORATION**

Gary Works Facility

**Gary, Indiana**

# Year 2017 CAMU Use and Operations and Maintenance Annual Report

June 2018

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## **LIST OF ACRONYMS**

ALR	Action Leakage Rate
AMOP	Air Monitoring Operations Plan
CAMU	Corrective Action Management Unit
COLDR	Construction Operations Level Design Report
ESV	Ecological Screening Value
Ft	feet
GAC	Granular Activated Carbon
GCR	Grand Calumet River
IDEM	Indiana Department of Environmental Management
IDW	Investigation-Derived Waste
ISM	Interim Stabilization Measure
LCS	Leachate Collection System
LDS	Leak Detection System
MCL	Maximum Contaminant Level
mg/l	milligrams per liter
msl	mean sea level
N	Nitrogen
NPDES	National Pollution Discharge Elimination System
O&M Plan	Operations and Maintenance Plan
ORP	Oxidation-Reduction Potential
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PM <sub>10</sub>	Particulate Matter (10 microns)
ppm	parts per million

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QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RSL	Regional Screening Level
SOP	Standard Operating Procedure
SVOC	Semi-volatile Organic Compound
SWMA	Solid Waste Management Area
TDS	Total Dissolved Solids
TSCA	Toxic Substance Control Act
TSS	Total Suspended Solids
ug/l	micrograms per liter
ug/m <sup>3</sup>	micrograms per cubic meter
USEPA	United States Environmental Protection Agency
USS	United States Steel Corporation
UV	ultraviolet
VOC	Volatile Organic Compound
WTP	Water Treatment Plant



## **1.0 INTRODUCTION**

**Weaver Consultants Group** (Weaver Consultants) has prepared this Corrective Action Management Unit (CAMU) Annual Report on behalf of the United States Steel Corporation (USS) Gary Works Facility (Facility). This annual report provides information for waste placement, inspection and maintenance, and monitoring activities performed during calendar year 2017.

There are nine sections to this report as follows:

- Section 1.0 presents a description of the CAMU and outlines the objectives of this report.
- Section 2.0 summarizes waste placement activities conducted at the CAMU.
- Section 3.0 discusses the leak detection and leachate monitoring programs, and the evaporative spray system.
- Section 4.0 discusses the CAMU water discharge.
- Section 5.0 summarizes groundwater monitoring performed at the CAMU.
- Section 6.0 discusses ambient air monitoring performed at the CAMU.
- Section 7.0 discusses CAMU inspections.
- Section 8.0 summarizes the annual report findings.
- Section 9.0 lists the references used for this report.

### **1.1 Facility Description**

The USS Gary Works Facility is an integrated steel making facility located in Gary, Indiana, on the shore of Lake Michigan (Figure 1). The plant occupies an area approximately 7 miles long and 1 mile or more wide.

The facility name, operator, and location are as follows:

Facility Name and Address:	USS Gary Works
	1 North Broadway
	Gary, Indiana 46402

EPA Facility Identification Number:	IND005444062
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Owner:	United States Steel Corporation
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Owner's Address: 600 Grant Street  
Pittsburgh, PA 15219-2800  
(412) 433-1121

## **1.2 CAMU Description**

The CAMU provides containment, passive dewatering, and disposal of dredged sediments as part of the Grand Calumet River (GCR) Sediment Remediation Project, as well as Resource Conservation and Recovery Act (RCRA) investigative and Corrective Action waste materials. The existing layout of the CAMU has a plan area of 31.2 acres (as measured at the inside edge of the top of berm at CAMU Units 1 and 2). The CAMU is divided into two units: Unit 1, which is authorized for disposal of Toxic Substance and Control Act (TSCA) regulated materials; and Unit 2, which is approved for disposal of non-TSCA materials. The plan area of Unit 1 is approximately 8.6 acres (footprint of 10.6 acres), and the plan area of Unit 2 is approximately 22.6 acres (footprint of 27 acres).

The key elements of the CAMU design include a perimeter berm, an interior berm separating Units 1 and 2, primary and secondary liner systems, leachate collection and leak detection systems, and a surface water management system. The design elements are described in the *CAMU Construction/Operation Level Design Report* (COLDR) (Earth Tech, 2001).

The location of the CAMU is presented in **Figure 1**.

## **1.3 Objectives**

The information and data presented in this report are intended to fulfill the annual monitoring and reporting requirements outlined in Section 1.3 of the *CAMU Operations and Maintenance Plan* (O&M Plan) (USS, 2014a). Annual reporting for the CAMU began in 2007.

A revised O&M Plan was submitted to the United States Environmental Protection Agency (USEPA) in June 2014 and was approved with conditions on August 12, 2014 (USEPA, 2014).

## 2.0 WASTE PLACEMENT ACTIVITIES

On April 15 and 16, 2013, USS submitted to USEPA an updated request for approval to dispose of IDW generated during site-wide investigative activities into the CAMU. The proposed IDW included drilling muds, cuttings, and purge water from test pit and well installation; purge water, soil, and other materials from collection of samples; residues from testing of treatment technologies and pump and treat systems; and contaminated personal protective equipment. USS' request estimated the volume of IDW that would be generated during any given investigation event to range from a few cubic yards or gallons to several hundred cubic yards or gallons. The IDW would be generated as result of the Corrective Action program conducted pursuant to the 3008(h) RCRA Order on Consent (Order).

Approval for the disposal of IDW was granted by USEPA on April 25, 2013.

The analytical results from samples collected from proposed waste materials are used to evaluate placement into the appropriate cell of the CAMU. Materials containing concentrations of polychlorinated biphenyls (PCBs above the TSCA limit of 50 parts per million (ppm) are placed in CAMU Unit 1 (TSCA designated cell), and materials containing PCB concentrations below the TSCA limit are placed in CAMU Unit 2 (non-TSCA designated cell).

Waste placement activities during calendar year 2017 included the disposal of investigation-derived waste (IDW) including soil cuttings generated during the East Side Groundwater Interim Stabilization Measure (ISM) extraction well installation, Six Areas air sparge well installations, Coke Plant Solid Waste Management Area (SWMA) former Northwest Tank Farm replacement well installation soil IDW, and purge water generated during groundwater sampling activities at the CAMU, the former Hazardous Waste Disposal Unit No. 2 (HWD-2) Landfill, the former Hazardous Waste Disposal Unit No. 5 (HWD-5) Landfill, the East Side Groundwater ISM, and the Solid Waste Disposal (SWD-1) Landfill. The specific waste placement activities performed at the CAMU in 2017 are discussed below.

### 2.1 East Side Groundwater ISM Extraction Well and Six Areas Air Sparge Well Installation Soil IDW

On June 22, 2017, 17 drums (approximately 4.6 cubic yards) of soil cuttings generated during the East Side Groundwater ISM extraction well installation and Six Areas air sparge well installations were placed in CAMU Unit 2. The IDW was placed in the northwest corner of CAMU Unit 2 adjacent to the base of the ramp. The estimated mass of chemicals in the soil IDW placed in CAMU Unit 2 is presented in **Table 1A**. The analytical laboratory report is provided in **Appendix A-1**. The Internal Bill of Lading for the placement of the soil drums and a Haul Route Inspection Form are provided in **Appendix A-2**. Although

completed, the Haul Route Inspection Form was not required as the IDW was containerized within 55-gallon drums (i.e., IDW was not transported loose within a roll-off box).

## **2.2 Coke Plant SWMA Former Northwest Tank Farm Replacement Well Installation Soil IDW**

On October 30, 2017, 13 drums (approximately 3-4 cubic yards) of soil cuttings generated during the Coke Plant Solid Waste Management Area (SWMA) former Northwest Tank Farm replacement well installation were placed in CAMU Unit 2. The IDW was placed in the northwest corner of CAMU Unit 2 adjacent to the base of the ramp. The estimated mass of chemicals in the soil IDW placed in CAMU Unit 2 is presented in **Table 1B**. The analytical laboratory report is provided in **Appendix A-1**. The Internal Bill of Lading for the placement of the soil drums is provided in **Appendix A-2**. Completion of a Haul Route Inspection Form was not required, as the IDW was containerized within 55-gallon drums (i.e., IDW was not transported loose within a roll-off box).

## **2.3 CAMU Groundwater Monitoring**

On March 7, 2017, approximately 15 gallons of purge water generated during the CAMU First Quarter 2017 verification sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1C**. The analytical laboratory results are provided in **Appendix D-2**.

On June 21, 2017, approximately 10 gallons of purge water generated during the CAMU Second Quarter 2017 verification sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1D**. The analytical laboratory results are provided in **Appendix D-2**.

Between August 14 and 15, 2017, approximately 40 gallons of purge water generated during the CAMU 2017 annual sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1E**. The analytical laboratory results are provided in **Appendix D-2**.

## **2.4 HWD-2 Landfill and Refuse Area Post-Closure Groundwater Monitoring**

Between March 16 and 20, 2017, approximately 51 gallons of purge water generated during the HWD-2 First Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1F**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-2 and Refuse Area* (USS, 2018a).

Between June 16 and 20, 2017, approximately 58 gallons of purge water generated during the HWD-2 Second Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1G**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-2 and Refuse Area* (USS, 2018a).

Between August 18 and 19, 2017, approximately 58 gallons of purge water generated during the HWD-2 Third Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1H**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-2 and Refuse Area* (USS, 2018a).

On December 5 and 8, 2017, approximately 67 gallons of purge water generated during the HWD-2 Fourth Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1I**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-2 and Refuse Area* (USS, 2018a).

## **2.5 HWD-5 Landfill and TTP Area Post-Closure Groundwater Monitoring**

Between March 8 and 9, 2017, approximately 27 gallons of purge water generated during the HWD-5 First Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1J**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-5 and TTP Area* (USS, 2018b).

Between June 14 and 15, 2017, approximately 31 gallons of purge water generated during the HWD-5 Second Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1K**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-5 and TTP Area* (USS, 2018b).

Between August 16 and 17, 2017, approximately 33 gallons of purge water generated during the HWD-5 Third Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1L**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-5 and TTP Area* (USS, 2018b).

Between December 4 and 8, 2017, approximately 30 gallons of purge water generated during the HWD-5 Fourth Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1M**. The analytical laboratory reports are presented in Appendix D of the *Year 2017 Groundwater Monitoring Report for HWD-5 and TTP Area* (USS, 2018b).

## **2.6 East Side Groundwater ISM Compliance Groundwater Monitoring**

Between March 10 and 17, 2017, approximately 98 gallons of purge water generated during the ISM First Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1N**. The analytical laboratory reports are presented in the *2017 Annual Remediation System Report, East Side Groundwater SWMA – Interim Stabilization Measure* (USS, 2018c).

Between June 16 and 20, 2017, approximately 116 gallons of purge water generated during the ISM Second Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1O**. The analytical laboratory reports are presented in the *2017 Annual Remediation System Report, East Side Groundwater SWMA – Interim Stabilization Measure* (USS, 2018c).

Between August 25 and 30, 2017, approximately 68 gallons of purge water generated during the ISM Third Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1P**. The analytical laboratory reports are presented in the *2017 Annual Remediation System Report, East Side Groundwater SWMA – Interim Stabilization Measure* (USS, 2018c).

Between November 29 and December 4, 2017, approximately 75 gallons of purge water generated during the ISM Fourth Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1Q**. The analytical laboratory reports are presented in the *2017 Annual Remediation System Report, East Side Groundwater SWMA – Interim Stabilization Measure* (USS, 2018c).

## **2.7 SWD-1 Landfill Groundwater Monitoring**

On August 31 and September 20, 2017, a combined approximately 12 gallons of purge water generated during the SWD-1 Third Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1R**. The analytical laboratory reports are provided in **Appendix A-1**.

On November 28, 2017, approximately 18 gallons of purge water generated during the SWD-1 Fourth Quarter 2017 sampling event were placed in CAMU Unit 2. The estimated mass of chemicals in the purge water is presented in **Table 1S**. The analytical laboratory reports are provided in **Appendix A-1**.

### **3.0 LEAK DETECTION AND LEACHATE MONITORING**

In accordance with the approved designs, the CAMU was constructed with a leak detection system (LDS) and leachate collection system (LCS) in each unit (Unit 1 and Unit 2) of the CAMU.

#### **3.1 Leak Detection and Leachate Fluid Treatment**

The CAMU formerly included a water treatment plant (WTP) permitted under the authority of the National Pollutant Discharge Elimination System (NPDES) to manage fluids (NPDES Permit No. IN0061077). Fluids include supernatant (surface water from precipitation events or liquids lying above settled solids), leachate, and leak detection water. Leachate and leak detection fluids have never been sent directly to the WTP. These fluids were first pumped from their respective collection systems and directed to the surface of CAMU Unit 1, where they were mixed with the supernatant. The Unit 1 supernatant was subsequently directed to the WTP for treatment and discharge through NPDES Outfall 001.

When NPDES Permit No. IN006107 was renewed effective December 1, 2006, a 3-year compliance schedule was established for meeting newly established daily and monthly concentrations and mass limits for ammonia (as Nitrogen) for Outfall 001. The ammonia compliance date was November 30, 2009. Because the WTP did not have the process equipment in place at the time to maintain compliance with the Permit's new limits, USS evaluated five options to achieve compliance. These included: 1) redirection of WTP effluent to the C-Lot Lagoons; 2) zeolite absorption; 3) break-point chlorination; 4) air stripping; and 5) evaporation and transpiration (spray system). The spray system was ultimately selected because it eliminated all discharges to the GCR, thereby allowing for compliance with the new ammonia limits. The spray system was also selected as the best available option to address the decreasing volume of supernatant in the CAMU.

##### **3.1.1 Spray System Pilot Test Demonstration**

A description of the spray system pilot test is presented in prior Annual Reports.

##### **3.1.2 Current Operations**

The evaporative spray system is the current method for fluid management in the CAMU, having been proven effective in managing internal CAMU fluids, and by maintaining compliance with applicable air emissions standards. The spray system is typically re-started in the early summer and continues operating through the fall. Air monitoring will continue at the CAMU during operation of the spray system, as specified in the *Air Monitoring Operations Plan* (AMOP) (USS, 2014b). The spray system is designed to receive water from the LCS of either CAMU unit (Unit 1 and Unit 2) and will withdraw from either unit as supernatant conditions warrant.

In 2014, USS reconfigured the spray system piping and sprinkler heads. The main discharge header runs from the carbon tanks south along the center berm of the CAMU. The spray nozzles are attached to the main header via line drops every 40 feet.

GAC will continue to be used to treat the leachate prior to it being sprayed. The GAC units will operate in a lead and lag configuration. Weekly sampling at the GAC units has been performed to monitor the treatment efficiency of the units. Samples shall be obtained of the influent to the lead GAC unit, of the effluent from the lead GAC unit and of the effluent from the lag GAC unit. Based on the weekly sample results, carbon change out will be performed following evidence of breakthrough. Because the spray system eliminates fluid discharges to the GCR, monitoring of all parameters required under NPDES Permit IN0061077 is not necessary.

Discharges to the GCR ceased beginning in December 2009. NPDES Permit IN0061077 was renewed in June 2012 and remains current, in the event that CAMU operating conditions warrant treatment and discharge of supernatant (surface water) in addition to operation of the spray system.

### 3.1.3 Spray System Sampling and 2017 Results

The spray system was re-started on June 12, 2017, and was shut down on September 15, 2017. The spray system was sampled approximately once per week in 2017 for a total of 14 events. Three samples were collected for each event, and included 1) the influent to the lead GAC unit, 2) the effluent from the lead GAC unit (called “middle”), and 3) the effluent from the lag GAC unit. The first set of samples was collected on June 14, 2017, and the last set of samples was collected on September 13, 2017. The CAMU Evaporative Spray System Operating Log is presented in **Appendix C-4**.

Parameters of concern included ammonia as nitrogen (N), benzene, toluene, ethylbenzene, total xylenes (BTEX), and naphthalene. A trip blank was included with each shipment of samples. The analytical laboratory reports are provided in **Appendix C-5**.

The analytical data are used to monitor the treatment efficiency of the GAC units. When the laboratory results from a given weekly sampling event indicate a positive detection of BTEX or naphthalene in the effluent sample collected from the lag GAC unit, the spray system is shut down and is not placed back into operation until the carbon has been changed out in both the lead and lag GAC units. Spray system shut downs and carbon change outs were performed as follows:

- The spray system was shut down on June 30, 2017, when the result of the June 28, 2017 sampling event indicated break-through of the carbon (benzene, m&p-xylenes, and o-xylene). Carbon change out was completed on July 5, 2017, and the system was re-started.



- The spray system was shut down on July 24, 2017, when the result of the July 19, 2017 sampling event indicated break-through of the carbon (benzene, ethylbenzene, toluene, and naphthalene). Carbon change out was completed on July 26, 2017, and the system was re-started.
- The spray system was shut down on August 25, 2017, when the result of the August 24, 2017 sampling event indicated break-through of the carbon (benzene and naphthalene). Carbon change out was completed on August 29, 2017, and the system was re-started.

It should be noted that the results of the August 30, 2017 sampling event indicated a trace detection of benzene (0.38 J ug/l) in the effluent sample from the lag GAC unit. However, the carbon was changed out the day before the sample was collected (August 29, 2017), and benzene was reported as non-detect in the effluent sample collected from the lead GAC unit (“middle” sample). Therefore, the detection of benzene in the August 30, 2017 sample from the lag GAC unit effluent is not believed to be indicative of carbon breakthrough. Subsequent weekly samples also confirmed that this reported concentration was not indicative of breakthrough.

### 3.2 Leak Detection Monitoring

#### 3.2.1 CAMU Unit 1

The average monthly CAMU Unit 1 water elevations for 2017 are depicted in **Graph 1 – CAMU Unit 1 2017 Average Monthly Water Elevations**. The average daily leak detection water volumes collected from the CAMU Unit 1 sumps for the months in 2017 are depicted in **Graph 2 – CAMU Unit 1 2017 Average Monthly Leak Detection Water Volumes**. The average water volumes and average flow rates are presented below:

**CAMU Unit 1 Average Monthly Leak Detection Volumes**

Month	Average Leak Detection Water Volumes (Gallons/Day)	Average Leak Detection Flow Rate (Gallons/Acre per Day)	CAMU-Specific Action Leakage Rate (Gallons/Acre per Day)
January 2017	2,457	204	8,075
February 2017	2,137	177	8,075
March 2017	2,607	216	8,075
April 2017	2,203	183	8,075
May 2017	2,743	227	8,075
June 2017	751	62	8,075
July 2017	2,586	214	8,075

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Month	Average Leak Detection Water Volumes (Gallons/Day)	Average Leak Detection Flow Rate (Gallons/Acre per Day)	CAMU-Specific Action Leakage Rate (Gallons/Acre per Day)
August 2017	1,618	134	8,075
September 2017	1,097	91	8,075
October 2017	3,862	320	8,075
November 2017	1,309	109	8,075
December 2017	2,777	230	8,075

Notes:

The average leak detection flow rate was calculated by dividing the average daily water volume by the combined CAMU Unit 1 leak detection (sump DS1-1 and sump DS1-2) drainage area of 12.06 acres.

The CAMU Unit 1 average daily leak detection flow rate was calculated by dividing the average daily water volume by the Unit 1 leak detection system drainage area of 12.06 acres. The average daily leak detection flow rates for each month were compared to the CAMU-specific Action Leakage Rate (ALR) of 8,075 gallons/acre per day, as defined in the Response Action Plan, Appendix K6, of the CAMU COLDR (Earth Tech, 2001). Because the flow rates were below the ALR, no further action (i.e., increased monitoring/pumping frequency, USEPA/IDEM notification, third party inspections, etc.) was required.

CAMU Unit 1 water elevations and leak detect volumes are provided as **Appendix B**.

The leak detection water from CAMU Unit 1 was sampled from leak detection sampling port D-1 for VOCs, SVOCs, PAHs (a subset of SVOCs), PCBs, total RCRA metals, total hexavalent chromium, total lithium, ammonia as N, total dissolved solids (TDS), and total suspended solids (TSS) on the following dates:

- March 20, 2017
- September 11, 2017

Constituents detected in CAMU Unit 1 leak detection samples were:

VOCs	SVOCs and PAHs	Total Metals	General Chemistry
2-Butanone	2,4-Dimethylphenol	Arsenic	Ammonia as N
Acetone	2-Methylnaphthalene	Barium	TDS
Benzene	2-Methylphenol	Chromium	TSS
Ethylbenzene	2-Picoline	Lead	
Toluene	3&4-Methylphenol	Lithium	
m&p-Xylenes	Acenaphthene	Mercury	
o-Xylenes	Acenaphthylene	Selenium	
Total Xylenes	Acetophenone		
	Aniline		
	Anthracene		

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VOCs	SVOCs and PAHs	Total Metals	General Chemistry
	Benzo(a)anthracene		
	Benzo(a)pyrene		
	Benzo(b)fluoranthene		
	Benzo(g,h,i)perylene		
	Benzo(k)fluoranthene		
	Benzyl alcohol		
	Bis(2-ethylhexyl)phthalate		
	Carbazole		
	Chrysene		
	Dibenzo(a,h)anthracene		
	Dibenzofuran		
	Fluoranthene		
	Fluorene		
	Indeno(1,2,3-cd)pyrene		
	Naphthalene		
	Phenanthrene		
	Phenol		
	Pyrene		
	Pyridine		

There were no reportable concentrations of PCBs detected in the CAMU Unit 1 leak detection samples for 2017.

A summary of the concentrations of constituents detected in CAMU Unit 1 leak detection samples is presented in **Table 2**. Because the CAMU Unit 1 leak detection fluids are contained within the CAMU and are treated by the evaporative spray system (in the summer months), the leak detection results were not compared to the CAMU groundwater screening criteria (USEPA Maximum Contaminant Levels [MCLs][USEPA, 2009], USEPA Regional Screening Levels [RSLs] [USEPA, 2017c], or USS Gary Works Ecological Screening Values [ESVs] for the Gary Works Site [USS, 2016]).

The analytical lab reports for the CAMU Unit 1 leak detection sampling analysis are provided in **Appendix C-1**. The data review reports are provided in **Appendix E-1**. These reports outline the data review process and present the usability of the data set for the CAMU 2017 leak detection monitoring period.

The concentrations of the most commonly detected parameters by the analytical laboratory (i.e., detected during four or more monitoring events) in leak detection samples collected during the 2007 – 2017 CAMU Unit 1 leak detection monitoring period are presented graphically in **Appendix C-2**. The most commonly detected parameters in CAMU Unit 1 leak detection samples are:

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- VOCs: 2-butanone (methyl ethyl ketone), acetone, benzene, ethylbenzene, toluene, m&p-xylenes, o-xylenes, and total xylenes.
- SVOCs and PAHs: 2,4-dimethylphenol, 2-methylnaphthalene, 2-methylphenol, 2-picoline, 3&4-methylphenol, acenaphthene, acenaphthylene, acetophenone, anthracene, carbazole, dibenzofuran, fluoranthene, fluorene, naphthalene, phenanthrene, phenol, and pyrene.
- Total Metals: arsenic, barium, chromium, mercury, and lithium.
- General Chemistry: ammonia as N.

### 3.2.1 CAMU Unit 2

The average monthly CAMU Unit 2 water elevations for 2017 are depicted in **Graph 3 – CAMU Unit 2 2017 Average Monthly Water Levels**. The average daily leak detection water volumes collected from the CAMU Unit 2 sumps for the months in 2017 are depicted in **Graph 4 – CAMU Unit 2 2017 Average Monthly Leak Detection Water Volumes**. The average water levels and average flow rates are presented below:

**CAMU Unit 2 Average Monthly Leak Detection Volumes**

Month	Average Leak Detection Water Volumes (Gallons/Day)	Average Leak Detection Flow Rate (Gallons/Acre per Day)	CAMU-Specific Action Leakage Rate (Gallons/Acre per Day)
January 2017	15,792	547	8,075
February 2017	16,273	564	8,075
March 2017	16,642	576	8,075
April 2017	16,514	572	8,075
May 2017	19,296	668	8,075
June 2017	21,583	748	8,075
July 2017	21,273	737	8,075
August 2017	23,798	824	8,075
September 2017	21,704	752	8,075
October 2017	28,613	991	8,075
November 2017	27,258	944	8,075
December 2017	27,133	940	8,075

Notes:

The average leak detection flow rate was calculated by dividing the average daily water volume by the combined CAMU Unit 2 leak detection (sump DS2-1, sump DS2-2, and sump DS2-3) drainage area of 28.87 acres.

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The CAMU Unit 2 average daily leak detection flow rate was calculated by dividing the average daily water volume by the Unit 2 leak detection system drainage area of 28.87 acres. The average daily leak detection flow rates for each month were compared to the CAMU-specific ALR of 8,075 gallons/acre per day, as defined in the Response Action Plan, Appendix K6, of the CAMU COLDR (Earth Tech, 2001). Because the flow rates were below the ALR, no further action was required.

CAMU Unit 2 water elevations and leak detect volumes are provided as **Appendix B**.

The leak detection water from CAMU Unit 2 was sampled from leak detection sampling port D-2 for VOCs, SVOCs, PAHs, PCBs, RCRA metals, hexavalent chromium, lithium, ammonia as N, total dissolved solids (TDS), and total suspended solids (TSS) on the following dates:

- March 20, 2017
- September 11, 2017

Constituents detected in CAMU Unit 2 leak detection samples were:

VOCs	SVOCs and PAHs	Total Metals	General Chemistry
Acetone	2,4-Dimethylphenol	Barium	Ammonia as N
Benzene	2-Methylnapthalene	Chromium	TDS
m&p-Xylenes	2-Methylphenol	Lithium	TSS
Xylenes (total)	3&4-Methylphenol		
	Acenaphthene		
	Acenaphthylene		
	Anthracene		
	Carbazole		
	Dibenzofuran		
	Fluoranthene		
	Fluorene		
	Naphthalene		
	Phenanthrene		
	Phenol		
	Pyrene		

There were no reportable concentrations of PCBs detected in the CAMU Unit 2 leak detection samples for 2017.

A summary of the concentrations of constituents detected in CAMU Unit 2 leak detection samples is presented in **Table 2**.

The analytical lab reports for the CAMU Unit 2 leak detection sampling analysis are provided in **Appendix C-1**. The data review reports are provided in **Appendix E-1**. These reports outline the data review process and present the usability of the data set for the CAMU 2017 leak detection monitoring period.

The concentrations of the most commonly detected parameters by the analytical laboratory (detected during four or more monitoring events) in leak detection samples collected during the 2007 – 2017 CAMU Unit 2 leak detection monitoring period are presented graphically in **Appendix C-2**. The most commonly detected parameters in CAMU Unit 2 leak detection samples are:

- VOCs: 2-butanone (methyl ethyl ketone), acetone, benzene, ethylbenzene, toluene, ethylbenzene, and total xylenes.
- SVOCs and PAHs: 2,4-dimethylphenol, 2-methylnaphthalene, 2-methylphenol, 3&4-methylphenol, acenaphthene, acenaphthylene, anthracene, carbazole, dibenzofuran, fluoranthene, fluorene, naphthalene, phenanthrene, phenol, and pyrene.
- Total Metals: barium, chromium, lead, and lithium.
- General Chemistry: ammonia as N.

### **3.3 Leachate Monitoring**

#### **3.3.1 CAMU Unit 1**

Leachate samples were collected from CAMU Unit 1 leachate collection port L-1 for VOCs, SVOCs, PAHs, PCBs, RCRA metals, hexavalent chromium, lithium, ammonia as N, TDS, and TSS on a monthly frequency on the following dates:

- January 11, 2017
- February 16, 2017
- March 20, 2017
- April 19, 2017
- May 10, 2017
- June 13, 2017
- July 12, 2017
- August 9, 2017
- September 11, 2017
- October 5, 2017
- November 7, 2017
- December 11, 2017

Constituents detected in CAMU Unit 1 leachate samples were:

VOCs	SVOCs and PAHs	PCBs	Total Metals	General Chemistry
2-Butanone	2,4-Dimethylphenol	Aroclor-1242	Arsenic	Ammonia as N

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VOCs	SVOCs and PAHs	PCBs	Total Metals	General Chemistry
4-Methyl-2-pentanone	2,6-Dinitrotoluene	Total PCBs	Barium	TDS
Acetone	2-Chloronaphthalene		Cadmium	TSS
Benzene	2-Methylnaphthalene		Chromium	
Chloroform	2-Methylphenol		Lithium	
Ethylbenzene	2-Picoline		Mercury	
Styrene	3&4-Methylphenol		Selenium	
Toluene	Acenaphthene			
m&p-Xylenes	Acenaphthylene			
o-Xylenes	Acetophenone			
Total Xylenes	Aniline			
	Anthracene			
	Benzo(a)anthracene			
	Benzo(a)pyrene			
	Benzo(b)fluoranthene			
	Benzo(g,h,i)perylene			
	Benzo(k)fluoranthene			
	Bis(2-chloroethyl)ether			
	Carbazole			
	Chrysene			
	Dibenzo(a,h)anthracene			
	Dibenzofuran			
	Fluoranthene			
	Fluorene			
	Indeno(1,2,3-cd)pyrene			
	Naphthalene			
	o-Toluidine			
	Phenanthrene			
	Phenol			
	Pyrene			
	Pyridine			

A summary of the concentrations of constituents detected in CAMU Unit 1 leachate samples is presented in **Table 3**.

The analytical laboratory reports for the CAMU Unit 1 leachate collection system sampling events are provided in **Appendix C-1**. The data review reports are provided in **Appendix E-1**. These reports outline the data review process and present the usability of the data set.

The concentrations of the most commonly detected parameters by the analytical laboratory (detected during four or more monitoring events) in leachate samples collected during the 2008 – 2017 CAMU Unit 1 leachate collection monitoring period are presented graphically in **Appendix C-3**. (No VOCs, SVOCs, or metals analyses were performed in 2007.) The most commonly detected parameters are:

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- VOCs: acetone, benzene, ethylbenzene, styrene, toluene, m&p-xylenes, o-xylenes, and total xylenes.
- SVOCs: 2,4-dimethylphenol, 2-methylnaphthalene, 2-methylphenol, 2-picoline, 3&4-methylphenol, acenaphthene, acenaphthylene, acetophenone, aniline, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, carbazole, chrysene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, phenol, pyrene, and pyridine.
- PCBs: Aroclor-1242.
- Total Metals: arsenic, barium, cadmium, chromium, hexavalent chromium, lead, lithium, mercury, and selenium.
- General Chemistry: ammonia as N.

### 3.3.2 CAMU Unit 2

Leachate samples were collected from CAMU Unit 2 leachate collection port L-2 for VOCs, SVOCs, PAHs, PCBs, total RCRA metals, total hexavalent chromium, total lithium, ammonia as N, TDS, and TSS on the following dates:

- January 11, 2017
- February 16, 2017
- March 20, 2017
- April 19, 2017
- May 10, 2017
- June 13, 2017
- July 12, 2017
- August 9, 2017
- September 11, 2017
- October 5, 2017
- November 7, 2017
- December 11, 2017

Constituents detected in CAMU Unit 2 leachate samples were:

VOCs	SVOCs and PAHs	Total Metals	General Chemistry
2-Butanone	2,4-Dimethylphenol	Arsenic	Ammonia as N
Acetone	3&4-Methylphenol	Barium	TDS
Benzene	2-Methylnaphthalene	Cadmium	TSS



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VOCs	SVOCs and PAHs	Total Metals	General Chemistry
Carbon disulfide	2-Methylphenol	Chromium	
Chloroform	2-Nitroaniline	Lead	
Ethylbenzene	3&4-Methylphenol	Lithium	
Methylene chloride	Acenaphthene	Mercury	
Toluene	Acenaphthylene	Selenium	
m&p-Xylenes	Acetophenone		
o-Xylenes	Aniline		
Total Xylenes	Anthracene		
	Benzo(a)anthracene		
	Benzo(a)pyrene		
	Benzo(b)fluoranthene		
	Benzo(k)fluoranthene		
	Benzyl alcohol		
	Carbazole		
	Chrysene		
	Dibenz(a,h)anthracene		
	Dibenzofuran		
	Fluoranthene		
	Fluorene		
	Indeno(1,2,3-cd)pyrene		
	Isophorone		
	Naphthalene		
	o-Toluidine		
	Phenanthrene		
	Phenol		
	Pyrene		

There were no reportable levels of PCBs detected in the CAMU Unit 2 leachate samples for 2017.

A summary of the concentrations of constituents detected in CAMU Unit 2 leachate samples is presented in **Table 3**.

The analytical laboratory reports for the CAMU Unit 2 leachate collection system sampling events are provided in **Appendix C-1**. The data review reports are provided in **Appendix E-1**. These reports outline the data review process and present the usability of the data set.

The concentrations of the most commonly detected parameters by the analytical laboratory (detected during four or more monitoring events) in leachate samples collected during the 2008 – 2017 CAMU Unit 2 leachate collection monitoring period are presented graphically in **Appendix C-3**. (No VOCs, SVOCs, or metals analyses were performed in 2007, and no CAMU Unit 2 leachate sampling was performed in 2009.) The most commonly detected parameters are:

- VOCs: 2-butanone (methyl ethyl ketone), acetone, benzene, carbon disulfide, ethylbenzene, styrene, toluene, m&p-xylenes, o-xylenes, and total xylenes.

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- SVOCs: 2,4-dimethylphenol, 2-methylnaphthalene, 2-methylphenol, 3&4-methylphenol, acenaphthene, acenaphthylene, acetophenone, aniline, anthracene, benzo(a)anthracene, benzyl alcohol, carbazole, dibenzofuran, fluoranthene, fluorene, naphthalene, o-toluidine, phenanthrene, phenol, and pyrene.
- Total Metals: arsenic, barium, cadmium, chromium, hexavalent chromium, lead, lithium, and selenium.
- General Chemistry: ammonia as N.

## **4.0 CAMU WATER DISCHARGES**

Discharges of CAMU leachate and leak detection fluids to the WTP were suspended beginning in December 2009. As noted in Section 3.1, fluids internal to the CAMU are currently managed by the spray system and no discharges occurred in 2017.

## 5.0 GROUNDWATER MONITORING

Eight groundwater-monitoring wells and six piezometers are located around CAMU Units 1 and 2, as listed below, and as presented on **Figure 2**. The following wells and piezometers are gauged for static water levels and sampled for water quality parameters.

Monitoring Well	Piezometer
MW01R (upgradient)	P01R (upgradient)
MW02R (side gradient)	
MW04 (side gradient)	
MW05 (downgradient)	P05 (downgradient)
MW06R (upgradient)	P06R (upgradient)
MW07 (upgradient)	P07 (upgradient)
MW08 (downgradient)	P08 (downgradient)
MW09R (downgradient)	P09 (downgradient)

Note: Historically, the shallow monitoring wells were designated as “wells” during installation, and the deep monitoring wells were designated as “piezometers” during installation. Both “wells” and “piezometers” are permanent monitoring wells constructed of 2-inch inner diameter polyvinyl chloride (PVC).

### 5.1 Groundwater Sampling

Verification sampling events were conducted on March 7, 2017 and June 21, 2017. The March and June verification sampling events were conducted to confirm exceedances of groundwater screening criteria from the CAMU 2016 annual groundwater sampling event. The CAMU annual groundwater sampling event was conducted on August 14-15, 2017. Prior to sampling, the monitoring wells and piezometers were gauged for static water levels. A groundwater elevation contour map for the August 2017 sampling event is provided as **Figure 3**.

The groundwater monitoring wells and piezometers were sampled using low-flow techniques in accordance with Standard Operating Procedure (SOP) F104 (Groundwater Sampling Revised: November 2015) or as originally outlined in Attachment B of the *Uniform Federal Policy Quality Assurance Project Plan for the U. S. Steel Corporation, Gary Works* (QAPP) (USS, 2016a). Sampling was performed using a bladder pump in order to maintain low-flow rates and minimize drawdown. The depth to water, flow rate, turbidity, pH, conductivity, oxidation-reduction potential (ORP), and temperature were recorded every two minutes. Monitoring wells/piezometers were purged until parameters stabilized for three consecutive readings. Stabilization is determined when three consecutive readings are within 10% of

the mean for each field parameter or parameters or in accordance with the USEPA (USEPA, 2015) stabilization criteria for water quality parameters:

<u>Parameter</u>	<u>Stabilization Criteria</u>
pH	+/- 0.1 units
Conductivity	+/- 3%
ORP	+/- 10 millivolts
Turbidity	+/- 10%

Upon parameter stabilization, groundwater samples were collected in the following order: VOCs, SVOCs, PCBs, and metals. The groundwater samples were shipped by the ALS (laboratory) courier to the ALS Holland, Michigan laboratory for analysis. Groundwater samples for hexavalent chromium analysis were shipped by the ALS courier to the ALS Valparaiso, Indiana laboratory.

Purge water was containerized in a polyethylene tank and was placed into Unit 2 of the CAMU.

#### 5.1.1 March and June 2017 Verification Groundwater Sampling Events

In accordance with the CAMU O&M Plan (USS, 2014b), historically, USS has increased sampling frequency in the event that a detected parameter is reported in a downgradient monitoring well or piezometer at a concentration above the MCL, RSL, or ESV (whichever is the lowest screening value). During the 2017 groundwater monitoring period, USS performed re-sampling to confirm the detections of parameters above the screening criteria. If the parameter remained elevated, USS continued sampling for the parameter at the affected well or piezometer quarterly until four consecutive quarters demonstrate the parameter concentration to be below the screening criteria. As agreed with USEPA on November 12, 2012, groundwater verification sampling is not required for groundwater exceedances observed in upgradient monitoring wells and piezometers.

Beginning with the Second Quarter 2017 sampling event, and continuing for future monitoring events, USS compares the metals analytical results to the statistically-derived background prediction limits approved by the USEPA by correspondence dated June 29, 2017 (USEPA, 2017b). Because there were insufficient detections of VOCs, SVOCs, and PCBs to derive statistical background prediction limits, future detections of these parameters will be evaluated using the double quantification rule described in the USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance* (USEPA, 2009a). For parameters for which there are no calculated prediction limits, an exceedance of risk-based screening criteria (i.e., MCLs, RSLs, ESVs) will not be confirmed unless the analytical result can be quantified at or above the reporting limit in two consecutive sampling/re-sampling events. If the exceedance is not confirmed, sampling will continue on an annual basis. If the exceedance is confirmed, the parameter(s) in the affected well(s) will be monitored quarterly until four consecutive quarters demonstrate the parameter concentration to be below the applicable criteria. Via email

correspondence dated June 29, 2017 (USEPA, 2017a), USEPA approved the use of the double quantification rule to evaluate these parameters.

Groundwater sampling was performed in 2017 at downgradient monitoring wells and piezometers on the following dates: March 7, 2017 and June 21, 2017. During the March 2017 verification sampling event, total metals analysis was performed. Beginning with the June 2017 verification sampling event, USS began performing dissolved metals analysis (as approved by USEPA via email correspondence dated April 12, 2017 [USEPA, 2017a]).

On March 7, 2017, a sample for total lithium analysis was collected at monitoring well MW08 and samples for total hexavalent chromium were collected at monitoring well MW09R, and piezometers P05, P08, and P09. The concentration of total lithium detected at MW08 (0.026 mg/l) was greater than the ESV (0.014 mg/l). The concentration of total hexavalent chromium detected at MW09R (0.002 J mg/l), P05 (0.0058 mg/l for both the parent and field duplicate samples), P08 (0.011 mg/l), and P09 (0.012 mg/l) were greater than the RSL (0.00035 mg/l).

Beginning with the June 2017 sampling event, analytical results for metals were compared to the USEPA approved CAMU-specific Prediction Limits. From June 2017 onward, verification sampling for metals exceedances will be based on exceedances of the CAMU-specific Prediction Limits.

On June 21, 2017, a sample for dissolved lithium analysis was collected at monitoring well MW08 and samples for dissolved hexavalent chromium were collected at monitoring well MW09R, and piezometers P05, P08, and P09. The concentration of dissolved lithium detected at MW08 (0.024 mg/l) was less than the CAMU-specific Prediction Limit derived for MW08. Dissolved hexavalent chromium was reported as non-detect in the samples collected from MW09R, P05, P08, and P09. The reporting limit for dissolved hexavalent chromium (0.0050 mg/l) was equal to the CAMU-specific Prediction Limit derived for shallow monitoring wells (0.005 mg/l). The reporting limit was less than the CAMU-specific Prediction Limits of 0.014 mg/l derived for deep wells and for individual wells P05 and P08.

A summary of the analytical results is presented in **Table 4**.

#### 5.1.2 August 2017 Annual Groundwater Sampling Event

Groundwater sampling activities were performed on August 14-15, 2017. Groundwater samples were analyzed for VOCs, SVOCs, PCBs, dissolved RCRA metals, dissolved hexavalent chromium, and dissolved lithium.

A summary of the analytical results is presented in **Table 4**. The groundwater monitoring purge sheets are provided in **Appendix D-1** and the analytical laboratory reports are provided in **Appendix D-2**.

The analytical results are summarized as follows:

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- PCBs were not detected during the August 2017 annual monitoring event.
- VOCs were not detected during the August 2017 annual monitoring event.
- The SVOC bis(2-ethylhexyl)phthalate was reported at one monitoring well location (P07).
- Metals detected in groundwater samples included: dissolved arsenic, dissolved barium, dissolved lithium, and dissolved selenium.

For 2017, the concentrations of organic constituents detected in groundwater samples were compared to the USEPA MCLs (USEPA, 2009b), USEPA RSLs for tap water (USEPA, 2016), and the USS – Gary Works ESVs selected for the East Breakwater Area (USS, 2016b). The concentrations of metals detected in groundwater samples were compared to the statistically-derived prediction limits for the CAMU monitoring wells and piezometers (WCG, 2017). In accordance with the CAMU O&M Plan (USS, 2014b), confirmation sampling is required if a detected constituent exceeds the (MCL, RSL, or ESV for organic compounds and Prediction Limits for metals). As agreed with USEPA on November 12, 2012, groundwater verification sampling is not required for groundwater exceedances observed in upgradient monitoring wells and piezometers.

The concentration of bis(2-ethylhexyl)phthalate (8.0 ug/l) detected in the groundwater sample collected from downgradient monitoring well P05 exceeded the MCL (6 ug/l), the RSL (5.6 ug/l), and the ESV (0.3 ug/l). Due to an oversight, confirmation sampling was not performed immediately following the annual sampling event. When the oversight was identified, USS immediately collected a confirmation sample on May 17, 2018, and bis(2-ethylhexyl)phthalate was reported as non-detect (1.0 U ug/l). No further sampling is required.

The concentrations of dissolved arsenic, dissolved barium detected in the groundwater samples were less than the CAMU-specific Prediction Limits.

The concentrations of dissolved barium detected in the groundwater samples were less than the CAMU-specific Prediction Limits.

The concentration of dissolved lithium detected in the groundwater sample collected from piezometer P07 (0.016 mg/l) exceeded the CAMU-specific Prediction Limit of 0.015 mg/l (for deep wells). Because piezometer P07 is located upgradient of the CAMU, confirmation sampling was not required at this location. The concentrations of dissolved lithium detected in the remaining groundwater samples were less than the CAMU-specific Prediction Limits.

The concentration of dissolved selenium detected in the groundwater sample collected from monitoring well MW04 (0.0050 mg/l) was less than the CAMU-specific Prediction limit of 0.21 mg/l for shallow wells.

**Figure 4** presents a summary of constituents detected during the August 2017 groundwater sampling event. The groundwater data review reports are provided in **Appendix E-2**. These reports outline the data review process and present the usability of the data set.

Time series plots were prepared for the most commonly detected parameters (detected during four or more monitoring events) in groundwater samples collected during the 2007 – 2017 CAMU groundwater monitoring period. The most commonly detected parameters in CAMU groundwater samples during the 2007 – 2017 monitoring period are arsenic, barium, hexavalent chromium, lead, lithium, and selenium. (Note: metals analysis was not performed during 2007 and 2008 groundwater monitoring events.) The times-series plots are presented in **Appendix D-3**.

## **5.2 Comparison of Detections in Groundwater, Leak Detection and Leachate Samples**

In previous years' CAMU Annual Reports, to evaluate the potential for chemical movement from the CAMU, parameters detected in upgradient monitoring wells/piezometers were compared to parameters detected in downgradient monitoring wells/piezometers. In addition, parameters detected in groundwater samples previously were compared to parameters detected in CAMU Unit 1 and Unit 2 leak detection and leachate samples. These evaluations were previously performed because groundwater analytical data were compared to screening criteria (i.e., USEPA MCLs, USEPA RSLs, and Gary Works ESVs). In select instances, detected parameters exceeded the screening criteria; however, exceedances of these criteria were not necessarily indicative of a statistically significant change in groundwater quality or release from the CAMU. As a result, groundwater analytical results were compared to leachate and leak detection results to evaluate if there was the potential for chemical movement from the CAMU.

The CAMU-specific Prediction Limits are statistically-derived concentrations for the comparison of groundwater compliance data against site-specific background data. Because the Prediction Limits are an estimated upper limit of the background data, a confirmed exceedance of a given parameter's Prediction Limit would suggest that groundwater concentrations increased above background levels (i.e., an exceedance of a Prediction Limit in a downgradient groundwater sample would suggest the potential for release from the CAMU). The concentrations of chemicals detected in downgradient groundwater samples were either less than their respective Prediction Limits (for metals) or satisfied the double quantification rule (for organics). Therefore, groundwater concentrations have not increased above background levels and the CAMU liner appears to be functioning as designed with respect to limiting interaction between the CAMU fluids and the surrounding groundwater (i.e., there is no chemical movement from the CAMU). The use of prediction limits is an appropriate indicator of a potential release from the CAMU; therefore, upgradient/downgradient groundwater comparisons and



comparisons to CAMU leachate and leak detection samples were not conducted for the 2017 CAMU groundwater data set.

### **5.3 Comparison of CAMU Groundwater Levels to Leak Detection Levels**

To evaluate potential interaction between the CAMU leak detection fluids and the surrounding groundwater, the groundwater elevations measured during the August 2017 annual groundwater sampling event were compared to the 2017 average monthly leak detection elevations. The August 2017 groundwater elevations ranged from 589.55 feet (ft) above mean sea level (msl) (on the north side of the CAMU at CAMU-MW01R) to 585.74 ft msl (on the south side of the CAMU at CAMU-P09). The base of the CAMU sits at approximately 592 ft msl on the north side of the CAMU and 586 ft msl on the south side of the CAMU. For year 2017, the average monthly leak detection water elevations from 604.88 to 613.07 ft msl at CAMU Unit 1, and from 611.60 to 612.20 ft msl at CAMU Unit 2 (**Appendix B**).

The groundwater elevations for the August 2017 annual groundwater sampling event were below the base of the CAMU liner, and were below the CAMU Unit 1 and Unit 2 leak detection elevations. Therefore, there was no direct interaction between the CAMU leak detection fluids and the surrounding aquifer.

## 6.0 AMBIENT AIR MONITORING

Ambient air monitoring was performed for BTEX and naphthalene in 2017. The on-site (CAMU Air Monitoring Stations 1 and 2) and residential air monitoring data for BTEX and naphthalene and a comparison to their respective action levels are presented in **Appendix F-1**. Wind roses are also provided in **Appendix F-1**. The analytical laboratory reports are provided in **Appendix F-2**.

### 6.1 On-Site Air Monitoring

The minimum and maximum detected concentrations of BTEX and naphthalene detected at the on-site air monitoring stations are as follows:

Detected Concentrations (ug/m <sup>3</sup> )		Station 1	Station 2	Notification Level
Benzene	Minimum	0.21 J	0.24 J	17.5 ug/m <sup>3</sup>
	Maximum	1.60	1.30	
Ethylbenzene	Minimum	0.20 J	0.20 J	55 ug/m <sup>3</sup>
	Maximum	0.69	2.70	
Toluene	Minimum	0.33 J	0.27 J	48,667 ug/m <sup>3</sup>
	Maximum	22	190	
Total Xylenes	Minimum	0.38 J	0.36 J	973 ug/m <sup>3</sup>
	Maximum	2.30	8.40	
Naphthalene	Minimum	0.28 J	0.24 J	4 ug/m <sup>3</sup>
	Maximum	1.30	0.69	

Notes:

ug/m<sup>3</sup> = micrograms per cubic meter

J = Estimated value

Detected concentrations of BTEX and naphthalene in air samples did not exceed their respective notification levels during the 2017 monitoring period.

### 6.2 Residential Air Monitoring

A residential air monitoring station is located at the intersection of Ellsworth Street and 1<sup>st</sup> Avenue in Gary, Indiana. The minimum and maximum detected concentrations of BTEX and naphthalene detected at the residential air monitoring station are as follows:

Detected Concentrations (ug/m <sup>3</sup> )		Ellsworth Street and 1 <sup>st</sup> Avenue	Notification Level
Benzene	Minimum	0.24 J	17.5 ug/m <sup>3</sup>
	Maximum	6.40	
Ethylbenzene	Minimum	0.20 J	55 ug/m <sup>3</sup>

Detected Concentrations (ug/m <sup>3</sup> )		Ellsworth Street and 1 <sup>st</sup> Avenue	Notification Level
Toluene	Maximum	1.20	48,667 ug/m <sup>3</sup>
	Minimum	0.30 J	
	Maximum	12.0	
Total Xylenes	Minimum	0.36 J	973 ug/m <sup>3</sup>
	Maximum	3.10 J	
Naphthalene	Minimum	0.26 J	4 ug/m <sup>3</sup>
	Maximum	9.0	

Notes:

ug/m<sup>3</sup> = micrograms per cubic meter

J = Estimated value

Detected concentrations of BTEX in air samples did not exceed their respective notification levels during the 2017 monitoring period. Air samples at the residential station exceeded the notification level for naphthalene once in the week ending on September 2, 2017. Naphthalene was detected at 9.0 ug/m<sup>3</sup> over a twenty-four (24) hour period from August 31, 2017 and September 1, 2017 which was in excess of the 4.0 ug/m<sup>3</sup> notification level. USS notified the USEPA of the air monitoring exceedance at Ellsworth Street residential monitoring station for naphthalene.

### 6.3 PM<sub>10</sub> Monitoring

Previously, sampling for particulate matter 10 micrometers in diameter (PM<sub>10</sub>) was performed at the CAMU using two rental units. In December 2010, USS replaced the rental units with two permanent units and one mobile unit. The three units are situated at the top berm of the CAMU within 5 to 10 feet of the sediment in the CAMU cells. PM<sub>10</sub> Unit 1 is located along the eastern berm of CAMU Unit 1 and PM<sub>10</sub> Unit 2 is located along the eastern berm of CAMU Unit 2. PM<sub>10</sub> Unit 3 is located along the southern berm of the CAMU and is a mobile unit that can be moved in conjunction with disposal activities. PM<sub>10</sub> monitoring is not conducted in residential neighborhoods.

The PM<sub>10</sub> monitoring units provide real-time results hourly throughout the day. The data are collected by the unit and then downloaded via software programming each hour, as well as on 5-minute intervals. Data from the monitoring units are compiled hourly and are recorded on a daily basis. The daily PM<sub>10</sub> summary sheets are provided in **Appendix F-3**. Notation of CAMU waste placement activities are also recorded on the daily PM<sub>10</sub> summary sheets.

Due to monitoring unit maintenance activities, the PM<sub>10</sub> units were not in operation on the following dates:

- PM<sub>10</sub> Unit 2: October 15, 2017 and December 9, 2017.

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- PM<sub>10</sub> Unit 3: January 4, 2017; January 6, 2017; January 15, 2017; January 16, 2017; October 31, 2017; November 5, 2017; and December 26, 2017.

Due to calibration/recalibration activities, the PM<sub>10</sub> Units were not in operation on the following dates:

- PM<sub>10</sub> Unit 3: January 5, 2017 and January 11, 2017.

Due to operational issues/malfunctions, the PM<sub>10</sub> Units were not in operation on the following dates:

- PM<sub>10</sub> Unit 1: June 1, 2017
- PM<sub>10</sub> Unit 3: January 7, 2017; January 8, 2017; January 10, 2017; January 30, 2017; March 19, 2017; March 24, 2017.

Due to operational issues/malfunctions or calibration/recalibration activities, the PM<sub>10</sub> Units collected only part of a day's data (< 24 hours) on the following dates:

- PM<sub>10</sub> Unit 1: January 22, 2017 and October 14, 2017.
- PM<sub>10</sub> Unit 2: February 12 through 13, 2017; July 5, 2017; October 4, 2017; and October 14, 2017.
- PM<sub>10</sub> Unit 3: January 1, 2017; January 3, 2017; January 22, 2017; January 25, 2017; January 31, 2017; February 1, 2017; February 2, 2017; February 5, 2017; February 7 through 15, 2017; February 23, 2017; March 20 through 21, 2017; April 27, 2017; June 1, 2017; October 14, 2017; November 6, 2017; November 10, 2017; November 30, 2017; December 27, 2017; and December 30 through 31, 2017.

Due to a unit exchange, the PM<sub>10</sub> Units collected only part of a day's data (< 24 hours) on the following dates:

- PM<sub>10</sub> Unit 1: April 6, 2017.
- PM<sub>10</sub> Unit 3: February 24, 2017

Monitoring results are compared to the National Ambient Air Quality Standards (NAAQS) for PM<sub>10</sub> (USEPA, 2013). USS provides notification to USEPA if the monitoring results are greater than 50 ug/m<sup>3</sup>. The USS action level is 150 ug/m<sup>3</sup>, which is the NAAQS for a 24-hour averaging time. However, USS has elected to set an internal alert level at 100 ug/m<sup>3</sup> in order to allow time to assess air conditions before the NAAQS action level is exceeded. Action taken when PM<sub>10</sub> values have approached the action level of 150 ug/m<sup>3</sup> has included watering of the roadways to minimize dust.

Notification level events were observed as follows:

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Exceedance Date	PM <sub>10</sub> Concentration (ug/m <sup>3</sup> )			Waste Placement?
	PM <sub>10</sub> Unit 1	PM <sub>10</sub> Unit 2	PM <sub>10</sub> Unit 3	
January 15, 2017	24.14	<b>50.00</b>	Down for maintenance	No
February 19, 2017	<b>94.15</b>	<b>110.05</b>	<b>89.09</b>	No
March 8, 2017	<b>106.31</b>	<b>50.44</b>	40.97	Yes – Purge Water
April 26, 2017	<b>61.76</b>	23.97	30.86	No
May 17, 2017	<b>69.94</b>	<b>51.34</b>	<b>53.63</b>	No
May 28, 2017	36.58	<b>62.56</b>	26.03	No
December 5, 2017	<b>57.10</b>	27.97	11.70	Yes – Purge Water

Notes:

ug/m<sup>3</sup> = micrograms per cubic meter

Bold = notification level (50 ug/m<sup>3</sup>) exceeded

PM<sub>10</sub> Unit 1 is located at the CAMU Unit 1 west berm

PM<sub>10</sub> Unit 2 is located at the CAMU Unit 2 east berm

PM<sub>10</sub> Unit 3 is a mobile unit currently located at the south berm of CAMU Unit 2

USEPA was appropriately notified for each of the above exceedances.

### 6.4 Ammonia Monitoring

In accordance with the CAMU O&M Plan (USS, 2014a), continuous air monitoring for ammonia is performed when the evaporation spray system is actively operating. Ammonia samples are collected from stands located on the north, south, and east sides of the CAMU. The weekly (7-day averaged sampling) ammonia monitoring summary sheets are provided in **Appendix F-4**.

The 7-day sampling results were compared to the screening level of 100 ug/m<sup>3</sup>. The sampling results for the weekly events were reported below the screening level.

### 6.5 Approved Changes to the Air Monitoring Program

Air monitoring data has been below action levels for several years, with only minor notification level events. The notification level is representative of the most conservative (carcinogenic risk factor of 10<sup>-6</sup>) and is 5 times lower than the level that requires action to be taken. On October 13, 2017, USS submitted to USEPA a request to suspend air monitoring at the CAMU when USS is not actively disposing of investigation-derived waste or remediation waste (i.e., non-operational time periods).

USS' request included a review of approximately ten (10) years of air monitoring data. This review noted the following:

- The NAAQS of 150 ug/m<sup>3</sup> for PM<sub>10</sub> has not been exceeded more than once per year, on average, over three years. The maximum detected 24-hour PM<sub>10</sub> reading at the CAMU exceeded the NAAQS of 150 ug/m<sup>3</sup> one time since 2010.
- The concentration of benzene has not exceeded the Action Level of 87 ug/m<sup>3</sup> in the past ten years. The concentration of benzene exceeded the Notification Level of 17.5 ug/m<sup>3</sup> (CAMU Unit 3) one time.
- The concentration of ethylbenzene has not exceeded the Action Level of 273 ug/m<sup>3</sup> or the Notification Level of 55 ug/m<sup>3</sup> in the past ten years.
- The concentration of toluene has not exceeded the Action Level of 243,333 ug/m<sup>3</sup> or the Notification Level of 48,667 ug/m<sup>3</sup> in the past ten years.
- The concentration of total xylenes has not exceeded the Action Level of 4,867 ug/m<sup>3</sup> or the Notification Level of 973 ug/m<sup>3</sup> in the past ten years.
- The concentration of naphthalene has not exceeded the Action Level of 20 ug/m<sup>3</sup> in the past ten years. The concentration of naphthalene has exceeded the Notification Level of 4 ug/m<sup>3</sup> in the past ten years. Most of these exceedances occurred at the air monitoring units at the CAMU in the period following the Grand Calumet River dredging project. Periodic exceedances of the Notification Level also occurred at the residential air monitoring station during this time. Since July 2013, there have been a total of four (4) exceedances of the Notification Level at the CAMU air monitoring stations and one exceedance of the Notification Level at the residential air monitoring station.

By letter dated February 1, 2018 (USEPA, 2018), USEPA approved USS' request for a reduction in air monitoring frequency. The following modifications to the AMOP were approved:

- A reduction in PM<sub>10</sub> monitoring to a period of one week per month during non-disposal times;
- A reduction in the frequency of volatiles monitoring (BTEX and naphthalene) to a period of twice per month during non-disposal times;
- A reduction in the frequency of ammonia monitoring to discontinue monthly monitoring during non-disposal periods. Weekly ammonia monitoring will continue when the evaporative spray system is operating.

During disposal events of investigation-derived waste, USS will coordinate disposal activities to coincide with the PM<sub>10</sub> and volatiles sampling. During disposal events for remediation wastes (managed as part of an interim measure or final remedy), USS will perform air monitoring in accordance with the approved AMOP, or as modified (and approved by USEPA) in USS' Request to Dispose of Remediation Waste for the specific interim measure or final remedy.

## 7.0 INSPECTIONS

### 7.1 CAMU Site Inspections

General inspections were performed in and around the CAMU to monitor the following:

- Berm condition (vegetative cover, erosion, deep rooted plants);
- Roadway condition (erosion, ruts, settlement);
- Liner condition (wrinkles, abrasions, tears, punctures);
- Perimeter fence condition (tightness, poles, holes);
- Drainage swales (erosion, sediment accumulation, debris accumulation); and
- Infiltration ponds (water accumulation, sediment accumulation, erosion, vegetation).

Monthly site inspections and leachate and leak detection system inspections performed in 2017 were recorded on the CAMU Site Inspection Form and the Leachate and Leak Detection System and Evaporative Spray System Inspection Form, respectively. The CAMU Site inspection forms for January through December 2017 are provided as **Appendix G-1**.

### 7.2 Geosynthetic Inspections

Inspections of the geosynthetic liner were performed on April 12-13, 2017, and September 12-13, 2017. The results of the April and September 2017 inspections indicated that tears were present in the ultra-violet (UV) protective geonet layer (which is intended serve as a protective layer above the geomembrane) and that portions of the underlying geomembrane were exposed. AMS Mechanical repaired tears identified within the protective geonet on May 26, 2017 and October 21, 2017. The repairs were performed by placing double-sided geocomposite over the exposed geomembrane and fastening the geocomposite to the existing net (that overlies the geomembrane) with plastic ties, as recommended by the geomembrane manufacturer. The inspections did not indicate damage to the underlying geomembrane (i.e., the geomembrane was not compromised).

Inspections were recorded and inspection records are maintained on-site by USS – Gary Works Environmental Affairs Department. Copies of the geosynthetic inspection logs are provided in **Appendix G-2**.

## 8.0 SUMMARY

The following is a summary for CAMU Unit 1 and CAMU Unit 2 operations and maintenance and environmental monitoring for the calendar year 2017:

1. Waste placement activities were performed at CAMU Unit 2 in 2017. Seventeen disposal events were performed at CAMU Unit 2, during which approximately 809 gallons of decontamination fluids and groundwater sampling purge water, and 8 cubic yards of soils were placed in Unit 2.
2. No wastes were placed in CAMU Unit 1 in 2017.
3. There were no water discharges to the GCR in 2017.
4. Air monitoring was performed in 2017 in accordance with the CAMU O&M Plan (USS, 2014a). Due to maintenance, operational issues/malfunctions, and calibration issues, the PM<sub>10</sub> monitoring units were out of service on select days. However, these days did not coincide with waste placement events, and therefore, did not impact the operation of the CAMU.
5. Repairs to the CAMU UV protective geonet liner were conducted in May 26, 2017, and October 21, 2017.

Approved changes to the monitoring program that took effect in 2017 included:

1. Statistically-derived prediction limits were generated for groundwater for metals constituents. USEPA approved the use of CAMU-specific Prediction Limits via correspondence dated June 29, 2017. Beginning in June 2017, CAMU-specific Prediction Limits have been used to evaluate the potential for a release of metals from the CAMU.
2. Air monitoring data has been below action levels for several years with a minimal number of notification level events. On October 13, 2017, USS submitted to USEPA a request to suspend air monitoring at the CAMU when USS is not actively disposing of investigation-derived waste or remediation waste (i.e., non-operational time periods). By letter dated February 1, 2018 (USEPA, 2018), USEPA approved USS' request for a reduction in air monitoring frequency.

Based on the data collected during the 2017 operating year, the CAMU appears to be functioning as designed for the following reasons:

1. **Graphs 2 and 4** present the monthly average leak detection volumes for CAMU Unit 1 and CAMU Unit 2, respectively, during 2017. As shown in the graphs, each average monthly leak detection volumes were less than the ALR.
2. Groundwater elevations (from the August 2017 annual groundwater sampling event) were compared to leak detection water elevations and the bottom elevations of the CAMU. The



measured groundwater elevations were below the elevation of the leak detection fluids and below the base of the CAMU. Therefore, there was no direct interaction between the CAMU fluids and the surrounding groundwater.

3. Metals constituent concentrations from samples collected during the June 2017 groundwater verification event and the August 2017 annual groundwater sampling event were compared to the statistically derived CAMU-specific Prediction Limits. Because the Prediction Limits are an estimated upper limit of the background data, a confirmed exceedance of a given parameter's prediction limit would suggest that groundwater concentrations increased above background levels. The concentrations of chemicals detected in downgradient groundwater samples were either less than their respective Prediction Limits (for metals) or satisfied the double quantification rule (for organics). Therefore, groundwater concentrations have not increased above background levels and the CAMU liner system appears to be functioning as designed with respect to limiting interaction between the CAMU fluids and the surrounding groundwater.

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