ERM

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September 16, 2019

Mr. Les Arnold
ALS Environmental
3352 128th Avenue
Holland, MI 49424

Reference: 0501867.0152

Subject: Whole Effluent Toxicity Test Results

Dear Les,

Enclosed please find the final results of the following Chronic Toxicity Tests performed on samples of the ArcelorMittal Burns Harbor Outfall 001 effluent.

- 26 August 2019, Chronic *Ceriodaphnia dubia* Toxicity Test
- 26 August 2019, Chronic *Pimephales promelas* Toxicity Test

If you have any questions concerning this report or if I can be of any further assistance to you, please feel free to contact me at (616) 738-7308 or via e-mail at bruce.rabe@erm.com.

Yours sincerely,

Bruce A. Rabe
Director, Aquatic Toxicology Laboratory

BAR:km

Enclosure: Whole Effluent Toxicity Test Report

cc: Amanda Grzybowski
Brandon Frye
File

Permittee/Location: ArcelorMittal Burns Harbor LLC 250 West U.S. Hwy 12 Burns Harbor, IN 46304	**Permit number:** IN0000175	**Outfall number:** 001
Laboratory Name and Contact: Environmental Resources Management 3352 128th Avenue Holland, MI 49424	**Report Due Date:** N/A	**Report Date:** September 16, 2019

WETT Reporting Frequency or Type:	Monthly	Quarterly	Semi-annual	Annual	TRE	Post TRE	First (per Reporting Frequency)?
							Re-take (per Reporting Frequency)?

Test Organism	Test Type	Endpoint	Units	Result	Pass/ Fail	Limit	Reporting
Ceriodaphnia dubia	7-day Survival and Reproduction Definitive Static-Renewal	NOEC Survival	%	100		N/A	Laboratory Report
			TU_c	1.0		1.0	
		NOEC Reproduction	%	100		N/A	
			TU_c	1.0		1.0	
		IC_{25} Reproduction	%	>100		N/A	
			TU_c	1.0		1.0	
		48 hr. LC_{50}	%	>100		N/A	
			TU_a	1.0		1.0	
		Toxicity (chronic)	**TU_c**	**1.0**	Pass	**1.0**	Laboratory Report and **NetDMR** (Parameter Code 61426)
		Toxicity (acute)	**TU_a**	**1.0**	Pass	**1.0**	Laboratory Report and **NetDMR** (Parameter Code 61425)
Pimephales promelas	7-day Larval Survival and Growth Definitive Static-Renewal	NOEC Survival	%	100		N/A	Laboratory Report
			TU_c	1.0		1.0	
		NOEC Growth	%	100		N/A	
			TU_c	1.0		1.0	
		IC_{25} Growth	%	>100		N/A	
			TU_c	1.0		1.0	
		96 hr. LC_{50}	%	>100		N/A	
			TU_a	1.0		1.0	
		Toxicity (chronic)	**TU_c**	**1.0**	Pass	**1.0**	Laboratory Report and **NetDMR** (Parameter Code 61428)
		Toxicity (acute)	**TU_a**	**1.0**	Pass	**1.0**	Laboratory Report and **NetDMR** (Parameter Code 61427)

FINAL REPORT

Chronic Toxicity Test
Freshwater Invertebrate,
Ceriodaphnia dubia
EPA Test Method 1002.0

Submitted To:
ALS Environmental
3352 128th Avenue
Holland, MI 49424

Sample: ArcelorMittal Burns Harbor, LLC - Outfall 001

Testing Period: 26 August – 2 September 2019

Laboratory I.D. Number: 082619-1

ACCREDITED IN ACCORDANCE WITH nelac
PA DEP ID No. 68-04227
NJ DEP ID No. MI013

Conducted By:
Environmental Resources Management, Inc.
3352 128th Avenue
Holland, Michigan 49424

ERM

Test Overview

Permittee:	ArcelorMittal Burns Harbor, LLC
Location:	250 West U.S. Hwy 12 Burns Harbor, IN 46304
Contact:	Robert Maciel
Telephone #:	219.787.2120
NPDES Permit #:	IN0000175
Permit Requirements:	Acute Toxicity Limit = 1.0 TUa Chronic Toxicity Limit = 1.0 TUc
Test Sample:	Outfall 001
Receiving Water:	East Branch, Little Calumet River
Testing Date:	26 August – 2 September 2019
Sample Date(s):	26 August 2019 28 August 2019 30 August 2019
Test/Method:	Daphnid, *Ceriodaphnia dubia*, Survival and Reproduction Test EPA 821-R-02-013 Method 1002.0.
QC Objectives:	Test data met all test acceptability criteria, except where noted below.
Data Qualifiers:	None

DATA SUMMARY

Effluent Concentrations (%)	Survival (%)	Reproduction (Average Young/Female)
Control	100	28.3
6	100	25.5
13	100	25.8
25	100	26.0
50	100	30.2
100	100	36.6

TEST RESULTS

48-Hour LC_{50}	>100%
NOEC (Survival & Reproduction)	100%
LOEC (Survival & Reproduction)	>100%
IC_{25}	>100%
MSDp (Reproduction)	29.3%
TUa ($100/LC_{50}$)	1.0
TUc ($100/IC_{25}$)	1.0

TEST CONCLUSION

In accordance with the NPDES permit requirements for ArcelorMittal Burns Harbor, LLC, this toxicity test did not exceed either the acute or the chronic toxicity limit.

Bruce A. Rabe
Director, Aquatic
Toxicology Laboratory
ERM Project No. 0501867.0152

Environmental Resources Management
3352 128th Avenue
Holland, Michigan 49424-9263
Phone: 616.399.3500
Fax: 616.399.3777

ERM Testing Method

Ceriodaphnia dubia – Survival and Reproduction Toxicity Test

Upon sample receipt, each effluent sample was analyzed for a suite of water quality parameters (Appendix A - Table 1). Where indigenous organisms were present, the sample was filtered through a 60 micron (µm) NITEX® screen. All samples were maintained at 0 – 6 degrees Celsius (°C) until needed for testing.

A series of five effluent concentrations and a control solution were established for testing. All test solutions were prepared by mixing appropriate volumes of dilution water and effluent in the test containers. Dilution water consisted of reconstituted moderately hard water. The control solution consisted of 100 percent dilution water.

Ceriodaphnia dubia used to initiate this test were obtained from individual, in-house cultures and were less than 24-hours old, and had an age range of 0 to 8 hours at test initiation. Test organisms used to initiate this test were released from adults which met acceptable performance criteria (i.e., ≥15 young/surviving female within 3 broods and obtained from a brood of at least 8 young) and were maintained in reconstituted moderately hard water prior to test initiation.

The *Ceriodaphnia dubia* test was conducted using 30-milliliter (mL) disposable polystyrene containers containing 15 mL of control water or test solution. One *Ceriodaphnia dubia* was added to each test chamber with ten replicate chambers per treatment. Each *Ceriodaphnia dubia* test chamber was fed a 0.2-mL suspension consisting of yeast-Cerophyll-trout chow (YCT) and green algae (*Raphidocelis subcapitata*) mixture daily.

The test solutions were renewed daily during the exposure by transferring the adult daphnid, by way of a wide bore pipette, into fresh control water or test solution.

Percent survival of exposed *Ceriodaphnia dubia* was determined by inspecting for adult mortality daily. Mortality was defined as no body or appendage movement after gentle prodding. Production of young was also determined by daily inspections and enumeration. When 60 percent of the surviving females in the control treatment produced three broods, mean reproduction was determined by calculating the average number of live young produced per female for each treatment.

The test was conducted at a temperature of 25 ± 1°C under fluorescent lighting with a photoperiod of 16 hours light and 8 hours dark. Water quality measurements were performed on all control and test solutions prior to test initiation and on selected treatments daily thereafter, as indicated in the raw data (Appendix A - Table 2).

Following termination of the chronic toxicity test, No Observed Effect Concentrations (NOEC) and Lowest Observed Effect Concentrations (LOEC) were determined for *Ceriodaphnia dubia* survival and reproduction, and a 25 percent Inhibition Concentration (IC_{25}) was determined for *Ceriodaphnia dubia* reproduction. An NOEC is defined as the highest effluent concentration that does not produce any observed adverse effect to the exposed test organism. An LOEC is defined as the lowest effluent concentration that does produce an observed adverse effect to the exposed test organism. An adverse effect is determined as a statistically significant difference between the control and a given effluent concentration. Significant differences in *Ceriodaphnia dubia* survival were determined using the Fisher's Exact Test.

Prior to the determination of any significant differences in *Ceriodaphnia dubia* reproduction, the data were evaluated for normal distribution and homogeneity characteristics. Depending on the result and the number of test replicates per concentration, an analysis of variance test was performed followed by one of the following mean comparison tests: Dunnett's Procedure, Bonferroni t-Test, Steel's Many-One Rank Test, Wilcoxon Rank Sum Test, or the T-Test. For reporting purposes, a chronic toxic unit (TUc) is calculated and is defined as the most conservative of either 100/NOEC based on the more sensitive test endpoint or $100/IC_{25}$.

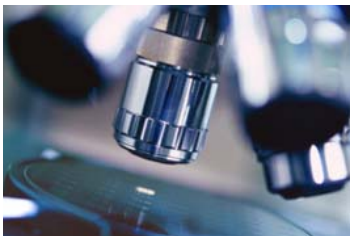
To evaluate acute toxicity, a 48-hour LC_{50} and corresponding 95 percent confidence interval was also calculated, where possible. The LC_{50} value estimate was determined by using one of the following statistical methods: graphical, Spearman-Karber, Trimmed Spearman-Karber, or Probit. The method selected for reporting test results was determined by the characteristics of the data; that is, the presence or absence of 0 and 100 percent mortality and the number of concentrations in which mortalities between 0 and 100 percent occurred. For reporting purposes, the 48-hour LC_{50} value was converted to an acute toxic unit (TUa) by $100/LC_{50}$. All statistical analyses were performed using the CETIS™ Version 1.9.4.3 software program.

The reference toxicant, sodium chloride, was used to monitor the sensitivity of the test organisms and the precision of the testing procedure. Chronic reference toxicant tests are performed at least monthly and the resulting IC_{25} are plotted to determine if the results are within prescribed limits (Appendix A - Standard Reference Toxicant Data). If the IC_{25} of a particular reference toxicant test does not fall within the expected range of ± two standard deviations from the mean for a given test organism, the sensitivity of that organism and the overall credibility of the test system is suspect.

Reference:

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Ed. U.S. Environmental Protection Agency, Office of Water, Washington, D.C., EPA-821-R-02-013.

Case Narrative



1.0 TEST PERFORMANCE CRITERIA

The quality control results achieved laboratory specifications.

2.0 MODIFICATIONS TO ERM'S STANDARD TEST METHOD

Test was performed in accordance with ERM's standard test method (see page 3).

Appendix A
Supporting Documents

- *Raw Test Data*
- *Statistical Analysis (if necessary)*
- *Chain-of-Custody Forms*
- *Standard Reference Toxicant Data*

Environmental Resources Management

***Ceriodaphnia dubia* - Chronic Toxicity Test**
Initial Water Quality and Test Solution Preparation

Permittee/Client:	ArcelorMittal Burns Harbor, LLC	Control/Dilution Water:	RMHW
Effluent/Location:	Outfall 001	Organism Batch #:	150-19
Lab I.D.#:	082619-1	Organism Age:	SAR 09/03/19 9-16 ~~to 18~~ KCS
Beginning Date:	08/26/19 Time: 1600	QC Review:	SAR
Ending Date:	09/02/19 Time: 1200	QC Review Date:	09/03/19

Initial Water Quality:

Parameter	Units	Effluent			Synthetic Water		
Sample #	--	1	2	3	--	--	--
Lab I.D.#/ Batch #	--	082619-1	082819-1	0830B-1	99-19	-	-
Temperature	° C	5	5	2	--	--	--
Dissolved Oxygen	mg / L	10.5	7.3	9.2	--	--	--
pH	S.U.	7.1	7.2	7.3	7.8	-	-
Conductivity	umhos/cm	417	391	454	315	-	-
Alkalinity	mg / L $CaCO_3$	110	108	102	60	-	-
Hardness	mg / L $CaCO_3$	140	160	140	80	-	-
Total Ammonia	mg / L NH_3	0.29	0.04	0.42	--	--	--
Total Residual Chlorine	mg / L Cl_2	<0.01	<0.01	<0.01	<0.01	-	-
Total mls of 7.0 g/L Sodium Thiosulfate added per liter	mL / L	--	--	--	--	--	--
Initials	--	RM	RM	RMS	KM	-	-

Test Solution Preparation: Test Solution Prepared For Both Species.

Treatment (% Effluent)	Effluent (mL)	Dilution (mL)
Control	0	1200
6%	72	1128
13%	156	1044
25%	300	900
50%	600	600
100%	1200	0

Test Day	Initials	Effluent Sample #	Synthetic Batch #
0	RH	1	99-19
1	RH	1	99-19
2	RM	2	99-19
3	RWM	2	99-19
4	RMS	3	99-19
5	RH	3	99-19
6	RH	3	99-19
7	—	—	—

Environmental Resources Management

***Ceriodaphnia dubia* - Chronic Toxicity Test**
Water Quality Data

Permittee/Client: ArcelorMittal Burns Harbor, LLC
Effluent/Location: Outfall 001
Lab I.D.#: 082619-1

Water Quality Data:

Dissolved Oxygen (mg/L)

Day

Meter #	5	5	3	3	5	5	3	5	5	3	3	5	3	5
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	7.8	7.7	8.3	7.7	7.9	7.4	8.4	7.8	7.9	8.1	8.2	7.9	8.3	8.0
6%	7.8	7.7	8.3	7.8	7.9	7.4	8.4	7.9	7.9	8.0	8.2	7.9	8.3	8.2
13%	7.8	7.7	8.3	7.7	7.9	7.4	8.4	7.8	7.9	8.0	8.2	7.8	8.3	8.1
25%	7.8	7.7	8.3	7.7	7.9	7.4	8.4	7.8	7.9	8.0	8.2	7.8	8.3	8.1
50%	7.8	7.7	8.3	7.8	8.0	7.4	8.3	7.7	7.9	8.0	8.2	7.8	8.3	8.1
100%	7.8	7.6	8.3	7.6	8.0	7.3	8.3	7.7	8.0	8.0	8.2	7.8	8.3	8.1

pH (S.U.)

Day

Meter #	9	9	10	9	8	8	10	9	9	10	10	9	10	10
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	7.8	7.2	7.9	7.8	7.8	7.6	7.6	7.4	7.8	7.3	7.8	7.7	7.8	7.9
6%	--	7.3	--	7.9	--	7.7	--	7.6	--	7.6	--	7.7	--	8.0
13%	--	7.4	--	8.0	--	7.7	--	7.7	--	7.7	--	7.7	--	8.0
25%	--	7.4	--	8.0	--	7.8	--	7.7	--	7.8	--	7.8	--	8.0
50%	--	7.6	--	8.1	--	7.9	--	7.9	--	7.9	--	7.9	--	8.1
100%	7.5	7.7	7.5	8.2	7.5	8.1	7.7	8.0	7.6	8.0	7.6	8.0	7.6	8.1

Conductivity (umhos / cm)

Day

Meter #	4	--	4	--	4	--	4	--	4	--	3	--	3	--
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	318	--	320	--	323	--	324	--	320	--	319	--	314	--
6%	324	--	326	--	324	--	349	--	326	--	322	--	326	--
13%	329	--	330	--	326	--	349	--	326	--	331	--	332	--
25%	341	--	342	--	345	--	336	--	341	--	340	--	347	--
50%	363	--	363	--	364	--	356	--	374	--	369	--	380	--
100%	412	--	412	--	411	--	392	--	441	--	421	--	440	--
		--		--		--		--		--		--		--

Temperature (° C)

Day

Meter #	5	5	3	3	5	5	3	5	5	3	3	5	3	5
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	24	24	24	24	24	24	24	24	24	24	24	24	24	25
6%	24	24	24	24	24	24	24	24	24	24	24	24	24	25
13%	24	24	24	24	24	24	24	24	24	24	24	24	24	25
25%	24	24	24	24	24	24	24	24	24	24	24	24	24	25
50%	24	24	24	24	24	24	24	24	24	24	24	24	24	25
100%	24	24	24	24	24	24	24	24	24	24	24	24	24	25

I = Initial Chemistry F = Final Chemistry

Note: D.O. meter also used for temperature measurement unless otherwise noted.

Environmental Resources Management

Ceriodaphnia dubia - Chronic Toxicity Test
Survival and Reproduction Data

Permittee/Client: ArcelorMittal Burns Harbor, LLC
Effluent/Location: Outfall 001
Lab I.D.#: 082619-1

Treatment (% Effluent)	Day No.	Replicate 1	2	3	4	5	6	7	8	9	10	Average Young/ Female	Number of Live Adults (% Sur.)	Average Young/ Female % CV
Control	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	-	-	-	-	-	-	-	-	-	-		10	
	4	5	6	8	6	-	6	5	8	6	6		10	
	5	12	13	9	10	5	12	8	13	9	-		10	
9/12	6	-	-	-	-	9	-	-	-	-	12		10	
9/13	7	20 ~~17~~	21 ~~15~~	-	3	21	11	9	16	13	16		10	
Totals:		37	40	17	19	35	29	22	37	28	19	29.3	(100)	30.6
# Broods (% 3rd Brood)		3	3	2	3	3	3	3	3	3	3	(90)		
6%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	-	-	-	-	-	-	-	-	-	-		10	
	4	6	3	8	8	7	6	5	7	6	7		10	
	5	12	10	12	14	11	13	9	12	12	10		10	
9/12	6	-	-	-	-	-	12	-	12	-	-		10	
9/13	7	10 ~~19~~	~~19~~ 9	-	-	15	-	-	-	10	-		10	
Totals:		37	22	20	22	33	31	14	31	28	17	25.5	(100)	29.7
13%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	-	-	-	-	-	-	-	-	-	6		10	
	4	7	7	4	7	-	5	6	8	7	-		10	
	5	12	10	-	-	6	10	-	10	9	14		10	
9/12	6	-	15	8	8	-	20	10	-	-	17		10	
9/13	7	25 ~~14~~	-	-	7	25	-	-	-	5	-		10	
Totals:		54	32	12	22	31	58	16	18	21	37	25.8	(100)	34.9
25%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	-	-	-	-	-	-	-	-	-	-		10	
	4	6	7	7	8	5	7	7	8	5	5		10	
	5	11	11	12	10	10	14	9	12	10	11		10	
	6	13	-	-	-	-	21	12	-	14	14		10	
	7	-	11	-	-	-	-	-	-	-	-		10	
Totals:		30	29	19	18	15	42	28	20	29	30	26.0	(100)	30.9
50%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	-	-	-	-	-	-	-	-	-	-		10	
	4	6	7	7	8	7	7	8	1	6	7		10	
	5	13	-	11	13	12	12	13	-	12	14		10	
	6	22	14	19	-	-	22	19	12	17	13		10	
	7	-	-	-	-	-	-	-	-	-	-		10	
Totals:		41	21	37	21	19	41	40	13	35	34	30.2	(100)	35.0
100%	1	--	--	--	--	--	--	--	--	--	--		10	
	2	--	--	--	--	--	--	--	--	--	--		10	
	3	-	-	-	-	-	-	-	-	-	-		10	
	4	5	5	6	8	5	7	5	5	3	6		10	
	5	12	12	13	10	11	13	10	12	12	13		10	
	6	-	19	20	18	-	20	19	18	-	20		10	
9/13	7	22 ~~24~~	-	-	-	18	-	-	-	19	-		10	
Totals:		39	36	39	36	34	40	34	35	34	39	36.6	(100)	6.6

X = DEAD ADULT
1X = DEAD ADULT, ONE YOUNG PRODUCED BEFORE DEATH
-- = NO YOUNG RECORDED
(E) = ABORTED EMBRYOS /EGGS
(1) = ONE DEAD YOUNG
(S) = SPLIT BROOD
* = 4th BROOD EXCLUDED FROM TOTAL

Environmental Resources Management

Ceriodaphnia dubia - Chronic Toxicity Test Support Data

Permittee/Client: ArcelorMittal Burns Harbor, LLC
Effluent/Location: Outfall 001
Lab I.D.#: 082619-1

Brood Board Information:

Replicate	1	2	3	4	5	6	7	8	9	10	Brood Board Date: 08/12/19
Chamber Number	58	57	56	55	48	47	46	45	41	21	Young Age Range: ~~0-18~~ 8-16 hours SPR 09/03/19

Test Information:

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
YCT Batch #:	17-19	17-19	17-19	17-19	17-19	17-19	17-19	—
Algae Batch #:	18-19	18-19	18-19	18-19	18-19	18-19	18-19	—
Observation Time:	1600	1600	1430	1430	1500	1230	1230	1200
Initials:	[illegible]	SPR	[illegible]	SPR	MS	KM	KM	MS
Date:	08/26/19	08/27/19	08/28/19	08/29/19	08/30/19	08/31/19	09/01/19	09/02/19

Comment Section:

Day	Date	Initials	Comments

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analysis ID:	13-2016-6890	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 10:14	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	17-5546-6047	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	26 Aug-19 16:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	02 Sep-19 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	6d 20h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24
Sample ID:	20-9122-8489	**Code:**	7CA59D49	**Project:**	WET Testing
Sample Date:	26 Aug-19 06:18	**Material:**	Industrial Effluent	**Source:**	ArcelorMittal Burns Harbor, LLC
Receipt Date:	26 Aug-19 12:00	**CAS (PC):**		**Station:**	Outfall 001
Sample Age:	10h (5 °C)	**Client:**	ArcelorMittal Burns Harbor, LLC		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	>100	n/a	1	29.34%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Water		6	0.772	2.289	8.303	18	CDF	0.5219	Non-Significant Effect
		13	0.6892	2.289	8.303	18	CDF	0.5603	Non-Significant Effect
		25	0.6341	2.289	8.303	18	CDF	0.5857	Non-Significant Effect
		50	-0.5238	2.289	8.303	18	CDF	0.9441	Non-Significant Effect
		100	-2.288	2.289	8.303	18	CDF	0.9998	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	28.3	15	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	907.533	181.507	5	2.759	0.0272	Significant Effect
Error	3552.2	65.7815	54			
Total	4459.73		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	14.85	15.09	0.0110	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9734	0.9459	0.2140	Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	L	10	28.3	22.11	34.49	28.5	17	40	2.737	30.58%	0.00%
6		10	25.5	20.09	30.91	25	14	37	2.391	29.65%	9.89%
13		10	25.8	19.37	32.23	26.5	12	37	2.843	34.85%	8.83%
25		10	26	20.26	31.74	28.5	15	42	2.539	30.88%	8.13%
50		10	30.2	22.65	37.75	34.5	13	41	3.339	34.97%	-6.71%
100		10	36.6	34.87	38.33	36	34	40	0.763	6.59%	-29.33%

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	L	37	40	17	19	35	29	22	37	28	19
6		37	22	20	22	33	31	14	31	28	17
13		34	32	12	22	31	35	16	18	21	37
25		30	29	19	18	15	42	28	20	29	30
50		41	21	37	21	19	41	40	13	35	34
100		39	36	39	36	34	40	34	35	34	39

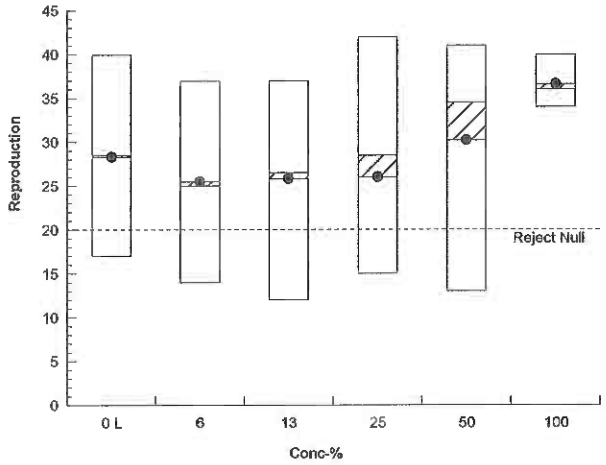
Analyst: VM QA:

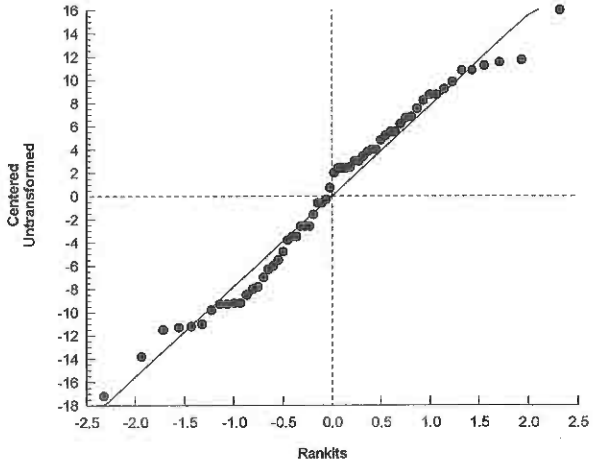
Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analysis ID:	13-2016-6890	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 10:14	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analysis ID:	01-1546-9422	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 10:14	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	17-5546-6047	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	26 Aug-19 16:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	02 Sep-19 12:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	6d 20h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24
Sample ID:	20-9122-8489	**Code:**	7CA59D49	**Project:**	WET Testing
Sample Date:	26 Aug-19 06:18	**Material:**	Industrial Effluent	**Source:**	ArcelorMittal Burns Harbor, LLC
Receipt Date:	26 Aug-19 12:00	**CAS (PC):**		**Station:**	Outfall 001
Sample Age:	10h (5 °C)	**Client:**	ArcelorMittal Burns Harbor, LLC		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1515610	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	28.3	15	>>	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>100	n/a	n/a	<1	n/a	n/a
IC10	>100	n/a	n/a	<1	n/a	n/a
IC15	>100	n/a	n/a	<1	n/a	n/a
IC20	>100	n/a	n/a	<1	n/a	n/a
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Reproduction Summary

			Calculated Variate						Isotonic Variate	
Conc-%	**Code**	**Count**	**Mean**	**Min**	**Max**	**Std Dev**	**CV%**	**%Effect**	**Mean**	**%Effect**
0	L	10	28.3	17	40	8.654	30.58%	0.0%	28.73	0.0%
6		10	25.5	14	37	7.561	29.65%	9.89%	28.73	0.0%
13		10	25.8	12	37	8.991	34.85%	8.83%	28.73	0.0%
25		10	26	15	42	8.028	30.88%	8.13%	28.73	0.0%
50		10	30.2	13	41	10.56	34.97%	-6.71%	28.73	0.0%
100		10	36.6	34	40	2.413	6.59%	-29.33%	28.73	0.0%

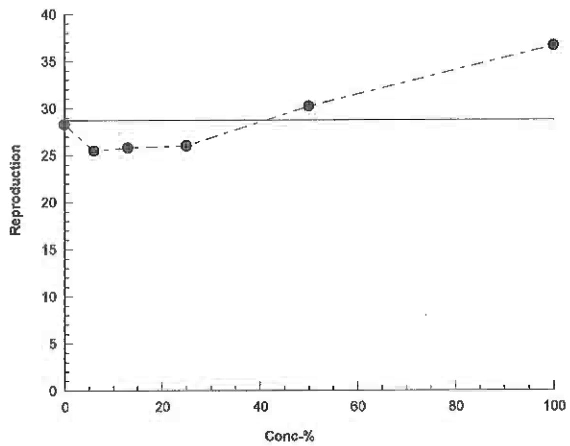
Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	L	37	40	17	19	35	29	22	37	28	19
6		37	22	20	22	33	31	14	31	28	17
13		34	32	12	22	31	35	16	18	21	37
25		30	29	19	18	15	42	28	20	29	30
50		41	21	37	21	19	41	40	13	35	34
100		39	36	39	36	34	40	34	35	34	39

Ceriodaphnia 7-d Survival and Reproduction Test **ERM**

Analysis ID:	01-1546-9422	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 10:14	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: KM QA: MJ

ENVIRONMENTAL RESOURCES MANAGEMENT

3352 128th Avenue Holland, Michigan 49424-9263
Phone: 616- 399-3500 FAX: 616-399-3777

AQUATIC TOXICITY LAB CHAIN OF CUSTODY FORM *

CLIENT NAME:	AMBH (Arcelor)	SAMPLER	
ADDRESS:		PHONE NUMBER:	

SAMPLE DESCRIPTION (i.e. Outfall 001)	DATE (Begin / End)	TIME (Begin / End)	GRAB OR COMP	NUMBER AND SIZE OF CONTAINERS	FIELD PARAMETERS	SAMPLE ID NUMBER (Filled in by ERM)	INITIAL WATER QUALITY PARAMETERS UPON RECEIPT BY LABORATORY (filled in by ERM)			
001 OSB2619	08/25/19 / ~~8-25-19~~	0613 / 0618		1-2.5 gal	pH= s.u. NH_3= mg/L	082619-1	Temp. 5 (°C) ☒ On Ice	D.O. 10.5 mg/L	pH 7.1 s.u.	Cond 417 umhos/cm
011 SAR 09/03/19 OSB2619	08/25/19 / ~~8-25-19~~	0604 / 0608		1-2.5 gal	pH= s.u. NH_3= mg/L	082619-2	Temp. 5 (°C) ☒ On Ice	D.O. 9.9 mg/L	pH 7.5 s.u.	Cond 444 umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm

ANALYSES REQUESTED [check item(s)]	Test Material:	Test Type:	Test Species:
	____ Water/Wastewater ____ Sediment ____ Product	____ Acute ____ Chronic ____ Other	___ *Ceriodaphnia dubia* ___ *Daphnia magna* ___ *Daphnia pulex* ___ Fathead minnow (*Pimephales promelas*) ___ Rainbow Trout (*Oncorhynchus mykiss*) ___ Sheepshead minnow (*Cyprinodon variegatus*) ___ Silverside minnow (*Menidia beryllina*) ___ *Americamysis bahia* ___ *Hyalella azteca* ___ *Chironomus dilutus* ___ Other (write in comments section)

COMMENT SECTION: See ALS COC 41579

SAMPLE TRANSFERS

RELINQUISHED BY: Signature / Organization	DATE	TIME	ACCEPTED BY: Signature /Organization	DATE	TIME

* See Instructions for Sample Collection on Back of Sheet

February 2018

Cincinnati, OH +1 513 733 5336
Fort Collins, CO +1 970 490 1511
Everett, WA +1 425 356 2600
Holland, MI +1 616 399 6070
Houston, TX +1 281 530 5656
Spring City, PA +1 610 948 4903
South Charleston, WV +1 304 356 3168
Middletown, PA +1 717 944 5541
Salt Lake City, UT +1 801 266 7700
York, PA +1 717 505 5280

Chain of Custody Form

Page _____ of _____

COC ID: 41579

ALS Project Manager:		ALS Work Order #:	

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name	AMBH WETT week 2	A	WETT - Sub ERM
Work Order		Project Number		B	
Company Name	AMBH + EPT	Bill To Company	AMBH	C	
Send Report To		Invoice Attn		D	
Address		Address		E	
				F	
City/State/Zip		City/State/Zip		G	
Phone		Phone		H	
Fax		Fax		I	
e-Mail Address		e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	Outfall 001 Comp *	8-25-19	0618	AQ	8	1	X		052619-1								
2	Outfall 011 Comp *	8-25-19	0608	AQ	8	1	X		052619-2								
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: B. Frye

Shipment Method:

Turnaround Time in Business Days (BD): ☐ 10 BD ☐ 5 BD ☐ 3 BD ☐ 2 BD ☐ 1 BD ☐ Other _____

Results Due Date:

Relinquished by:	Date:	Time:	Received by:
	8-26-19	1207	ERM
Relinquished by:	Date:	Time:	Received by (Laboratory):
			0826/19-1200
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):

Notes: *Composite grabs on 052619 at same time - SPR 09/03/19

Cooler ID	Cooler Temp

QC Package: (Check One Box Below)
☐ Level II Std QC ☐ TRRP Checklist
☐ Level III Std QC/Raw Date ☐ TRRP Level IV
☐ Level IV SW846/CLP
☐ Other _____

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

ENVIRONMENTAL RESOURCES MANAGEMENT

3352 128th Avenue Holland, Michigan 49424-9263
Phone: 616- 399-3500 FAX: 616-399-3777

AQUATIC TOXICITY LAB CHAIN OF CUSTODY FORM *

CLIENT NAME:	AMBN	SAMPLER	
ADDRESS:		PHONE NUMBER:	

SAMPLE DESCRIPTION (i.e. Outfall 001)	DATE (Begin End)	TIME (Begin End)	GRAB OR COMP	NUMBER AND SIZE OF CONTAINERS	FIELD PARAMETERS	SAMPLE ID NUMBER (Filled in by ERM)	INITIAL WATER QUALITY PARAMETERS UPON RECEIPT BY LABORATORY (filled in by ERM)			
001	09/27/19	0610		2.5 g	pH= s.u. NH_3= mg/L	082819-1	Temp. 5 (° C) ☐ On Ice	D.O. 7.3 mg/L	pH 7.2 s.u.	Cond 391 umhos/cm
	~~09/27/19~~	0610								
011	09/27/19	0555		2.5 g	pH= s.u. NH_3= mg/L	082819-2	Temp. 5 (° C) ☒ On Ice	D.O. 5.5 mg/L	pH 7.3 s.u.	Cond 459 umhos/cm
	~~09/27/19~~	0555								
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm

ANALYSES REQUESTED [check item(s)]

Test Material:
- _____ Water/Wastewater
- _____ Sediment
- _____ Product

Test Type:
- _____ Acute
- _____ Chronic
- _____ Other

Test Species:
- ___ *Ceriodaphnia dubia*
- ___ *Daphnia magna*
- ___ *Daphnia pulex*
- ___ Fathead minnow (*Pimephales promelas*)
- ___ Rainbow Trout (*Oncorhynchus mykiss*)
- ___ Sheepshead minnow (*Cyprinodon variegatus*)
- ___ Silverside minnow (*Menidia beryllina*)
- ___ *Americamysis bahia*
- ___ *Hyalella azteca*
- ___ *Chironomus dilutus*
- ___ Other (write in comments section)

COMMENT SECTION: See ALS COC 42011

SAMPLE TRANSFERS

RELINQUISHED BY: Signature / Organization	DATE	TIME	ACCEPTED BY: Signature /Organization	DATE	TIME

* See Instructions for Sample Collection on Back of Sheet

February 2018

+1 423 356 2600 | +1 616 399 6070 | Page ____ of ____ | Middletown, PA +1 717 944 5541 | Salt Lake City, UT +1 801 266 7700

LS

COC ID: 42011

Customer Information		Project Information		Parameter/Method Request for An
	Project Name	AMBH WETT week 2	A	WETT sub to EK
AMBH + EPT	Project Number		B	
	Bill To Company	AMBH	C	
	Invoice Attn		D	
	Address		E	
			F	
Zip	City/State/Zip		G	
Phone	Phone		H	
Fax	Fax		I	
Address	e-Mail Address		J	

ALS Project Manager:

ALS Work Order #:

	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H
1	Outfall 001 Comp	*8-27-19	0610	AQ	8	1-2gal	X		082719-1					
2	Outfall 011 Comp	*8-27-19	0555	AQ	8	1-2gal	X		082719-2					
3														
4														
5														
6														
7														
8														
9														
10														

Sampler(s) Please Print & Sign: B. Frye

Shipment Method:

Turnaround Time in Business Days (BD): ☐ 10 BD ☐ 5 BD ☐ 3 BD ☐ 2 BD ☐ 1 BD ☐ Other ____

Result

Relinquished by: B. Frye — Date: 8-28-19 — Time:

Received by:

Relinquished by: — Date: — Time:

Received by (Laboratory): 8-28-19 1300

Logged by (Laboratory): — Date: — Time:

Checked by (Laboratory):

Notes: *Composite sample ends on 08/28/19 at same time -SPR

Cooler ID	Cooler Temp

QC Package: (Check

☐ Level II Std QC
☐ Level III Std QC/R
☐ Level IV SW846/C
☐ Other

082619-1 Cd
Page 18 of 21

ENVIRONMENTAL RESOURCES MANAGEMENT

3352 128th Avenue Holland, Michigan 49424-9263
Phone: 616- 399-3500 FAX: 616-399-3777

AQUATIC TOXICITY LAB CHAIN OF CUSTODY FORM *

CLIENT NAME:	ArcelorMittal	SAMPLER	
ADDRESS:		PHONE NUMBER:	

SAMPLE DESCRIPTION (i.e. Outfall 001)	DATE (Begin End)	TIME (Begin End)	GRAB OR COMP	NUMBER AND SIZE OF CONTAINERS	FIELD PARAMETERS	SAMPLE ID NUMBER (Filled in by ERM)	INITIAL WATER QUALITY PARAMETERS UPON RECEIPT BY LABORATORY (filled in by ERM)			
001	8/29/19 8/30/19	0622 0622		1 gal & 2.5 gal	pH= s.u. NH_3= mg/L	083019-1	Temp. 2 (°C) ☐ On Ice	D.O. 9.2 mg/L	pH 7.3 s.u.	Cond 454 umhos/cm
011	8/29 8/30	0604 0604		1 gal & 2.5 gal	pH= s.u. NH_3= mg/L	083019-2	Temp. 2 (°C) ☐ On Ice	D.O. 6.7 mg/L	pH 7.2 s.u.	Cond 464 umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm

ANALYSES REQUESTED [check item(s)]

Test Material:
- _____ Water/Wastewater
- _____ Sediment
- _____ Product

Test Type:
- _____ Acute
- _____ Chronic
- _____ Other

Test Species:
- ___ *Ceriodaphnia dubia*
- ___ *Daphnia magna*
- ___ *Daphnia pulex*
- ___ Fathead minnow (*Pimephales promelas*)
- ___ Rainbow Trout (*Oncorhynchus mykiss*)
- ___ Sheepshead minnow (*Cyprinodon variegatus*)
- ___ Silverside minnow (*Menidia beryllina*)
- ___ *Americamysis bahia*
- ___ *Hyalella azteca*
- ___ *Chironomus dilutus*
- ___ Other (write in comments section)

COMMENT SECTION: See ALS COC 42012

SAMPLE TRANSFERS

RELINQUISHED BY: Signature / Organization	DATE	TIME	ACCEPTED BY: Signature / Organization	DATE	TIME
			[signature] / Eam	8/30/19	1330

* See Instructions for Sample Collection on Back of Sheet

February 2018

Cincinnati, OH +1 513 733 5336
Fort Collins, CO +1 970 490 1511
Everett, WA +1 425 356 2600
Holland, MI +1 616 399 6070
Houston, TX +1 281 530 5656
Spring City, PA +1 610 948 4903
South Charleston, WV +1 304 356 3168
Middletown, PA +1 717 944 5541
Salt Lake City, UT +1 801 266 7700
York, PA +1 717 505 5280

Chain of Custody Form

Page ____ of ____

COC ID: 42012

ALS Project Manager:		ALS Work Order #:	

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name	AMBH WETT week 2	A	WETT sub to ERM
Work Order		Project Number		B	
Company Name	AMBH - EPT	Bill To Company	AMBH	C	
Send Report To		Invoice Attn		D	
Address		Address		E	
				F	
City/State/Zip		City/State/Zip		G	
Phone		Phone		H	
Fax		Fax		I	
e-Mail Address		e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	Outfall 001 Comp *	8-29-19	0622	AQ	8	2-3gal	X		093019-1								
2	Outfall 011 Comp *	8-29-19	0608	AQ	8	2-3gal	X		093019-2								
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: B. Frye

Shipment Method:

Turnaround Time in Business Days (BD): ☐ 10 BD ☐ 5 BD ☐ 3 BD ☐ 2 BD ☐ 1 BD ☐ Other ____

Results Due Date:

Relinquished by:	Date:	Time:	Received by:	Notes:
	8-30-19		ERM	*Composite samples ends on 09/30/19 at same time -SMR 09/03/19
Relinquished by:	Date:	Time:	Received by (Laboratory):	
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):	

Cooler ID	Cooler Temp

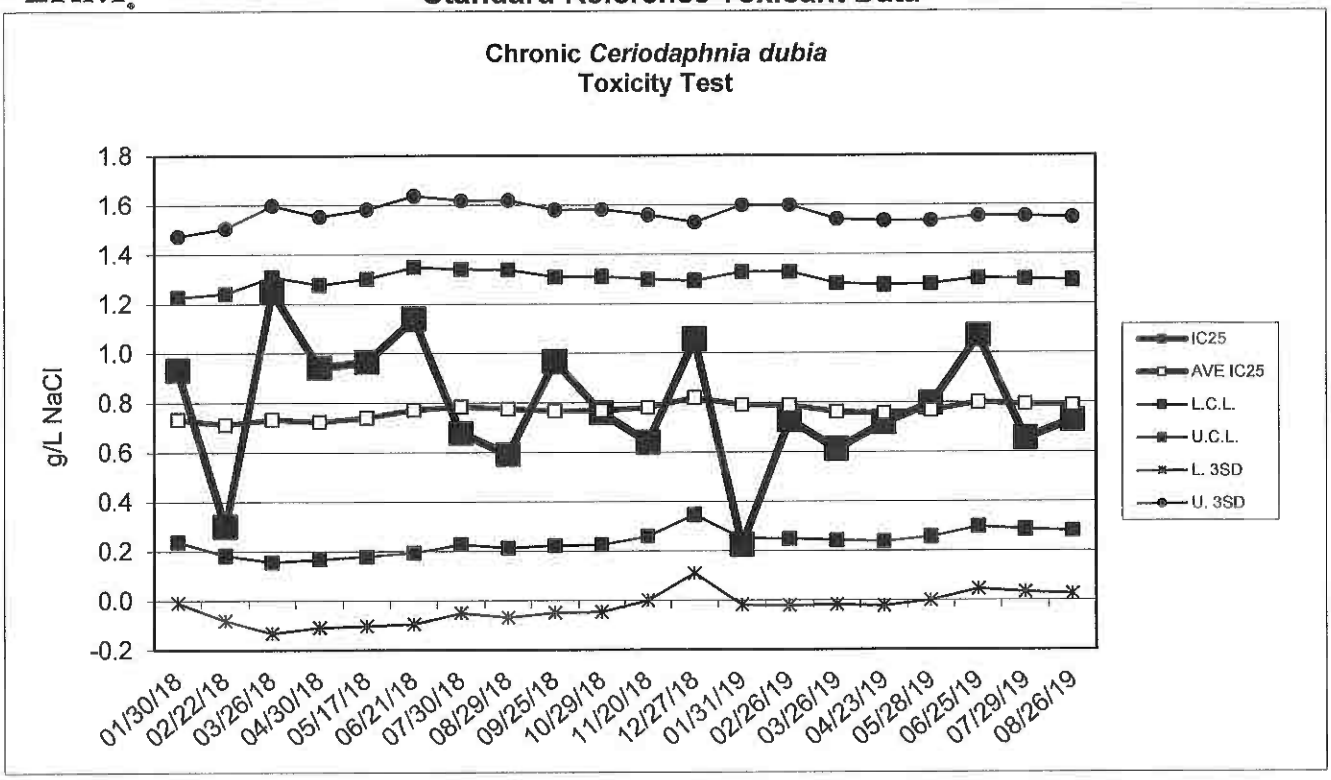
QC Package: (Check One Box Below)
☐ Level II Std QC ☐ TRRP Checklist
☐ Level III Std QC/Raw Date ☐ TRRP Level IV
☐ Level IV SW846/CLP
☐ Other ____

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

Environmental Resources Management

Standard Reference Toxicant Data



Chronic *Ceriodaphnia dubia* Toxicity Test Data

Date	IC25 (g/L NaCl)	AVE IC25 (g/L NaCl)	CONTROL LIMIT Lower	CONTROL LIMIT Upper	Survival (%)	CONTROL Reproduction (ave. young)	CV (%)
01/30/18	0.93	0.7	0.24	1.23	100	25.5	36.3
02/22/18	0.30	0.7	0.18	1.24	100	17.8	35.0
03/26/18	1.25	0.7	0.16	1.31	90	32.5	38.5
04/30/18	0.94	0.7	0.17	1.28	100	32.0	25.5
05/17/18	0.97	0.7	0.18	1.30	100	30.0	38.6
06/21/18	1.14	0.8	0.19	1.35	80	35.2	8.2
07/30/18	0.68	0.8	0.23	1.34	100	25.5	16.3
08/29/18	0.59	0.8	0.21	1.34	100	30.1	26.2
09/25/18	0.97	0.8	0.22	1.31	100	27.6	26.7
10/29/18	0.76	0.8	0.22	1.31	100	32.7	24.8
11/20/18	0.64	0.8	0.26	1.30	100	34.8	15.2
12/27/18	1.06	0.8	0.35	1.29	100	26.8	43.7
01/31/19	0.23	0.8	0.25	1.33	100	34.7	14.9
02/26/19	0.73	0.8	0.25	1.33	100	27.9	9.3
03/26/19	0.61	0.8	0.24	1.28	100	40.2	9.9
04/23/19	0.72	0.8	0.24	1.28	100	36.1	25.4
05/28/19	0.79	0.8	0.26	1.28	100	37.6	3.1
06/25/19	1.07	0.8	0.30	1.30	100	29.4	26.7
07/29/19	0.65	0.8	0.29	1.30	100	33.7	14.6
08/26/19	0.73	0.8	0.28	1.29	100	30.4	23.5

FINAL REPORT

Chronic Toxicity Test
Freshwater Vertebrate,
Pimephales promelas
EPA Test Method 1000.0

Submitted To:
ALS Environmental
3352 128th Avenue
Holland, MI 49424

Sample: ArcelorMittal Burns Harbor, LLC - Outfall 001

Testing Period: 26 August – 2 September 2019

Laboratory I.D. Number: 082619-1

ACCREDITED IN ACCORDANCE WITH nelac
PA DEP ID No. 68-04227
NJ DEP ID No. MI013

Conducted By:
Environmental Resources Management, Inc.
3352 128th Avenue
Holland, Michigan 49424

ERM

Test Overview

Permittee:	ArcelorMittal Burns Harbor, LLC
Location:	250 West U.S. Hwy 12 Burns Harbor, IN 46304
Contact:	Robert Maciel
Telephone #:	219.787.2120
NPDES Permit #:	IN0000175
Permit Requirements:	Acute Toxicity Limit = 1.0 TUa Chronic Toxicity Limit = 1.0 TUc
Test Sample:	Outfall 001
Receiving Water:	East Branch, Little Calumet River
Testing Date:	26 August – 2 September 2019
Sample Date(s):	26 August 2019 28 August 2019 30 August 2019
Test/Method:	Fathead Minnow, *Pimephales promelas*, Survival and Growth Test EPA 821-R-02-013 Method 1000.0.
QC Objectives:	Test data met all test acceptability criteria, except where noted below.
Data Qualifiers:	None

DATA SUMMARY

Effluent Concentrations (%)	Survival (%)	Growth Average Wt./ Organism (mg)
Control	97.5	0.501
6	95	0.532
13	95	0.468
25	87.5	0.465
50	90	0.434
100	100	0.526

TEST RESUL TS

96-Hour LC_{50}	>100%
NOEC (Survival)	100%
LOEC (Survival)	>100%
IC_{25}	>100%
MSDp (Survival)	26.9%
TUa (100/LC_{50})	1.0
TUc (100/ NOEC or IC_{25})	1.0

TEST CONCLUSION

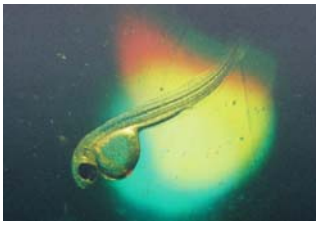
In accordance with the NPDES permit requirements for ArcelorMittal Burns Harbor, LLC, this toxicity test did not exceed either the acute or the chronic toxicity limit.

Bruce A. Rabe
Director, Aquatic
Toxicology Laboratory
ERM Project No. 0501867.0152

Environmental Resources Management
3352 128th Avenue
Holland, Michigan 49424-9263
Phone: 616.399.3500
Fax: 616.399.3777

ERM Testing Method

Pimephales promelas – Survival and Growth Toxicity Test



Upon sample receipt, each effluent sample was analyzed for a suite of water quality parameters (Appendix A - Table 1). Where indigenous organisms were present, the sample was filtered through a 60 micron (µm) NITEX® screen. All samples were maintained at 0 – 6 degrees Celsius (°C) until needed for testing.

A series of five effluent concentrations and a control solution were established for testing. All test solutions were prepared by mixing appropriate volumes of dilution water and effluent in the test containers. Dilution water consisted of reconstituted moderately hard water. The control solution consisted of 100 percent dilution water.

Pimephales promelas used to initiate this test were obtained from in-house cultures and were less than 24-hours old at test initiation. Test organisms were maintained in reconstituted moderately hard water prior to test initiation.

The *Pimephales promelas* test was conducted using 300 to 500-milliliter (mL) disposable polypropylene containers containing 250 mL of control water or test solution. Ten fish were randomly added to each test chamber with four replicate chambers per treatment. Each *Pimephales promelas* test chamber was fed 0.2 mL of a concentrated suspension of less than 24-hour old live brine shrimp nauplii (*Artemia* sp.) two times per day. Test solutions were renewed daily during the exposure by replacing approximately 90 percent of the 24-hour old solution with fresh control water or appropriate test solution. Prior to test solution renewal, uneaten and dead brine shrimp, along with other debris, were removed from the bottom of the test chambers.

Percent survival of exposed *Pimephales promelas* was determined daily by enumeration of live organisms. Mortality was defined as no body movement after gentle prodding. At the termination of the chronic test, larvae in each test chamber were counted, dried, and weighed to the nearest 0.01 milligram (mg) on an analytical balance.

The test was conducted at a temperature of 25± 1°C under fluorescent lighting with a photoperiod of 16 hours light and 8 hours dark. Water quality measurements were performed on all control and test solutions prior to test initiation and on selected treatments daily thereafter, as indicated in the raw data (Appendix A - Table 2).

Following termination of the chronic toxicity test, No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) were determined for both *Pimephales promelas* survival and growth and a 25 percent Inhibition Concentration (IC_{25}) was determined for *Pimephales promelas* growth. The NOEC is defined as the highest effluent concentration which does not produce any observed adverse effect to the exposed test organism whereas the LOEC is defined as the lowest effluent concentration which does produce an observed adverse effect to the exposed test organism. An adverse effect is determined as a statistically significant difference between the control and a given effluent concentration.

Prior to the determination of any significant differences in *Pimephales promelas* survival and growth, the data were evaluated for normal distribution and homogeneity characteristics. Depending on the result and the number of test replicates per concentration, an analysis of variance test was performed, followed by one of the following mean comparison tests: Dunnett's Procedure, Bonferroni t-Test, Steel's Many-One Rank Test, Wilcoxon Rank Sum Test, or the T-Test.
For reporting purposes, a chronic toxic unit (TUc) is calculated and is defined as the most conservative of either 100/NOEC based on the most sensitive test endpoint or $100/IC_{25}$.

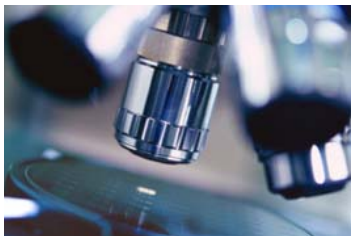
To evaluate acute toxicity, a 96-hour LC_{50} and corresponding 95 percent confidence interval were also calculated, where possible. The LC_{50} value estimate was determined by using one of the following statistical methods: graphical, Spearman-Karber, Trimmed Spearman-Karber, or Probit. The method selected for reporting test results was determined by the characteristics of the data; that is, the presence or absence of 0 and 100 percent mortality and the number of concentrations in which mortalities between 0 and 100 percent occurred. For reporting purposes, the 96-hour LC_{50} value was converted to an acute toxic unit (TUa) by $100/LC_{50}$. All statistical analyses were performed using the CETIS™ Version 1.9.4.3 software program.

The reference toxicant, sodium chloride, was used to monitor the sensitivity of the test organisms. Chronic reference toxicant tests are performed at least monthly and the resulting Inhibition Concentrations (IC_{25}) are plotted to determine if the results are within prescribed limits (Appendix A - Standard Reference Toxicant Data). If the IC_{25} of a particular reference toxicant test does not fall within the expected range of $\pm$ two standard deviations from the mean for a given test organism, the sensitivity of that organism and the overall credibility of the test system is suspect.

Reference:

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Ed. U.S. Environmental Protection Agency, Office of Water, Washington, D.C., EPA-821-R-02-013.

Case Narrative



1.0 TEST PERFORMANCE CRITERIA

The quality control results achieved laboratory specifications.

2.0 MODIFICATIONS TO ERM'S STANDARD TEST METHOD

Test was performed in accordance with ERM's standard test method (see page 3).

Appendix A
Supporting Documents

- *Raw Test Data*
- *Statistical Analysis (if necessary)*
- *Chain-of-Custody Forms*
- *Standard Reference Toxicant Data*

Environmental Resources Management

Pimephales promelas - Chronic Toxicity Test
Initial Water Quality and Test Solution Preparation

Permittee/Client: ArcelorMittal Burns Harbor, LLC
Effluent/Location: Outfall 001
Lab I.D.#: 082619-1
Beginning Date: 8/26/19 Time: 530
Ending Date: 09-02-19 Time: 1500

Control/Dilution Water: RMHW
Organism Batch #: 149-19
Organism Age: 24 hrs
QC Review: KM
QC Review Date: 09/09/19

Initial Water Quality:

Parameter	Units	Effluent			Synthetic Water		
Sample #	--	1	2	3	--	--	--
Lab I.D.#/ Batch #	--	082619-1	082819-1	083019-1	99-19	~	~
Temperature	° C	5	5	2	--	--	--
Dissolved Oxygen	mg / L	10.5	7.3	9.2	--	--	--
pH	S.U.	7.1	7.2	7.3	7.8	-	-
Conductivity	umhos/cm	417	391	454	315	-	-
Alkalinity	mg / L $CaCO_3$	110	108	102	60	-	-
Hardness	mg / L $CaCO_3$	140	160	140	80	-	-
Total Ammonia	mg / L NH_3	0.29	0.04	0.42	--	--	--
Total Residual Chlorine	mg / L Cl_2	<0.01	<0.01	<0.01	<0.01	-	-
Total mls of 7.0 g/L Sodium Thiosulfate added per liter	mL / L	--	--	--	--	--	--
Initials	--	RH	RH	MS	RH 8-26-19	-	-

Test Solution Preparation: Test Solution Prepared For Both Species.

Treatment (% Effluent)	Effluent (mL)	Dilution (mL)
Control	0	1200
6%	72	1128
13%	156	1044
25%	300	900
50%	600	600
100%	1200	0

Test Day	Initials	Effluent Sample #	Synthetic Batch #
0	RH	1	99-19
1	RH	1	99-19
2	RH	2	99-19
3	RWM	2	99-19
4	MS	3	99-19
5	RH	3	99-19
6	RH	3	99-19
7	RH	--	--

Environmental Resources Management

Pimephales promelas - Chronic Toxicity Test
Water Quality Data

Permittee/Client: ArcelorMittal Burns Harbor, LLC
Effluent/Location: Outfall 001
Lab I.D.#: 082619-1

Water Quality Data:

Dissolved Oxygen (mg/L)

Day														
Meter #	5	5	3	5	5	3	3	5	5	3	3	5	3	3
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	7.8	6.2	8.3	5.8	7.9	5.9	8.4	6.3	7.9	6.2	8.2	6.8	8.3	7.6
6%	7.8	5.2	8.3	5.9	7.9	5.8	8.4	5.5	7.9	6.6	8.2	6.9	8.3	7.3
13%	7.8	6.4	8.3	5.6	7.9	6.0	8.4	5.7	7.9	6.2	8.2	6.6	8.3	7.3
25%	7.8	5.5	8.3	5.6	7.9	5.1	8.4	5.5	7.9	6.0	8.2	6.5	8.3	7.1
50%	7.8	5.1	8.3	5.8	8.0	6.8	8.3	5.4	7.9	5.7	8.2	6.2	8.3	7.0
100%	7.8	5.0	8.3	6.0	8.0	6.7	8.3	6.0	8.0	5.5	8.2	6.2	8.3	6.7

pH (S.U.)

Day														
Meter #	9	9	10	8	8	10	10	9	9	10	10	9	10	10
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	7.8	7.2	7.9	7.0	7.8	7.3	7.6	7.4	7.8	7.3	7.8	7.3	7.8	7.6
6%	--	7.2	--	7.0	--	7.3	--	7.3	--	7.3	--	7.4	--	7.6
13%	--	7.3	--	7.0	--	7.3	--	7.4	--	7.3	--	7.4	--	7.6
25%	--	7.3	--	7.1	--	7.3	--	7.4	--	7.4	--	7.4	--	7.6
50%	--	7.3	--	7.1	--	7.4	--	7.4	--	7.4	--	7.5	--	7.6
100%	7.5	7.3	7.5	7.2	7.5	7.5	7.7	7.5	7.6	7.5	7.6	7.5	7.6	7.7

Conductivity (umhos / cm)

Day														
Meter #	4	--	4	--	4	--	4	--	4	--	3	--	3	--
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	318	--	320	--	328	--	324	--	310	--	319	--	314	--
6%	324	--	326	--	324	--	349	--	316	--	322	--	326	--
13%	329	--	330	--	326	--	349	--	~~344~~ 326	--	331	--	332	--
25%	341	--	342	--	328 ~~334~~	--	336	--	341	--	340	--	347	--
50%	363	--	363	--	364	--	356	--	374	--	369	--	380	--
100%	412	--	412	--	411	--	392	--	441	--	421	--	440	--

Temperature (° C)

Day														
Meter #	5	5	3	5	5	3	3	5	5	3	3	5	3	3
Treatment	0	1		2		3		4		5		6		7
(% Effluent)	I	F	I	F	I	F	I	F	I	F	I	F	I	F
Control	24	25	24	25	24	25	24	25	24	25	24	25	24	25
6%	24	26	24	25	24	25	24	25	24	25	24	25	24	25
13%	24	26	24	25	24	25	24	25	24	25	24	25	24	25
25%	24	26	24	25	24	25	24	25	24	25	24	25	24	25
50%	24	26	24	25	24	25	24	25	24	25	24	25	24	25
100%	24	26	24	25	24	25	24	25	24	25	24	25	24	25

I = Initial Chemistry F = Final Chemistry

Note: D.O. meter also used for temperature measurement unless otherwise noted.

Environmental Resources Management

Pimephales promelas - Chronic Toxicity Test
Survival Data

Permittee/Client: ArcelorMittal Burns Harbor, LLC
Effluent/Location: Outfall 001
Lab I.D.#: 082619-1

Survival Data:

Treatment (% Effluent)	Rep.	# Live Organisms Day 0	1	2	3	4	5	6	7	Rep.	# Live Organisms Day 0	1	2	3	4	5	6	7	96 Hour Survival Summary Total Live Initial	Final	% Survival
Control	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	10	40	40	100
6%	A	10	10	10	10	6	10	10	10	B	10	10	10	10	10	10	9	9	40	39	97.5
13%	A	10	10	10	10	10	10	9	9	B	10	10	10	10	10	10	10	10	40	39	97.5
25%	A	10	10	10	10	9	7	6	6	B	10	9	9	9	9	9	9	9	40	38	95
50%	A	10	10	10	10	10	10	9	9	B	10	10	10	10	9	9	8	8	40	39	97.5
100%	A	10	10	10	10	10	10	10	10	B	10	10	10	10	10	10	10	10	40	40	100

Treatment (% Effluent)	Rep.	# Live Organisms Day 0	1	2	3	4	5	6	7	Rep.	# Live Organisms Day 0	1	2	3	4	5	6	7	7 Day Survival Summary Total Live Initial	Final	% Survival
Control	C	10	10	10	10	10	9	9	9	D	10	10	10	10	10	10	10	10	40	39	97.5
6%	C	10	10	10	10	9	9	9	9	D	10	10	10	10	10	10	10	10	40	38	95
13%	C	10	10	10	9	9	9	9	9	D	10	10	10	10	10	10	10	10	40	38	95
25%	C	10	10	10	10	10	10	10	10	D	10	10	10	10	10	10	10	10	40	35	87.5
50%	C	10	10	10	10	10	10	10	10	D	10	10	10	10	10	9	9	9	40	36	90
100%	C	10	10	10	10	10	10	10	10	D	10	10	10	10	10	10	10	10	40	40	100

Test Information:

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time:	1530	1600	1400	1400	1500	1300	1130	1500
Initials:		SPR	KM			KM	KM	KH
Date:	08/26/19	08/27/19	08-28-19	08-29-19	08/30/19	08/31/19	09/01/19	09-02-19

Feeding:

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Batch #:	237-19	238-19	239-19	240-19	241-19	242-19	243-19	--
Initials AM:	--	KH	KM	SPR	KM	KM	KM	--
Initials PM:	KM	SPR	KM	KM	KM	KM	KM	--

Oven:

Date In	Time In	Initials	Date Out	Time Out	Initials
09-02-19	1500	KH	09-03-19	1500	KH

Comment Section:

Day	Date	Initials	Comments

Permittee/Client: ArcelorMittal Burns Harbor, LLC
Effluent/Location: Outfall 001
Lab I.D.#: 082619-1

Pan #	Conc. (% Effluent)	Replicate	Final Weight (mg)	Initial Weight (mg)	Larvae Weight (mg)	# of Initial Organisms	Avg. Wt./ Organism/ Replicate (mg)	Avg. Wt./ Organism/ Treatment (mg)	Avg. Wt./ Organism/ Treatment % CV
Date			9/4/2019	9/1/2019					
Analyst			rh	km					
1	Control	A	24.78	20.34	4.44	10	0.444		
2	Control	B	25.58	20.74	4.84	10	0.484		
3	Control	C	25.59	21.11	4.48	10	0.448		
4	Control	D	30.52	24.24	6.28	10	0.628	0.501	17.3
5	6%	A	32.57	26.45	6.12	10	0.612		
6	6%	B	26.31	21.22	5.09	10	0.509		
7	6%	C	30.70	26.57	4.13	10	0.413		
8	6%	D	33.22	27.28	5.94	10	0.594	0.532	17.1
9	13%	A	24.52	19.69	4.83	10	0.483		
10	13%	B	25.35	20.44	4.91	10	0.491		
11	13%	C	26.29	21.94	4.35	10	0.435		
12	13%	D	27.35	22.73	4.62	10	0.462	0.468	5.4
13	25%	A	29.10	25.97	3.13	10	0.313		
14	25%	B	22.88	18.44	4.44	10	0.444		
15	25%	C	22.29	16.66	5.63	10	0.563		
16	25%	D	25.72	20.34	5.38	10	0.538	0.465	24.4
17	50%	A	21.95	17.89	4.06	10	0.406		
18	50%	B	28.11	23.55	4.56	10	0.456		
19	50%	C	30.91	25.63	5.28	10	0.528		
20	50%	D	24.63	21.16	3.47	10	0.347	0.434	17.7
21	100%	A	24.30	19.70	4.60	10	0.460		
22	100%	B	25.30	19.55	5.75	10	0.575		
23	100%	C	26.11	20.69	5.42	10	0.542		
24	100%	D	25.26	20.01	5.25	10	0.525	0.526	9.2

Quality Assurance					Final Wt. (mg)
25	Blank	A	15.33	15.32	0.01
26	Blank	B	17.58	17.6	-0.02

* Biomass data were transferred directly to the spreadsheet using the data transfer function of the analytical balance.

Fathead Minnow 7-d Larval Survival and Growth Test

ERM

Analysis ID:	08-4531-1791	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 15:07	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	01-9158-7474	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	26 Aug-19 15:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	02 Sep-19 15:00	**Species:**	Pimephales promelas	**Brine:**	
Test Length:	6d 23h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:** <24
Sample ID:	20-6551-5761	**Code:**	7B1D44F1	**Project:**	WET Testing
Sample Date:	26 Aug-19 06:18	**Material:**	Industrial Effluent	**Source:**	ArcelorMittal Burns Harbor, LLC
Receipt Date:	26 Aug-19 12:00	**CAS (PC):**		**Station:**	Outfall 001
Sample Age:	9h (5 °C)	**Client:**	ArcelorMittal Burns Harbor, LLC		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	C > T	100	>100	n/a	1	14.55%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Water		6	0.4433	2.407	0.221	6	CDF	0.6719	Non-Significant Effect
		13	0.4433	2.407	0.221	6	CDF	0.6719	Non-Significant Effect
		25	1.43	2.407	0.221	6	CDF	0.2510	Non-Significant Effect
		50	1.272	2.407	0.221	6	CDF	0.3085	Non-Significant Effect
		100	-0.4433	2.407	0.221	6	CDF	0.9314	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.975	0.8	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0880378	0.0176076	5	1.042	0.4235	Non-Significant Effect
Error	0.304143	0.0168969	18			
Total	0.392181		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	2.7	4.248	0.0545	Equal Variances
Variances	Mod Levene Equality of Variance Test	1.654	4.248	0.1966	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9118	0.884	0.0385	Normal Distribution

7d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	L	4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	0.00%
6		4	0.9500	0.8581	1.0000	0.9500	0.9000	1.0000	0.0289	6.08%	2.56%
13		4	0.9500	0.8581	1.0000	0.9500	0.9000	1.0000	0.0289	6.08%	2.56%
25		4	0.8750	0.5738	1.0000	0.9500	0.6000	1.0000	0.0947	21.63%	10.26%
50		4	0.9000	0.7701	1.0000	0.9000	0.8000	1.0000	0.0408	9.07%	7.69%
100		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-2.56%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	L	4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	0.00%
6		4	1.331	1.181	1.48	1.331	1.249	1.412	0.04705	7.07%	2.97%
13		4	1.331	1.181	1.48	1.331	1.249	1.412	0.04705	7.07%	2.97%
25		4	1.24	0.8452	1.634	1.331	0.8861	1.412	0.124	20.00%	9.59%
50		4	1.254	1.056	1.453	1.249	1.107	1.412	0.06231	9.93%	8.53%
100		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.00%	-2.97%

Fathead Minnow 7-d Larval Survival and Growth Test **ERM**

Analysis ID:	08-4531-1791	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 15:07	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	L	1.0000	1.0000	0.9000	1.0000
6		1.0000	0.9000	0.9000	1.0000
13		0.9000	1.0000	0.9000	1.0000
25		0.6000	0.9000	1.0000	1.0000
50		0.9000	0.8000	1.0000	0.9000
100		1.0000	1.0000	1.0000	1.0000

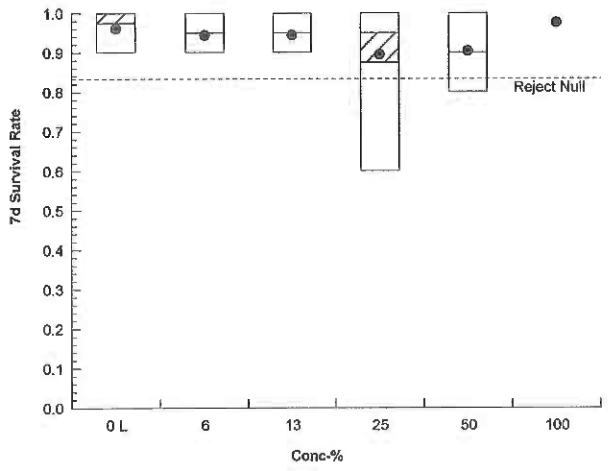
Angular (Corrected) Transformed Detail

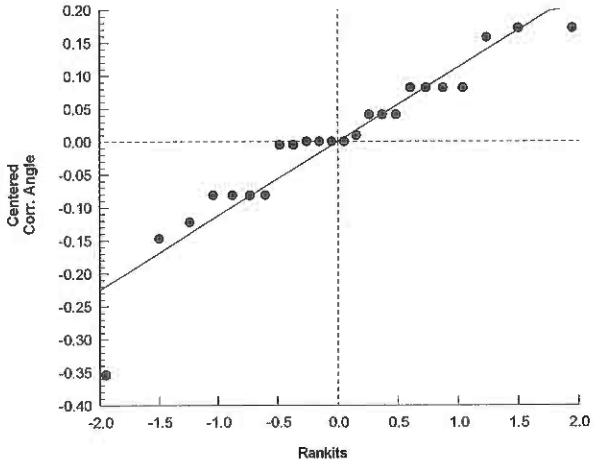
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	L	1.412	1.412	1.249	1.412
6		1.412	1.249	1.249	1.412
13		1.249	1.412	1.249	1.412
25		0.8861	1.249	1.412	1.412
50		1.249	1.107	1.412	1.249
100		1.412	1.412	1.412	1.412

7d Survival Rate Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	L	10/10	10/10	9/10	10/10
6		10/10	9/10	9/10	10/10
13		9/10	10/10	9/10	10/10
25		6/10	9/10	10/10	10/10
50		9/10	8/10	10/10	9/10
100		10/10	10/10	10/10	10/10

Graphics





CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test ERM

Analysis ID:	04-1375-2485	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 15:07	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	01-9158-7474	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	26 Aug-19 15:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	02 Sep-19 15:00	**Species:**	Pimephales promelas	**Brine:**	
Test Length:	6d 23h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:** <24
Sample ID:	20-6551-5761	**Code:**	7B1D44F1	**Project:**	WET Testing
Sample Date:	26 Aug-19 06:18	**Material:**	Industrial Effluent	**Source:**	ArcelorMittal Burns Harbor, LLC
Receipt Date:	26 Aug-19 12:00	**CAS (PC):**		**Station:**	Outfall 001
Sample Age:	9h (5 °C)	**Client:**	ArcelorMittal Burns Harbor, LLC		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	>100	n/a	1	26.85%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Lab Water		6	-0.5547	2.407	0.135	6	CDF	0.9468	Non-Significant Effect
		13	0.5949	2.407	0.135	6	CDF	0.6056	Non-Significant Effect
		25	0.6531	2.407	0.135	6	CDF	0.5794	Non-Significant Effect
		50	1.194	2.407	0.135	6	CDF	0.3394	Non-Significant Effect
		100	-0.4384	2.407	0.135	6	CDF	0.9306	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.501	0.25	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0294445	0.0058889	5	0.9426	0.4775	Non-Significant Effect
Error	0.112451	0.0062473	18			
Total	0.141896		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	5.724	15.09	0.3340	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9854	0.884	0.9714	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	L	4	0.501	0.3633	0.6387	0.466	0.444	0.628	0.04328	17.28%	0.00%
6		4	0.532	0.3869	0.6771	0.5515	0.413	0.612	0.04558	17.14%	-6.19%
13		4	0.4678	0.4279	0.5076	0.4725	0.435	0.491	0.01251	5.35%	6.64%
25		4	0.4645	0.2843	0.6447	0.491	0.313	0.563	0.05663	24.38%	7.29%
50		4	0.4343	0.3121	0.5564	0.431	0.347	0.528	0.03838	17.67%	13.32%
100		4	0.5255	0.4486	0.6024	0.5335	0.46	0.575	0.02417	9.20%	-4.89%

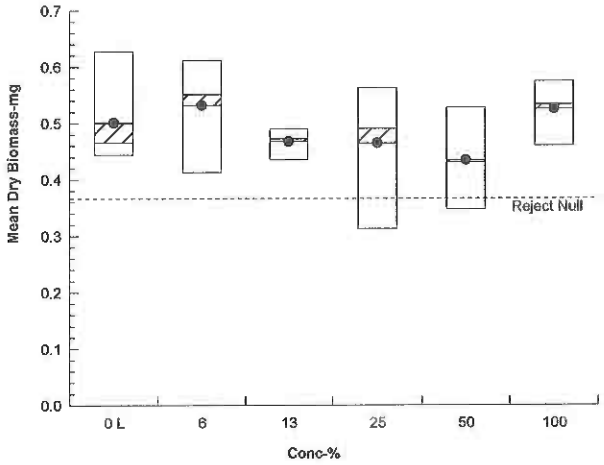
Mean Dry Biomass-mg Detail

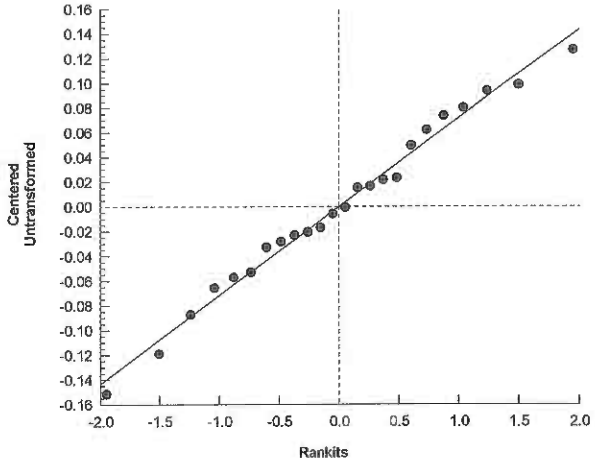
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	L	0.444	0.484	0.448	0.628
6		0.612	0.509	0.413	0.594
13		0.483	0.491	0.435	0.462
25		0.313	0.444	0.563	0.538
50		0.406	0.456	0.528	0.347
100		0.46	0.575	0.542	0.525

Fathead Minnow 7-d Larval Survival and Growth Test **ERM**

Analysis ID:	04-1375-2485	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 15:07	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test **ERM**

Analysis ID:	13-8214-7378	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 15:07	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	01-9158-7474	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	26 Aug-19 15:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Reconstituted Water
Ending Date:	02 Sep-19 15:00	**Species:**	Pimephales promelas	**Brine:**	
Test Length:	6d 23h	**Taxon:**	Actinopterygii	**Source:**	In-House Culture **Age:** <24
Sample ID:	20-6551-5761	**Code:**	7B1D44F1	**Project:**	WET Testing
Sample Date:	26 Aug-19 06:18	**Material:**	Industrial Effluent	**Source:**	ArcelorMittal Burns Harbor, LLC
Receipt Date:	26 Aug-19 12:00	**CAS (PC):**		**Station:**	Outfall 001
Sample Age:	9h (5 °C)	**Client:**	ArcelorMittal Burns Harbor, LLC		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	484944	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.501	0.25	>>	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	9.564	n/a	n/a	10.46	n/a	n/a
IC10	>100	n/a	n/a	<1	n/a	n/a
IC15	>100	n/a	n/a	<1	n/a	n/a
IC20	>100	n/a	n/a	<1	n/a	n/a
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Mean Dry Biomass-mg Summary

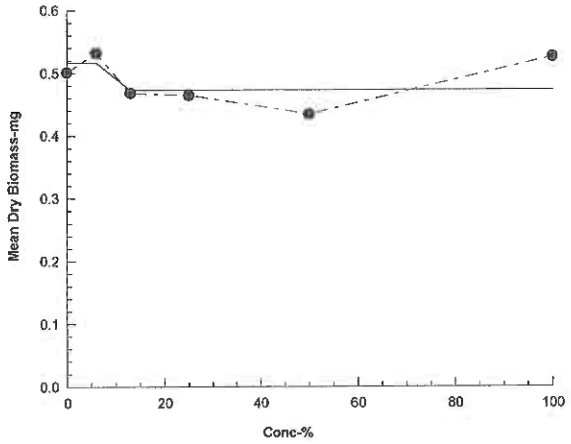
			Calculated Variate						Isotonic Variate	
Conc-%	**Code**	**Count**	**Mean**	**Min**	**Max**	**Std Dev**	**CV%**	**%Effect**	**Mean**	**%Effect**
0	L	4	0.501	0.444	0.628	0.08656	17.28%	0.0%	0.5165	0.0%
6		4	0.532	0.413	0.612	0.09117	17.14%	-6.19%	0.5165	0.0%
13		4	0.4678	0.435	0.491	0.02503	5.35%	6.64%	0.473	8.42%
25		4	0.4645	0.313	0.563	0.1133	24.38%	7.29%	0.473	8.42%
50		4	0.4343	0.347	0.528	0.07675	17.67%	13.32%	0.473	8.42%
100		4	0.5255	0.46	0.575	0.04835	9.20%	-4.89%	0.473	8.42%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	L	0.444	0.484	0.448	0.628
6		0.612	0.509	0.413	0.594
13		0.483	0.491	0.435	0.462
25		0.313	0.444	0.563	0.538
50		0.406	0.456	0.528	0.347
100		0.46	0.575	0.542	0.525

Analysis ID:	13-8214-7378	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	04 Sep-19 15:07	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



ENVIRONMENTAL RESOURCES MANAGEMENT

3352 128th Avenue Holland, Michigan 49424-9263
Phone: 616- 399-3500 FAX: 616-399-3777

AQUATIC TOXICITY LAB CHAIN OF CUSTODY FORM *

CLIENT NAME:	AMBH (Arcelor)	SAMPLER	
ADDRESS:		PHONE NUMBER:	

SAMPLE DESCRIPTION (i.e. Outfall 001)	DATE (Begin End)	TIME (Begin End)	GRAB OR COMP	NUMBER AND SIZE OF CONTAINERS	FIELD PARAMETERS	SAMPLE ID NUMBER (Filled in by ERM)	INITIAL WATER QUALITY PARAMETERS UPON RECEIPT BY LABORATORY (filled in by ERM)			
001	08/25/19	0618		1-2.5 gal	pH= s.u. NH_3= mg/L	082619-1	Temp. 5 (° C) ☒ On Ice	D.O. 10.5 mg/L	pH 7.1 s.u.	Cond 417 umhos/cm
outside	8-25-19	0618								
011 SOR 08/03/19	08/25/19	0604		1-2.5 gal	pH= s.u. NH_3= mg/L	082619-2	Temp. 5 (° C) ☒ On Ice	D.O. 9.9 mg/L	pH 7.5 s.u.	Cond 444 umhos/cm
outside	8-25-19	0608								
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (° C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm

ANALYSES REQUESTED [check item(s)]	Test Material:	Test Type:	Test Species:
	_____ Water/Wastewater _____ Sediment _____ Product	_____ Acute _____ Chronic _____ Other	___ *Ceriodaphnia dubia* ___ *Daphnia magna* ___ *Daphnia pulex* ___ Fathead minnow (*Pimephales promelas*) ___ Rainbow Trout (*Oncorhynchus mykiss*) ___ Sheepshead minnow (*Cyprinodon variegatus*) ___ Silverside minnow (*Menidia beryllina*) ___ *Americamysis bahia* ___ *Hyalella azteca* ___ *Chironomus dilutus* ___ Other (write in comments section)

COMMENT SECTION: See ALS COC 41579

SAMPLE TRANSFERS

RELINQUISHED BY: Signature / Organization	DATE	TIME	ACCEPTED BY: Signature /Organization	DATE	TIME

* See Instructions for Sample Collection on Back of Sheet

February 2018

Cincinnati, OH +1 513 733 5336
Fort Collins, CO +1 970 490 1511
Everett, WA +1 425 356 2600
Holland, MI +1 616 399 6070
Houston, TX +1 281 530 5656
Spring City, PA +1 610 948 4903
South Charleston, WV +1 304 356 3168
Middletown, PA +1 717 944 5541
Salt Lake City, UT +1 801 266 7700
York, PA +1 717 505 5280

Chain of Custody Form

Page _____ of _____

COC ID: 41579

ALS Project Manager:		ALS Work Order #:	

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name	AMBH WETT week 2	A	WETT - Sub ERM
Work Order		Project Number		B	
Company Name	AMBA + EPT	Bill To Company	AMBH	C	
Send Report To		Invoice Attn		D	
Address		Address		E	
				F	
City/State/Zip		City/State/Zip		G	
Phone		Phone		H	
Fax		Fax		I	
e-Mail Address		e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	Outfall 001 Comp *	8-25-19	0618	AQ	8	1	X		082619-1								
2	Outfall 011 Comp *	8-25-19	0608	AQ	8	1	X		082619-2								
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: B. Frye

Shipment Method:

Turnaround Time in Business Days (BD): ☐ 10 BD ☐ 5 BD ☐ 3 BD ☐ 2 BD ☐ 1 BD ☐ Other _____

Results Due Date:

Relinquished by:	Date:	Time:	Received by:
	8-26-19	1217	ERM
Relinquished by:	Date:	Time:	Received by (Laboratory):
			0826-1200
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):

Notes: *Composite samples ends on 082619 at same time - SK 09/03/19

Cooler ID	Cooler Temp

QC Package: (Check One Box Below)
☐ Level II Std QC
☐ Level III Std QC/Raw Date
☐ Level IV SW846/CLP
☐ Other _____
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note:
1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

ERM®

ENVIRONMENTAL RESOURCES MANAGEMENT

3352 128th Avenue Holland, Michigan 49424-9263
Phone: 616- 399-3500 FAX: 616-399-3777

AQUATIC TOXICITY LAB CHAIN OF CUSTODY FORM *

CLIENT NAME:	AMBN	SAMPLER	
ADDRESS:		PHONE NUMBER:	

SAMPLE DESCRIPTION (i.e. Outfall 001)	DATE (Begin End)	TIME (Begin End)	GRAB OR COMP	NUMBER AND SIZE OF CONTAINERS	FIELD PARAMETERS	SAMPLE ID NUMBER (Filled in by ERM)	INITIAL WATER QUALITY PARAMETERS UPON RECEIPT BY LABORATORY (filled in by ERM) Temp.	D.O.	pH	Cond
001	08/27/19 ~~8/27/19~~ 08/28/19	0610 0610		2.5g	pH= s.u. NH3= mg/L	082819-1	5 (°C) ☒ On Ice	7.3 mg/L	7.2 s.u.	391 umhos/cm
011	~~08/28/19~~ 08/27/19 ~~8/27/19~~ 08/28/19	0555 0555		2.5g	pH= s.u. NH3= mg/L	082819-2	5 (°C) ☒ On Ice	5.5 mg/L	7.3 s.u.	459 umhos/cm
					pH= s.u. NH3= mg/L		(°C) ☐ On Ice	mg/L	s.u.	umhos/cm
					pH= s.u. NH3= mg/L		(°C) ☐ On Ice	mg/L	s.u.	umhos/cm
					pH= s.u. NH3= mg/L		(°C) ☐ On Ice	mg/L	s.u.	umhos/cm
					pH= s.u. NH3= mg/L		(°C) ☐ On Ice	mg/L	s.u.	umhos/cm

ANALYSES REQUESTED [check item(s)]

Test Material:
___ Water/Wastewater
___ Sediment
___ Product

Test Type:
___ Acute
___ Chronic
___ Other

Test Species:
___ *Ceriodaphnia dubia*
___ *Daphnia magna*
___ *Daphnia pulex*
___ Fathead minnow (*Pimephales promelas*)
___ Rainbow Trout (*Oncorhynchus mykiss*)
___ Sheepshead minnow (*Cyprinodon variegatus*)
___ Silverside minnow (*Menidia beryllina*)
___ *Americamysis bahia*
___ *Hyalella azteca*
___ *Chironomus dilutus*
___ Other (write in comments section)

COMMENT SECTION: See ALS COC 42011

SAMPLE TRANSFERS

RELINQUISHED BY: Signature / Organization	DATE	TIME	ACCEPTED BY: Signature /Organization	DATE	TIME

* See Instructions for Sample Collection on Back of Sheet

February 2018

+1 425 356 2600 | +1 616 399 6070 | Page ____ of ____ | Middletown, PA +1 717 944 5541 | Salt Lake City, UT +1 801 266 7700

LS)

COC ID: 42011

Customer Information		Project Information			Parameter/Method Request for Ana
		Project Name	AMBH WETT week 2	A	WETT sub to EK
	AMBH + EPT	Project Number		B	
		Bill To Company	AMBH	C	
		Invoice Attn		D	
s		Address		E	
				F	
Zip		City/State/Zip		G	
hone		Phone		H	
Fax		Fax		I	
Address		e-Mail Address		J	

ALS Project Manager: | ALS Work Order #:

	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H
1	Outfall 001 Comp	*8-27-19	0610	AQ	8	1-2gal	X		082819-1					
2	Outfall 011 Comp	*8-27-19	0555	AQ	8	1-2gal	X		082819-2					
3														
4														
5														
6														
7														
8														
9														
10														

Sampler(s) Please Print & Sign: B. Frye

Shipment Method:

Turnaround Time in Business Days (BD): ☐ 10 BD ☐ 5 BD ☐ 3 BD ☐ 2 BD ☐ 1 BD ☐ Other ____

Relinquished by: B. Frye | Date: 8-28-19 | Time:

Relinquished by: | Date: | Time:

Logged by (Laboratory): | Date: | Time:

Received by: | Received by (Laboratory): 8-28-19 1300

Checked by (Laboratory):

Notes: *Composite sample ends on 08/28/19 at same time - 0915

Cooler ID	Cooler Temp

QC Package: (Check

☐ Level II Std QC
☐ Level III Std QC/R
☐ Level IV SW846/C
☐ Other

082619-1 Pp
Page 20 of 23

ENVIRONMENTAL RESOURCES MANAGEMENT

3352 128th Avenue Holland, Michigan 49424-9263
Phone: 616- 399-3500 FAX: 616-399-3777

AQUATIC TOXICITY LAB CHAIN OF CUSTODY FORM *

CLIENT NAME:	Arcelor Mittal	SAMPLER	
ADDRESS:		PHONE NUMBER:	

SAMPLE DESCRIPTION (i.e. Outfall 001)	DATE (Begin End)	TIME (Begin End)	GRAB OR COMP	NUMBER AND SIZE OF CONTAINERS	FIELD PARAMETERS	SAMPLE ID NUMBER (Filled in by ERM)	INITIAL WATER QUALITY PARAMETERS UPON RECEIPT BY LABORATORY (filled in by ERM)			
001	8/29/19 8/30/19	0622 0622		1gal + 2.5gal	pH= s.u. NH_3= mg/L	083019-1	Temp. 2 (°C) ☐ On Ice	D.O. 9.2 mg/L	pH 7.3 s.u.	Cond 454 umhos/cm
011	8/29 8/30	0605 0605		1gal + 2.5gal	pH= s.u. NH_3= mg/L	083019-2	Temp. 2 (°C) ☐ On Ice	D.O. 6.7 mg/L	pH 7.2 s.u.	Cond 464 umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm
					pH= s.u. NH_3= mg/L		Temp. (°C) ☐ On Ice	D.O. mg/L	pH s.u.	Cond umhos/cm

ANALYSES REQUESTED [check item(s)]

Test Material:
- _____ Water/Wastewater
- _____ Sediment
- _____ Product

Test Type:
- _____ Acute
- _____ Chronic
- _____ Other

Test Species:
- ___ *Ceriodaphnia dubia*
- ___ *Daphnia magna*
- ___ *Daphnia pulex*
- ___ Fathead minnow (*Pimephales promelas*)
- ___ Rainbow Trout (*Oncorhynchus mykiss*)
- ___ Sheepshead minnow (*Cyprinodon variegatus*)
- ___ Silverside minnow (*Menidia beryllina*)
- ___ *Americamysis bahia*
- ___ *Hyalella azteca*
- ___ *Chironomus dilutus*
- ___ Other (write in comments section)

COMMENT SECTION: See ALS COC 42012

SAMPLE TRANSFERS

RELINQUISHED BY: Signature / Organization	DATE	TIME	ACCEPTED BY: Signature / Organization	DATE	TIME
			ERM	8/30/19	1330

* See Instructions for Sample Collection on Back of Sheet

February 2018

Cincinnati, OH +1 513 733 5336
Fort Collins, CO +1 970 490 1511
Everett, WA +1 425 356 2600
Holland, MI +1 616 399 6070
Houston, TX +1 281 530 5656
Spring City, PA +1 610 948 4903
South Charleston, WV +1 304 356 3168
Middletown, PA +1 717 944 5541
Salt Lake City, UT +1 801 266 7700
York, PA +1 717 505 5280

Chain of Custody Form

Page _____ of _____

COC ID: 42012

ALS Project Manager:		ALS Work Order #:	

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name	AMBH WETT week 2	A	WETT sub to ERM
Work Order		Project Number		B	
Company Name	AMBH - EPT	Bill To Company	AMBH	C	
Send Report To		Invoice Attn		D	
Address		Address		E	
				F	
City/State/Zip		City/State/Zip		G	
Phone		Phone		H	
Fax		Fax		I	
e-Mail Address		e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	Outfall 001 Comp *	8-29-19	0622	AQ	8	2-3gal	X		083019-1								
2	Outfall 011 Comp *	8-29-19	0608	AQ	8	2-3gal	X		083019-2								
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: B. Frye

Shipment Method:

Turnaround Time in Business Days (BD): ☐ 10 BD ☐ 5 BD ☐ 3 BD ☐ 2 BD ☐ 1 BD ☐ Other _____

Results Due Date:

Relinquished by:	Date:	Time:	Received by:	Notes:
	8-30-19		ERM	*Composite samples ends on 08/29/19 at same time -SR 09/03/19
Relinquished by:	Date:	Time:	Received by (Laboratory):	
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):	

Cooler ID	Cooler Temp

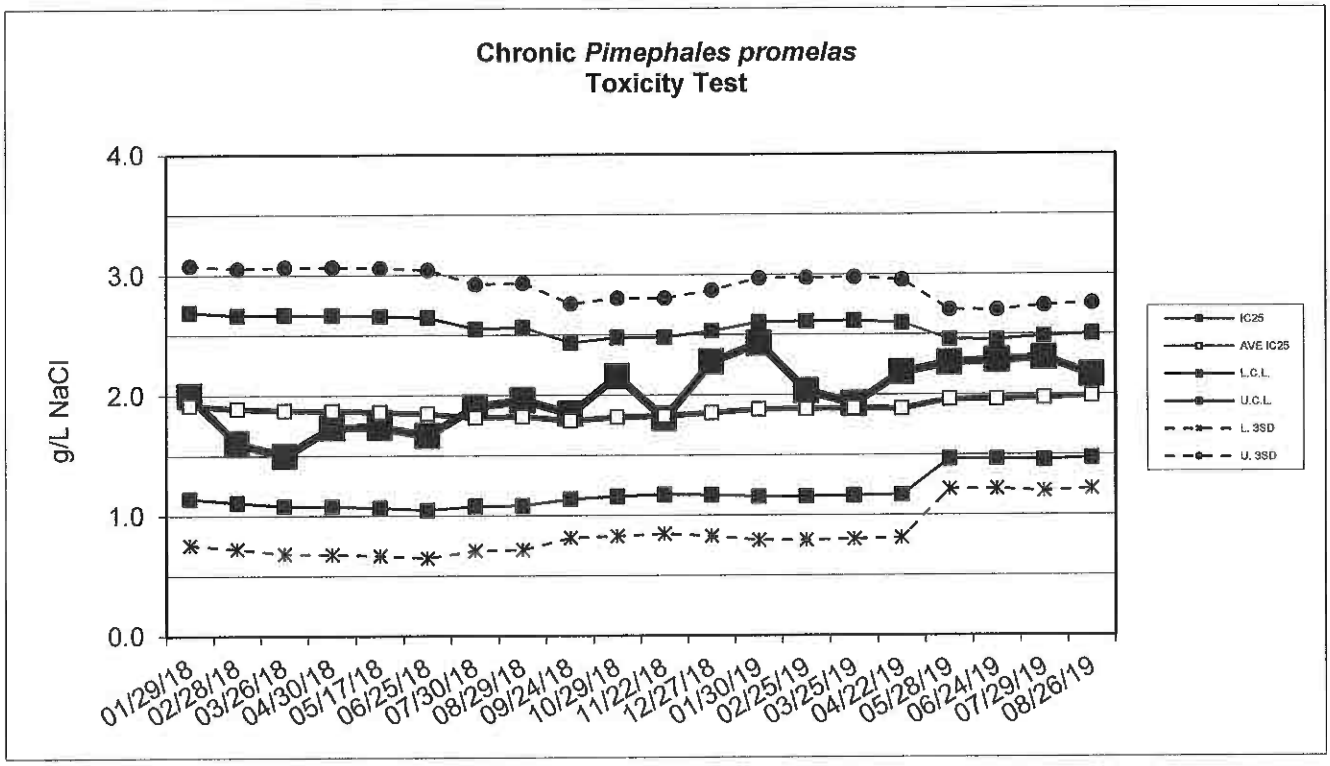
QC Package: (Check One Box Below)
☐ Level II Std QC ☐ TRRP Checklist
☐ Level III Std QC/Raw Date ☐ TRRP Level IV
☐ Level IV SW846/CLP
☐ Other _____

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

Environmental Resources Management

Standard Reference Toxicant Data



Chronic *Pimephales promelas* Toxicity Test Data

Date	IC25 (g/L NaCl)	AVE IC25 (g/L NaCl)	CONTROL LIMIT Lower	CONTROL LIMIT Upper	Survival (%)	CONTROL Growth (mg)	CV (%)
01/29/18	2.0	1.9	1.1	2.7	97.5	0.39	4.8
02/28/18	1.6	1.9	1.1	2.7	92.5	0.44	10.7
03/26/18	1.5	1.9	1.1	2.7	97.5	0.47	3.5
04/30/18	1.7	1.9	1.1	2.7	95	0.45	11.4
05/17/18	1.7	1.9	1.1	2.7	100	0.54	10.8
06/25/18	1.7	1.8	1.0	2.6	95	0.56	17.8
07/30/18	1.9	1.8	1.1	2.6	97.5	0.43	4.3
08/29/18	2.0	1.8	1.1	2.6	100	0.58	9.4
09/24/18	1.8	1.8	1.1	2.4	97.5	0.46	8.2
10/29/18	2.2	1.8	1.2	2.5	97.5	0.45	7.7
11/22/18	1.8	1.8	1.2	2.5	95	0.65	5.2
12/27/18	2.3	1.8	1.2	2.5	97.5	0.64	7.4
01/30/19	2.4	1.9	1.2	2.6	100	0.53	10.5
02/25/19	2.0	1.9	1.2	2.6	95	0.53	10.2
03/25/19	1.9	1.9	1.2	2.6	97.5	0.63	6.0
04/22/19	2.2	1.9	1.2	2.6	100	0.57	2.0
05/28/19	2.3	2.0	1.5	2.5	100	0.68	10.4
06/24/19	2.3	2.0	1.5	2.5	92.5	0.48	11.0
07/29/19	2.3	2.0	1.5	2.5	100	0.51	5.6
08/26/19	2.2	2.0	1.5	2.5	100	0.38	15.0