Intended for

American Electric Power – Clinch River
Columbus, Ohio

Date

August 2017

3RD CHRONIC TOXICITY TEST RESULTS – OUTFALL D003

PROJECT NUMBER: 20-15119K

RAMBOLL ENVIRON

WATER

Ms. Lindsey Forhan, Engineer
Water & Ecological Resources Services
American Electric Power
1 Riverside Plaza, 22nd Floor
Columbus, OH 43215-2373

CLINCH RIVER CHRONIC TEST RESULTS – OUTFALL D003
RAMBOLL ENVIRON PROJECT NO. 20-15119K

September 6, 2017

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Dear Ms. Forhan:
Attached are the results of *Pimephales promelas* (fathead minnow) and *Ceriodaphnia dubia (C. dubia)* chronic (seven day) toxicity tests performed with effluent samples collected from Outfall D003. Testing was conducted in accordance with VA permit number VA0001015. Fathead minnow and *C. dubia* were exposed to 8, 16, 32, 64, and 100 percent effluent concentrations. Composite samples were collected August 21, 23, and 25, 2017 and utilized within 36 hours of collection. All samples were received between the USEPA-recommended sample receipt temperature of 0.0 - 6.0 ºC. Moderately hard water served as the control and dilution water for both species. Tests were initiated on August 22, 2017. Tests initiated August 15, 2017 were terminated early due to no third sample. The data for these tests are attached.

Test methods followed EPA-821-R-02-013, *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition*. Results from the chronic toxicity tests were:

NELAP Accredited or Laboratory Certification in the following United States: AR (02-008-0), AZ (0751), CA (2465), FL (E87896), IA (386), KS (E-10391), LA (02061), MN, NC (003), OK (9973), SC (84015), TX (T104704410-11-2), VA (460171), WI (399050850), WV (351).

Test Results contained in this report meet NELAP requirements.

TEST RESULTS FOR OUTFALL D003 EFFLUENT

Toxicity Endpoint	Permit Limits	Fathead Minnow	*C. dubia*
48-hr LC50	100%	> 100%	> 100%
TUa	1.0	<1.0	<1.0
NOEC Value - Survival	32%	100%	100%
NOEC Value – Growth/Reproduction	32%	100%	100%
$TUc_{(NOEC)}$	3.12	1.0	1.0
IC25	Report only	> 100%	> 100%

LC50 – Lethal Concentration to 50 percent of the organisms, a calculated value.
NOEC – No Observed Effect Concentration, highest test concentration at which there was no observable effect.
TUc – Chronic Toxic Units, based on the NOEC (100/NOEC).
IC25 – Inhibition Concentration to 25 percent of the organisms, a calculated value.

No acute mortality was observed in either the fathead minnow or *C. dubia* tests. The LC50 values were greater than 100 percent effluent. The calculated TUa values were both less than 1.0.

Results of the fathead minnow and *C. dubia* tests indicated No Observed Effect Concentration (NOEC) values of 100 percent effluent for the lethal endpoints and sublethal endpoints, respectively. The calculated $TUc_{(NOEC\ sublethal)}$ values were 1.0 for fathead minnow and *C. dubia*, which meets the permit $TUc_{(NOEC\ sublethal)}$ value of 3.12.

The controls in the fathead minnow test met all test acceptability criteria (TAC). Precision for the fathead minnow growth test, as Percent Minimum Significant Difference (PMSD), was within the USEPA PMSD bounds listed in Table 6 of EPA-821-R-02-013. The concentration-response curve was flat and cannot be described according to EPA821-B-00-004 *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing*. A flat concentration-response is indicative of a lack of toxicity. This test is considered valid for assessment of permit compliance. The monthly reference toxicant test also met all the test acceptability criteria.

The *C. dubia* moderately hard water controls met USEPA TAC. PMSD for the *C. dubia* reproduction test was within the USEPA PMSD bounds. The concentration-response is consistent with pattern Type 4 described in EPA-B-00-004. A Type 4 concentration-response curve is characterized by an increase in reproduction in the lower test concentration but no significant effects at the higher concentrations. The monthly reference toxicant test also met all the test acceptability criteria.

This report contains 47 pages, which include this summary report with test condition summary forms, the statistical results and data for fathead minnow and *C. dubia* tests (Attachment 1), Virginia state chain-of-custody form, Chain-of-Custody documentation, and reference toxicant data (Attachment 2), the data for early terminated tests (Attachment 3), and attachment and spacer pages.

If you have any questions or concerns regarding this report, please call Liza Heise at (615) 277-7517. Thank you for the continued opportunity to assist American Electric Power with their toxicity testing needs.

Yours sincerely

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Data Review Form

Acute and Chronic WET Tests

Ramboll Environ

The raw data (i.e., laboratory bench sheets) and data in the applicable summary sheets have been checked and found to be complete. Additionally, test conditions and control performance meet test acceptability criteria specified by the US Environmental Protection Agency and the certifying state authority for the tests conducted[1].

Robin L. Richards, REM
Department Head
Water Management and Planning

[1] Any data limitations regarding their applicability for determining NPDES permit compliance are discussed in the report cover letter.

ATTACHMENT 1
STATISTICAL RESULTS AND RAW TEST DATA

Ceriodaphnia 7-d Survival and Reproduction Test — **Ramboll Environ**

Analysis ID:	02-8313-2005	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:31	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Batch ID:	07-2645-8331	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	22 Aug-17	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Aug-17	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	8d 0h	**Source:**	In-House Culture	**Age:**	

Sample ID:	02-2464-0834	**Code:**	D63BF42	**Client:**	AEP - Clinch River
Sample Date:	21 Aug-17	**Material:**	Power Plant	**Project:**	WET Monthly Compliance Test (AUG)
Receive Date:	22 Aug-17	**Source:**	Discharge Monitoring Report		
Sample Age:	24h	**Station:**	D003		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	100	>100	NA	1

Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water		8	1	1.0000	Exact	Non-Significant Effect
		16	1	1.0000	Exact	Non-Significant Effect
		32	1	1.0000	Exact	Non-Significant Effect
		64	1	1.0000	Exact	Non-Significant Effect
		100	0.2368	1.0000	Exact	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water	10	0	10	1	0	0.0%
8		10	0	10	1	0	0.0%
16		10	0	10	1	0	0.0%
32		10	0	10	1	0	0.0%
64		9	0	9	1	0	0.0%
100		8	2	10	0.8	0.2	20.0%

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	1	1	1	1	1	1	1	1	1	1
8		1	1	1	1	1	1	1	1	1	1
16		1	1	1	1	1	1	1	1	1	1
32		1	1	1	1	1	1	1	1	1	1
64		1	1	1	1	1	1	1	1	1	
100		1	1	1	1	0	1	1	1	0	1

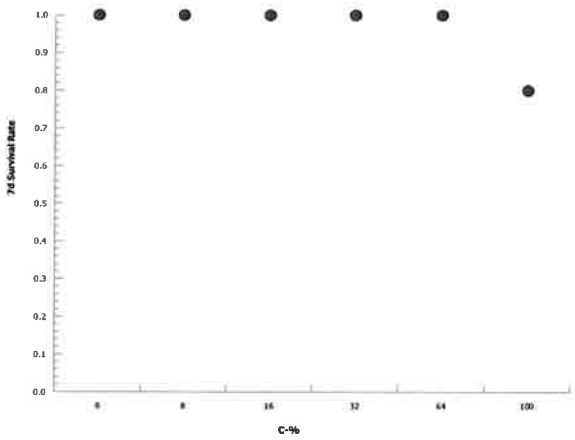
7d Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
8		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
16		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
32		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
64		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
100		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	0/1	1/1

Ceriodaphnia 7-d Survival and Reproduction Test **Ramboll Environ**

Analysis ID:	02-8313-2005	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:31	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Graphics



Ceriodaphnia 7-d Survival and Reproduction Test — **Ramboll Environ**

Analysis ID:	17-4451-7577	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:43	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes

Batch ID:	07-2645-8331	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	22 Aug-17	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Aug-17	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	8d 0h	**Source:**	In-House Culture	**Age:**	

Sample ID:	02-2464-0834	**Code:**	D63BF42	**Client:**	AEP - Clinch River
Sample Date:	21 Aug-17	**Material:**	Power Plant	**Project:**	WET Monthly Compliance Test (AUG)
Receive Date:	22 Aug-17	**Source:**	Discharge Monitoring Report		
Sample Age:	24h	**Station:**	D003		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	NA	C > T	NA	NA	100	>100	NA	1	37.7%

Bonferroni Adj t Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water		8	-0.7448	2.4	9.381	17	1.0000	CDF	Non-Significant Effect
		16	-2.28	2.4	9.381	17	1.0000	CDF	Non-Significant Effect
		32	-1.692	2.4	9.381	17	1.0000	CDF	Non-Significant Effect
		64	-0.4711	2.4	9.625	16	1.0000	CDF	Non-Significant Effect
		100	1.379	2.4	9.381	17	0.4347	CDF	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	24.89	15 - NL	Yes	Passes Acceptability Criteria
PMSD	0.3769	0.13 - 0.47	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1263.58	252.7159	5	3.493	0.0085	Significant Effect
Error	3762.645	72.35854	52			
Total	5026.224		57			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	3.313	15.09	0.6519	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9692	0.9443	0.1460	Normal Distribution

Reproduction Summary

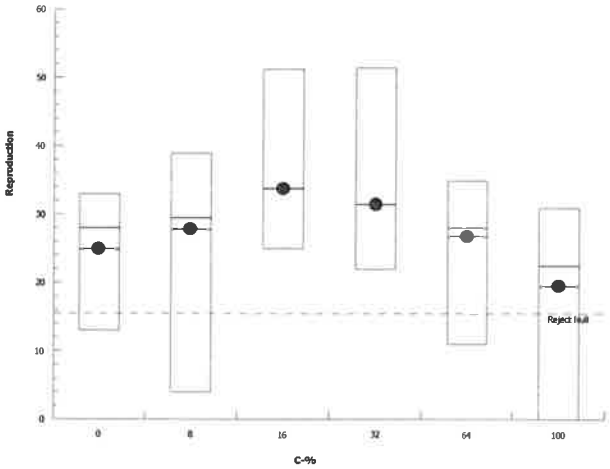
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	9	24.89	19.81	29.97	28	13	33	2.201	26.53%	0.0%
8		10	27.8	20.59	35.01	29.5	4	39	3.186	36.24%	-11.7%
16		10	33.8	29	38.6	33.5	25	51	2.123	19.86%	-35.8%
32		10	31.5	24.99	38.01	29	22	49	2.876	28.87%	-26.56%
64		9	26.78	21.24	32.32	28	11	35	2.402	26.92%	-7.59%
100		10	19.5	12.21	26.79	22.5	0	31	3.222	52.26%	21.65%

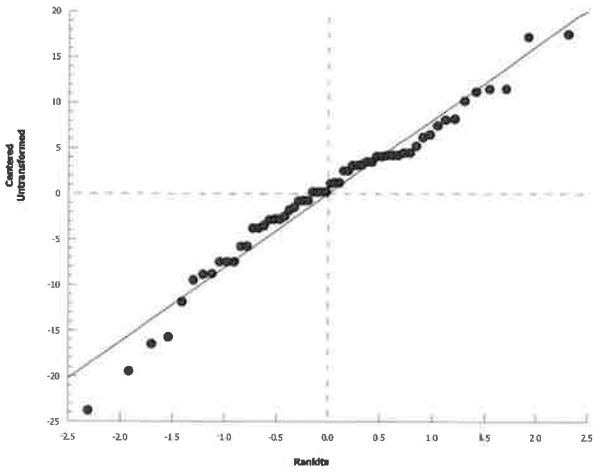
Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	29	22	28	29	33	16	13	26	28	
8		39	34	28	38	32	31	4	22	24	26
16		31	33	25	34	30	51	35	34	31	34
32		35	28	36	22	24	43	24	49	30	24
64		28	31	31	26	35	21	11	32	26	
100		26	22	17	24	0	27	22	31	3	23

Analysis ID:	17-4451-7577	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:43	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date:	05 Sep-17 10:45 (p 1 of 1)
Test Code:	18896cd | 19-3358-9892

Ceriodaphnia 7-d Survival and Reproduction Test — **Ramboll Environ**

Analysis ID:	12-4631-8144	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:43	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	07-2645-8331	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	22 Aug-17	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	30 Aug-17	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	8d 0h	**Source:**	In-House Culture	**Age:**	

Sample ID:	02-2464-0834	**Code:**	D63BF42	**Client:**	AEP - Clinch River
Sample Date:	21 Aug-17	**Material:**	Power Plant	**Project:**	WET Monthly Compliance Test (AUG)
Receive Date:	22 Aug-17	**Source:**	Discharge Monitoring Report		
Sample Age:	24h	**Station:**	D003		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1608026	1000	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	24.89	15 - NL	Yes	Passes Acceptability Criteria

Point Estimates

Level	% >100	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	~~87.03~~	62.38	N/A	1.149	NA	1.603

Reproduction Summary

			Calculated Variate						
C-%	**Control Type**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	Lab Water	9	24.89	13	33	2.201	6.604	26.53%	0.0%
8		10	27.8	4	39	3.186	10.08	36.24%	-11.7%
16		10	33.8	25	51	2.123	6.713	19.86%	-35.8%
32		10	31.5	22	49	2.876	9.095	28.87%	-26.56%
64		9	26.78	11	35	2.402	7.207	26.92%	-7.59%
100		10	19.5	0	31	3.222	10.19	52.26%	21.65%

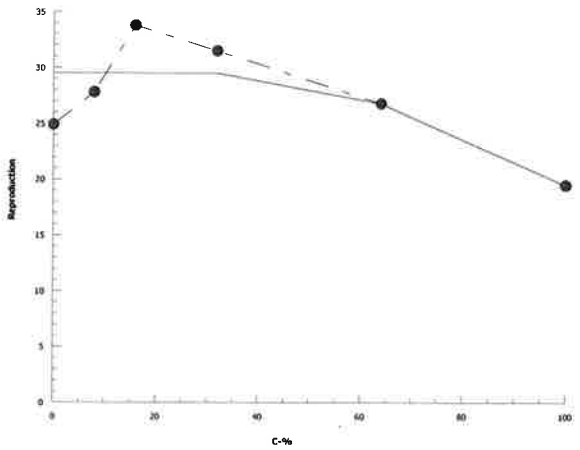
Smoothing effect

<25%

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	29	22	28	29	33	16	13	26	28	
8		39	34	28	38	32	31	4	22	24	26
16		31	33	25	34	30	51	35	34	31	34
32		35	28	36	22	24	43	24	49	30	24
64		28	31	31	26	35	21	11	32	26	
100		26	22	17	24	0	27	22	31	3	23

Graphics



ENVIRON CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION 3-BROOD CHRONIC TOXICITY TEST
EPA-821-R-02-013 Method 1002.0

TEST LOG NO.: 18896

JOB NUMBER.: 20-15119K

INDUSTRY: AEP- Clinch River

SAMPLE ID: Outfall 003D

DILUTION WATER: Mod Hard

NPDES (Y/N) : Y

PHOTOPERIOD: 16 hr light/8 hr dark

FEEDING REGIME: 0.1 mL YCT / 0.1 mL R. subcapitata per 15 mL

TEST VESSEL CAPACITY: 30 mL

TEST SOLUTION VOLUME: 15 mL

NO. ORGANISMS/REPLICATE: 1

NO. REPLICATES: 10

ORGANISM SOURCE INFORMATION:

AGE (date): 8/21/17

TEMP @ TEST START: 24.6

RANDOMIZED BY: LM

SOURCE ID:	AGE (time):
11871	1215-1412
11873	1215-1414

TEST START:

HOURS: 1000 DATE: 8/22/17

TEST END:

HOURS: 1030 DATE: 8/30/17

SURVIVAL AND REPRODUCTION DATA

Test Start & Feeding/ End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Control Mod Hard Temp (°C)			REPLICATES 71					873					Notes
						1	2	3	4	5	6	7	8	9	10	
					Adult	2	6	7	10	11	2	7	10	9	11	
LM 1000		8/22	24.7		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1407	8/23	24.7	24.3	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1151	8/24	24.3	24.1	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LTH 1005	8/25	24.5	24.4	Day 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1015	8/26	24.4	24.3	Day 4	4	5	3	3	✓	5	✓	✓	4	4	
	TL 1615	8/27	24.5	24.1	Day 5	✓	12, 2	✓	7,	9	✓	✓	5	11	10	
	LM 1040	8/28	24.6	24.9	Day 6	✓		10	5	11	✓	✓	✓	✓	✓	
	LM 1119	8/29	24.5	24.7	Day 7	13	✓ 35 small	✓	✓	13	✓	✓	✓	15	14	
LM 1030		8/30		24.9	Day 8	12	✓	15	14	✓	11	✓	8	✓	18	70%
			Total			29	22	28	29	33	16	n-1 male	13	26	28	224/9 = 24.889

✓ = Test Organism Alive
D = Test Organism Dead
0 = Live neonates
(-0) = Dead neonates
Miss = Lost or Missing
M = Male

L/Ecotoxlab/Labforms/ToxTestSheets/7DchronicCD.doc

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TEST LOG # 18896 JOB # 20-15119K

CLIENT/SAMPLE ID: AEP- Clinch River 003D LAB/STATE: ENVIRON / TN

SURVIVAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 8.0% Temp (°C)			REPLICATES										Notes
						1	2	3	4	5	6	7	8	9	10	
					Adult											
LM 1000		8/22	24.3		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1407	8/23	24.1	24.2	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1151	8/24	24.4	24.5	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LTH 1005	8/25	24.6	24.6	Day 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1015	8/26	24.5	24.3	Day 4	2	✓	✓	✓	✓	✓	✓	4	4	✓	
	TL 1615	8/27	24.3	24.3	Day 5	(2)	7	✓	8	6	13	✓	7	~~[illegible]~~ ✓	16	Die TL 8/27/17
	LM 1040	8/28	25.3	25.8	Day 6	18	1	12	14	12	18	4	11	1	✓	
	LM 1119	8/29	24.6	24.5	Day 7	✓	(8)	16	16	14	✓	✓	✓	23	✓	
LM 1036		8/30		24.5	Day 8	17	18	✓	✓	✓	✓	✓	✓	18	10	
			Total			39	34	28	38	32	31	4	22	24	26	278

SURVIVIAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 16% Temp (°C)			REPLICATES										Notes
						1	2	3	4	5	6	7	8	9	10	
LM 1000		8/22	24.5		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1407	8/23	24.4	24.2	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1151	8/24	24.3	24.1	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LTH 1005	8/25	24.7	24.7	Day 3	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1015	8/26	24.4	24.6	Day 4	✓	4	3	✓	✓	✓	4	5	✓	4	
	TL 1615	8/27	24.7	24.3	Day 5	8	14	11	7	7	15	15	16	5	13	
	LM 1040	8/28	24.5	24.2	Day 6	✓	15	11	14	11	17	16	13	13	17	
	LM 1119	8/29	24.7	24.8	Day 7	20	16	✓	13	✓	19	✓	✓	13	✓	
LM 1036		8/30		24.9	Day 8	18	✓	1	✓	12	✓	16	15	✓	14	
			Total			31	33	25	34	30	51	35	34	31	34	338

✓ = Test Organism Alive
D = Test Organism Dead
0 = Live neonates
(-0) = Dead neonates
Miss = Lost or Missing
M = Male

L/Ecotoxlab/Labforms/ToxTestSheets/7DchronicCD.doc

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TEST LOG # 18896 JOB # 20-15119K

CLIENT/SAMPLE ID: AEP- Clinch River 003D LAB/STATE: ENVIRON / TN

SURVIVAL AND REPRODUCTION DATA

Test Start & Feeding/ End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 32% Temp (°C)			REPLICATES 1	2	3	4	5	6	7	8	9	10	Notes
					Adult											
LM 1000		8/22	24.8		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1407	8/23	24.7	24.8	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1151	8/24	24.4	24.6	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LTH 1005	8/25	25.0	25.2	Day 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1015	8/26	24.7	24.6	Day 4	✓	✓	2	2	2	✓	2	✓	5	3	
	TC 1615	8/27	24.8	24.4	Day 5	6	7	14	7	8	10	8	13	11	7	
	LM 1040	8/28	25.1	25.2	Day 6	13	✓	20	13	14	18	14	✓	14	14	
	LM 1119	8/29	24.9	24.8	Day 7	16	6	16	✓	✓	15	14	18	✓	✓	
LM 1036		8/30	24.8		Day 8	✓	15	✓	15	14	✓	✓	18	19	14	
			Total			35	28	36	22	24	43	24	49	30	24	315

SURVIVIAL AND REPRODUCTION DATA

Test Start & Feeding/ End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 64% Temp (°C)			REPLICATES 1	2	3	4	5	6	7	8	9	10	Notes
LM 1000		8/22	24.8		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1407	8/23	24.4	24.3	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1151	8/24	24.5	24.7	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LTH 1005	8/25	25.0	25.0	Day 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1015	8/26	25.1	24.8	Day 4	~~4~~	~~4~~ 3	2 4	3	3	✓	3	✓	4	4	HM 8/26 UP
	TC 1615	8/27	25.0	24.6	Day 5	2	4	11	D/9	10	5	7	✓	12	✓	* pinched
	LM 1040	8/28	25.3	25.5	Day 6	12	10 (big)	16	|	✓	13	✓	✓	16	9	
	LM 1119	8/29	25.1	24.9	Day 7	✓	✓	✓	|	13	17	11	✓	✓	13	
LM 1036		8/30		24.5	Day 8	14	15	19	|	16	✓	14	11	15	✓	
			Total			28	32	31	D/12 n-1	26	35	21	11	32	26	242/9 = 26.889

✓ = Test Organism Alive 0 = Live neonates Miss = Lost or Missing

D = Test Organism Dead (-0) = Dead neonates M = Male

L/Ecoloxlab/Labforms/ToxTestSheets/7DchronicCD.doc

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TEST LOG # 18896 JOB # 20-15119K

CLIENT/SAMPLE ID: AEP- Clinch River 003D LAB/STATE: ENVIRON / TN

SURVIVAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 100% Temp (°C)			REPLICATES 1	2	3	4	5	6	7	8	9	10	Notes
					Adult											
LM 1000		8/22	24.8		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1407	8/23	24.3	24.3	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1151	8/24	24.2	24.3	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1005	8/25	25.0	25.0	Day 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1015	8/26	24.6	24.7	Day 4	2	3	✓	3	D/0	✓	✓	4	3	4	
	TL 1615	8/27	25.2	24.6	Day 5	10	9	7	10	|	4	11	21	D/0	7	
	LM 1040	8/28	25.0	24.9	Day 6	14	✓	10	11	|	✓	11	✓	|	12	
	LM 1119	8/29	24.7	24.9	Day 7	10	10	✓	✓	|	12	✓	6	|	✓	
LM 1036		8/30		24.7	Day 8	✓	10	✓	6	|	11	✓	✓	|	4	
			Total			26	22	17	24	D/0	27	22	31	D/3	23	195

SURVIVIAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration Temp (°C)			REPLICATES 1	2	3	4	5	6	7	8	9	10	Notes
					Day 0											
					Day 1											
					Day 2											
					Day 3											
					Day 4											
					Day 5											
					Day 6											
					Day 7											
					Day 8											
			Total													

✓ = Test Organism Alive 0 = Live neonates Miss = Lost or Missing

D = Test Organism Dead (-0) = Dead neonates M = Male

L/Ecoloxlab/Labforms/ToxTestSheets/7DchronicCD.doc

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TEST LOG NO. 18896

JOB NO. 20-11519K

CLIENT/SAMPLE ID: AEP- Clinch River 003D

TEST ORGANISM: *C. dubia*

DATE: 8/22/17

D.O. (mg/L)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	8.4	8.2	8.4	8.0	8.3	8.3	8.5	8.2	8.3	8.2	8.3	8.4	8.1	8.6
8.0%	8.4	8.1	8.2	8.1	8.4	8.3	8.4	8.1	8.3	8.2	8.4	8.6	8.1	8.4
16.0%	8.3	8.1	8.2	8.1	8.4	8.4	8.5	8.0	8.4	8.2	8.4	8.4	8.1	8.4
32%	8.2	8.0	8.1	8.2	8.2	8.5	8.6	8.0	8.4	8.2	8.4	8.2	8.1	8.4
64%	8.3	8.2	8.2	8.1	8.1	8.4	8.5	8.0	8.2	8.2	8.4	8.0	8.1	8.6
100%	8.1	8.1	8.3	8.0	8.2	8.5	8.5	8.0	8.2	8.2	8.5	7.9	8.2	8.5

pH (s.u.)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	7.59	7.31	7.46 7.42	7.60	7.57	7.54	7.64	7.62	7.66	7.49	7.58	7.34	7.49	7.30 7.54
8.0%	7.60	7.33	7.40 7.51	7.66	7.56	7.60	7.66	7.69	7.65	7.61	7.70	7.46	7.56	7.30 7.60
16.0%	7.59	7.33	7.40 7.55	7.84	7.60	7.66	7.83	7.63	7.71	7.72	7.77	7.58	7.62	7.36 7.62
32%	7.65	7.44	7.50 7.60	7.96	7.73	7.82	7.88	7.69	7.70	7.91	7.87	7.74	7.69	7.46 7.68
64%	7.73	7.56	7.60 7.60	8.06	7.82	8.03	7.92	7.88	7.72	8.08	7.92	7.95	7.80	7.71 7.74
100%	7.74	7.96	7.81 7.60	8.12	7.96	8.19	7.98	8.10	7.81	8.25	7.98	8.15	7.85	8.06 7.88
		7.94												

Conductivity (µmhos/cm)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	245	201	242 234	244	240	258	243	226	244	269	225	231	222	212 201
8.0%	297	298	237 309	304	485	451	469	441	330	349	323	323	294	291 316
16.0%	359	355	344 336	366	607	659	673	637	396	418	390	386	378	365 324
32%	492	431	470 483	494	1009	1068	1044	1088	571	891	520	520	505	479 512
64%	716	631	684 710	710	1440	1925	1978	2150	1107	906	765	745	729	694 733
100%	976	916	970 980	910	2090	2820	2790	2720	1147	1168	1115	1006	1066	1012 1104

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Params Intl/Time:	HM 0820	HM 1420 HM 0940	HM 1320 HM 0955	LZ 1019 HM 0937	HM 1043 HM 0915	TL 1646 TL 1104	LH 1045 LH 0725	LH 1300 HM 0877
Dilutions Intl/Time:	HM 0810	HM 0935 HM 0943	HM 0943	HM 0922	HM 0901	TL 1056	LH 0715	HM 0877
Control Water Batch#:	10596	10596	10597	10597	10597	6597	10597
Food Batch	5976 1160001	7L0103	7L0103	7L0103	160 03102	02.05	02.00

pH	Cond
7.53	219
7.48	300
7.49	368
7.50	496
7.57	742
7.80	1043

Day 8 only
DO 8.3
8.0
7.8
7.7
7.6
7.6

Fathead Minnow 7-d Larval Survival and Growth Test — **Ramboll Environ**

Analysis ID:	07-5994-1800	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:53	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	06-3400-8448	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	22 Aug-17	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	29 Aug-17	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	Environmental Consult & Test	**Age:**	

Sample ID:	02-2464-0834	**Code:**	D63BF42	**Client:**	AEP - Clinch River
Sample Date:	21 Aug-17	**Material:**	Power Plant	**Project:**	WET Monthly Compliance Test (AUG)
Receive Date:	22 Aug-17	**Source:**	Discharge Monitoring Report		
Sample Age:	24h	**Station:**	D003		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	NA	C > T	NA	NA	100	>100	NA	1	4.57%

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water		8	16	10	1	6	0.6105	Asymp	Non-Significant Effect
		16	18	10	1	6	0.8333	Asymp	Non-Significant Effect
		32	18	10	1	6	0.8333	Asymp	Non-Significant Effect
		64	18	10	1	6	0.8333	Asymp	Non-Significant Effect
		100	18	10	1	6	0.8333	Asymp	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.00543113	0.001086226	5	0.9788	0.4572	Non-Significant Effect
Error	0.01997585	0.001109769	18			
Total	0.02540698		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	0.9788	4.248	0.4572	Equal Variances
Variances	Levene Equality of Variance	8.809	4.248	0.0002	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.4936	0.884	<0.0001	Non-normal Distribution

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	4	1	1	1	1	1	1	0	0.0%	0.0%
8		4	0.975	0.8954	1	1	0.9	1	0.025	5.13%	2.5%
16		4	1	1	1	1	1	1	0	0.0%	0.0%
32		4	1	1	1	1	1	1	0	0.0%	0.0%
64		4	1	1	1	1	1	1	0	0.0%	0.0%
100		4	1	1	1	1	1	1	0	0.0%	0.0%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
8		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	2.89%
16		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
32		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
64		4	1.41	1.403	1.417	1.412	1.403	1.412	0.002171	0.31%	0.15%
100		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%

Fathead Minnow 7-d Larval Survival and Growth Test — **Ramboll Environ**

Analysis ID:	07-5994-1800	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:53	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1	1	1	1
8		1	1	0.9	1
16		1	1	1	1
32		1	1	1	1
64		1	1	1	1
100		1	1	1	1

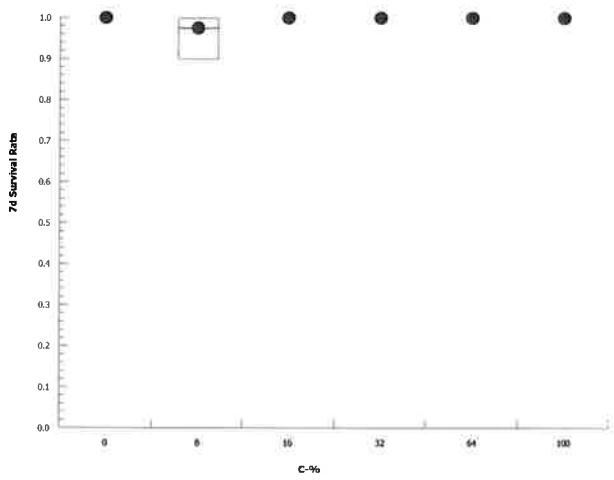
Angular (Corrected) Transformed Detail

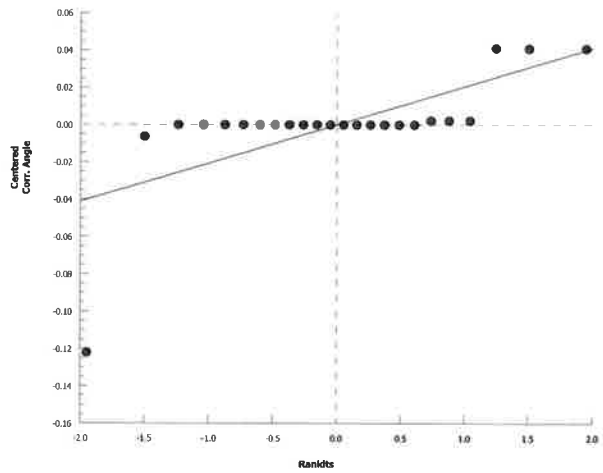
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	1.412	1.412	1.412	1.412
8		1.412	1.412	1.249	1.412
16		1.412	1.412	1.412	1.412
32		1.412	1.412	1.412	1.412
64		1.403	1.412	1.412	1.412
100		1.412	1.412	1.412	1.412

7d Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	10/10	10/10	10/10	10/10
8		10/10	10/10	9/10	10/10
16		10/10	10/10	10/10	10/10
32		10/10	10/10	10/10	10/10
64		9/9	10/10	10/10	10/10
100		10/10	10/10	10/10	10/10

Graphics





Fathead Minnow 7-d Larval Survival and Growth Test — **Ramboll Environ**

Analysis ID:	03-6110-5591	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:57	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	06-3400-8448	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	22 Aug-17	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	29 Aug-17	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	Environmental Consult & Test	**Age:**	

Sample ID:	02-2464-0834	**Code:**	D63BF42	**Client:**	AEP - Clinch River
Sample Date:	21 Aug-17	**Material:**	Power Plant	**Project:**	WET Monthly Compliance Test (AUG)
Receive Date:	22 Aug-17	**Source:**	Discharge Monitoring Report		
Sample Age:	24h	**Station:**	D003		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	NA	C > T	NA	NA	100	>100	NA	1	19.5%

Dunnett Multiple Comparison Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water		8	-1.561	2.407	0.068	6	0.9966	CDF	Non-Significant Effect
		16	-1.064	2.407	0.068	6	0.9855	CDF	Non-Significant Effect
		32	0.8512	2.407	0.068	6	0.4888	CDF	Non-Significant Effect
		64	-1.634	2.407	0.068	6	0.9972	CDF	Non-Significant Effect
		100	-0.7451	2.407	0.068	6	0.9664	CDF	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.3482	0.25 - NL	Yes	Passes Acceptability Criteria
PMSD	0.1949	0.12 - 0.3	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01476059	0.002952117	5	1.857	0.1523	Non-Significant Effect
Error	0.02861178	0.001589543	18			
Total	0.04337237		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.831	15.09	0.4368	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9761	0.884	0.8153	Normal Distribution

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	4	0.3482	0.2763	0.4202	0.3445	0.297	0.407	0.0226	12.98%	0.0%
8		4	0.3922	0.3117	0.4728	0.4005	0.326	0.442	0.0253	12.9%	-12.63%
16		4	0.3783	0.3344	0.4221	0.38	0.351	0.402	0.01379	7.29%	-8.62%
32		4	0.3243	0.3011	0.3474	0.3275	0.304	0.338	0.007261	4.48%	6.89%
64		4	0.3943	0.3089	0.4797	0.3745	0.356	0.4722	0.02683	13.61%	-13.22%
100		4	0.3693	0.3169	0.4216	0.357	0.346	0.417	0.01645	8.91%	-6.03%

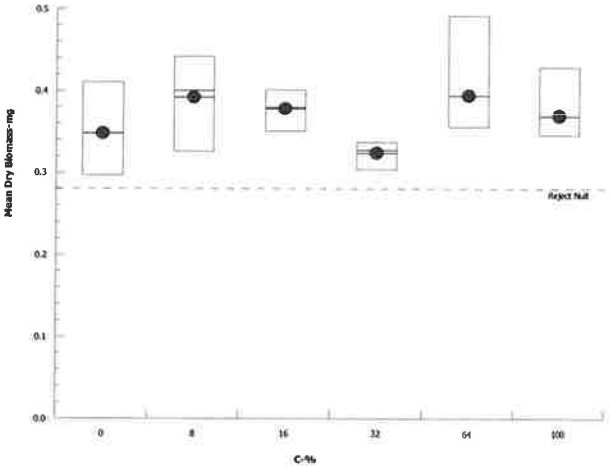
Mean Dry Biomass-mg Detail

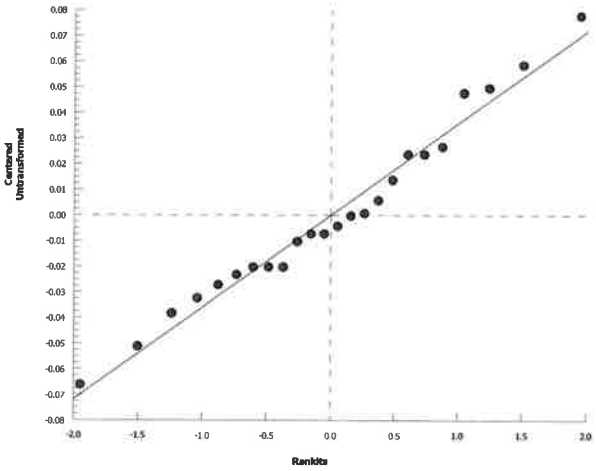
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	0.407	0.297	0.348	0.341
8		0.442	0.382	0.419	0.326
16		0.402	0.351	0.358	0.402
32		0.304	0.338	0.325	0.33
64		0.4722	0.387	0.356	0.362
100		0.365	0.349	0.346	0.417

Fathead Minnow 7-d Larval Survival and Growth Test — **Ramboll Environ**

Analysis ID:	03-6110-5591	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:57	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date:	05 Sep-17 10:58 (p 1 of 1)
Test Code:	18896 FISH | 00-4277-0510

Fathead Minnow 7-d Larval Survival and Growth Test — **Ramboll Environ**

Analysis ID:	18-6503-9027	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.4
Analyzed:	05 Sep-17 10:57	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	06-3400-8448	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	22 Aug-17	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	29 Aug-17	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	Environmental Consult & Test	**Age:**	

Sample ID:	02-2464-0834	**Code:**	D63BF42	**Client:**	AEP - Clinch River
Sample Date:	21 Aug-17	**Material:**	Power Plant	**Project:**	WET Monthly Compliance Test (AUG)
Receive Date:	22 Aug-17	**Source:**	Discharge Monitoring Report		
Sample Age:	24h	**Station:**	D003		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	887350	1000	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.3482	0.25 - NL	Yes	Passes Acceptability Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	N/A	N/A	<1	NA	NA

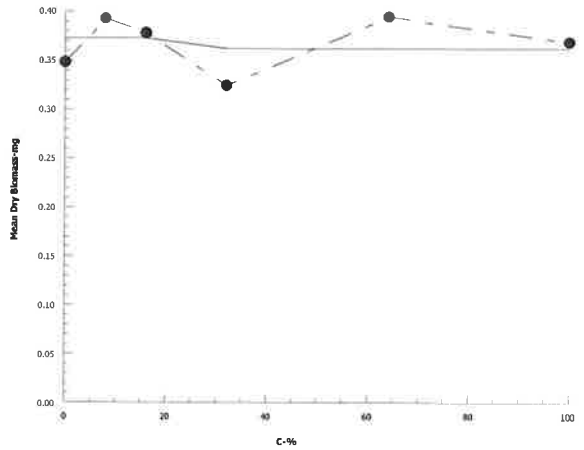
Mean Dry Biomass-mg Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	4	0.3482	0.297	0.407	0.0226	0.0452	12.98%	0.0%
8		4	0.3922	0.326	0.442	0.0253	0.05061	12.9%	-12.63%
16		4	0.3783	0.351	0.402	0.01379	0.02757	7.29%	-8.62%
32		4	0.3243	0.304	0.338	0.007261	0.01452	4.48%	6.89%
64		4	0.3943	0.356	0.4722	0.02683	0.05365	13.61%	-13.22%
100		4	0.3693	0.346	0.417	0.01645	0.03291	8.91%	-6.03%

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Lab Water	0.407	0.297	0.348	0.341
8		0.442	0.382	0.419	0.326
16		0.402	0.351	0.358	0.402
32		0.304	0.338	0.325	0.33
64		0.4722	0.387	0.356	0.362
100		0.365	0.349	0.346	0.417

Graphics



ENVIRON FATHEAD MINNOW SURVIVAL AND GROWTH 7-DAY CHRONIC TOXICITY TEST
EPA-821-R-02-013 Method 1000.0

TEST LOG NO.: 18896
JOB NUMBER.: 20-15119K
INDUSTRY: AEP-Clinch River
SAMPLE ID: Outfall 003D
DILUTION WATER: Mod Hard
NPDES: Yes X No
FOOD BATCH: 5910

BEGINNING: HRS: 1114 DATE: 8/22/17
ENDING: HRS: 1310 DATE: 8/29/17
TEST DILUTIONS: 8, 16, 32, 64, 100
ORGANISM AGE (date): 8/21/17
ORGANISM SOURCE: ECT#6004
SOURCE TEMP @ TEST START: 24.3
RANDOMIZED BY: LM

PHOTOPERIOD: 16 hr light/8 hr dark
FEEDING REGIME: 0.15 mL Artemia @ 2 times/day
TEST VESSEL CAPACITY: 450 mL
TEST SOLUTION VOLUME: 250 - 300 mL
NO. ORGANISMS/TREATMENT: 10
NO. REPLICATES: 4

CONC (%)	REP ID	SURVIVAL (#) START	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
Mod Hard	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.2	24.3/24.2	24.1/24.0	24.3/24.0	24.1/24.2	24.0/24.2	24.5/24.0	24.0
8	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	9
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.4	24.0/24.1	24.5/24.2	24.3/24.2	24.3/24.2	24.1/24.3	24.7/24.3	24.2
16	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.2	24.2/24.3	24.4/24.2	24.4/24.3	24.1/24.2	24.1/24.3	24.8/24.5	24.2
32	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.7	24.2/24.5	24.3/24.6	24.5/24.5	24.3/24.2	24.1/24.2	24.5/24.7	24.4
64	A	10	10	10	10	10	9 (n-1)	9	9 (n-1)
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.8	24.3/24.2	24.4/24.1	24.6/24.6	24.3/24.3	24.2/24.2	24.5/24.5	24.3
100	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.8	24.4/24.2	24.5/24.3	24.5/24.1	24.4/24.4	24.1/24.4	24.5/25.7	24.6
Test Renewal	Time	1114	1447	1255	1122	1208	1650	1115	1310
	Date	8/22/17	8/23/17	8/24/17	8/25/17	8/26/17	8/27/17	8/28/17	8/29/17
	Initials	LM	HM	HM	LM	HM	TL	LM	HM
morning feeding	Int/Time		HM0730	LM0657	HM0700	HM0745	TL0955	LM0650	
afternoon feeding	Int/Time	HM1545	HM1530	HM1500	HM1500	HM1445	TL1715	LM1500	

ENVIRON FATHEAD MINNOW SURVIVAL AND GROWTH 7-DAY CHRONIC TOXICITY TEST
EPA-821-R-02-013 Method 1000.0

TEST LOG NO.: 18896 BEGINNING: HRS: 1114 DATE: 8/22/17
JOB NO.: 20-15119K ENDING: HRS: 1300 DATE: 8/29/17
INDUSTRY: AEP-Clinch River
EFFLUENT: Outfall 003D NO. ORGANISMS/TREATMENT: 10
NPDES: Yes X No NO. REPLICATES: 4

PHOTOPERIOD: 16 hr light
FEEDING REGIME:
0.15 mL Artemia @ 2 times/day
TEST VESSEL CAPACITY: 450 mL
TEST SOLUTION VOLUME: 250 mL

GROWTH RESULTS

CONC (%)	REP ID	Boat ID 15	Tare wt (g)	Combined wt (g)	Tot Fish wt (g)	# of Fish	Fish Wt (mg) Per Final # of Fish
Mod Hard	A	1	1.09431	1.09838	0.00407	10	0.407
	B	2	1.04487	1.04784	0.00297	10	0.297
	C	3	1.09890	1.0238	0.00348	10	0.348
	D	4	1.10114	1.10455	0.00341	10	0.341
	E						
8	A	5	1.08306	1.08748	0.00442	10	
	B	6	1.02010	1.02392	0.00382	10	
	C	7	1.11352	1.11771	0.00419	9	
	D	8	1.10296	1.10622	0.00326	10	
	E						
16	A	9	1.09116	1.09518	0.00402	10	
	B	10	1.09744	1.10095	0.00351	10	
	C	11	1.10569	1.10927	0.00358	10	
	D	12	1.11977	1.12379	0.00402	10	
	E						
32	A	13	1.09269	1.09573	0.00304	10	
	B	14	1.10119	1.10457	0.00338	10	
	C	15	1.09234	1.09559	0.00325	10	
	D	16	1.08857	1.08587	0.00330	10	
	E						
64	A	17	1.12188	1.12613	0.00425	9 (n-1)	
	B	18	1.11132	1.11519	0.00387	10	
	C	19	1.08590	1.08946	0.00356	10	
	D	20	1.10443	1.10805	0.00362	10	
	E						
100	A	21	1.09697	1.10062	0.00365	10	
	B	22	1.11734	1.12083	0.00349	10	
	C	23	1.11832	1.12178	0.00346	10	
	D	24	1.10013	1.10430	0.00417	10	
	E						
	A						
	B						
	C						
	D						
	E						
	Initials / Date:		HM 8/17/16	—	—	—	

AVG Control Fish wt. 0.3482 **(using final #)**

Oven ID: 1

Tins In:
Date: 8/29/17
Time: 1322
Temp (°C): 100
Initials: HM

Tins Out:
Date: 8/30/17
Time: 0745
Temp (°C): 100
Initials: LM

FINAL WEIGHTS
DATE: 8/30/17
INITIALS: LM

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TEST LOG NO. 18896

CLIENT/SAMPLE ID: AEP- Clinch River 003D

JOB NO. 20-11519K

TEST ORGANISM: Fathead Minnow

DATE: 8/22/12

switch

D.O. (mg/L)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	8.4	8.4	8.2	8.5	8.3	8.6	8.5	8.2	8.3	7.9	8.3	7.8	8.1	7.8
8.0%	8.4	8.2	8.2	8.1	8.4	8.6	8.4	8.2	8.5	7.9	8.4	7.6	8.1	7.9
16.0%	8.3	8.2	8.3	7.4	8.4	8.5	8.5	8.1	8.4	7.9	8.4	7.9	8.1	7.9
32%	8.2	8.1	8.4	7.2	8.2	8.5	8.6	8.0	8.4	7.9	8.4	7.5	8.1	7.6
64%	8.3	8.2	8.4	7.0	8.1	8.5	8.5	8.0	8.2	7.9	8.4	7.4	8.2	7.6
100%	8.1	8.3	8.2	7.0	8.2	8.5	8.5	8.0	8.2	7.9	8.5	7.2	8.2	7.5

pH (s.u.)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	7.59	7.56	7.46	7.26	7.57	7.37	7.64	7.46	7.66	8.49	7.58	7.51	7.49	7.60
8.0%	7.60	7.59	7.42	7.31	7.56	7.42	7.66	7.49	7.65	7.49	7.70	7.56	7.56	7.58
16.0%	7.59	7.58	7.40	7.40	7.60	7.54	7.83	7.58	7.71	7.58	7.77	7.59	7.62	7.60
32%	7.65	7.60	7.50	7.42	7.73	7.68	7.85	7.80	7.70	7.62	7.87	7.78	7.69	7.76
64%	7.73	7.66	7.69	7.56	7.82	7.86	7.92	7.94	7.77	7.87	7.92	7.94	7.80	7.84
100%	7.74	7.66	7.85	7.74	7.90	8.04	7.98	8.01	7.81	8.02	7.98	7.98	7.85	7.89

Conductivity (µmhos/cm)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	245	234	242	219	240	235	243	246	244	272	225	231	222	217
8.0%	297	357	295	292	425	390	469	433	331	359	323	329	294	319
16.0%	359	323	344	343	1007	578	763	1023	390	453	390	404	378	384
32%	498	444	470	455	1129	924	1044	906	571	604	520	581	508	526
64%	716	742	1024	1068	1746	1589	1978	1000	1067	928	765	819	729	709
100%	976	930	970	923	2690	2530	2790	2550	1147	1394	1115	1132	1066	1104

	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
Params Intl/Time:	HM 0822	HM 0730	HM 0940	LH 0634	HM 0851	HM 0820	LH 0937	HM 0817	HM 0915	TL 0936	TL 1104	LH 0634	LH 0727	LH 0649
Dilutions Intl/Time:	HM 0820		HM 0923		HM 0943		HM 0922		HM 0901		TL 1056		LH 0710	
Control Water Batch#:	6597		6597		6597		6597		6597		6597		6597	
Food Batch	5910		5910		5910		5910		5910		5910		5910	

HM
up 8/23

TEST LOG NO. 18896 CLIENT: AEP Clinch River 003D DATE OF TEST: 8/22/17

JOB NO. 20-17828K TEST TYPE(S) PERFORMED: Fm & Cd Chronic

100% EFFLUENT

Batch #	Sample ID	Sample Date	1st Use Date	Hardness mg/L CaCO3	Alkalinity mg/L	TRC mg/L	NH_3N mg/L
07756	D003	8/20-21/17	8/22/17	240	130	0.03	<0.1
07762	D003	8/22-23/17	8/24/17	196	120	<0.02	0.102
07767	D003	8/24-25/17	8/26/17	208	130	<0.02	0.129

CONTROL / DILUTION WATER

Batch #	Sample ID	Sample Date	1st Use Date	Hardness mg/L CaCO3	Alkalinity mg/L	TRC mg/L
05916	MH	8/15/17	8/20/17	82.4	46	<0.02
05917	MH	8/17/17	8/23/17	92.8	45	<0.02

ATTACHMENT 2
CHAIN-OF-CUSTODY DOCUMENTATION AND REFERENCE TOXICANT DATA

Sample Receipt Checklist:

Client: AEP Clinch

Date/Time received 8/22/17 0625 by LM

1. Cooler sealed and intact upon arrival?	Yes	No
2. Custody seals present?	Yes	No
3. Samples received below 6 degrees Celsius?	Yes	No
4. Was ice present?	Yes	No
5. Is the COC filled out correctly including the sample date/time and signed?	Yes	No
6. Was the sample received within 36 hours of collection?	Yes	No
7. Did the sample(s) arrive in good condition?	Yes	No
8. Was pH and DO measured and in range?	Yes	No
9. Was residual chlorine present?	Yes	No
➢ 1.0 mg/L? (did dechlor occur)	Yes	No

Comments:

Batch #	Sample ID	Temp (C°)	pH (s.u.)	DO (mg/L)	TRC (mg/L)
20756	Outfall003	4.9	7.63	9.1	0.03

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Project Name: D003 WET Testing
Project Number:
Industry: AEP- Clinch River Plant
Phone: 2769897314
FAX:
County: Russell
City: Cleveland
State: VA
Sample Collected by (print): Bailey Jake Jackson, Jr.
Sample Collected by (signature): Bailey Jake Jackson Jr.
NPDES Permit No.: VA0001015
NPDES Test: ☐ No ☒ Yes

CHAIN-OF-CUSTODY

RAMBOLL ENVIRON
201 Summit View Drive, Suite 300
Brentwood, TN 37027
PHONE: 615-277-7554
FAX: (615) 377-4976

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other	Description Definitive or Screen	Sample B# (lab only)	Receipt Temp °C
Outfall 0003	Comp	Cube	yes	~~[illegible]~~ 1045/8/20	~~[illegible]~~ 1045/8/21	1	10					X	X				Definitive	207946	4.9

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **AW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks: Results due to VDEQ by 09/10/17

Measured TRC (if applicable): _____ mg/L

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples shipped via: ☒ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered	Condition: (lab use only)
Bailey Jake Jackson Jr.	8/21/17	1225			
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Containers/Volume Received: 1 / 10L	
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) Dan Klee	Date: 8/22/17	Time: 0625

pH upon arrival: 7.63
DO upon arrival: 9.1

Sample Receipt Checklist:

Client: AEP Clinch River

Date/Time received 8/24/17 0626 by LM

1. Cooler sealed and intact upon arrival?	Yes	No
2. Custody seals present?	Yes	No
3. Samples received below 6 degrees Celsius?	Yes	No
4. Was ice present?	Yes	No
5. Is the COC filled out correctly including the sample date/time and signed?	Yes	No
6. Was the sample received within 36 hours of collection?	Yes	No
7. Did the sample(s) arrive in good condition?	Yes	No
8. Was pH and DO measured and in range?	Yes	No
9. Was residual chlorine present?	Yes	No
➢ 1.0 mg/L? (did dechlor occur)	Yes	No

Comments:

Batch #	Sample ID	Temp (C°)	pH (s.u.)	DO (mg/L)	TRC (mg/L)
207162	Outfall 003	2.6	7.86	10.2	<0.02

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CHAIN-OF-CUSTODY

Ramboll ENVIRON
201 Summit View Drive, Suite 300
Brentwood, TN 37027
(615) 377-4775
FAX: (615) 377-4976

Project Name: D003 WET Testing
Project Number:
Industry: American Electric Power - Clinch River Plant
Phone: 276 889 7314
FAX:
County: Russell
City: Cleveland
State: VA
Sample Collected by (print): Karen Gilmer
NPDES Permit No.: VA0001015
Sample Collected by (signature): Karen M. Gilmer
NPDES Test: ☐ No ☒ Yes

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other	Description Definitive or Screen	Sample B# (lab only)
Outfall D003	Comp	Cube	yes	8/23/17 1220	8/24/17 1220	1	10					X	X				Definitive	20762

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **AW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks: Results due to VDEQ by 9/8/17

Measured TRC (if applicable): _____ mg/L (upon sampling)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples shipped via:	Condition:	TRC upon arrival:
Karen M. Gilmer	8/23/17	1330		☒ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered	good	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Receipt Temp: 2.6°C	Containers/Volume Received: 1/10L	Received on ice: (Y) / N
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 8/24/17	Time: 0626	pH upon arrival: 7.86
						DO upon arrival: 10.2

Sample Receipt Checklist:

Client: AEP Clinch

Date/Time received 8/26/17 0810 by HM

1. Cooler sealed and intact upon arrival? Yes No
2. Custody seals present? Yes No
3. Samples received below 6 degrees Celsius? Yes No
4. Was ice present? Yes No
5. Is the COC filled out correctly including the sample date/time and signed? Yes No
6. Was the sample received within 36 hours of collection? Yes No
7. Did the sample(s) arrive in good condition? Yes No
8. Was pH and DO measured and in range? Yes No
9. Was residual chlorine present? Yes No
   - 1.0 mg/L? (did dechlor occur) Yes No

Comments:

Batch #	Sample ID	Temp (C°)	pH (s.u.)	DO (mg/L)	TRC (mg/L)
20767	DOB	2.7	7.92	8.6	<0.02

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Project Name: D003 WET Testing
Project Number:
Industry: AEP-Clinch River Plant
Phone: 2760899 7314
FAX:
County: Russell
City: Cleveland
State: VA
Sample Collected by (print): Karen Gilmer
NPDES Permit No.: VA0001015
Sample Collected by (signature): Karen M. Gilmer
NPDES Test: ☐ No ☒ Yes

CHAIN-OF-CUSTODY

Ramboll ENVIRON
201 Summit View Drive, Suite 300
Brentwood, TN 37027
(615) 377-4775
FAX: (615) 377-4976

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other	Description Definitive or Screen	Sample B# (lab only)
																	~~Definitive~~	
D003	comp	cube	yes	8/24/17 1140	8/25/17 1140	1	10					X	X				Definitive	207107

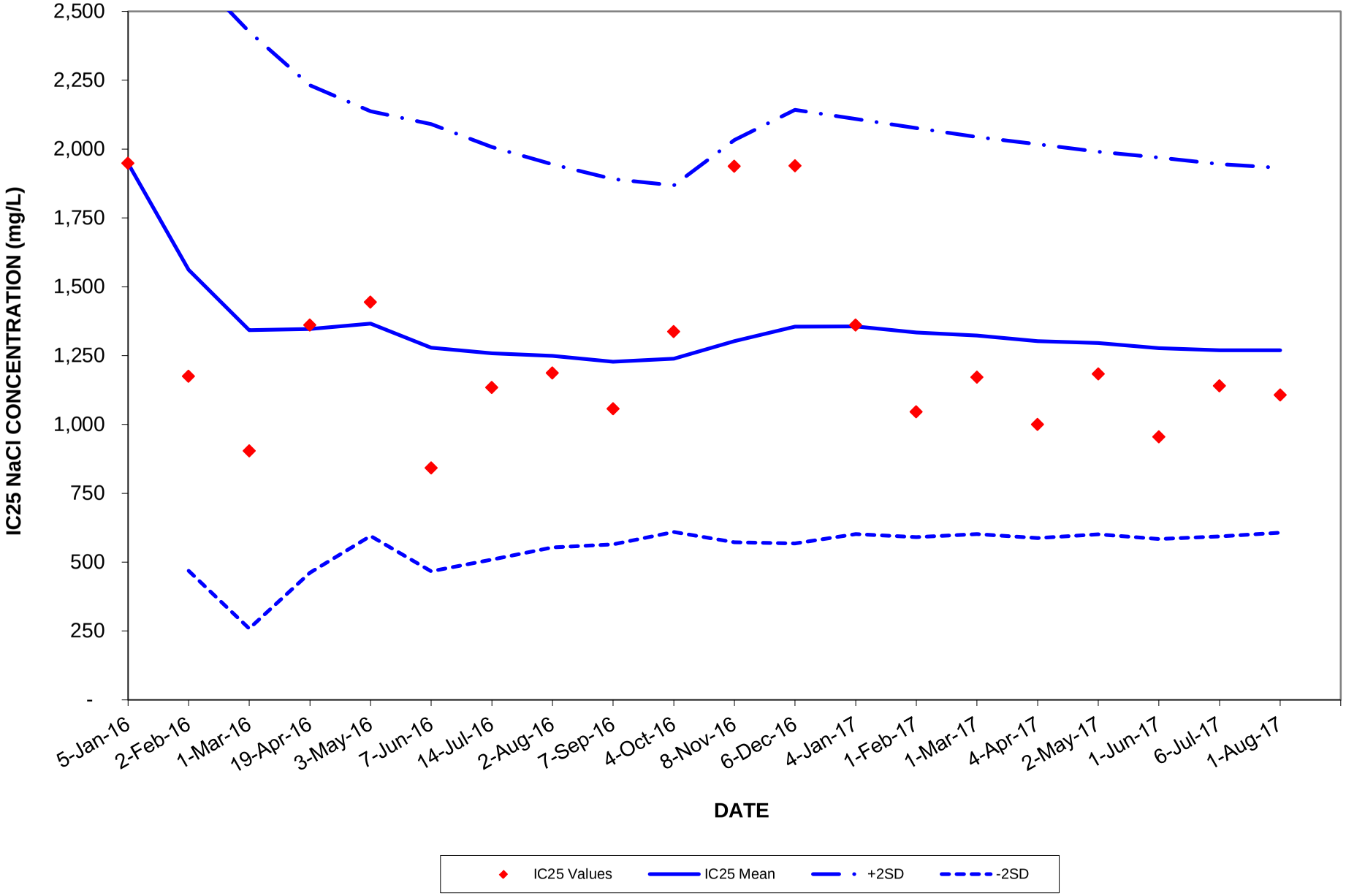
* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **AW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks: Results due to VDEQ by 09/08/17

Measured TRC (if applicable): _____ mg/L (upon sampling)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples shipped via: ☒ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered	Condition:	TRC upon arrival:
Karen M. Gilmer	8/25/17	1300			OK	
Relinquished by: (Signature)	**Date:**	**Time:**	**Received by: (Signature)**	**Receipt Temp:** 2.7	**Containers/Volume Received:** 10L	**Received on ice:** Y / N
Relinquished by: (Signature)	**Date:**	**Time:**	**Received for lab by: (Signature)**	**Date:** 8/26/17	**Time:** 0810	**pH upon arrival:** 7.92 / **DO upon arrival:** 8.6

CHRONIC REFERENCE TOXICANT TEST (NaCl) 2016 - 2017
FATHEAD MINNOWS



Fathead Minnow CHRONIC REFERENCE TOXICANT TESTING-SODIUM CHLORIDE (NaCl) 2016 - 2017

Test Number	Log Number	Test Initiation Date	Control Survival (%) (*)	Control Mean Dry Weight (mg/fish) (*)	SURVIVAL NOEC (mg/L)	SURVIVAL LOEC (mg/L)	GROWTH NOEC (mg/L)	GROWTH LOEC (mg/L)	PMSD (%)	IC25 VALUE (mg/L)	IC25 CUMULATIVE MEAN (mg/L)	IC25 ST. DEV. (mg/L)	IC25 2+ STD. DEV.	IC25 2- STD. DEV.	Coefficient of Variation (%)
1	17994	05-Jan-16	100	0.339	750	1,500	1,500	3,000	19.8	1,948	1,948				
2	18025	02-Feb-16	100	0.377	750	1,500	750	1,500	26.0	1,175	1,562	547	2,655	468	25
3	18074	01-Mar-16	100	0.672	750	1,500	750	1,500	22.0	904	1,342	542	2,426	259	33
4	18185	19-Apr-16	100	0.516	750	1,500	750	1,500	20.6	1,361	1,347	442	2,232	462	28
5	18205	03-May-16	100	0.399	750	1,500	750	1,500	27.5	1,444	1,366	386	2,138	595	25
6	18275	07-Jun-16	100	0.541	750	1,500	750	1,500	28.5	842	1,279	406	2,091	467	29
7	18340	14-Jul-16	100	0.347	750	1,500	750	1,500	22.0	1,134	1,258	375	2,007	509	28
8	18361	02-Aug-16	100	0.459	750	1,500	750	1,500	23.9	1,187	1,249	348	1,945	554	26
9	18425	07-Sep-16	95	0.403	750	1,500	750	1,500	22.2	1,057	1,228	332	1,891	565	25
10	18456	04-Oct-16	100	0.411	1,500	3,000	750	1,500	21.9	1,337	1,239	314	1,868	610	24
11	18579	08-Nov-16	100	0.514	1,500	3,000	1,500	3,000	23.8	1,937	1,302	365	2,033	572	27
12	18626	06-Dec-16	100	0.458	1,500	3,000	1,500	3,000	24.3	1,939	1,355	394	2,143	568	28
13	18675	04-Jan-17	100	0.406	750	1,500	750	1,500	24.0	1,361	1,356	377	2,110	602	27
14	18711	01-Feb-17	95	0.396	1,500	3,000	750	1,500	18.2	1,046	1,334	371	2,077	591	27
15	18752	01-Mar-17	97.5	0.471	750	1,500	750	1,500	15.2	1,171	1,323	360	2,044	602	26
16	18809	04-Apr-17	100	0.413	750	1,500	750	1,500	18.3	1,000	1,303	357	2,018	588	27
17	18850	02-May-17	97.5	0.564	1,500	3,000	375	750	16.8	1,183	1,296	347	1,990	601	26
18	18897	01-Jun-17	100	0.351	750	1,500	750	1,500	19.8	955	1,277	346	1,969	584	26
19	18934	06-Jul-17	97.5	0.358	750	1,500	750	1,500	21.0	1,140	1,270	338	1,946	593	26
20	18973	01-Aug-17	100	0.364	750	1,500	750	1,500	18.0	1,107	1,270	331	1,932	607	26
		Avg	99	0.438	938	1875	844	1688	21.7	1261	1354	383	2080	547	

Notes:

Dilution series - 0.375 g/L - 6.0 g/L

NOEC - No Observable Effect Concentration (survival or growth)

LOEC - Lowest Observable Effect Concentration (survival or growth)

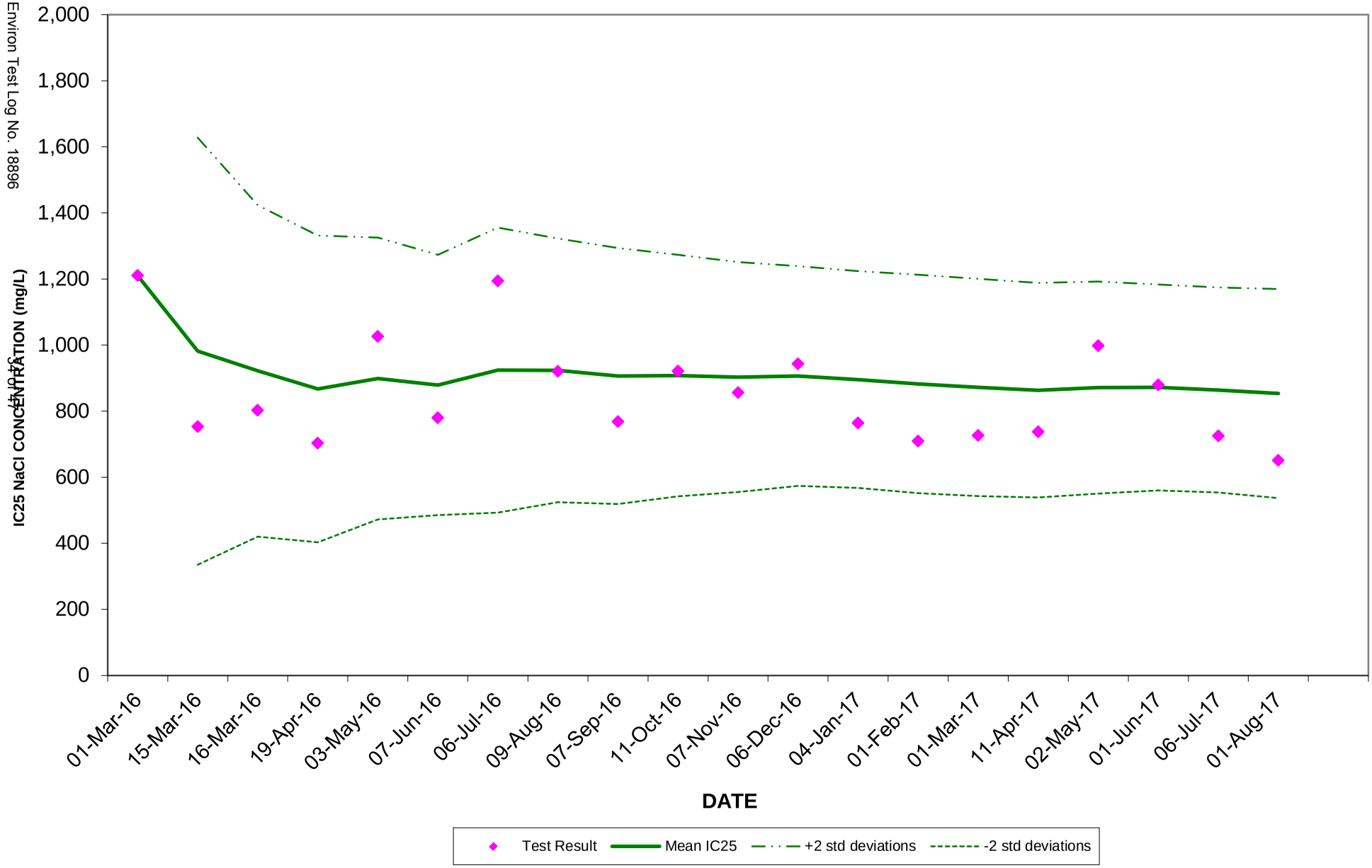
ACCEPTABLE TEST RESULTS - A growth NOEC ranging from 750 mg/L to 3,000 mg/L.

(*) used ABS fish

Minimum USEPA CONTROL CRITERIA - 80 percent survival and average dry weight of 0.25 mg (weight based on surviving number of fish).

Ramboll Environ Test Log No. 18896

CHRONIC REFERENCE TOXICANT (NaCl) 2016-2017
Ceriodaphnia dubia IC25



Ceriodaphnia dubia **CHRONIC REFERENCE TOXICANT TESTING IC25 - SODIUM CHLORIDE (NaCl) 2016-2017**

Test Number	Log Number	Test Initiation Date	Control Survival (%) (*)	3 Brood Production (%) (*)	Control Average Repro (*)	Survival		Reproduction			IC25 VALUE (mg/L)	IC25 CUMULATIVE MEAN (mg/L)	IC25 ST. DEV. (mg/L)	IC25 2+ STD. DEV.	IC25 2- STD. DEV.	Coefficient of Variation (%)
						NOEC (mg/L)	LOEC (mg/L)	NOEC (mg/L)	LOEC (mg/L)	PMSD						
1	18073	01-Mar-16	100	100	35.0	2,000	>2,000	500	1,000	7.4	1,210	1,210				0
2	18107	15-Mar-16	90	90	32.7	2,000	>2,000	500	1,000	22.6	753	982	323	1,628	335	23
3	18112	16-Mar-16	100	90	31.9	2,000	>2,000	500	1,000	16.4	802	922	251	1,423	420	22
4	18178	19-Apr-16	100	100	27.2	1,000	2,000	500	1,000	11.1	703	867	232	1,331	403	23
5	18206	03-May-16	100	100	29.3	1,000	2,000	500	1,000	13.4	1,026	899	213	1,325	472	21
6	18277	07-Jun-16	100	80	25.2	1,000	2,000	500	1,000	19.5	780	879	197	1,273	485	20
7	18328	06-Jul-16	100	100	28.8	2,000	>2000	1,000	2,000	12.5	1,194	924	216	1,355	493	22
8	18372	09-Aug-16	100	100	29.0	1,000	2,000	500	1,000	16.7	920	924	200	1,323	524	20
9	18424	07-Sep-16	90	90	25.4	1,000	2,000	500	1,000	15.6	768	906	194	1,294	519	20
10	18468	11-Oct-16	100	100	32.5	2,000	>2,000	500	1,000	19.8	921	908	183	1,273	542	19
11	18580	07-Nov-16	100	90	26.4	1,000	2,000	1,000	2,000	24.1	856	903	174	1,251	555	18
12	18632	06-Dec-16	100	80	24.9	2,000	>2000	500	1,000	23.9	943	906	166	1,239	574	18
13	18674	04-Jan-17	100	80	23.2	2,000	>2000	500	1,000	34.5	764	895	164	1,224	567	18
14	18712	01-Feb-17	100	90	28.1	1,000	2,000	500	1,000	17.3	709	882	165	1,213	551	18
15	18751	01-Mar-17	100	90	24.1	2,000	>2000	500	1,000	28.1	726	872	164	1,200	543	18
16	18830	11-Apr-17	100	90	27.4	2,000	>2000	500	1,000	28.6	737	863	162	1,188	539	18
17	18849	02-May-17	100	80	25.3	2,000	>2000	1,000	2,000	19.9	998	871	160	1,192	550	18
18	18893	01-Jun-17	90	80	24.6	2,000	>2000	1,000	2,000	40.4	879	872	156	1,183	560	17
19	18935	06-Jul-17	100	90	25.9	2,000	>2000	500	1,000	24.1	725	864	155	1,174	554	17
20	18972	01-Aug-17	90	80	28.2	1,000	2,000	500	1,000	33.9	651	853	158	1,170	537	18
		Avg	98	90	27.8	1600	2000	600	1200	21.5	853	910	191	1277	512	

Notes:
NOEC - No Observable Effect Concentration (survival or reproduction)
LOEC - Lowest Observable Effect Concentration (survival or reproduction)
(*) Minimum USEPA CONTROL CRITERIA - 80 percent survival, 80 percent with 3 broods, and average reproduction of 15 neonates/adult.

ATTACHMENT 3
DATA FOR TEST TERMINATED EARLY

ENVIRON FATHEAD MINNOW SURVIVAL AND GROWTH 7-DAY CHRONIC TOXICITY TEST
EPA-821-R-02-013 Method 1000.0

TEST LOG NO.: 18985
JOB NUMBER: 20-15119K
INDUSTRY: AEP-Clinch River
SAMPLE ID: Outfall 003D
DILUTION WATER: Mod Hard
NPDES: Yes X No
FOOD BATCH: 5910

BEGINNING: HRS: 1108 DATE: 8/15/17
ENDING: HRS: DATE:
TEST DILUTIONS: 8, 16, 32, 64, 100
ORGANISM AGE (date): 8/14/17
ORGANISM SOURCE: ECT # 59916
SOURCE TEMP @ TEST START: 24.2
RANDOMIZED BY: HM

PHOTOPERIOD: 16 hr light/8 hr dark
FEEDING REGIME: 0.15 mL Artemia @ 2 times/day
TEST VESSEL CAPACITY: 450 mL
TEST SOLUTION VOLUME: 250 - 300 mL
NO. ORGANISMS/TREATMENT: 10
NO. REPLICATES: 4

CONC (%)	REP ID	SURVIVAL (#) START	DAY 1	DAY 2 HHC	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
Mod Hard	A	10	10	9 10	10	10	10		
	B	10	10	10	10	10	10		
	C	10	10	10	10	10	10		
	D	10	10	10	10	10	10		
	E								
	Temp(°c):old/new	24.2	24.3/24.3	24.2/24.1	24.0/24.0	24.0/24.0	24.2/24.2		
8	A	10	10	10	10	10	10		
	B	10	10	10	10	10	10		
	C	10	10	10	10	10	10		
	D	10	10	10	10	10	10		
	E								
	Temp(°c):old/new	24.0	24.5/24.4	24.3/24.5	24.4/24.2	24.1/24.0	24.4/24.8		
16	A	10	10	10	10	10	10		
	B	10	10	10	10	10	9		
	C	10	10	10	10	10	10		
	D	10	10	10	10	9 (n-1)	8		
	E								
	Temp(°c):old/new	24.4	24.6/24.3	24.1/24.2	24.0/24.0	24.1/24.0	24.0/24.8		
32	A	10	10	10	10	10	9		
	B	10	10	10	10	10	10		
	C	10	10	10	10	10	10		
	D	10	10	10	10	10	10		
	E								
	Temp(°c):old/new	24.3	24.3/24.2	24.0/24.4	24.0/24.0	24.0/24.2	24.2/24.6		
64	A	10	10	10	10	10	10		
	B	10	10	10	10	10	10		
	C	10	10	10	10	10	10		
	D	10	10	10	10	10	10		
	E								
	Temp(°c):old/new	24.2	24.3/24.5	24.2/24.3	24.0/24.0	24.1/24.5	24.1/24.7		
100	A	10	10	10	9	9	9		
	B	10	10	10	10	10	10		
	C	10	10	10	10	10	10		
	D	10	10	10	10	10	10		
	E								
	Temp(°c):old/new	24.8	24.5/24.7	24.2/24.1	24.1/24.0	24.1/24.2	24.1/24.6		
Test Renewal	Time	1100	1114	1040	1228	1238	1405		
	Date	8/15/17	8/16/17	8/17/17	8/18/17	8/19/17	8/20/17		
	Initials	HM	LM	HM	LM	TL	TL		
morning feeding	Int/Time		LM 0700	LM 0700	LM 0700	HM 0700	LM 0715		
afternoon feeding	Int/Time	HM 1515	LM 1520	LM 1515	HM 1530	TL 1346	LM 1445		

No Sample

TEST LOG NO. 18985

JOB NO. 20-11519K

CLIENT/SAMPLE ID: AEP- Clinch River 003D

TEST ORGANISM: Fathead Minnow

DATE: 8/15/17

D.O. (mg/L)

Concentration	Start (HM 8/15)	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	8.5	8.4	8.3	8.0	8.5	7.6	8.4	8.7	8.6	8.6	8.2	8.6	8.3	
8.0%	8.4	8.5	8.3	7.8	8.3	7.6	8.4	8.7	8.3	8.5	8.1	8.4	8.2	
16.0%	~~8.4~~ 8.3	8.2	8.1	7.7	8.4	7.4	8.2	8.7	8.3	8.5	8.2	8.5	8.3	
32%	8.3	8.2	8.2	7.6	8.4	7.6	8.1	8.7	8.2	8.5	7.9	8.6	8.4	
64%	~~8.3~~ 8.4	8.0	8.1	7.5	8.3	7.4	8.2	8.7	8.3	8.5	8.1	8.6	8.3	
100%	8.4	8.0	8.2	7.5	8.2	7.2	8.3	8.7	8.3	8.5	8.2	8.7	8.4	

pH (s.u.)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	7.64	7.48	7.62	7.29	7.59	7.50	7.80	7.52	7.49	8.18	7.55	7.40	7.46	
8.0%	7.65	7.36	7.66	7.33	7.63	7.38	7.79	7.48	7.52	7.39	7.65	7.36	7.51	
16.0%	7.69	7.36	7.69	7.33	7.72	7.34	7.79	7.52	7.56	7.44	7.67	7.39	7.56	
32%	7.77	7.56	7.76	7.44	7.82	7.39	7.76	7.59	7.61	7.44	7.69	7.68	7.62	
64%	7.84	7.71	7.85	7.69	7.86	7.64	7.80	7.75	7.76	7.56	7.76	7.91	7.74	
100%	7.93	7.91	7.84	7.90	7.94	7.86	7.86	7.87	7.78	7.80	7.79	8.12	7.77	

Conductivity (µmhos/cm)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	234	218	234	235	247	238	241	230	252	261	254	237	238	
8.0%	273	259	277	284	286	275	286	270	286	289	291	261	279	
16.0%	307	301	305	313	328	312	314	302	336	329	346	289	323	
32%	366	360	375	373	402	382	384	377	401	390	396	330	388	
64%	521	479	516	516	546	498	530	498	546	522	517	419	517	
100%	670	624	698	664	706	641	684	624	699	662	669	589	683	

	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
Params Intl/Time:	HM 0920	LM 0635	HM 0932	LM 0628	HM 0932	LM 0641	HM 0840	TL 0830	LTH 1200	TL 0926	LTH 1015	LTH 0840	LTH 0948	
Dilutions Intl/Time:	HM 0940		HM 0920		HM 0920		HM 0828		LTH 1145		LTH 1800		LTH 0930	
Control Water Batch#:	6588		6588		6595		6595		6595		6596		6596	
Food Batch	5910		5910		5910		5910		5910		5910		5910	

L:\Ecotox Lab\LABFORMS\Client Test Sheets\AEP -Clinch River\Clinch 003\Parameter Sheet

ENVIRON CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION 3-BROOD CHRONIC TOXICITY TEST
EPA-821-R-02-013 Method 1002.0

TEST LOG NO.: 18985

JOB NUMBER.: 20-15119K

INDUSTRY: AEP- Clinch River

SAMPLE ID: Outfall 003D

DILUTION WATER: Mod Hard

NPDES (Y/N) : Y

PHOTOPERIOD: 16 hr light/8 hr dark

FEEDING REGIME: 0.1 mL YCT / 0.1 mL R. subcapitata per 15 mL

TEST VESSEL CAPACITY: 30 mL

TEST SOLUTION VOLUME: 15 mL

NO. ORGANISMS/REPLICATE: 1

NO. REPLICATES: 10

ORGANISM SOURCE INFORMATION:

AGE (date): 8/14/17

TEMP @ TEST START: 24.6

RANDOMIZED BY: LM

SOURCE ID:	AGE (time):
11869	1231- 1502
11868	1231- 1501

TEST START:

HOURS: 1048 DATE: 8/15/17

TEST END:

HOURS: DATE:

SURVIVAL AND REPRODUCTION DATA

Test Start & Feeding/ End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Control Mod Hard Temp (°C)			REPLICATES 1 (69)	2	3 (68)	4 (69)	5	6	7	8	9	10 (68)	Notes
					Adult	1	5	5	11	13	17	18	19	16	10	
LM 1048		8/15	24.4		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1025	8/16	24.9	25.2	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1014	8/17	24.4	24.3	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1126	8/18	24.7	24.9	Day 3	4	4	4	6	5	✓	6	5	✓	6	
	LTH 1210	8/19	24.3	24.4	Day 4	✓	✓	✓	✓	✓	5	✓	9	4	✓	
	TL 1052	8/20	24.1	24.3	Day 5	10	13	11	14	9	13	6	✓	14	13	
	LTH 1150	8/21		24.9	Day 6	12	15	13	10	19	✓	10	15	✓	20	
					Day 7											
					Day 8	NO		3rd		Sample						
			Total													

✓ = Test Organism Alive
D = Test Organism Dead
0 = Live neonates
(-0) = Dead neonates
Miss = Lost or Missing
M = Male

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TEST LOG # 18985 JOB # 20-15119K

CLIENT/SAMPLE ID: AEP- Clinch River 003D LAB/STATE: ENVIRON / TN

SURVIVAL AND REPRODUCTION DATA

Test Start & Feeding/ End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 8.0% Temp (°C)			REPLICATES 1	2	3	4	5	6	7	8	9	10	Notes
					Adult											
LM 1048		8/15	24.5		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1025	8/16	24.8	25.3	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1014	8/17	24.6	24.2	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1124	8/18	25.1	24.8	Day 3			3	4	5	✓	6	5		5	
	LTH 1210	8/19	24.6	24.9	Day 4	7		8	✓	✓	4	12	11	7	✓	
	TL 1052	8/20	24.2	24.5	Day 5	11	7	✓	12	13	9	✓	✓	12	16	
	LTH 1150	8/21		25.4	Day 6	✓	12	15	18	18	✓	14	18	17	16	
					Day 7											
					Day 8											
			Total													

SURVIVIAL AND REPRODUCTION DATA

Test Start & Feeding/ End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 16% Temp (°C)			REPLICATES 1	2	3	4	5	6	7	8	9	10	Notes
LM 1048		8/15	24.6		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1025	8/16	25.1	25.4	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1014	8/17	24.3	24.4	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1124	8/18	24.7	24.6	Day 3	✓	✓	4	3	4	5	5	3	5	5	
	LTH 1210	8/19	24.5	24.9	Day 4	4	4	✓	✓	✓	✓	✓	8	✓	9	
	TL 1052	8/20	24.8	25.3	Day 5	10	9	11	11	7	13	10	✓	15	✓	
	LTH 1150	8/21		25.5	Day 6	13	✓	(2)	14	15	18	10	15	23	20	
					Day 7											
					Day 8											
			Total													

✓ = Test Organism Alive 0 = Live neonates Miss = Lost or Missing

D = Test Organism Dead (-0) = Dead neonates M = Male

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TEST LOG # 18985 JOB # 20-15119K

CLIENT/SAMPLE ID: AEP- Clinch River 003D LAB/STATE: ENVIRON / TN

SURVIVAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 32% Temp (°C)			REPLICATES										Notes
						1	2	3	4	5	6	7	8	9	10	
					Adult											
LM 1048		8/15	24.7		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1025	8/16	24.9	25.1	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1014	8/17	24.4	24.6	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1126	8/18	24.9	25.1	Day 3	✓	✓	5	4	✓	4		3		4	
	LTH 1210	8/19	24.5	24.7	Day 4	2	5	✓	✓	4	✓	8	✓	6	12	
	TL 1052	8/20	24.6	24.8	Day 5	8	15	10	14	13	14	12	12	12	✓	
	LTH 1150	8/21		25.6	Day 6	10	23	16	20	18	24	✓	18	19	17	
					Day 7											
					Day 8											
			Total													

SURVIVIAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 64% Temp (°C)			REPLICATES										Notes
						1	2	3	4	5	6	7	8	9	10	
LM 1048		8/15	24.6		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1025	8/16	24.9	25.1	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1014	8/17	24.5	24.8	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1126	8/18	24.7	24.8	Day 3	✓	4	✓	4	6	✓	✓	4	5	✓	
	LTH 1210	8/19	24.7	25.7	Day 4	2	✓	5	13	✓	4	3	✓	✓	3	
	TL 1052	8/20	24.6	24.1	Day 5	✓	16	12	✓	13	9	8	9	13	14	
	LTH 1150	8/21		25.4	Day 6	8	20	✓	22	22	17	18	10	23	✓	
					Day 7											
					Day 8											
			Total													

✓ = Test Organism Alive
D = Test Organism Dead
0 = Live neonates
(-0) = Dead neonates
Miss = Lost or Missing
M = Male

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TEST LOG # 18985 JOB # 20-15119K

CLIENT/SAMPLE ID: AEP- Clinch River 003D LAB/STATE: ENVIRON / TN

SURVIVAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration 100% Temp (°C)			REPLICATES										Notes
						1	2	3	4	5	6	7	8	9	10	
					Adult											
LM 1048		8/15	24.7		Day 0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1025	8/16	25.2	25.1	Day 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	HM 1014	8/17	24.0	24.4	Day 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	LM 1126	8/18	24.7	24.9	Day 3	6	✓	✓	✓	5	✓	3	✓	5	5	
	LTH 1210	8/19	25.6	25.6	Day 4	✓	6	6	6	10	3	✓	5	✓	✓	
	TL 1052	8/20	24.7	24.4	Day 5	14	13	12	✓	✓	8	4	12	10	10	
	LTH 1150	8/21		25.8	Day 6	15	✓	✓	16	15	13	12	14	12	14	
					Day 7											
					Day 8											
			Total													

SURVIVIAL AND REPRODUCTION DATA																
Test Start & Feedingl / End Initials/ Time	Daily Renewal & Feeding Initials/ Time	Date	Concentration Temp (°C)			REPLICATES										Notes
						1	2	3	4	5	6	7	8	9	10	
					Day 0											
					Day 1											
					Day 2											
					Day 3											
					Day 4											
					Day 5											
					Day 6											
					Day 7											
					Day 8											
			Total													

✓ = Test Organism Alive 0 = Live neonates Miss = Lost or Missing

D = Test Organism Dead (-0) = Dead neonates M = Male

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TEST LOG NO. 18985

JOB NO. 20-11519K

CLIENT/SAMPLE ID: AEP- Clinch River 003D

TEST ORGANISM: *C. dubia*

DATE: 8/15/17

D.O. (mg/L)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	8.5	8.6	8.3	8.4	8.5	8.3	8.4	8.2	8.6	8.6	8.2	8.4		
8.0%	8.4	8.6	8.2	8.4	8.3	8.4	8.4	8.1	8.3	8.6	8.1	8.4		
16.0%	8.3	8.5	8.1	8.1	8.4	8.2	8.2	8.1	8.3	8.6	8.2	8.4		
32%	8.3	8.4	8.2	8.2	8.4	8.3	8.1	8.0	8.2	8.6	7.9	8.5		
64%	8.4	8.3	8.1	8.2	8.3	8.2	8.2	8.0	8.3	8.5	8.1	8.4		
100%	8.4	8.2	8.2	8.3	8.2	8.1	8.3	8.1	8.3	8.5	8.2	8.3		

pH (s.u.)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	7.64	7.48	7.62	7.66	7.59	7.40	7.80	7.49	7.49	7.56	7.55	7.43		
8.0%	7.65	7.53	7.66	7.72	7.63	7.48	7.79	7.50	7.52	7.64	7.65	7.48		
16.0%	7.69	7.63	7.69	7.74	7.72	7.55	7.79	7.64	7.56	7.70	7.67	7.63		
32%	7.77	7.72	7.76	7.85	7.82	7.68	7.76	7.70	7.61	7.79	7.69	7.71		
64%	7.84	7.95	7.85	8.01	7.86	7.80	7.80	7.85	7.76	7.95	7.76	7.81		
100%	7.92	8.16	7.84	8.22	7.91	7.96	7.80	7.99	7.78	8.09	7.79	7.97		

Conductivity (µmhos/cm)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	234	221	234	244	247	225	241	272	252	275	254	245		
8.0%	273	272	277	289	286	281	286	305	286	307	291	273		
16.0%	307	314	305	320	328	316	314	333	336	356	346	328		
32%	366	377	378	388	402	387	384	408	401	417	396	384		
64%	521	504	516	547	546	516	530	547	546	567	517	511		
100%	670	702	698	710	706	654	684	704	699	705	669	675		

	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
Params Intl/Time:	HM 0920	LM1032	HM0931	HM1021	HM 0932	LM1135	HM0842	LTH1225	LTH 1200	TL1133	LTH 1015	LTH 1205		
Dilutions Intl/Time:	HM 0910		HM0920		HM 0920		HM0820		LTH 1145		LTH 1000			
Control Water Batch#:	6588		6588		6595		6595		6595		6596			
Food Batch	5976, 5995		76,98		76,98		76,98		76,98		76,01			

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Sample Receipt Checklist:

Client: AEP Clinch

Date/Time received 8/15/17 0630 by LM

1. Cooler sealed and intact upon arrival?	Yes	No
2. Custody seals present?	Yes	No
3. Samples received below 6 degrees Celsius?	Yes	No
4. Was ice present?	Yes	No
5. Is the COC filled out correctly including the sample date/time and signed?	Yes	No
6. Was the sample received within 36 hours of collection?	Yes	No
7. Did the sample(s) arrive in good condition?	Yes	No
8. Was pH and DO measured and in range?	Yes	No
9. Was residual chlorine present?	Yes	No
➢ 1.0 mg/L? (did dechlor occur)	Yes	No

Comments:

Batch #	Sample ID	Temp (C°)	pH (s.u.)	DO (mg/L)	TRC (mg/L)
20743	Outfall 008	2.1	7.76	9.2	<0.02

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Project Name: D003 WET Testing
Project Number:
Industry: AEP- Clinch River Plant
Phone: 2769897314
FAX:
County: Russell
City: Cleveland
State: VA
Sample Collected by (print): Karen Gilmer
NPDES Permit No.: VA0001015
Sample Collected by (signature): Karen M Gilmer
NPDES Test: ☐ No ☒ Yes

CHAIN-OF-CUSTODY

RAMBOLL ENVIRON
201 Summit View Drive, Suite 300
Brentwood, TN 37027
PHONE: 615-277-7554
FAX: (615) 377-4976

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other	Description Definitive or Screen	Sample B# (lab only)	Receipt Temp °C
Outfall D003	Comp	Cube	yes	8/13/17 1200	8/14/17 1200	1	10	X		X		X	X				Definitive	20743	2.1

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **AW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks: Results due to VDEQ by 9/10/17

Measured TRC (if applicable): _____ mg/L

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples shipped via: ☐ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered	Condition: (lab use only)
Karen M Gilmer	8/14/17	1340			
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Containers/Volume Received: 1/10L	
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 8/15/17	Time: 0630

pH upon arrival: 7.76
DO upon arrival: 9.2

Sample Receipt Checklist:

Client: AEP Clinch

Date/Time received 8/17/17 0620 by LM

1. Cooler sealed and intact upon arrival?	Yes	No
2. Custody seals present?	Yes	No
3. Samples received below 6 degrees Celsius?	Yes	No
4. Was ice present?	Yes	No
5. Is the COC filled out correctly including the sample date/time and signed?	Yes	No
6. Was the sample received within 36 hours of collection?	Yes	No
7. Did the sample(s) arrive in good condition?	Yes	No
8. Was pH and DO measured and in range?	Yes	No
9. Was residual chlorine present?	Yes	No
➢ 1.0 mg/L? (did dechlor occur)	Yes	No

Comments:

Batch #	Sample ID	Temp (C°)	pH (s.u.)	DO (mg/L)	TRC (mg/L)
20747	outfall 003	2.0	7.85	8.4	<0.02

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CHAIN-OF-CUSTODY

RAMBOLL ENVIRON
201 Summit View Drive, Suite 300
Brentwood, TN 37027
PHONE: 615-277-7554
FAX: (615) 377-4976

Project Name: D003 WET Testing
Project Number:
Industry: AEP- Clinch River Plant
Phone: 2769997314
FAX:
County: ~~Rutte~~ Russell
City: Cleveland
State: VA
Sample Collected by (print): Karen Gilmer
NPDES Permit No.: VA0001015
Sample Collected by (signature): Karen M Gilmer
NPDES Test: ☐ No ☒ Yes

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other	Description Definitive or Screen	Sample B# (lab only)	Receipt Temp °C
outfall D003	Comp	Cube	yes	8/15/17 1145	8/16/17 1145	1	10					X	X				Definitive	20747	2.0

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **AW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks: Results due to VDEQ by 9/10/17

Measured TRC (if applicable): _____ mg/L

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
Karen M Gilmer	8/16/17	1330	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)
			Karen Miller

Samples shipped via: ☒ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered

Condition: OK (lab use only)

Containers/Volume Received: 1/10L

Date: 8/17/17 Time: 0620 pH upon arrival: 7.85 DO upon arrival: 8.4