TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A, Fort Collins, Colorado, 80524
T 970.416.0916 F 970.490.2963

TRE Environmental Strategies

July 29, 2020

Mr. Christopher Bittner
Standards Coordinator
Utah Dept. of Environmental Quality
195 N 1950 W
Salt Lake City, UT 84116

Dr. Gary Belovsky
Environ. Res. Center & Dept. Biol Sci.
University of Notre Dame
Notre Dame, IN 46556

Subject: Results of Analytical Data for Experiment #18

Mr. Bittner/ Dr. Belovsky:

Below is a summary of the copper analytical data for the short-term chronic brine shrimp experiment initiated on May 28, 2020. Total copper samples were collected in new solutions at test initiation or on Day 1.

Characterization of Recon Water

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)	Salinity (ppt)
RW#13943	7.9	NM	NM	136,000	NM	NM	120

[a]As CaCO3
[b]Total residual chlorine

Results of Copper Analysis

Total Copper (µg/L)		
Nominal Value (µg/L)	Day 0/1 New Solution	Percent of Nominal
0	<42 U	---
125	113	90
250	254	102
500	459	92
1,000	1,020	102
2,000	2,080	104

U= below method detection limit (42 µg/L)

Measured copper concentrations were then used to recalculate test survival and growth endpoints on a measured basis.

Test Endpoints

Basis	Survival NOEC	Survival IC20	Growth NOEC	Growth IC20
Nominal	1,000	1,196 (768-1,501)	500	752 (602–888)
Measured	1,020	1,223 (752-1,574)	459	741 (570- 879)

We greatly appreciate the opportunity to complete this study for you. Please do not hesitate to call if you have any questions or concerns.

Sincerely,

Amanda Bidlack
Project Specialist / QA Officer
bidlackac.tre@gmail.com

Rami B. Naddy, Ph.D.
Manager / Environmental Toxicologist
naddyrb.tre@gmail.com

17001-474-073

Attachment

cc: David Pillard, TRE

(1) ~~Fathead Minnow~~ 7-d Larval Survival and Growth Test — TRE Environmental Strategies

Analysis ID:	19-2331-3875	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	23 Jul-20 10:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	12-4587-5991	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	28 May-20 14:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	rGSL
Ending Date:	04 Jun-20 13:50	**Species:**	Artemia franciscana	**Brine:**	Crystal Sea
Duration:	7d	**Source:**	In-House Culture	**Age:**	48h
Sample ID:	13-8865-2988	**Code:**	52C529BC	**Client:**	Notre Dame
Sample Date:	28 May-20 10:35	**Material:**	Copper chloride	**Project:**	Special Studies
Receive Date:	28 May-20 10:35	**Source:**	Discharge Monitoring Report		
Sample Age:	4h	**Station:**	Effluent		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1373496	200	Yes	Two-Point Interpolation

Point Estimates

Level	µg/L	95% LCL	95% UCL
LC5	688.1	321.6	1318
LC10	963.9	455.3	1340
LC15	1110	617.2	1430
LC20	1223	751.7	1574
LC25	1337	872.4	1703
LC40	1676	1276	2184
LC50	1903	1418	N/A

7d Survival Rate Summary — Calculated Variate(A/B)

C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
42	Dilution Water	4	0.975	0.9	1	0.025	0.05	5.13%	0.0%	39	40
113		4	0.975	0.9	1	0.025	0.05	5.13%	0.0%	39	40
254		4	1	1	1	0	0	0.0%	-2.56%	40	40
459		4	0.975	0.9	1	0.025	0.05	5.13%	0.0%	39	40
1020		4	0.875	0.7	1	0.06292	0.1258	14.4%	10.3%	35	40
2080		4	0.4114	0.1	0.6	0.112	0.2241	54.5%	57.8%	17	41

7d Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
42	Dilution Water	0.9	1	1	1
113		1	1	0.9	1
254		1	1	1	1
459		0.9	1	1	1
1020		1	0.7	0.9	0.9
2080		0.4	0.6	0.1	0.5455

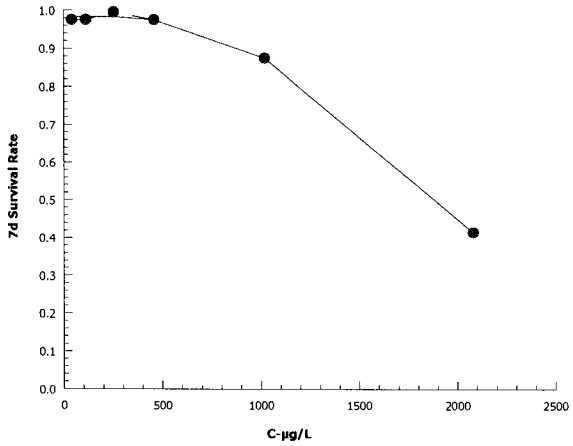
7d Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
42	Dilution Water	9/10	10/10	10/10	10/10
113		10/10	10/10	9/10	10/10
254		10/10	10/10	10/10	10/10
459		9/10	10/10	10/10	10/10
1020		10/10	7/10	9/10	9/10
2080		4/10	6/10	1/10	6/11

(1) DNP 7/24/20 E

Analysis ID:	19-2331-3875	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	23 Jul-20 10:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



(1) DAP 7/24/20 E

CETIS Analytical Report

Brine shrimp

Report Date:	23 Jul-20 10:32 (p 1 of 2)
Test Code:	474-073 | 20-3062-8299

① ~~Fathead Minnow~~ 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	16-7793-9613	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	23 Jul-20 10:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	12-4587-5991	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	28 May-20 14:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	rGSL
Ending Date:	04 Jun-20 13:50	**Species:**	Artemia franciscana	**Brine:**	Crystal Sea
Duration:	7d	**Source:**	In-House Culture	**Age:**	48h
Sample ID:	13-8865-2988	**Code:**	52C529BC	**Client:**	Notre Dame
Sample Date:	28 May-20 10:35	**Material:**	Copper chloride	**Project:**	Special Studies
Receive Date:	28 May-20 10:35	**Source:**	Discharge Monitoring Report		
Sample Age:	4h	**Station:**	Effluent		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1687133	200	Yes	Two-Point Interpolation

Point Estimates

Level	µg/L	95% LCL	95% UCL
IC5	509.7	11.63	571
IC10	586.9	416.3	673.1
IC15	664.1	479.3	776
IC20	741.3	570.1	878.7
IC25	818.4	647	988.9
IC40	1061	833.7	1294
IC50	1269	959.5	1461

Mean Dry Biomass-mg Summary — **Calculated Variate**

C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
42	Dilution Water	4	0.1042	0.096	0.112	0.003326	0.006652	6.38%	0.0%
113		4	0.1145	0.091	0.131	0.008568	0.01714	15.0%	-9.83%
254		4	0.1085	0.098	0.124	0.005867	0.01173	10.8%	-4.08%
459		4	0.1075	0.104	0.11	0.001258	0.002517	2.34%	-3.12%
1020		4	0.06775	0.054	0.079	0.00517	0.01034	15.3%	35.0%
2080		4	0.01216	0.005	0.021	0.003435	0.00687	56.5%	88.3%

Mean Dry Biomass-mg Detail

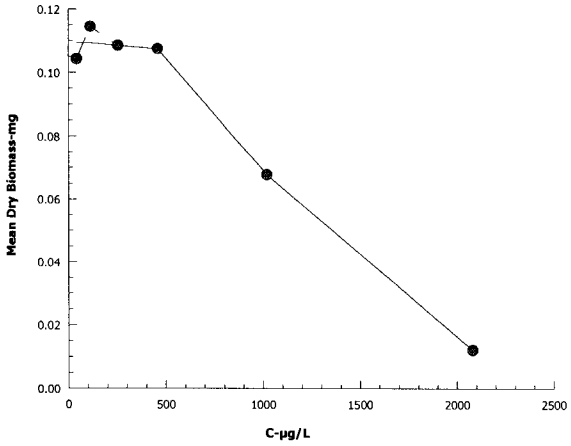
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
42	Dilution Water	0.096	0.103	0.106	0.112
113		0.131	0.122	0.091	0.114
254		0.111	0.098	0.124	0.101
459		0.11	0.108	0.104	0.108
1020		0.07	0.054	0.079	0.068
2080		0.009	0.021	0.005	0.01364

① DAP 7/24/20 E

Analyst: AB QA: DAP 7/24/20

Analysis ID:	16-7793-9613	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	23 Jul-20 10:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



DLP 7/24/20 E

TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A, Fort Collins, Colorado, 80524
T 970.416.0916 F 970.490.2963

June 12, 2020

Mr. Christopher Bittner
Standards Coordinator
Utah Dept. of Environmental Quality
195 N 1950 W
Salt Lake City, UT 84116

Dr. Gary Belovsky
Environ. Res. Center & Dept. Biol Sci.
University of Notre Dame
Notre Dame, IN 46556

Subject: Results of Short-term Chronic Brine Shrimp Experiment #18

Mr. Bittner/ Dr. Belovsky:

Below is a summary of the short-term chronic brine shrimp experiment initiated on May 28, 2020. The purpose of this experiment was to investigate the effect of copper on *Artemia franciscana* toxicity in a short-term chronic test.

Along with a control, five different copper concentrations (introduced at $CuCl_2$) were tested, based off of the previously conducted acute test:

- 125, 250, 500, 1,000, and 2,000 µg/L

The results of these studies will help determine the chronic toxicity of metals to brine shrimp in reconstituted Great Salt Lake water. The test volume was consistent at 50 ml.

Species: *Artemia franciscana*

Test type:

- Test duration: 7 days
- Test type: static-renewal (solutions and food renewed daily)
- Algae: *Dunaliella viridis*
- Food concentration: 72.5 µg/L Chl*a* and 0.3 ml YTC[1]
- Temperature: 20°C
- Test volume(s): 50 ml
- Replicates: 4
- Organisms/Rep: 10
- Test media: 120 ppt rGSL media (per Notre Dame recipe)

Pretest conditions: <24-h old *A. franciscana* were hatched out in ~29 ppt artificial seawater (Crystal Sea Marine Mix) and ~200 organisms were placed in 120 ppt rGSL water and fed *Dunaliella viridis* at a density of 72.5 µg/L Chl*a* and 0.3 ml YTC. Solutions were gently aerated.

[1] yeast-trout chow-cerophyl mixture used as a typical food for water fleas in whole effluent toxicity testing (USEPA 2002)

Characterization of Recon Water

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)	Salinity (ppt)
RW#13943	7.9	NM	NM	136,000	NM	NM	120

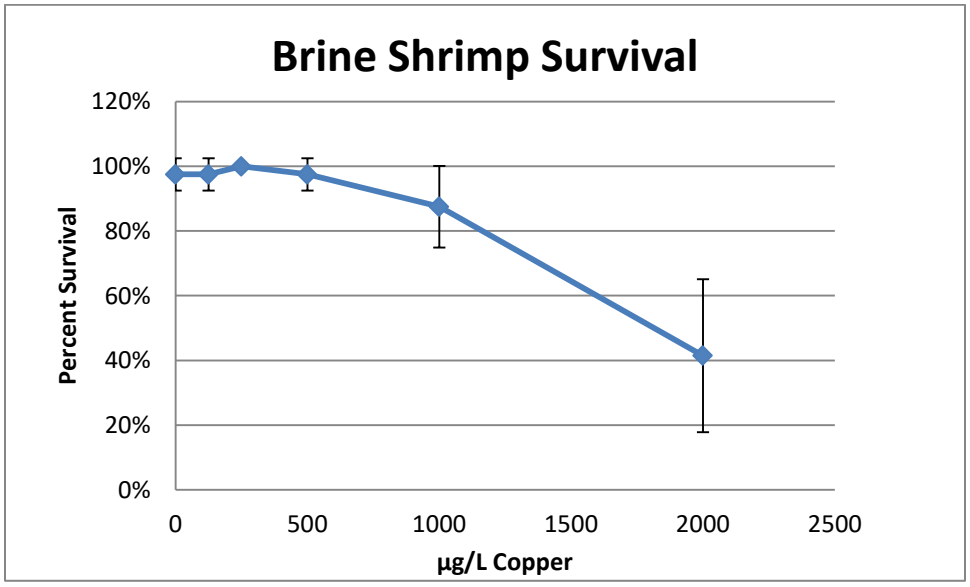
[a]As CaCO3
[b]Total residual chlorine

Test activities:

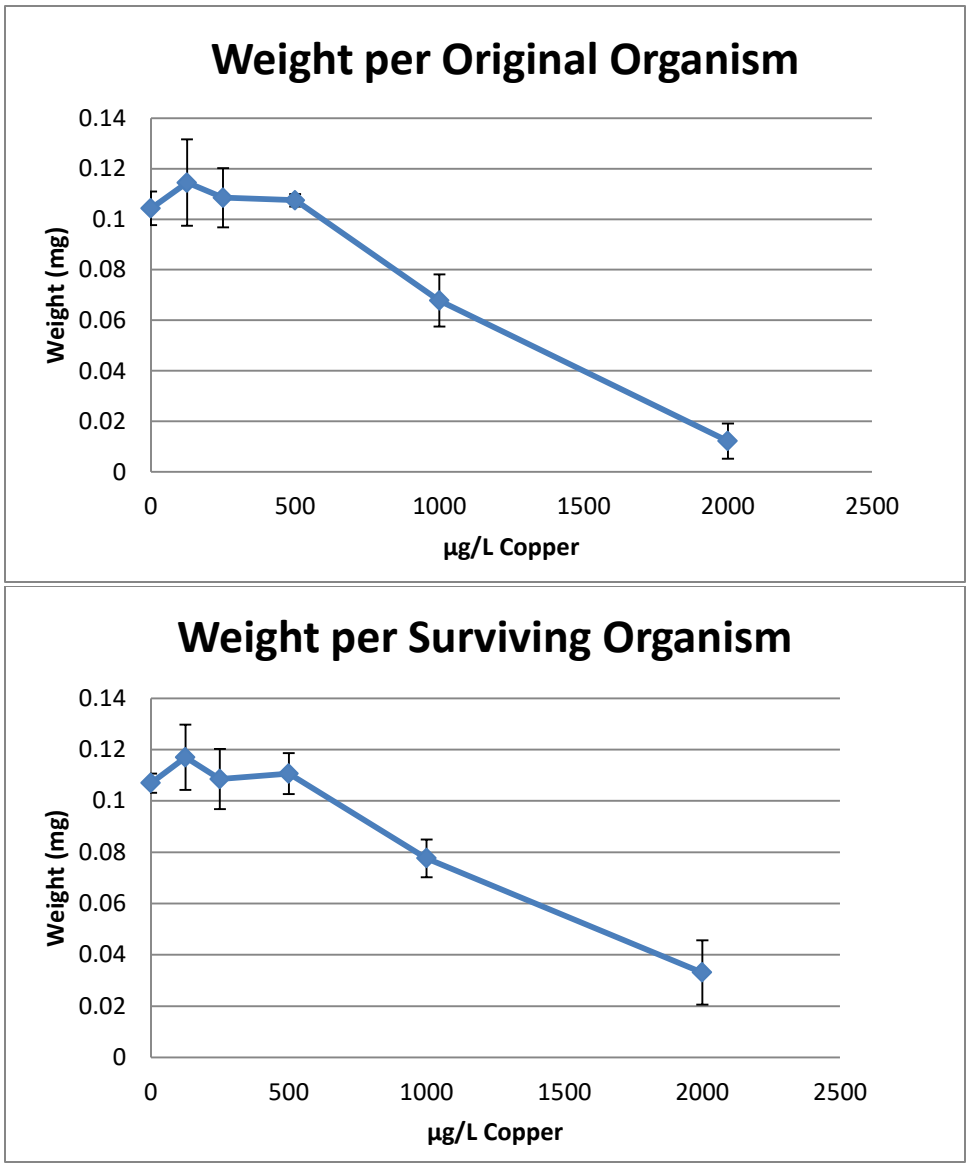
- Biological observations (primarily survival) taken daily.
- Chemistries taken on renewal days (i.e., pH, dissolved oxygen, and temperature).
- Conductivity was measured at test termination or when there was 0% survival in that treatment.
- Dry weights were determined at test termination.
- Copper was added to 120 rGSL media containing food and allowed to equilibrate for 3 hours prior to use in the toxicity tests.
- Copper analytical samples were collected on day 0, 1, and 6.

Results:

The survival and average dry weights for the brine shrimp in the copper (nominal) treatments are illustrated in the following figures.



TRE



Test Endpoints

Study	Test Endpoints (µg Cu/L, nominal)					
	Survival NOEC	Survival LOEC	Survival IC20	Growth NOEC	Growth LOEC	Growth IC20
7-Day	1,000	2,000	1,196 (768-1,501)	500	1,000	752 (602–888)

TRE

Summary and findings:

- Organism survival was ≥ 90% for the control.
- A survival effect was observed in the highest concentration.
- There was a growth effect for the highest two concentrations tested.

Analytical samples from each treatment have been collected and sent in for copper measurement. We will provide a summary of those results separately.

We greatly appreciate the opportunity to complete this study for you. Please do not hesitate to call if you have any questions or concerns.

Sincerely,

Amanda Bidlack
Project Specialist / QA Officer
bidlackac.tre@gmail.com

Rami B. Naddy, Ph.D.
Manager / Environmental Toxicologist
naddyrb.tre@gmail.com

17001-474-073
Attachment

cc: David Pillard, TRE

TOXICITY DATA PACKAGE COVER SHEET

QA: DMP 6/9/20

Test Type: Chronic

Project Number: 17001-474-073

Test Substance: Copper (CuCl2)

Species: *Artemia franciscana*

Dilution Water: rGSL

Organism Lot or Batch Number: 052620

Concurrent Control Water: NA

Age: 48h (48 hr)

Supplier: TRE

Date and Time Test Began: 5/28/20 @ 1410

Date and Time Test Ended: 6/4/20 @ 1350

Protocol Number:

Investigator(s): AB/EN/HR/ES/CP/AF/GP

Background Information

pH control?: Yes **No**

Type of Test: Static-Renewal (Daily)

If yes, give % CO_2: NA

Test Temperature: 20 ± 1 °C

Env. Chmbr/Bath #: 25

Test Chmbrs: 147-ml cups

Photoperiod: 16 h light : 8 h dark

Light intensity: 50-100 ft-c.

Test Solution Vol.: 50 ml

Replicates per Treatment: 4

Length of Test: 7 days

Organisms per Replicate: 10

Type of Food and Quantity per Chamber: 72.5 ug/L Chla/ 0.3 ml YTC

Feeding Frequency: Initiation and Renwals

Test Substance Characterization Parameters and Frequency:

Hardness: Test Initiation

Alkalinity: Test Initiation

NH_3: Test Initiation

TRC: Test Initiation

pH: Daily

Conductivity: Daily

Test Concentrations (Volume:Volume): rGSL, 125, 250, 500, 1,000, and 2,000 µg/L as Cu

Agency Summary Sheet(s)?: None

Reference Toxicant Data: Test Dates: _____ to _____	IC_{25}: _____
Hist. 95% Control Limits: _____ to _____	Method for Determining Ref. Tox. Value: Linear Interpolation

Special Procedures and Considerations:
Organisms hatched 2 days prior to initiation and held in rGSL with 72.5 ug/L Chla/ 0.3 ml YTC
Appropriate correction factors have been applied to all temperatures recorded in this data package
Study Director Initials: AB Date: 5/27/20

TEST SUBSTANCE USAGE LOG

QA: DAP 6/9/20

Project Number: 17001-474-073

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	ENSR #19122			
Test Substance Collection Date and Time	From: @	From: @	From: @	From: @
	To: @	To: @	To: @	To: @
Sample Type (Grab or Comp)				
Date Test Substance Received				
Dilution Water Number RW# or TRE#, circle one	13943			
Concurrent Control Water RW#	NA			
Date(s) Used	5/28/20 | 6/1/20			
	5/29/20 | 6/2/20			
	5/30/20 | 6/3/20			
	5/31/20			

Preparation of Test Solutions

Test Substance Conc. (µg/L)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)
0	0	350	350						
125	22	328	350						
250	44	306	350						
500	88	263	350						
1000	175	175	350						
2000	350	0	350						
	678	1422	2100						

Initials / Date	AJ 5/28/20		
Initials / Date	AS 5/29/20		
Initials / Date	ES 5/30/20		
Initials / Date	HR 5/31/20		
Initials / Date	EW 6/1/20		
Initials / Date	AJ 6/2/20		
Initials / Date	HR 6/3/20		
Initials / Date			

Artemia franciscana
CHRONIC BIOLOGICAL DATA

QA: [illegible] 6/9/20

Project Number: 17001-474-073

mg/L	Test Replicate	Number of Surviving Organisms Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Remarks
0	A	10	10	10	10	10	10	10	9	97.5%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10□	10□	10□	10□	□ weak org
	D	10	10	10	10	10□	10□	10□	10□	□ weak org
125	A	10	10	10	10	10	10	10	10	97.5%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	9	9	9	9	
	D	10	10	10	10	10	10	10	10	
250	A	10	10	10	10	10	10	10	10	100%
	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	
500	A	10	10□	10	10	10	10	10	9	□ weak org 97.5%
	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	
1000	A	10	10	10	10	10	10	10	10	87.5%
	B	10	10	10	10	10	10	8	7	
	C	10	10	10	10	9	9	9	9	
	D	10	10	10	10	10	10	9	9	
2000	A	10	10	4	4	4	4	4	4	42.5%
	B	10	6	6	6	6	6	6	6	
	C	10	5	2	1	1	1	1	1	
	D	6	9•	6	6	6	6	6	6	• 1 extra org - dead
	A									
	B									
	C									
	D									
Date:		5/25/20	5/29/20	5/30/20	5/31/20	6/1/20	6/2/20	6/3/20	6/4/20	
Time:		1410	1145	1520	1230	1340	1345	1450	1350	
Initials:		AS/EN	HR	ES/CP	ES	AF	CP	CP	EN	

CHRONIC CHEMICAL DATA (INITIAL)

QA° DAP 6/9/20

Project Number:	17001-474-073
Test Species:	***Artemia franciscana***

mg/L	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 0									All Conc.	
pH	7.9	8.2	7.9	8.0	8.0	8.0	7.9		I-M27	
D.O. (mg/L)	6.6	8.2	6.6	6.5	5.3	5.1	4.9		17	
Temp. (°C)	20	20	20	20	20	20	20		L13	
Cond. (µS/cm)	136000	131000	128300	126400	130600	132300	132000		15	
Hard. (mg/L)									T.Tr	
Alk. (mg/L)									T.Tr	
TRC (mg/L)									22	
NH_3 (mg/L)									HA1	
Conc.: 125										
pH	8.0	8.1	7.9	7.9	8.0	8.0	7.9			
D.O. (mg/L)	6.0	8.2	5.5	5.0	5.3	5.0	4.9			
Temp. (°C)	20	20	20	20	20	20	20			
Cond. (µS/cm)	136300	132000	131100	127900	132400	132200	132500			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 250										
pH	8.0	8.1	7.9	7.9	8.0	8.0	7.9			
D.O. (mg/L)	5.5	8.0	6.1	5.1	5.3	4.8	4.9			
Temp. (°C)	20	20	20	20	20	20	20			
Cond. (µS/cm)	135100	132400	130600	129000	132400	132600	132900			
Conc.: 500										
pH	8.0	8.1	7.9	7.9	8.0	8.0	7.9			
D.O. (mg/L)	6.2	7.9	5.4	5.0	5.3	4.9	4.9			
Temp. (°C)	20	20	20	20	20	20	20			
Cond. (µS/cm)	135100	132700	132000	134000	132400	132600	132600			
Date:	5/28/20	5/29/20	5/30/20	5/31/20	6/1/20	6/2/20	6/3/20			
Time:	1350	1125	1455	1225	1315	1330	1435			
Initials:	AB	HR	ES	ES	AF	CP	CP			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25C.

(1) ES 5/31/20 JE

CHRONIC CHEMICAL DATA (INITIAL)

QA: DAP 6/9/20

Project Number:	17001-474-073
Test Species: *Artemia franciscana*	

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 1000									All Conc.	
pH	8.0	8.1	7.9	7.9	8.0	8.0	7.9			
D.O. (mg/L)	6.4	7.9	6.1	5.1	5.3	4.9	4.9			
Temp. (°C)	20	20	20	20	20	20	20			
Cond. (µS/cm)	134900	132000	125400	129700	132700	132500	132600			
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 2000										
pH	8.0	8.1	7.9	7.9	8.0	8.0	7.9			
D.O. (mg/L)	5.9	7.7	5.8	4.9	5.3	4.9	4.9			
Temp. (°C)	20	20	20	20	20	20	20			
Cond. (µS/cm)	135000	132300	130800	129300	132900	132100	132400			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Date:	5/28/20	5/29/20	5/30/20	5/31/20	6/1/20	6/2/20	6/3/20			
Time:	1350	1125	1455	1225	1315	1330	1435			
Initials:	[illegible]	HR	ES	ES	AF	CP	CP			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25C.

QA Form No. 059
Revision 3
Effective 02/14

CHRONIC CHEMICAL DATA (FINAL)

QA: DLD 6/9/20

Project Number:	17001-474-073
Test Species:	***Artemia franciscana***

mg/L	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.: 0			5.2				123000		All Conc.	* conductivity 15
pH	7.8	7.9	8.0	8.0	8.0	7.8	7.8		FM27	
D.O. (mg/L)	9.3	5.9	~~4.7~~	5.3	4.8	4.8	5.0		17	
Temp (°C)	21	21	22Δ	21	20	21	21		L-37	
Conc.: 125							122600			* conductivity
pH	7.9	7.9	8.0	8.0	8.0	7.7	7.8			
D.O. (mg/L)	8.5	4.9	5.2	5.0	4.8	4.5	4.6			
Temp (°C)	21	21	22Δ	21	21	21	21			
Conc.: 250							122000			* conductivity
pH	7.9	7.9	8.0	8.0	8.0	7.7	7.8			
D.O. (mg/L)	8.2	5.4	4.7	5.0	4.7	4.4	4.5			
Temp (°C)	21	21	22Δ	21	21	21	21			
Conc.: 500		7.8					121200			* conductivity
pH	8.0	5.1①	8.0	8.0	8.0	7.7	7.8			
D.O. (mg/L)	8.4	5.8	5.2	5.0	4.7	4.4	4.5			
Temp (°C)	21	21	22Δ	21	21	21	21			
Conc.: 1000							120800			* conductivity
pH	8.0	7.9	8.0	8.0	8.0	7.8	7.8			
D.O. (mg/L)	8.4	5.5	5.3	5.0	4.7	4.4	4.4			
Temp (°C)	21	21	22Δ	21	21	21	21			
Conc.: 2000							120000			* conductivity
pH	8.0	7.9	8.0	8.1	8.1	7.9	7.9			
D.O. (mg/L)	8.6	5.7	5.3	5.1	4.8	4.5	4.5			
Temp (°C)	21	21	22Δ	21	21	21	21			
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	5/29/20	5/30/20	5/31/20	6/1/20	6/2/20	6/3/20	6/4/20			
Time:	1140	1525	1250	1345	1400	1510	1345			
Initials:	HR	ES	ES	AF	CP	CP	EN			

① ES 5/30/20 jwp
② ES 5/31/20 jE

Δ chemical dil water

QA Form No. 055
Revision 3
Effective 02/14

QA: DAP 6/9/20

DAILY TOXICITY TEST LOG

Project Number:	17001-474-073
Test Species:	***Artemia franciscana***

General Comments		Feeding 72.5 ug/l Chla 0.3 ml YTC	Initials/Date
	Random Chart: D Min/Max Thermometer # M-15		
Test Day 0	Test Solution Mixed at: 1035 Test Organisms Added at: 1410 Spiked @ 1035	Fed @ 1035	DS 5/28/20
Test Day 1	Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 0825	Fed @ 0825	HR 5/29/20
Test Day 2	Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 1200 CP	Fed @ 1200 CP	ES/cl 5/30/20
Test Day 3	Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 0915 HR	Fed @ 0915 HR	ES 5/31/20
Test Day 4	Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 0930 EE	Fed @ 0930 EE	AF 6/1/20
Test Day 5	Real Time: 22 °C Min-Max Range: 21 - 22 °C Spiked @ 0750 * No significant growth in 2000 mg/L	Fed @ 0750	CP 6/2/20
Test Day 6	Real Time: 22 °C Min-Max Range: 21 - 22 °C Spiked @ 1125 * " " "	Fed @ 1125 HR	CP 6/3/20
Test Day 7	Real Time: 22 °C Min-Max Range: 21 - 22 °C	Fed @ None	EN 6/4/20

QA Form No.010
Revision 7
Effective 01/20

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

QA: DAP 6/9/20

Project Number: 17001-474-073
Test Substance: Copper Cl (CuCl2) ①
Species: Artemia franciscana
Analyst Tare: Eg Analyst Gross: AF
Date/Time of Tare Wt.: 6/4/20 1200
Date/Time of Gross Wt.: 6/10/20 1030
Comments:
Analytical Balance ID: Sart#1
Dried in Oven # 3 from Date: 6/4/20 Time: 1505
to Date: 6/6/20 Time: 1005

Weight Type (Circle): Wet Blot Dry Dry (60-90°C) Dry (>100°C) AFDW (>500°C)
Lot or Batch Number: 052620

Boat No.	Treatment mg/L	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	0	A		1.13102	1.13198	0.00096					8 ① 9		
		B		1.15422	1.15525	0.00103					10		
		C		1.15585	1.15691	0.00106					10		
		D		1.12864	1.12976	0.00112					10		
	125	A		1.16281	1.16412	0.00131					10		
		B		1.13660	1.13782	0.00122					10		
		C		1.15838	1.15929	0.00091					9		
		D		1.12500	1.12614	0.00114					10		
	250	A		1.16249	1.16360	0.00111					10		
		B		1.13970	1.14068	0.00098					10		
		C		1.13696	1.13820	0.00124					10		
		D		1.13047	1.13148	0.00101					10		
Blank			L ②	1.15361	1.15363	+0.00002							
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

② Eg 6/4/20

① AF 6/3/20 E

QA: [illegible] 6/9/20

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 17001-474-073 | Test Substance: Copper ($CuCl_2$) | Comments:
Species: Artemia franciscana | Analyst Tare: BY | Analyst Gross: AF | Analytical Balance ID: Sart#1
Date/Time of Tare Wt.: 6/4/20 1100 | Date/Time of Gross Wt.: 6/10/20@6/10/20@1630 | Dried in Oven # 3 from Date: 6/9/20 Time: 1505 to Date: 6/6/20 Time: 1005

Weight Type (Circle): Wet Blot Dry Dry (60-90°C) Dry (>100°C) AFDW (>500°C) | Lot or Batch Number: 052620

Boat No.	Treatment mg/L	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	500	A		1.17273	1.17383	0.00110					9		
		B		1.16557	1.16665	0.00108					10		
		C		1.17797	1.17901	0.00104					10		
		D		1.13783	1.13891	0.00108					10		
	1000	A		1.15098	1.15168	0.00070					10		
		B		1.14570	1.14624	0.00054					7		
		C		1.14390	1.14469	0.00079					9		
		D		1.16460	1.16528	0.00068					9		
	2000	A		1.15496	1.15505	0.00009					4		
		B		1.12613	1.12634	0.00021					6		
		C		1.12646	1.12651	0.00005					1		
		D		1.14985	1.15000	0.00015		11			6		
Blank				1.15361	1.15363	+0.00002							
Range													
Mean													

Test Solution Volume: | Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 14001-474 Species: Artemia franciscana

QA: DDP 6/12/20

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
rGSL	A		1.13102	1.13198	0.00096	0.00096	10	0.096	0.1043	9	0.107	0.1069
	B		1.15422	1.15525	0.00103	0.00103	10	0.103		10	0.103	
	C		1.15585	1.15691	0.00106	0.00106	10	0.106		10	0.106	
	D		1.12864	1.12976	0.00112	0.00112	10	0.112		10	0.112	
125 µg/L	A		1.16281	1.16412	0.00131	0.00131	10	0.131	0.1145	10	0.131	0.1170
	B		1.13660	1.13782	0.00122	0.00122	10	0.122		10	0.122	
	C		1.15838	1.15929	0.00091	0.00091	10	0.091		9	0.101	
	D		1.12500	1.12614	0.00114	0.00114	10	0.114		10	0.114	
250 µg/L	A		1.16249	1.16360	0.00111	0.00111	10	0.111	0.1085	10	0.111	0.1085
	B		1.13970	1.14068	0.00098	0.00098	10	0.098		10	0.098	
	C		1.13696	1.13820	0.00124	0.00124	10	0.124		10	0.124	
	D		1.13047	1.13148	0.00101	0.00101	10	0.101		10	0.101	
500 µg/L	A		1.17273	1.17383	0.00110	0.00110	10	0.110	0.1075	9	0.122	0.1106
	B		1.16557	1.16665	0.00108	0.00108	10	0.108		10	0.108	
	C		1.17797	1.17901	0.00104	0.00104	10	0.104		10	0.104	
	D		1.13783	1.13891	0.00108	0.00108	10	0.108		10	0.108	
1,000 µg/L	A		1.15098	1.15168	0.00070	0.00070	10	0.070	0.0678	10	0.070	0.0776
	B		1.14570	1.14624	0.00054	0.00054	10	0.054		7	0.077	
	C		1.14390	1.14469	0.00079	0.00079	10	0.079		9	0.088	
	D		1.16460	1.16528	0.00068	0.00068	10	0.068		9	0.076	
2,000 µg/L	A		1.15496	1.15505	0.00009	0.00009	10	0.009	0.0122	4	0.022	0.0331
	B		1.12613	1.12634	0.00021	0.00021	10	0.021		6	0.035	
	C		1.12646	1.12651	0.00005	0.00005	10	0.005		1	0.050	
	D		1.14985	1.15000	0.00015	0.00015	11	0.014		6	0.025	
Blank			1.15361	1.15363	0.00002							

Project Number: 14001-474 Species: Artemia franciscana

QA: DAP 6/12/20

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
rGSL	4	0.9	1.0	0.9750	0.0500	5.128%
125 µg/L	4	0.9	1.0	0.9750	0.0500	5.128%
250 µg/L	4	1.0	1.0	1.0000	0.0000	0.000%
500 µg/L	4	0.9	1.0	0.9750	0.0500	5.128%
1,000 µg/L	4	0.7	1.0	0.8750	0.1258	14.381%
2,000 µg/L	4	0.1	0.6	0.4114	0.2241	54.473%

Summary Statistics for Growth Data (dry wt per original)

Treatment	N	Min	Max	Mean	SD	C.V.
rGSL	4	0.096	0.112	0.1043	0.0067	6.381%
125 µg/L	4	0.091	0.131	0.1145	0.0171	14.967%
250 µg/L	4	0.098	0.124	0.1085	0.0117	10.814%
500 µg/L	4	0.104	0.110	0.1075	0.0025	2.341%
1,000 µg/L	4	0.054	0.079	0.0678	0.0103	15.262%
2,000 µg/L	4	0.005	0.021	0.0122	0.0069	56.498%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
rGSL	4	0.103	0.112	0.1069	0.0037	3.503%
125 µg/L	4	0.101	0.131	0.1170	0.0127	10.836%
250 µg/L	4	0.098	0.124	0.1085	0.0117	10.814%
500 µg/L	4	0.104	0.122	0.1106	0.0080	7.239%
1,000 µg/L	4	0.070	0.088	0.0776	0.0074	9.576%
2,000 µg/L	4	0.022	0.050	0.0331	0.0125	37.673%

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	16-2412-6765	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Jun-20 8:59	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes
Batch ID:	12-4587-5991	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	28 May-20 14:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	rGSL
Ending Date:	04 Jun-20 13:50	**Species:**	Artemia franciscana	**Brine:**	Crystal Sea
Duration:	7d	**Source:**	In-House Culture	**Age:**	48h
Sample ID:	13-8865-2988	**Code:**	52C529BC	**Client:**	Notre Dame
Sample Date:	28 May-20 10:35	**Material:**	Copper chloride	**Project:**	Special Studies
Receive Date:	28 May-20 10:35	**Source:**	Discharge Monitoring Report		
Sample Age:	4h	**Station:**	Effluent		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	15.6%	1000	2000	1414	

Steel Many-One Rank Sum Test

Control	vs	C-µg/L	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		125	18	10	2	6	0.8333	Asymp	Non-Significant Effect
		250	20	10	1	6	0.9516	Asymp	Non-Significant Effect
		500	18	10	2	6	0.8333	Asymp	Non-Significant Effect
		1000	13.5	10	2	6	0.2853	Asymp	Non-Significant Effect
		2000*	10	10	0	6	0.0417	Asymp	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.576496	0.3152992	5	16.49	<0.0001	Significant Effect
Error	0.3441775	0.01912097	18			
Total	1.920674		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1.461	4.25	0.2510	Equal Variances
Variances	Levene Equality of Variance	2.337	4.25	0.0841	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8447	0.884	0.0017	Non-normal Distribution

7d Survival Rate Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.975	0.8954	1	1	0.9	1	0.025	5.13%	0.0%
125		4	0.975	0.8954	1	1	0.9	1	0.025	5.13%	0.0%
250		4	1	1	1	1	1	1	0	0.0%	-2.56%
500		4	0.975	0.8954	1	1	0.9	1	0.025	5.13%	0.0%
1000		4	0.875	0.6748	1	0.9	0.7	1	0.06292	14.4%	10.3%
2000		4	0.4114	0.0548	0.7679	0.4727	0.1	0.6	0.112	54.5%	57.8%

Angular (Corrected) Transformed Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	0.0%
125		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	0.0%
250		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	-2.97%
500		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	0.0%
1000		4	1.225	0.9485	1.502	1.249	0.9912	1.412	0.08699	14.2%	10.6%
2000		4	0.6809	0.2766	1.085	0.7578	0.3218	0.8861	0.127	37.3%	50.3%

Analysis ID: 16-2412-6765 **Endpoint:** 7d Survival Rate **CETIS Version:** CETISv1.8.7
Analyzed: 12 Jun-20 8:59 **Analysis:** Nonparametric-Control vs Treatments **Official Results:** Yes

7d Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.9	1	1	1
125		1	1	0.9	1
250		1	1	1	1
500		0.9	1	1	1
1000		1	0.7	0.9	0.9
2000		0.4	0.6	0.1	0.5455

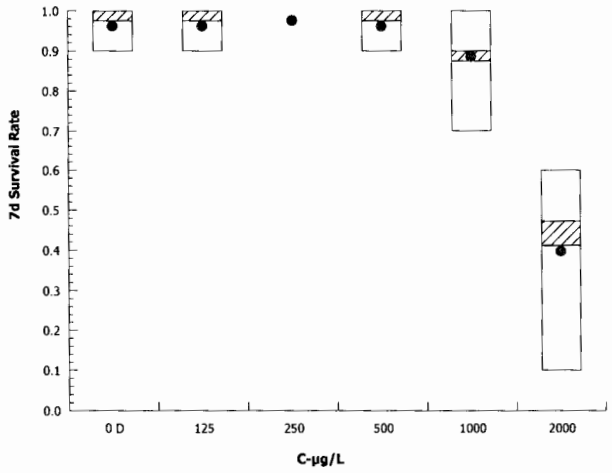
Angular (Corrected) Transformed Detail

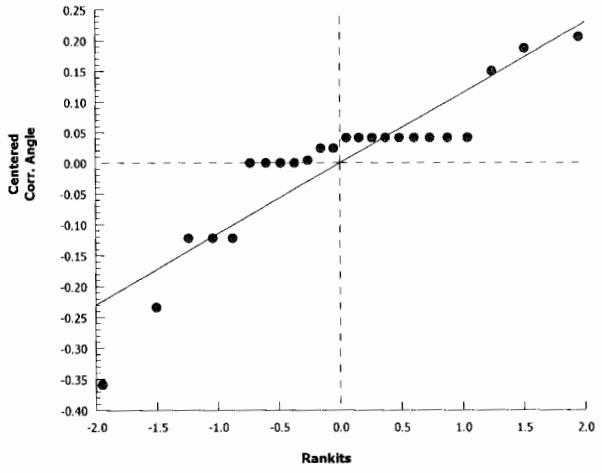
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.249	1.412	1.412	1.412
125		1.412	1.412	1.249	1.412
250		1.412	1.412	1.412	1.412
500		1.249	1.412	1.412	1.412
1000		1.412	0.9912	1.249	1.249
2000		0.6847	0.8861	0.3218	0.8309

7d Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	9/10	10/10	10/10	10/10
125		10/10	10/10	9/10	10/10
250		10/10	10/10	10/10	10/10
500		9/10	10/10	10/10	10/10
1000		10/10	7/10	9/10	9/10
2000		4/10	6/10	1/10	6/11

Graphics





Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	14-5321-3602	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Jun-20 8:59	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	12-4587-5991	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	28 May-20 14:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	rGSL
Ending Date:	04 Jun-20 13:50	**Species:**	Artemia franciscana	**Brine:**	Crystal Sea
Duration:	7d	**Source:**	In-House Culture	**Age:**	48h
Sample ID:	13-8865-2988	**Code:**	52C529BC	**Client:**	Notre Dame
Sample Date:	28 May-20 10:35	**Material:**	Copper chloride	**Project:**	Special Studies
Receive Date:	28 May-20 10:35	**Source:**	Discharge Monitoring Report		
Sample Age:	4h	**Station:**	Effluent		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	11516	200	Yes	Two-Point Interpolation

Point Estimates

Level	µg/L	95% LCL	95% UCL
LC5	704.2	364.2	1254
LC10	950	492.9	1272
LC15	1085	638.5	1380
LC20	1192	792.6	1474
LC25	1299	914.9	1599
LC40	1619	1243	2148
LC50	1833	1359	N/A

7d Survival Rate Summary — **Calculated Variate(A/B)**

C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	4	0.975	0.9	1	0.025	0.05	5.13%	0.0%	39	40
125		4	0.975	0.9	1	0.025	0.05	5.13%	0.0%	39	40
250		4	1	1	1	0	0	0.0%	-2.56%	40	40
500		4	0.975	0.9	1	0.025	0.05	5.13%	0.0%	39	40
1000		4	0.875	0.7	1	0.06292	0.1258	14.4%	10.3%	35	40
2000		4	0.4114	0.1	0.6	0.112	0.2241	54.5%	57.8%	17	41

7d Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.9	1	1	1
125		1	1	0.9	1
250		1	1	1	1
500		0.9	1	1	1
1000		1	0.7	0.9	0.9
2000		0.4	0.6	0.1	0.5455

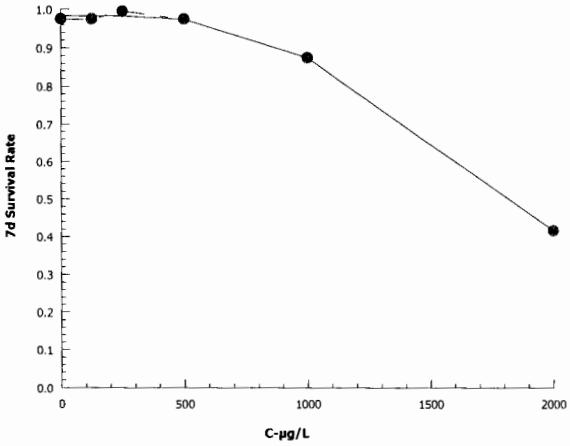
7d Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	9/10	10/10	10/10	10/10
125		10/10	10/10	9/10	10/10
250		10/10	10/10	10/10	10/10
500		9/10	10/10	10/10	10/10
1000		10/10	7/10	9/10	9/10
2000		4/10	6/10	1/10	6/11

Fathead Minnow 7-d Larval Survival and Growth Test | **TRE Environmental Strategies**

Analysis ID:	14-5321-3602	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Jun-20 8:59	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	16-4769-0510	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Jun-20 9:05	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes
Batch ID:	12-4587-5991	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	28 May-20 14:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	rGSL
Ending Date:	04 Jun-20 13:50	**Species:**	Artemia franciscana	**Brine:**	Crystal Sea
Duration:	7d	**Source:**	In-House Culture	**Age:**	48h
Sample ID:	13-8865-2988	**Code:**	52C529BC	**Client:**	Notre Dame
Sample Date:	28 May-20 10:35	**Material:**	Copper chloride	**Project:**	Special Studies
Receive Date:	28 May-20 10:35	**Source:**	Discharge Monitoring Report		
Sample Age:	4h	**Station:**	Effluent		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	17.3%	500	1000	707.1	

Dunnett Multiple Comparison Test

Control	vs	C-µg/L	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		125	-1.336	2.36	0.018	6	0.9895	CDF	Non-Significant Effect
		250	-0.5539	2.36	0.018	6	0.9298	CDF	Non-Significant Effect
		500	-0.4235	2.36	0.018	6	0.9078	CDF	Non-Significant Effect
		1000*	4.757	2.36	0.018	6	0.0005	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.005582499	0.001395625	4	11.85	0.0002	Significant Effect
Error	0.0017665	0.0001177666	15			
Total	0.007348999		19			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.752	13.3	0.1011	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9614	0.866	0.5719	Normal Distribution

Mean Dry Biomass-mg Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.1042	0.09367	0.1148	0.1045	0.096	0.112	0.003326	6.38%	0.0%
125		4	0.1145	0.08723	0.1418	0.118	0.091	0.131	0.008568	15.0%	-9.83%
250		4	0.1085	0.08983	0.1272	0.106	0.098	0.124	0.005867	10.8%	-4.08%
500		4	0.1075	0.1035	0.1115	0.108	0.104	0.11	0.001258	2.34%	-3.12%
1000		4	0.06775	0.0513	0.0842	0.069	0.054	0.079	0.00517	15.3%	35.0%

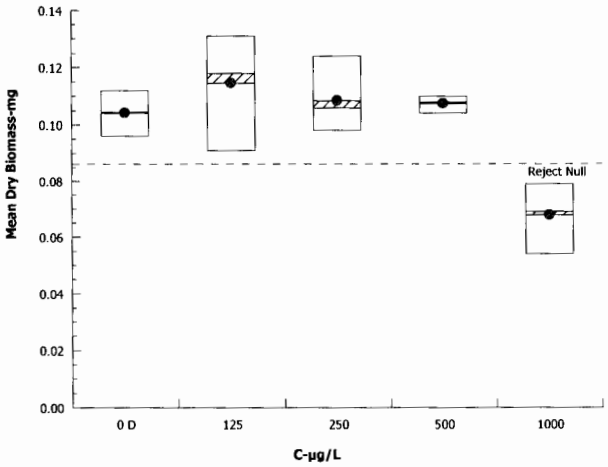
Mean Dry Biomass-mg Detail

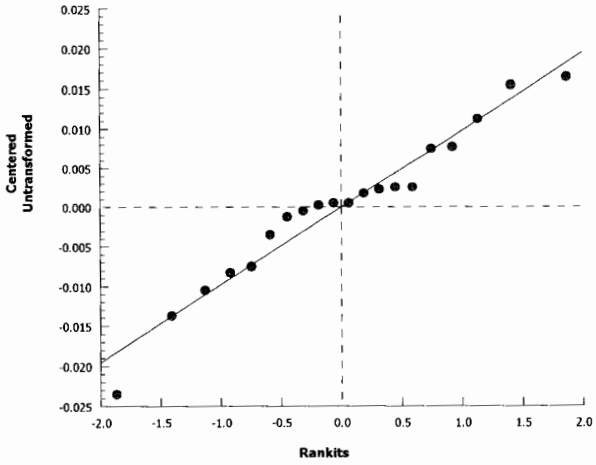
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.096	0.103	0.106	0.112
125		0.131	0.122	0.091	0.114
250		0.111	0.098	0.124	0.101
500		0.11	0.108	0.104	0.108
1000		0.07	0.054	0.079	0.068

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	16-4769-0510	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Jun-20 9:05	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	05-5041-3935	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Jun-20 9:05	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	12-4587-5991	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	28 May-20 14:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	rGSL
Ending Date:	04 Jun-20 13:50	**Species:**	Artemia franciscana	**Brine:**	Crystal Sea
Duration:	7d	**Source:**	In-House Culture	**Age:**	48h
Sample ID:	13-8865-2988	**Code:**	52C529BC	**Client:**	Notre Dame
Sample Date:	28 May-20 10:35	**Material:**	Copper chloride	**Project:**	Special Studies
Receive Date:	28 May-20 10:35	**Source:**	Discharge Monitoring Report		
Sample Age:	4h	**Station:**	Effluent		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	820758	200	Yes	Two-Point Interpolation

Point Estimates

Level	µg/L	95% LCL	95% UCL
IC5	545.2	N/A	595.6
IC10	614	469.2	679.8
IC15	682.8	542.5	776
IC20	751.6	613.8	864.7
IC25	820.4	679.8	959.8
IC40	1038	863	1230
IC50	1235	1008	1392

Mean Dry Biomass-mg Summary — **Calculated Variate**

C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.1042	0.096	0.112	0.003326	0.006652	6.38%	0.0%
125		4	0.1145	0.091	0.131	0.008568	0.01714	15.0%	-9.83%
250		4	0.1085	0.098	0.124	0.005867	0.01173	10.8%	-4.08%
500		4	0.1075	0.104	0.11	0.001258	0.002517	2.34%	-3.12%
1000		4	0.06775	0.054	0.079	0.00517	0.01034	15.3%	35.0%
2000		4	0.01216	0.005	0.021	0.003435	0.00687	56.5%	88.3%

Mean Dry Biomass-mg Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.096	0.103	0.106	0.112
125		0.131	0.122	0.091	0.114
250		0.111	0.098	0.124	0.101
500		0.11	0.108	0.104	0.108
1000		0.07	0.054	0.079	0.068
2000		0.009	0.021	0.005	0.01364

Fathead Minnow 7-d Larval Survival and Growth Test **TRE Environmental Strategies**

Analysis ID:	05-5041-3935	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Jun-20 9:05	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics