

July 29, 2020

Mr. Christopher Bittner
 Standards Coordinator
 Utah Dept. of Environmental Quality
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 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 #23

Mr. Bittner/ Dr. Belovsky:

Below is a summary of the lead analytical data for the acute brine shrimp experiments initiated on June 25, 2020. Total lead samples were collected in old solutions on day 2.

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#13962	7.9	NM	NM	133,200	NM	NM	114

^aAs CaCO₃

^bTotal residual chlorine

Results of Lead Analysis

<i>D. viridis</i> / YTC Mix			<i>D. viridis</i> Only		
Total Lead (mg/L)		Percent of Nominal	Total Lead (mg/L)		Percent of Nominal
Nominal Value (mg/L)	Day 2 Old Solution		Nominal Value (mg/L)	Day 2 Old Solution	
0 (rGSL)	U	---	0 (rGSL)	0.075	---
37.5	6.47	17	37.5	6.90	18
75	9.40	12	75	9.95	13
150	11.2	7	150	10.1	7
300	20.2	7	300	17.2	6
600	61.1	10	600	45.7	8

U= below method detection limit (0.053 mg/L)

Measured lead values were reduced from nominal values (~10.5%)¹. Average measured lead concentrations were then used to recalculate the test endpoint on a measured basis. Both nominal and measured median lethal concentrations are presented below for comparison.

Test Endpoints

Test	Survival 96-hour LC ₅₀	Value (mg/L Lead)
<i>D. viridis</i> / YTC Mix	Nominal	337.2 (C.L. 283.9 - 400.5)
	Measured	28.28 (C.L. 24.03 - 34.46)
<i>D. viridis</i> Only	Nominal	>600
	Measured	>45.7

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

Sincerely,



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17001-474-085,086

Attachment

cc: David Pillard, TRE

¹ We hypothesize that the low total lead concentrations were due to using a 600 mg/L stock to prepare test concentrations. This stock is a higher concentration than in previous studies and poorer solubility at the higher level could lead to lower levels after mixing.

CETIS Analytical Report

Report Date: 23 Jul-20 08:59 (p 1 of 2)
 Test Code: 474-085 | 17-2332-7978

① Brine shrimp

Fathead Minnow 96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 16-6600-2337	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 23 Jul-20 8:59	Analysis: Linear Regression (MLE)	Official Results: Yes
Batch ID: 14-9546-5338	Test Type: Survival (96h)	Analyst: Lab Tech
Start Date: 25 Jun-20 14:00	Protocol: EPA/821/R-02-012 (2002)	Diluent: rGSL
Ending Date: 29 Jun-20 14:30	Species: Artemia franciscana	Brine: Crystal Sea
Duration: 4d 0h	Source: Hog Island Oyster Co. TRE	Age: 48h
Sample ID: 21-1510-8137	Code: 7E11FD29	Client: Notre Dame
Sample Date: 25 Jun-20 10:50	Material: Lead Nitrate	Project: Special Studies
Receive Date: 25 Jun-20 14:00	Source: research	
Sample Age: 3h	Station:	

Linear Regression Options

Model Function	Threshold Option	Threshold	Optimized	Pooled	Het Corr	Weighted
Log-Normal [NED=A+B*log(X)]	Control Threshold	1E-07	No	No	No	Yes

Regression Summary

Iters	LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision(α:5%)
7	-56.63	117.8	119.6	1.452	0.267	0.876	1.731	2.928	0.1870	Non-Significant Lack of Fit

Point Estimates

Level	mg/L	95% LCL	95% UCL
LC5	10.29	7.863	12.5
LC10	12.86	10.29	15.29
LC15	14.96	12.28	17.6
LC20	16.86	14.07	19.77
LC25	18.68	15.76	21.92
LC40	24.2	20.64	28.89
LC50	28.28	24.03	34.46

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
Slope	3.746	0.432	2.899	4.592	8.671	<0.0001	Significant Parameter
Intercept	-5.437	0.582	-6.578	-4.296	-9.341	<0.0001	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	132.1418	132.1418	1	163.5	<0.0001	Significant
Lack of Fit	4.938939	1.234735	4	1.731	0.1870	Non-Significant
Pure Error	12.83756	0.713198	18			
Residual	17.7765	0.808023	22			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Goodness-of-Fit	Pearson Chi-Sq GOF	17.78	33.92	0.7192	Non-Significant Heterogeneity
	Likelihood Ratio GOF	19.77	33.92	0.5971	Non-Significant Heterogeneity
Variances	Mod Levene Equality of Variance	2.824	2.773	0.0471	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9322	0.9169	0.1090	Normal Distribution
	Anderson-Darling A2 Normality	0.888	2.492	0.0231	Non-normal Distribution

96h Survival Rate Summary

Calculated Variate(A/B)

C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0.053	Dilution Water	4	1	1	1	0	0	0.0%	0.0%	40	40
6.47		4	1	1	1	0	0	0.0%	0.0%	40	40
9.4		4	0.975	0.9	1	0.025	0.05	5.13%	2.5%	39	40
11.2		4	0.975	0.9	1	0.025	0.05	5.13%	2.5%	39	40
20.2		4	0.575	0.4	0.7	0.075	0.15	26.1%	42.5%	23	40
61.1		4	0.15	0	0.3	0.06455	0.1291	86.1%	85.0%	6	40

① DDP 7/24/20 E

CETIS Analytical Report

Report Date: 23 Jul-20 08:59 (p 2 of 2)
 Test Code: 474-085 | 17-2332-7978

Brine Shrimp

Fathead Minnow 96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 16-6600-2337 Endpoint: 96h Survival Rate
 Analyzed: 23 Jul-20 8:59 Analysis: Linear Regression (MLE)

CETIS Version: CETISv1.8.7
 Official Results: Yes

96h Survival Rate Detail

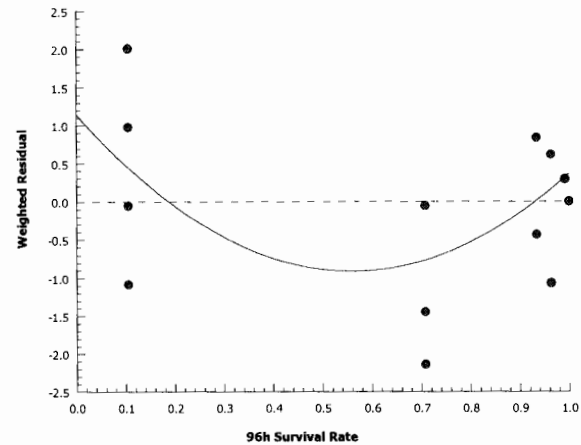
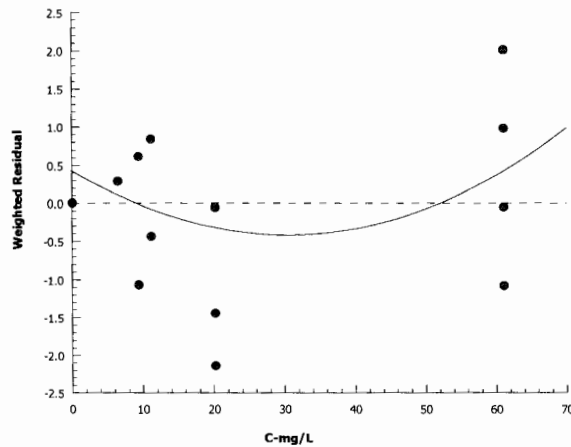
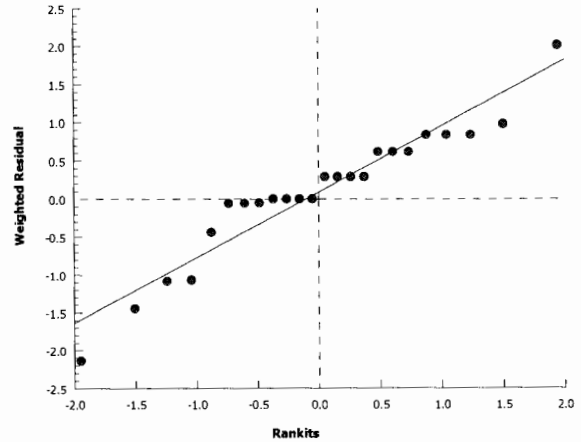
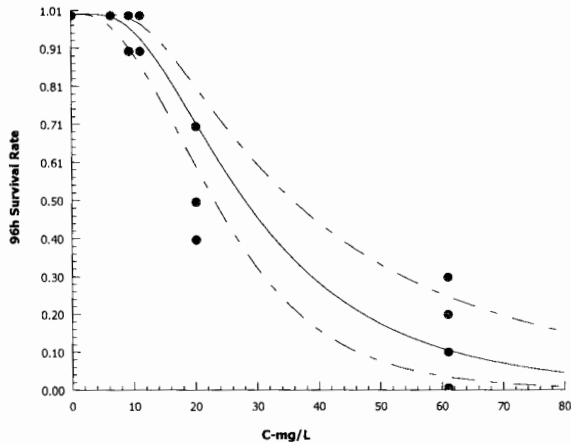
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0.053	Dilution Water	1	1	1	1
6.47		1	1	1	1
9.4		1	1	0.9	1
11.2		0.9	1	1	1
20.2		0.4	0.7	0.5	0.7
61.1		0	0.3	0.1	0.2

96h Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0.053	Dilution Water	10/10	10/10	10/10	10/10
6.47		10/10	10/10	10/10	10/10
9.4		10/10	10/10	9/10	10/10
11.2		9/10	10/10	10/10	10/10
20.2		4/10	7/10	5/10	7/10
61.1		0/10	3/10	1/10	2/10

Graphics

Log-Normal [NED=A+B*log(X)]



DAP 7/24/20 E

CETIS Analytical Report

Report Date: 23 Jul-20 09:00 (p 1 of 2)
 Test Code: 474-086 | 00-0785-0604

① Brine shrimp

Fathead Minnow 96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 15-2180-3707	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 23 Jul-20 9:00	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 07-3803-3948	Test Type: Survival (96h)	Analyst: Lab Tech
Start Date: 25 Jun-20 15:35	Protocol: EPA/821/R-02-012 (2002)	Diluent: rGSL
Ending Date: 29 Jun-20 15:05	Species: Artemia franciscana	Brine: Crystal Sea
Duration: 95h	Source: In-House Culture	Age: 48h
Sample ID: 06-7013-1137	Code: 27F163C1	Client: Notre Dame
Sample Date: 25 Jun-20 12:25	Material: Lead Nitrate	Project: Effluent Characterization (Weekly)
Receive Date: 29 Jun-20 15:35	Source: research	
Sample Age: 3h	Station:	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1046464	200	Yes	Two-Point Interpolation

Point Estimates

Level	mg/L	95% LCL	95% UCL
LC5	18.15	5.258	20.41
LC10	21.48	18.44	24.16
LC15	24.8	21.3	28.15
LC20	28.13	24.24	32.79
LC25	31.45	27.1	36.74
LC40	41.42	35.6	N/A
LC50	>45.7	N/A	N/A

96h Survival Rate Summary

Calculated Variate(A/B)

C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0.075	Dilution Water	4	0.85	0.8	0.9	0.02887	0.05774	6.79%	0.0%	34	40
6.9		4	0.975	0.9	1	0.025	0.05	5.13%	-14.7%	39	40
9.95		4	0.975	0.9	1	0.025	0.05	5.13%	-14.7%	39	40
10.1		4	0.925	0.9	1	0.025	0.05	5.41%	-8.82%	37	40
17.2		4	0.9	0.9	0.9	0	0	0.0%	-5.88%	36	40
45.7		4	0.5	0.4	0.6	0.04082	0.08165	16.3%	41.2%	20	40

96h Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0.075	Dilution Water	0.8	0.8	0.9	0.9
6.9		1	1	0.9	1
9.95		1	1	1	0.9
10.1		1	0.9	0.9	0.9
17.2		0.9	0.9	0.9	0.9
45.7		0.6	0.4	0.5	0.5

96h Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0.075	Dilution Water	8/10	8/10	9/10	9/10
6.9		10/10	10/10	9/10	10/10
9.95		10/10	10/10	10/10	9/10
10.1		10/10	9/10	9/10	9/10
17.2		9/10	9/10	9/10	9/10
45.7		6/10	4/10	5/10	5/10

① DAA 7/24/20 E

CETIS Analytical Report

Brine shrimp

Report Date: 23 Jul-20 09:00 (p 2 of 2)

Test Code: 474-086 | 00-0785-0604

① Fathead Minnow 96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 15-2180-3707

Endpoint: 96h Survival Rate

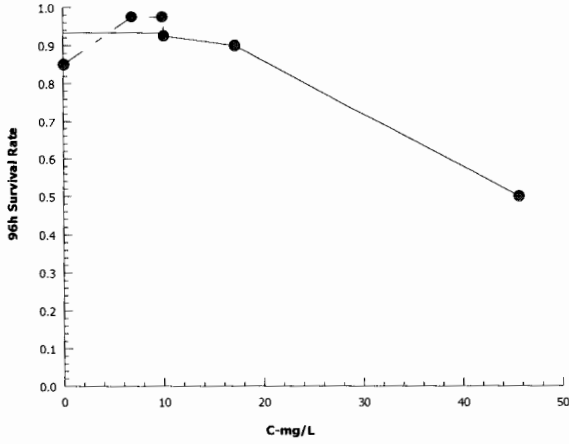
CETIS Version: CETISv1.8.7

Analyzed: 23 Jul-20 9:00

Analysis: Linear Interpolation (ICPIN)

Official Results: Yes

Graphics



⑥ DSD 7/24/20E

July 6, 2020

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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 Acute Brine Shrimp Bioavailability Experiment #23

Mr. Bittner/ Dr. Belovsky:

Below is a summary of the acute brine shrimp experiments initiated on June 25, 2020. The purpose of these experiments was to investigate the difference in the bioavailability of lead to brine shrimp when fed *D. viridis*/YTC¹ mixture or solely *D. viridis*.

Along with a control, five different nominal lead concentrations (prepared with Pb(NO₃)₂) were tested:

- 37.5, 75, 150, 300, and 600 mg/L

The results of these studies will help determine the observed toxicity of lead to brine shrimp fed two different diets. The test volume was consistent at 50 ml.

Species: *Artemia franciscana*

Test type:

- Test duration: 4 days
- Test type: static-renewal (solutions and food renewed at 48 hours)
- Algae: *Dunaliella viridis*
- Food concentration: 72.5 µg/L Chla and 0.3 ml YTC or 145 µg/L Chla
- Temperature: 20°C
- Test volume(s): 50 ml
- Replicates: 4
- Organisms/Rep: 10
- Test media: 120 ppt rGSL media (per Notre Dame recipe)

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

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 Chla and 0.3 ml YTC. Solutions were gently aerated.

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#13962	7.9	NM	NM	133,200	NM	NM	114

^aAs CaCO₃

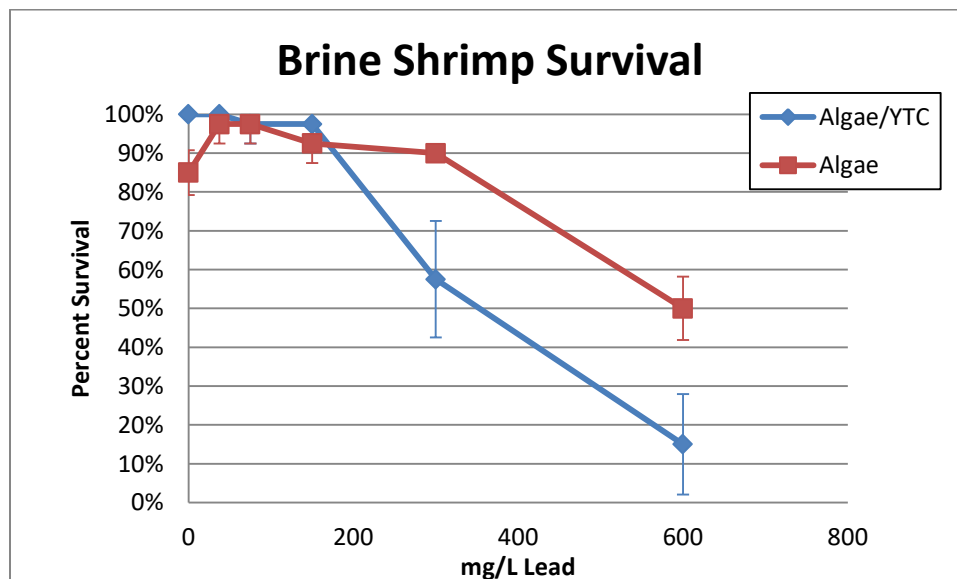
^bTotal residual chlorine

Test activities:

- Biological observations (primarily survival) taken daily.
- Chemistries taken daily (i.e., pH, dissolved oxygen, and temperature).
- Conductivity was measured at test initiation, renewal and termination or when there was 0% survival in that treatment.
- Lead was added to 120 rGSL media containing food and allowed to equilibrate for 3 hours prior to use in the toxicity tests.

Results:

The survival of the brine shrimp (mean ±1 standard deviation) in the lead treatments is illustrated in the following figure:



Test Endpoints

Food: <i>D. viridis</i> /YTC mix				
Test Concentration (mg/L Lead) (nominal)	Percent Survival of <i>Artemia franciscana</i>			
	24 hours	48 hours	72 hours	96 hours
0 (rGSL)	100	100	100	100
37.5	100	100	100	100
75	100	100	100	97.5
150	100	100	100	97.5
300	70	62.5	60	57.5
600	50	25	22.5	15
Control Performance		Acceptable		

Food: <i>D. viridis</i> alone				
Test Concentration (mg/L Lead) (nominal)	Percent Survival of <i>Artemia franciscana</i>			
	24 hours	48 hours	72 hours	96 hours
0 (rGSL)	85	85	85	85
37.5	97.5	97.5	97.5	97.5
75	100	97.5	97.5	97.5
150	95	95	95	92.5
300	92.5	90	90	90
600	82.5	72.5	62.5	50
Control Performance		Unacceptable ¹		

¹Performance in lowest treatment acceptable

Data Analysis and Test Endpoints

Test	Biological Endpoint	Statistical Endpoint	Value (mg/L Lead) (nominal)
<i>D. viridis</i> /YTC mix	Survival	96-hour LC ₅₀	337.2 (C.L. 283.9 - 400.5)
<i>D. viridis</i> only	Survival	96-hour LC ₅₀	>600

Summary and findings:

- Organism survival was $\geq 85\%$ for the controls. Even though control survival in the *D. viridis* only test was lower than the target threshold of 90%, the lowest effluent treatment had 97.5% survival, and the results are still reflective of lead toxicity and can be reliably compared to the *D. viridis*/YTC test data.
- Lead toxicity was clearly demonstrated at these testing concentrations.
- Samples were collected for lead analysis and measured endpoints will be forthcoming.
- Test end points were significantly higher (less toxicity) in the *D. viridis* only test. The 96-h LC₅₀ from the *D. viridis*/YTC was 56.2% of the 96-h LC₅₀ from the *D. viridis* only test.

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

Sincerely,



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Rami B. Naddy, Ph.D.
Manager / Environmental Toxicologist
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17001-474-(085,086)

Attachment

cc: David Pillard, TRE

TOXICITY DATA PACKAGE COVER SHEET

QA: DAP 6/30/20

Test Type: Chronic⁽ⁱ⁾ Acute Project Number: 17001-474-086
Test Substance: Lead (Pb(NO3)2) Species: Artemia franciscana
Dilution Water: rGSL Organism Lot or Batch Number: 062320
Concurrent Control Water: NA Age: 48HR (48 hr) Supplier: TRE
Date and Time Test Began: 6/25/20 @ 1535 Date and Time Test Ended: 6/29/20 @ 1505
Protocol Number: _____ Investigator(s): HR/CP/MS (EJ/EN)

Background Information

Type of Test: Static-Renewal (48 h) pH control?: Yes No
If yes, give % CO₂: 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: 96 hr Organisms per Replicate: 10
Type of Food and Quantity per Chamber: 145 ug/L Chla Feeding Frequency: Initiation and Renewals

Test Substance Characterization Parameters and Frequency:

Hardness: Test Initiation Alkalinity: Test Initiation NH₃: Test Initiation TRC: Test Initiation
pH: Daily Conductivity: Daily

Test Concentrations (Volume:Volume): rGSL, 37.5, 75, 150, 300, and 600 mg/L as Pb
Agency Summary Sheet(s)?: None

Reference Toxicant Data: Test Dates: _____ to _____ IC₂₅: _____
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: AS Date: 6/23/20

AS 6/23/20 E

TEST SUBSTANCE USAGE LOG

Project Number: 17001-474-086

QA: DAP 6/30/20

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	C17-020			
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 <u>RW#</u> or TRE#, circle one	13962/13970*			
Concurrent Control Water RW#	NA			
Date(s) Used	6/25/20			
	6/27/20*			

Preparation of Test Solutions

Test Substance Conc. (% Effluent)	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	250	250						
37.5	16	234	250						
75	31	219	250						
150	63	188	250						
300	125	125	250						
600	250	0	250						
	484	1016	1500						
Initials / Date	HR 6/25/20 Mixed BS								
Initials / Date	CP 6/27/20 " "								
Initials / Date									
Initials / Date									
Initials / Date									
Initials / Date									
Initials / Date									
Initials / Date									

Artemia franciscana
 CHRONIC BIOLOGICAL DATA

QA: DDP 7/1/20

Project Number: 17001-474-086

mg/L	Test Replicate	Number of Surviving Organisms								Remarks
		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	
0	A	10	8	8	8	8	/	/	/	85%
	B	10	8	8	8	8	/	/	/	
	C	10	089	9	9	9	/	/	/	
	D	10	9	9	9	9	/	/	/	
37.5	A	10	10	10	10	10	/	/	/	97.5% * 2 weak orgs
	B	10	10*	10	10	10	/	/	/	
	C	10	9	9	9	9	/	/	/	
	D	10	10*	10	10	10	/	/	/	
75	A	10	10	10	10	10	/	/	/	97.5%
	B	10	10	10	10	10	/	/	/	
	C	10	10	10	10	10	/	/	/	
	D	10	10	9	9	9	/	/	/	
150	A	10	10	10	10	10	/	/	/	92.5%
	B	10	9	9	9	9	/	/	/	
	C	10	9	9	9	9	/	/	/	
	D	10	10	10	10	9	/	/	/	
300	A	10	10	9	9	9	/	/	/	90% * 1 weak org
	B	10	9	9	9	9*	/	/	/	
	C	10	9	9	9	9	/	/	/	
	D	10	9	9	9	9	/	/	/	
600	A	10	8	7	7	6	/	/	/	50% * 1 weak org * 1 weak org * 1 weak org
	B	10	9	8*	5	4	/	/	/	
	C	10	8	8*	7	5	/	/	/	
	D	10	8	6*	6	② 5	/	/	/	
	A						/	/	/	
	B						/	/	/	
	C						/	/	/	
	D						/	/	/	
Date:		6/25/20	6/26/20	6/27/20	6/28/20	6/29/20				
Time:		1535	1815	1515	1040	1505				
Initials:		CP/MBS	CP	CP	ES	EN				

① CP 6/26/20 E
 ② EN 6/29/20 C

CHRONIC CHEMICAL DATA (INITIAL)

QA: DDP 7/1/20

Project Number: 17001-474-086

Test Species: *Artemia franciscana*

%	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	/	8.1	/	/	/	/	/	FM27	
D.O. (mg/L)	5.2	/	4.6	/	/	/	/	/	17	
Temp. (°C)	20	/	20	/	/	/	/	/	IR1	
Cond. (µS/cm)	133,900	/	130,100	/	/	/	/	/	15	
Hard. (mg/L)	/	/	/	/	/	/	/	/		
Alk. (mg/L)	/	/	/	/	/	/	/	/		
TRC (mg/L)	/	/	/	/	/	/	/	/		
NH ₃ (mg/L)	/	/	/	/	/	/	/	/		
Conc.: 37.5										
pH	7.9	/	8.0	/	/	/	/	/		
D.O. (mg/L)	5.2	/	4.6	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	135,200	/	128,900	/	/	/	/	/		
Hard. (mg/L)	/	/	/	/	/	/	/	/		
Alk. (mg/L)	/	/	/	/	/	/	/	/		
TRC (mg/L)	/	/	/	/	/	/	/	/		
NH ₃ (mg/L)	/	/	/	/	/	/	/	/		
Conc.: 75										
pH	7.8	/	8.0	/	/	/	/	/		
D.O. (mg/L)	5.1	/	4.6	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	135,600	/	129,300	/	/	/	/	/		
Hard. (mg/L)	/	/	/	/	/	/	/	/		
Alk. (mg/L)	/	/	/	/	/	/	/	/		
TRC (mg/L)	/	/	/	/	/	/	/	/		
NH ₃ (mg/L)	/	/	/	/	/	/	/	/		
Conc.: 150										
pH	7.7	/	7.9	/	/	/	/	/		
D.O. (mg/L)	5.1	/	4.6	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	135,300	/	129,000	/	/	/	/	/		
Date:	6/25/20		6/27/20							
Time:	1525		1500							
Initials:	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.

DDP 7/1/20 E

CHRONIC CHEMICAL DATA (INITIAL)

QA: DDP 7/1/20

Project Number:	17001-474-086
Test Species:	<i>Artemia franciscana</i>

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 300									All Conc.	
pH	7.2	/	7.7	/	/	/	/	/		
D.O. (mg/L)	5.0	/	4.6	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	134,500	/	125,200	/	/	/	/	/		
Conc.: 600										
pH	6.7	/	6.7	/	/	/	/	/		
D.O. (mg/L)	5.1	/	4.7	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	133,100	/	132,500	/	/	/	/	/		
Hard. (mg/L)	/	/	/	/	/	/	/	/		
Alk. (mg/L)	/	/	/	/	/	/	/	/		
TRC (mg/L)	/	/	/	/	/	/	/	/		
NH ₃ (mg/L)	/	/	/	/	/	/	/	/		
Date:	6/25/20		6/27/20							
Time:	1525		1500							
Initials:	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.

CHRONIC CHEMICAL DATA (FINAL)

QA: ~~DP~~ 7/1/20

Project Number:	17001-474-086
Test Species:	<i>Artemia franciscana</i>

%	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.: 0				215200	/	/	/	/	All Conc.	* conductivity
pH	8.0	7.9	8.1	8.1	/	/	/	/	FM27	
D.O. (mg/L)	5.2	4.6	4.6	4.7	/	/	/	/	17	
Temp (°C)	20	19	20	20	/	/	/	/	L-13	
Conc.: 37.5				214400	/	/	/	/		* conductivity
pH	8.0	7.9	8.0	8.0	/	/	/	/		
D.O. (mg/L)	5.2	4.7	4.6	4.8	/	/	/	/		
Temp (°C)	20	19	20	20	/	/	/	/		
Conc.: 75				218000	/	/	/	/		* conductivity
pH	7.9	7.8	7.9	8.0	/	/	/	/		
D.O. (mg/L)	5.2	4.7	4.6	4.8	/	/	/	/		
Temp (°C)	20	19	20	20	/	/	/	/		
Conc.: 150				215200	/	/	/	/		* conductivity
pH	7.8	7.8	7.9	8.0	/	/	/	/		
D.O. (mg/L)	5.2	4.7	4.7	4.9	/	/	/	/		
Temp (°C)	20	19	20	20	/	/	/	/		
Conc.: 300				206600	/	/	/	/		* conductivity
pH	7.6	7.7	7.7	7.9	/	/	/	/		
D.O. (mg/L)	5.2	4.7	4.6	4.9	/	/	/	/		
Temp (°C)	20	19	20	20	/	/	/	/		
Conc.: 600				201200	/	/	/	/		* conductivity
pH	7.2	7.3	7.4	7.5	/	/	/	/		
D.O. (mg/L)	5.2	① 4.50	4.7	5.1	/	/	/	/		
Temp (°C)	20	19	20	20	/	/	/	/		
Conc.:					/	/	/	/		
pH					/	/	/	/		
D.O. (mg/L)					/	/	/	/		
Temp (°C)					/	/	/	/		
Date:	6/26/20	6/27/20	6/28/20	6/29/20						
Time:	1845	1950	1045	1505						
Initials:	CP	CP	ES	EN						

① CP 6/27/20 E

QA: WAP 7/1/20

DAILY TOXICITY TEST LOG

Project Number:	17001-474-086
Test Species:	Artemia franciscana

General Comments	Feeding	Initials/Date
Random Chart: "D" Min/Max Thermometer # M-15	145 ug/l Chla	
Test Day 0 Test Solution Mixed at: 1225 Test Organisms Added at: 1535	Fed @ 1225	CP 6/25/20
Test Day 1 Real Time: 20 °C Min-Max Range: 20-20 °C	NONE	CP 6/26/20
Test Day 2 Real Time: 21 °C Min-Max Range: 20-22 °C	Fed @ 1140CP	CP 6/27/20
Test Day 3 Real Time: 22 °C Min-Max Range: 21-24 °C	NONE	ES 6/28/20
Test Day 4 Real Time: 22 °C Min-Max Range: 21-24 °C	NONE	EN 6/29/20

CETIS Analytical Report

Report Date: 30 Jun-20 08:31 (p 1 of 2)

Test Code: 474-086 | 00-0785-0604

① Brine shrimp

Fathead Minnow 96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 02-5469-8135	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 30 Jun-20 8:31	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 07-3803-3948	Test Type: Survival (96h)	Analyst: Lab Tech
Start Date: 25 Jun-20 15:35	Protocol: EPA/821/R-02-012 (2002)	Diluent: rGSL
Ending Date: 29 Jun-20 15:05	Species: Artemia franciscana	Brine: Crystal Sea
Duration: 95h	Source: In-House Culture	Age: 48h
Sample ID: 06-7013-1137	Code: 27F163C1	Client: Notre Dame
Sample Date: 25 Jun-20 12:25	Material: Lead Nitrate	Project: Effluent Characterization (Weekly)
Receive Date: 29 Jun-20 15:35	Source: research	
Sample Age: 3h	Station:	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	942518	200	Yes	Two-Point Interpolation

Point Estimates

Level	mg/L	95% LCL	95% UCL
LC5	310	48	336.4
LC10	345	315.4	374.6
LC15	380	348.5	420
LC20	415	380.3	464.1
LC25	450	410	507.7
LC40	555	493.7	N/A
LC50	>600	N/A	N/A

96h Survival Rate Summary

Calculated Variate(A/B)

C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	4	0.85	0.8	0.9	0.02887	0.05774	6.79%	0.0%	34	40
37.5		4	0.975	0.9	1	0.025	0.05	5.13%	-14.7%	39	40
75		4	0.975	0.9	1	0.025	0.05	5.13%	-14.7%	39	40
150		4	0.925	0.9	1	0.025	0.05	5.41%	-8.82%	37	40
300		4	0.9	0.9	0.9	0	0	0.0%	-5.88%	36	40
600		4	0.5	0.4	0.6	0.04082	0.08165	16.3%	41.2%	20	40

96h Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.8	0.8	0.9	0.9
37.5		1	1	0.9	1
75		1	1	1	0.9
150		1	0.9	0.9	0.9
300		0.9	0.9	0.9	0.9
600		0.6	0.4	0.5	0.5

96h Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	8/10	8/10	9/10	9/10
37.5		10/10	10/10	9/10	10/10
75		10/10	10/10	10/10	9/10
150		10/10	9/10	9/10	9/10
300		9/10	9/10	9/10	9/10
600		6/10	4/10	5/10	5/10

① DAA 7/1/20 E

CETIS Analytical Report

Report Date: 30 Jun-20 08:31 (p 2 of 2)

Test Code: 474-086 | 00-0785-0604

Brine shrimp

① Fathead Minnow-96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 02-5469-8135

Endpoint: 96h Survival Rate

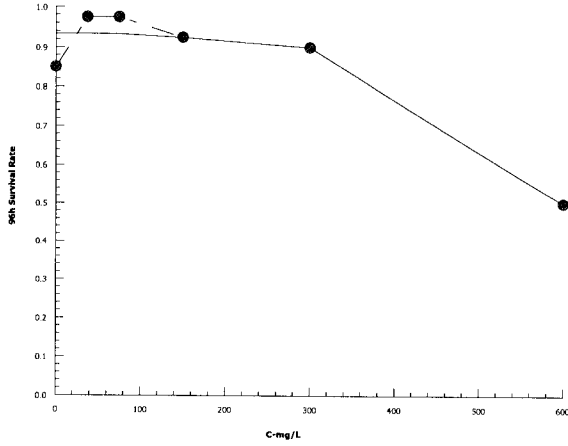
CETIS Version: CETISv1.8.7

Analyzed: 30 Jun-20 8:31

Analysis: Linear Interpolation (ICPIN)

Official Results: Yes

Graphics



① DSP 7/1/20 E

CETIS Analytical Report

Report Date: 30 Jun-20 08:31 (p 1 of 2)

Test Code: 474-086 | 00-0785-0604

Brine shrimp

Fathead Minnow-96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 18-3751-3712	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 30 Jun-20 8:31	Analysis: Trimmed Spearman-Kärber	Official Results: Yes
Batch ID: 07-3803-3948	Test Type: Survival (96h)	Analyst: Lab Tech
Start Date: 25 Jun-20 15:35	Protocol: EPA/821/R-02-012 (2002)	Diluent: rGSL
Ending Date: 29 Jun-20 15:05	Species: Artemia franciscana	Brine: Crystal Sea
Duration: 95h	Source: In-House Culture	Age: 48h
Sample ID: 06-7013-1137	Code: 27F163C1	Client: Notre Dame
Sample Date: 25 Jun-20 12:25	Material: Lead Nitrate	Project: Effluent Characterization (Weekly)
Receive Date: 29 Jun-20 15:35	Source: research	
Sample Age: 3h	Station:	

Trimmed Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	LC50	95% LCL	95% UCL
Zero Threshold	0	50.00%	2.778	0	600	N/A	N/A

96h Survival Rate Summary

Calculated Variate(A/B)

C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	4	0.85	0.8	0.9	0.02887	0.05774	6.79%	0.0%	34	40
37.5		4	0.975	0.9	1	0.025	0.05	5.13%	-14.7%	39	40
75		4	0.975	0.9	1	0.025	0.05	5.13%	-14.7%	39	40
150		4	0.925	0.9	1	0.025	0.05	5.41%	-8.82%	37	40
300		4	0.9	0.9	0.9	0	0	0.0%	-5.88%	36	40
600		4	0.5	0.4	0.6	0.04082	0.08165	16.3%	41.2%	20	40

96h Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.8	0.8	0.9	0.9
37.5		1	1	0.9	1
75		1	1	1	0.9
150		1	0.9	0.9	0.9
300		0.9	0.9	0.9	0.9
600		0.6	0.4	0.5	0.5

96h Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	8/10	8/10	9/10	9/10
37.5		10/10	10/10	9/10	10/10
75		10/10	10/10	10/10	9/10
150		10/10	9/10	9/10	9/10
300		9/10	9/10	9/10	9/10
600		6/10	4/10	5/10	5/10

REP 7/1/20 E

CETIS Analytical Report

Braia shrimp

Report Date: 30 Jun-20 08:31 (p 2 of 2)

Test Code: 474-086 | 00-0785-0604

① **Fathead Minnow 96-h Acute Survival Test**

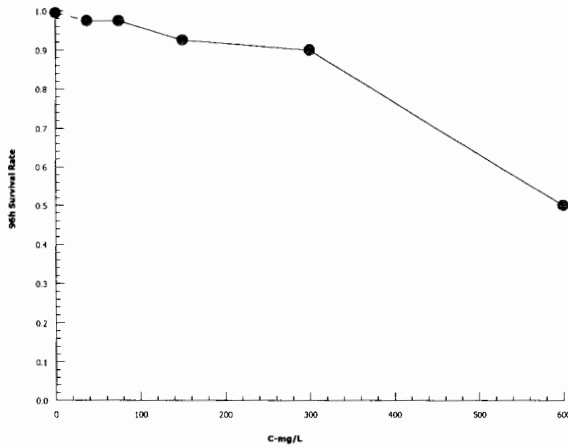
TRE Environmental Strategies

Analysis ID: 18-3751-3712
Analyzed: 30 Jun-20 8:31

Endpoint: 96h Survival Rate
Analysis: Trimmed Spearman-Kärber

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



① DAP 7/1/20 E

TOXICITY DATA PACKAGE COVER SHEET

QA: JAP 6/30/20

Test Type: Chronic ^① Acute Project Number: 17001-474-085
Test Substance: Lead (Pb(NO3)2) Species: Artemia franciscana
Dilution Water: rGSL Organism Lot or ^②Batch Number: 0628320
Concurrent Control Water: NA Age: 48 hr (48 hr) Supplier: TRE
Date and Time Test Began: 6/25/20 @ 1400 Date and Time Test Ended: 6/29/20 @ 1430
Protocol Number: _____ Investigator(s): EE/CP/EN/ES

Background Information

Type of Test: Static-Renewal (48 h) pH control?: Yes No
If yes, give % CO₂: 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: 96 hr Organisms per Replicate: 10
Type of Food and Quantity per Chamber: 72.5 ug/L Chla/ 0.3 ml YT Feeding Frequency: Initiation and Renewals

Test Substance Characterization Parameters and Frequency:

Hardness: Test Initiation Alkalinity: Test Initiation NH₃: Test Initiation TRC: Test Initiation
pH: Daily Conductivity: Daily
Test Concentrations (Volume:Volume): rGSL, 37.5, 75, 150, 300, and 600 mg/L as Pb
Agency Summary Sheet(s)?: None

Reference Toxicant Data: Test Dates: _____ to _____ IC₂₅: _____
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: MB Date: 6/23/20

① 6/25/20 E
②

TEST SUBSTANCE USAGE LOG

Project Number: 17001-474-085

QA: N/A 6/30/20

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	C17-020			
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 <u>RW#</u> or TRE#, circle one	13962/13970*			
Concurrent Control Water RW#				
Date(s) Used	6/25/20			
	6/27/20*			

Preparation of Test Solutions

Test Substance Conc. (% Effluent)	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	250	250						
37.5	16	234	250						
75	31	219	250						
150	63	188	250						
300	125	125	250						
600	250	0	250						
	484	1016	1500						
Initials / Date	CR 6/25/20 Mixed BS								
Initials / Date	CR 6/27/20 " "								
Initials / Date									
Initials / Date									
Initials / Date									
Initials / Date									
Initials / Date									
Initials / Date									

Artemia franciscana
CHRONIC BIOLOGICAL DATA

QA: DAP 6/30/20

Project Number: 17001-474-085

mg/L	Test Replicate	Number of Surviving Organisms								Remarks
		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	
0	A	10	10	10	10	10	/	/	/	
	B	10	10	10	10	10	/	/	/	
	C	10	10	10	10	10	/	/	/	
	D	10	10	10	10	10	/	/	/	
37.5	A	10	10	10	10	10	/	/	/	
	B	10	10*	10	10	10	/	/	/	* 1 weak org
	C	10	10	10	10	10	/	/	/	
	D	10	10	10	10	10	/	/	/	
75	A	10	10	10	10	10	/	/	/	
	B	10	10	10	10	10	/	/	/	
	C	10	10	10*	10	9	/	/	/	* 1 weak org
	D	10	10	10	10	10	/	/	/	
150	A	10	10	10*	10*	9	/	/	/	* 1 weak org
	B	10	10*	10*	10	10	/	/	/	* 2 weak orgs
	C	10	10	10	10	10	/	/	/	
	D	10	10	10	10	10	/	/	/	
300	A	10	5	4	4	4	/	/	/	
	B	10	8	7	7	7	/	/	/	
	C	10	7	6	6	5	/	/	/	
	D	10	8	8	7	7	/	/	/	
600	A	10	2	1	0	-	/	/	/	
	B	10	6*	4	4	3 ⁺	/	/	/	* 1 weak org † 2 weak orgs
	C	10	7*	2	2	1	/	/	/	* 2 weak orgs
	D	10	5*	3	3	2	/	/	/	* 2 weak orgs
	A						/	/	/	
	B						/	/	/	
	C						/	/	/	
	D						/	/	/	
Date:		6/25/20	6/26/20	6/27/20	6/28/20	6/29/20				
Time:		1400	1730	1410	1020	1430				
Initials:		CP/EN	CP	CP	ES	EN				

CHRONIC CHEMICAL DATA (INITIAL)

QA: DAP 6/30/20

Project Number:	17001-474-085
Test Species: <i>Artemia franciscana</i>	

%	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	/	8.0	/	/	/	/	/	FM27	
D.O. (mg/L)	5.1	/	4.6	/	/	/	/	/	17	
Temp. (°C)	20	/	20	/	/	/	/	/	IR1	
Cond. (µS/cm)	133,200	/	129,000	/	/	/	/	/	15	
Hard. (mg/L)		/		/	/	/	/	/		
Alk. (mg/L)		/		/	/	/	/	/		
TRC (mg/L)		/		/	/	/	/	/		
NH ₃ (mg/L)		/		/	/	/	/	/		
Conc.: 37.5										
pH	7.8	/	8.0	/	/	/	/	/		
D.O. (mg/L)	5.1	/	4.7	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	134,000	/	134,400	/	/	/	/	/		
Hard. (mg/L)		/		/	/	/	/	/		
Alk. (mg/L)		/		/	/	/	/	/		
TRC (mg/L)		/		/	/	/	/	/		
NH ₃ (mg/L)		/		/	/	/	/	/		
Conc.: 75										
pH	7.8	/	8.0	/	/	/	/	/		
D.O. (mg/L)	5.0	/	4.7	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	133,900	/	132,500	/	/	/	/	/		
Hard. (mg/L)		/		/	/	/	/	/		
Alk. (mg/L)		/		/	/	/	/	/		
TRC (mg/L)		/		/	/	/	/	/		
NH ₃ (mg/L)		/		/	/	/	/	/		
Conc.: 150										
pH	7.6	/	7.9	/	/	/	/	/		
D.O. (mg/L)	5.0	/	4.7	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	134,100	/	130,500	/	/	/	/	/		
Hard. (mg/L)		/		/	/	/	/	/		
Alk. (mg/L)		/		/	/	/	/	/		
TRC (mg/L)		/		/	/	/	/	/		
NH ₃ (mg/L)		/		/	/	/	/	/		
Date:	6/25/20		6/27/20							
Time:	1350		1400							
Initials:	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 CP 6/27/20 E

CHRONIC CHEMICAL DATA (INITIAL)

QA: DAP 6/30/20

Project Number:	17001-474-085
Test Species:	<i>Artemia franciscana</i>

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.:	300								All Conc.	
pH	7.3	/	7.7	/	/	/	/	/		
D.O. (mg/L)	5.0	/	4.8	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	133,400	/	129,600	/	/	/	/	/		
Conc.:		/	/	/	/	/	/	/		
pH	/	/	/	/	/	/	/	/		
D.O. (mg/L)	/	/	/	/	/	/	/	/		
Temp. (°C)	/	/	/	/	/	/	/	/		
Cond. (µS/cm)	/	/	/	/	/	/	/	/		
Conc.:		/	/	/	/	/	/	/		
pH	/	/	/	/	/	/	/	/		
D.O. (mg/L)	/	/	/	/	/	/	/	/		
Temp. (°C)	/	/	/	/	/	/	/	/		
Cond. (µS/cm)	/	/	/	/	/	/	/	/		
Conc.:	600	/	/	/	/	/	/	/		
pH	6.7	/	6.6	/	/	/	/	/		
D.O. (mg/L)	5.0	/	4.8	/	/	/	/	/		
Temp. (°C)	20	/	20	/	/	/	/	/		
Cond. (µS/cm)	132,100	/	129,200	/	/	/	/	/		
Hard. (mg/L)	/	/	/	/	/	/	/	/		
Alk. (mg/L)	/	/	/	/	/	/	/	/		
TRC (mg/L)	/	/	/	/	/	/	/	/		
NH ₃ (mg/L)	/	/	/	/	/	/	/	/		
Date:	6/25/20	/	6/27/20	/	/	/	/	/		
Time:	1350	/	1400	/	/	/	/	/		
Initials:	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.

CHRONIC CHEMICAL DATA (FINAL)

QA: AW 6/30/20

Project Number:	17001-474-085
Test Species:	<i>Artemia franciscana</i>

%					Day	Day	Day	Day	Day	Meter #	Remarks		
					1	2	3	4	5	6		7	8
Conc.:	0								222400	/	/	/	All Conc. * conductivity
pH		7.9	7.9	8.0	8.1	/	/	/	/	/	/	FM27	
D.O. (mg/L)		5.0	4.5	4.6	4.5	/	/	/	/	/	/	17	
Temp (°C)		20	20	20	20	/	/	/	/	/	/	L-13	
Conc.:	37.5								215400	/	/	/	* conductivity
pH		7.8	7.9	8.0	8.0	/	/	/	/	/	/		
D.O. (mg/L)		5.0	4.6	4.5	4.5	/	/	/	/	/	/		
Temp (°C)		20	20	20	20	/	/	/	/	/	/		
Conc.:	75								210000	/	/	/	* conductivity
pH		7.8	7.9	7.9	8.0	/	/	/	/	/	/		
D.O. (mg/L)		5.0	4.6	4.4	4.5	/	/	/	/	/	/		
Temp (°C)		20	20	20	20	/	/	/	/	/	/		
Conc.:	150								212600	/	/	/	* conductivity
pH		7.7	7.8	7.9	7.9	/	/	/	/	/	/		
D.O. (mg/L)		5.1	4.6	4.4	4.6	/	/	/	/	/	/		
Temp (°C)		20	20	21	20	/	/	/	/	/	/		
Conc.:	300								210800	/	/	/	* conductivity
pH		7.6	7.7	7.7	7.8	/	/	/	/	/	/		
D.O. (mg/L)		5.1	4.7	4.5	4.7	/	/	/	/	/	/		
Temp (°C)		20	20	21	20	/	/	/	/	/	/		
Conc.:	600								191600	/	/	/	* conductivity
pH		7.2	7.3	7.4	7.3	/	/	/	/	/	/		
D.O. (mg/L)		5.2	4.8	4.6	4.9	/	/	/	/	/	/		
Temp (°C)		20	20	21	20	/	/	/	/	/	/		
Conc.:									/	/	/	/	
pH						/	/	/	/	/	/		
D.O. (mg/L)						/	/	/	/	/	/		
Temp (°C)						/	/	/	/	/	/		
Date:		6/26/20	6/27/20	6/28/20	6/29/20								
Time:		1750	1450	1005	1425								
Initials:		CP	CP	ES	EN								

DAILY TOXICITY TEST LOG

QA: DAY 6/30/20

Project Number:	17001-474-085
Test Species:	<i>Artemia franciscana</i>

General Comments		Feeding 72.5 ug/l Chla 0.33ml YTC	Initials/Date
	Random Chart: "D" Min/Max Thermometer # M-15		
Test Day 0	Test Solution Mixed at: 1050 Test Organisms Added at: 1400	Fed @ 1050	CP 6/25/20
Test Day 1	Real Time: 20 °C Min-Max Range: 20-20 °C	NONE	CP CP 6/25/20 20
Test Day 2	Real Time: 21 °C Min-Max Range: 20-22 °C	Fed @ 1050 CP	CP 6/27/20
Test Day 3	Real Time: 21 °C Min-Max Range: 21-24 °C	NONE	E 6/28/20
Test Day 4	Real Time: 22 °C Min-Max Range: 21-24 °C	NONE	EN 6/29/20

① CP 6/25/20 E

CETIS Analytical Report

Report Date: 30 Jun-20 08:27 (p 1 of 2)

Test Code: 474-085 | 17-2332-7978

① Brine Shrimp

Fathead Minnow 96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 19-8853-2292	Endpoint: 96h Survival Rate	CETIS Version: CETISv1.8.7
Analyzed: 30 Jun-20 8:26	Analysis: Trimmed Spearman-Kärber	Official Results: Yes
Batch ID: 14-9546-5338	Test Type: Survival (96h)	Analyst: Lab Tech
Start Date: 25 Jun-20 14:00	Protocol: EPA/821/R-02-012 (2002)	Diluent: rGSL
Ending Date: 29 Jun-20 14:30	Species: Artemia franciscana	Brine: Crystal Sea
Duration: 4d 0h	Source: Hog Island Oyster Co. ① TRE	Age: 48h
Sample ID: 21-1510-8137	Code: 7E11FD29	Client: Notre Dame
Sample Date: 25 Jun-20 10:50	Material: Lead Nitrate	Project: Special Studies
Receive Date: 25 Jun-20 14:00	Source: research	
Sample Age: 3h	Station:	

Trimmed Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	LC50	95% LCL	95% UCL
Control Threshold	0	15.00%	2.528	0.03737	337.2	283.9	400.5

96h Survival Rate Summary

Calculated Variate(A/B)

C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	4	1	1	1	0	0	0.0%	0.0%	40	40
37.5		4	1	1	1	0	0	0.0%	0.0%	40	40
75		4	0.975	0.9	1	0.025	0.05	5.13%	2.5%	39	40
150		4	0.975	0.9	1	0.025	0.05	5.13%	2.5%	39	40
300		4	0.575	0.4	0.7	0.075	0.15	26.1%	42.5%	23	40
600		4	0.15	0	0.3	0.06455	0.1291	86.1%	85.0%	6	40

96h Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
37.5		1	1	1	1
75		1	1	0.9	1
150		0.9	1	1	1
300		0.4	0.7	0.5	0.7
600		0	0.3	0.1	0.2

96h Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	10/10	10/10	10/10	10/10
37.5		10/10	10/10	10/10	10/10
75		10/10	10/10	9/10	10/10
150		9/10	10/10	10/10	10/10
300		4/10	7/10	5/10	7/10
600		0/10	3/10	1/10	2/10

① DAP 6/30/20 E

CETIS Analytical Report

Brine Shrimp

Report Date: 30 Jun-20 08:27 (p 2 of 2)

Test Code: 474-085 | 17-2332-7978

① Fathead Minnow 96-h Acute Survival Test

TRE Environmental Strategies

Analysis ID: 19-8853-2292

Endpoint: 96h Survival Rate

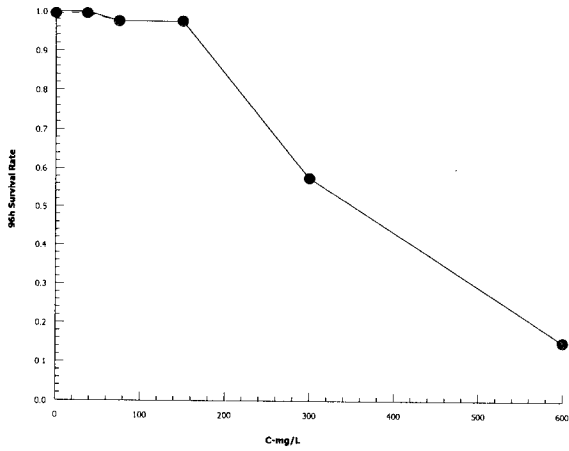
CETIS Version: CETISv1.8.7

Analyzed: 30 Jun-20 8:26

Analysis: Trimmed Spearman-Kärber

Official Results: Yes

Graphics



① DAP 6/30/20 F