



Toxicity Testing on Synthetic Effluent Samples

Final Toxicity Test Report

Report date: April 6, 2011

Submitted to:

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1.0 INTRODUCTION

Nautilus Environmental conducted acute and chronic toxicity tests for Hatfield Consultants on samples identified as Mixture 1 and Mixture 2, prepared on January 28, 2011. The mixtures were prepared in the laboratory from samples identified as Process Water, Mine Water and Ditch Water.

Mixture 1 was a 4:1 combination of Mine Water (80%) and Mill Water (20%) and Mixture 2 was a combination of Mine Water (77%), Mill Water (11%), and Ditch Water (12%), reflecting a 7:1 ratio of Mine to Mill Water, with a small contribution of Ditch Water. The following toxicity tests were performed on the Mixture 1 and Mixture 2 samples:

- 7-d *Ceriodaphnia dubia* survival and reproduction test
- 7-d *Lemna minor* growth inhibition test
- 96-h rainbow trout (*Oncorhynchus mykiss*) acute toxicity test (conducted with lab water and Prairie Creek water as dilution water)
- 48-h *Daphnia magna* acute toxicity test (conducted with lab water and Prairie Creek water as dilution water)

In addition, a single concentration screening test was conducted with *D. magna* on the full-strength Mine Water sample. Due to a technician error in producing Mixture 2, there was insufficient volume of remaining Mine Water sample available to conduct a 96-h single concentration screening test with rainbow trout.

This report describes the results of these toxicity tests. Copies of raw laboratory data sheets and statistical analysis for each test species are provided in Appendices A through F.

2.0 METHODS

Methods for the toxicity tests are summarized in Tables 1 through 6. Testing was conducted according to procedures described by Environment Canada (2000a, 2000b, 2007a and 2007b).

Statistical analyses for the tests were performed using CETIS (Tidepool Scientific Software, 2009).

2.1 Quality Assurance/Quality Control (QA/QC)

Nautilus follows a comprehensive QA/QC program to ensure that the data generated are of high quality and are scientifically defensible. To meet these objectives, Nautilus has implemented a number of quality control procedures that include the following:

- Negative controls to ensure that appropriate testing performance criteria are met;
- Positive controls to assess the health and sensitivity of the test organisms;
- Use of appropriate species and life stage to meet the study objectives;
- Appropriate number of replicates to allow proper statistical analyses;
- Calibration and proper maintenance of instruments to ensure accurate measurements;
- Proper documentation and recordkeeping to allow traceability of performance;
- Adequate supervision and training of staff to ensure that methods are followed;
- Proper handling and storage of samples to ensure their integrity;
- Procedures in place to address issues that may arise during testing and ensure the implementation of appropriate corrective actions; and
- Rigorous review of data by a Registered Professional Biologist to ensure they are of good quality and scientifically defensible prior to releasing to the client.

Table 1. Summary of test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test organism	<i>Ceriodaphnia dubia</i>
Test organism source	In-house culture
Test organism age	<24 hr old neonates produced within 12 hr
Test type	Static renewal
Test duration	7 ± 1 day
Test chamber	20 mL test tube
Test solution volume	15 mL
Number of replicates	10
Control/dilution water	20% Perrier water (hardness 80-100mg/L CaCO ₃)
Test solution renewal	Daily
Test temperature	25 ± 1°C
Number of organisms/chamber	1
Feeding	Daily, with 0.1 ml <i>Pseudokirchneriella subcapitata</i> and 0.05 mL YCT
Light intensity	100 to 600 lux
Photoperiod	16 hours light/8 hours dark
Aeration	None
Test protocol	Environment Canada (2007a), EPS 1/RM/21
Test endpoints	Survival and reproduction
Test acceptability criterion for controls	≥80% survival; ≥15 young per surviving control; ≥60% of controls producing three or more broods
Reference Toxicant	Sodium chloride

Table 2. Summary of test conditions: *Lemna minor* growth inhibition test.

Test organism	<i>Lemna minor</i>
Test organism source	In-house culture
Test organism age	7- to 10-day old
Test type	Static
Test duration	7 days
Test chamber	250-mL glass containers
Test solution volume	150 mL
Number of replicates	4
Control/Dilution water	Deionized or distilled water with nutrients added
Test solution renewal	None
Test temperature	25 ± 2°C
Number of organisms/chamber	Two 3-frond plants
Light intensity	3600 to 4400 lux full spectrum light
Photoperiod	Continuous
Aeration	None
Test protocol	Environment Canada (2007b), EPS 1/RM/37
Test endpoint	Number of fronds and dry weight
Test acceptability criteria for controls	≥ 8-fold increase in number of fronds
Reference toxicant	Potassium chloride

Table 3. Summary of test conditions: 96-h rainbow trout test.

Test organism	<i>Oncorhynchus mykiss</i>
Test organism source	Commercial hatchery
Test organism age	Juveniles
Test type	Static
Test duration	96 hours
Test chamber	20 L glass aquarium
Test solution volume	10 L
Number of replicates	1
Control/Dilution water	Dechlorinated municipal tapwater; and Prairie Creek Water
Test solution renewal	None
Test temperature	15 ± 1°C
Number of organisms/chamber	Ten
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light/8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test protocol	Environment Canada (2000a), EPS 1/RM/13
Test endpoint	96-h LC50
Test acceptability criteria for controls	Survival ≥ 90%
Reference toxicant	Sodium dodecyl sulphate

Table 4. Summary of test conditions: 48-h *Daphnia magna* test.

Test organism	<i>Daphnia magna</i>
Test organism source	In-house culture
Test organism age	< 24 h
Test type	Static
Test duration	48 hours
Test chamber	250-mL glass beakers
Test solution volume	200 mL
Number of replicates	Three (Single Concentration Screening), One (LC50)
Control/Dilution water	Moderately-hard reconstituted water (hardness 80-100 mg/L); and Prairie Creek Water
Test solution renewal	None
Test temperature	20 ± 2°C
Number of organisms/chamber	Ten
Feeding	None
Light intensity	400 to 800 lux
Photoperiod	16 hours light/8 hours dark
Aeration	None
Test protocol	Environment Canada (2000b), EPS 1/RM/14
Test endpoint	48-h LC50
Test acceptability criteria for controls	Survival ≥ 90%
Reference toxicant	Sodium chloride

3.0 RESULTS

Effects on survival of *Ceriodaphnia dubia* were minimal; the LC50 value for both samples was >100%. Conversely, effects were observed on reproduction of *C. dubia* in all concentrations of both Mixtures 1 and 2. The IC25 was <5% in both samples, and the IC50 was <5% for Mixture 1 and 16.1% for Mixture 2, respectively (Table 5). These values indicate that more than a 25% reduction in reproduction was observed in all test concentrations of both mixtures (the lowest test concentration was 5% sample).

The *Lemna minor* growth inhibition test exhibited enhanced growth in all test concentrations compared to the negative control for both Mixture 1 and Mixture 2 (Table 6). The IC25 and IC50 values for both samples were >97%, indicating that there was no evidence of an adverse toxicological effect associated with either of the samples to this species.

Acute toxicity tests using rainbow trout tests exhibited 100% survival in all concentration tested with Mixtures 1 and 2, using both dechlorinated and Prairie Creek water for dilution (Tables 7 and 8). Therefore the 96-h LC50 results were >100%, and there was no evidence of an adverse toxicological effect to this species.

Acute toxicity tests using *Daphnia magna* resulted in an LC50 value of 89% for Mixture 1 and >100% for Mixture 2 when diluted with laboratory-prepared moderately hard water (Table 9). The samples diluted with Prairie Creek water exhibited an unusual pattern of mortality in both tests; specifically, elevated mortality was observed at the lower concentrations of sample, and not in higher concentrations (Table 10). This is an unusual result, since you would typically anticipate a larger adverse effect associated with a larger dose, and in this case, the opposite occurred. This finding suggests that toxicity occurred as a result of some interaction between the water types. Regardless, the fact that mortalities were not observed in the higher concentrations of sample tends to suggest that this was not indicative of a substantial degree of toxicity in the samples.

It should be noted that the full-strength Mixture 1 elicited a 60% reduction in survival of *Daphnia magna* in one test (the one using moderately hard water) and no reduction in survival in the other (using Prairie Creek water for dilution). Since there is no dilution in the full-strength sample, these two treatments are equivalent to one another, and reflect two, somewhat different measures of effect in the Mixture 1 sample. Based on the partial effect observed in one of the

two tests, and the lack of effect in the second test, it would appear that this mixture contained a toxicant at close to its threshold for toxicity to this species.

In the *Daphnia magna* 48-h single concentration screening test with Mine Water, survival was 100% in the undiluted sample, indicating that the Mine Water did not exhibit an adverse effect on this species (Table 11).

Collectively, the results indicated that rainbow trout and duckweed were not sensitive to the samples. Conversely, *C. dubia* displayed a substantial reduction in reproduction in both mixtures, with a greater adverse effect associated with Mixture 1 than Mixture 2. Consistent with this finding, Mixture 1 exhibited a small degree of adverse effect on survival of *D. magna*, whereas Mixture 2 did not. These results suggest that the toxicity observed to cladocerans was from the Mill Water sample, since Mixture 1 contained a higher concentration of Mill Water than Mixture 2. This conclusion is supported by the fact that the full-strength Mine Water did not have any adverse effect on *D. magna*.

3.1 Quality Assurance/Quality Control

All the tests reported here met the acceptability criteria for test validity specified in the respective protocol. Water quality parameters measured during the toxicity tests were within acceptable ranges and results of the reference toxicant tests conducted during the testing program were all within the in-house historical mean $\pm$ two standard deviations. The reference toxicant test results are summarized in Table 12.

It should be noted that the samples produced for this testing project were derived from samples that had been collected previously, and treated in a manner that was similar to that anticipated at the mine site. Consequently, holding times associated with these samples exceeded those specified in the test methods. However, the time period in between preparation of the treated Mine and Mill Water samples and initiation of the toxicity tests fell within the required holding times associated with the various tests.

Table 5. Toxicity test results for the *Ceriodaphnia dubia* survival and reproduction tests.

Concentration (% v/v)	Mean $\pm$ SD			
	Mixture 1		Mixture 2	
	Survival (%)	Reproduction (No. of Young/Female)	Survival (%)	Reproduction (No. of Young/Female)
Control	100	16.1 $\pm$ 4.5	100	16.1 $\pm$ 1.9
5	100	6.3 $\pm$ 3.5	100	11.6 $\pm$ 2.6
10	100	7.1 $\pm$ 3.8	100	11.2 $\pm$ 3.2
20	100	9.1 $\pm$ 1.4	90	6.6 $\pm$ 2.8
40	100	0.0 $\pm$ 0.0	80	3.0 $\pm$ 3.1
60	90	0.0 $\pm$ 0.0	100	0.0 $\pm$ 0.0
80	80	0.0 $\pm$ 0.0	70	0.0 $\pm$ 0.0
100	100	0.0 $\pm$ 0.0	100	0.0 $\pm$ 0.0
Test endpoint				
(% v/v)				
LC50	>100	--	>100	--
IC25 (95% CL)	--	< 5%	--	< 5%
IC50 (95% CL)	--	< 5%	--	16.1 (13.1 - 20.2) %

LC = Lethal Concentration.

IC = Inhibition Concentration.

SD = Standard Deviation.

CL = Confidence Limits.

Table 6. Toxicity test results for the *Lemna minor* growth inhibition tests.

Concentration (% v/v)	Mean $\pm$ SD			
	Mixture 1		Mixture 2	
	Frond Growth (No. of Fronds)	Dry Weight (mg)	Frond Growth (No. of Fronds)	Dry Weight (mg)
Control	67.8 $\pm$ 5.6	6.7 $\pm$ 0.4	69.0 $\pm$ 6.0	7.0 $\pm$ 0.9
1.5	92.2 $\pm$ 22.0	9.1 $\pm$ 1.6	69.2 $\pm$ 7.9	7.2 $\pm$ 1.1
3.0	90.5 $\pm$ 14.5	8.7 $\pm$ 1.5	89.0 $\pm$ 16.5	9.3 $\pm$ 1.3
6.1	104.0 $\pm$ 9.9	10.1 $\pm$ 1.0	83.0 $\pm$ 10.9	8.7 $\pm$ 1.0
12.1	122.8 $\pm$ 23.2	12.6 $\pm$ 2.6	107.8 $\pm$ 25.0	11.1 $\pm$ 2.7
24.2	120.3 $\pm$ 14.5	11.9 $\pm$ 0.9	103.8 $\pm$ 16.5	10.9 $\pm$ 1.2
48.5	116.5 $\pm$ 12.4	13.9 $\pm$ 2.9	111.3 $\pm$ 22.9	12.0 $\pm$ 2.7
97	122.8 $\pm$ 14.0	14.7 $\pm$ 0.5	101.3 $\pm$ 32.3	13.9 $\pm$ 2.6
Test endpoint				
(% v/v)				
IC25	>97	>97	>97	>97
IC50	>97	>97	>97	>97

IC = Inhibition Concentration.

SD = Standard Deviation.

Table 7. Acute toxicity test results for rainbow trout using dechlorinated water for dilution.

Concentration (% v/v)	% Survival	
	Mixture 1	Mixture 2
Control	100	100
6.25	100	100
12.5	100	100
25.0	100	100
50.0	100	100
100.0	100	100
Test endpoint		
LC50	>100	>100

Table 8. Acute toxicity test results for rainbow trout using Prairie Creek water for dilution.

Concentration (% v/v)	% Survival	
	Mixture 1	Mixture 2
Control	100	100
6.25	100	100
12.5	100	100
25.0	100	100
50.0	100	100
100.0	100	100
Test endpoint		
LC50	>100	>100

Table 9. Acute toxicity test results for *Daphnia magna* using moderately hard water for dilution.

Concentration (% v/v)	% Survival	
	Mixture 1	Mixture 2
Control	100	100
6.25	90	80
12.5	100	90
25.0	100	90
50.0	100	80
100.0	40	90
Test endpoint		
LC50 (95% CL)	89 (65 and 100)	>100

CL = Confidence Limits.

Table 10 . Acute toxicity test results for *Daphnia magna* using Prairie Creek water for dilution.

Concentration (% v/v)	% Survival	
	Mixture 1	Mixture 2
Control	100	100
6.25	30	50
12.5	40	60
25.0	70	90
50.0	100	100
100.0	100	100
Test endpoint		
LC50	>100 ¹	>100 ¹

¹ See text for discussion of results.

Table 11. Acute toxicity test results for *Daphnia magna* single concentration screening test using Mine Water.

Concentration (% v/v)	Survival (%)
Control	100
100	100

Table 12. Reference toxicant test results.

Test Species	Endpoint	Mean (2SD Range)	CV(%)	Initiation Date
<i>C. dubia</i>	Survival (IC50): 1.7 g/L NaCl	1.8 (1.4 – 2.3)	12	January 27, 2011
	Reproduction (IC50): 1.1 g/L NaCl	1.2 (0.9 – 1.5)	13	
<i>L.minor</i>	Frond Count (IC50): 3.6 mg/L KCL	3.7 (2.8 – 5.0)	15	January 19, 2011
<i>O.mykiss</i>	Survival (LC50): 5.0 mg/L SDS	5.2 ± (4.4 – 6.1)	8	December 16, 2010
<i>D. magna</i>	Survival (LC50): 4.2 g/L NaCl	4.0 (3.6 – 4.3)	5	January 21, 2011

4.0 REFERENCES

- Environment Canada. 2000a. Biological test method: reference method for determining acute lethality of effluents to rainbow trout. Environmental Protection Series. Report EPS 1/RM/13, Second Edition, December 2000, including May 2007 amendments. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 23 pp.
- Environment Canada. 2000b. Biological test method: reference method for determining acute lethality of effluents to *Daphnia magna*. Environmental Protection Series. Report EPS 1/RM/14, Second Edition, December 2000. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 21 pp.
- Environment Canada. 2007a. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. Environmental Protection Series. Report EPS 1/RM/21, Second Edition, February 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 74 pp.
- Environment Canada. 2007b. Biological test method: tests for measuring the inhibition of growth using the freshwater macrophyte, *Lemna minor*. Environmental Protection Series, Report EPS 1/RM/37. Second Edition. January 2007. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 112 pp.
- Tidepool Scientific Software. 2009. CETIS comprehensive environmental toxicity information system, version 1.8.0. Tidepool Scientific Software, McKinleyville, CA. 222 pp.

APPENDIX A - *Ceriodaphnia dubia* Toxicity Test Data

Ceriodaphnia dubia Summary Sheet

Client:

Hotfield
11 066

Work Order No.:

Start Date/Time:

Set up by:

Jan 29 / 11 @ 1100L
KLS

Sample Information:

Sample ID:

Mixture 1

Sample Date:

Jan 28/11

Date Received:

Jan 28/11

Sample Volume:

2 x 2L

Test Organism Information:

Broodstock No.:

01811

Age of young (Day 0):

<24-h (within 12-h)

Avg No. young in first 3 broods of previous 7 d:

23

Mortality (%) in previous 7 d:

0

Individual female # used ≥ 8 young on test day

1, 2, 6, 7, 8, 10, 12, 15, 16

NaCl Reference Toxicant Results:

Reference Toxicant ID:

Cd 63

Stock Solution ID:

10 NaCl

Date Initiated:

Jan 29/11

7-d LC50 (95% CL):

1.7 (1.3 - 2.3) g/L NaCl

7-d IC50 (95% CL):

1.1 (0.9 - 1.4) g/L NaCl

7-d LC50 Reference Toxicant Mean (2SD Range):

1.8 (1.4 - 2.3) g/L NaCl CV (%): 12

7-d IC50 Reference Toxicant Mean (2SD Range):

1.2 (0.9 - 1.5) g/L NaCl CV (%): 13

Test Results:

	Survival	Reproduction
LC50 %(v/v) (95% CL)	<u>> 100</u>	
IC25 %(v/v) (95% CL)		<u>1.3 (1.1 - 2.0)</u>
IC50 %(v/v) (95% CL)		<u>4.4 (3.2 - 22.2)</u>

Reviewed by:

A. Tong

Date reviewed:

March 24, 2011

Chronic Freshwater Toxicity Test
C. dubia Reproduction Data

Client: Hatfield
Sample ID: Mixture 1 (4:1)
Work Order: 11066

Start Date & Time: Jan 29 2011 @ 1200h ^{KEB}
Stop Date & Time: Feb 4 2011 @ 1200h
Set up by: KEB, JAS

%(v/v)																																		
Days	Concentration: Control											Concentration: 5											Concentration: 10											
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	
1	/	/	/	/	/	/	/	/	/	/	~	/	/	/	/	/	/	/	/	/	/	~	/	/	/	/	/	/	/	/	/	/	/	~
2	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	/	KLB
3	✓	/	✓	✓	✓	3	✓	2	✓	✓	KLB	✓	✓	✓	✓	✓	3	2	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB
4	3	4	4	4	4	5	4	3	3	3	KLB	6	3	3	6	5	4	4	4	✓	✓	KLB	✓	4	4	2	4	✓	4	4	✓	2	KLB	
5	5	/	8	7	7	/	2	5	4	5	KSL	✓	/	/	/	/	✓	4	✓	✓	KSL	6	✓	5	2	✓	2	2	6	✓	3	KSL		
6	10	7	11	8	10	8	4	10	10	8	KLB	✓	4	✓	2	4	3	2	2	1	1	KSL	/	2	4	6	2	1	1	1	✓	4	KSL	
7																																		
8																																		
Total	18	11	23	19	21	16	10	10	17	16	KLB	6	7	3	8	9	10	8	10	1	1	KSL	6	6	13	10	6	3	7	11	0	9	KSL	

Days	Concentration: 20											Concentration: 40											Concentration: 60										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	/	/	/	/	/	/	/	/	/	/	~	/	/	/	/	/	/	/	/	/	/	~	/	/	/	/	/	/	/	/	/	/	~
2	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB
3	✓	✓	✓	✓	✓	32 ^{us}	2	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB
4	2	3	3	✓	4	5	5	2	✓	5	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB
5	3	7	5	4	6	1	✓	4	3	4	KSL	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KSL	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	KSL
6	4	✓	3	4	✓	5	3	/	7	/		✓	/	✓	✓	✓	✓	✓	✓	✓	✓	KSL	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KSL
7																																	
8																																	
Total	9	10	11	8	10	15	10	6	10	9	KSL	0	0	0	0	0	0	0	0	0	0	KSL	0	0	0	0	0	0	0	0	0	0	KSL

Days	Concentration: 80											Concentration: 100											Concentration:										
	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init
1	/	/	/	/	/	/	/	/	/	/	~	/	/	/	/	/	/	/	/	/	/	~											
2	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB											
3	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB											
4	X	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB											
5	/	/	/	/	/	/	/	/	/	/	KSL	/	/	/	/	/	/	/	/	/	/	KSL											
6	/	/	/	/	/	/	/	/	/	/	KSL	/	/	/	/	/	/	/	/	/	/	KSL											
7																																	
8																																	
Total	0	0	0	0	0	0	0	0	0	0	KSL	0	0	0	0	0	0	0	0	0	0	KSL											

Notes: X = mortality.

Sample Description: ①

Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: A. Teng

Date reviewed: March 24, 2011

CETIS Analytical Report

Report Date: 09 Feb-11 17:20 (p 1 of 2)
Test Code: 11063a | 17-1586-0743

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 06-7520-1693	Endpoint: 6d Survival Rate	CETIS Version: CETISv1.8.0
Analyzed: 09 Feb-11 17:05	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 03-7225-7749	Test Type: Reproduction-Survival (7d)	Analyst: Krysta Banack
Start Date: 29 Jan-11 11:00	Protocol: EC/EPS 1/RM/21	Diluent: Perrier Water
Ending Date: 04 Feb-11 12:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 1h	Source:	Age:
Sample ID: 08-2902-6478	Code: 3169F0AE	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 28 Jan-11	Source: Hatfield	
Sample Age: 35h	Station: Mixture 1	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	2.08E+09	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	49.01	44.28	N/A	2.04	N/A	2.258
EC10	100	49.01	N/A	1	N/A	2.04
EC15	>100	N/A	N/A	<1	N/A	N/A
EC20	>100	N/A	N/A	<1	N/A	N/A
EC25	>100	N/A	N/A	<1	N/A	N/A
EC40	>100	N/A	N/A	<1	N/A	N/A
EC50	>100	N/A	N/A	<1	N/A	N/A

6d Survival Rate Summary

Calculated Variate(A/B)

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Negative Control	10	1	1	1	0	0	0.0%	0.0%	10	10
5		10	1	1	1	0	0	0.0%	0.0%	10	10
10		10	1	1	1	0	0	0.0%	0.0%	10	10
20		10	1	1	1	0	0	0.0%	0.0%	10	10
40		10	1	1	1	0	0	0.0%	0.0%	10	10
60		10	0.9	0	1	0.1	0.3162	35.14%	10.0%	9	10
80		10	0.8	0	1	0.1333	0.4216	52.7%	20.0%	8	10
100		10	1	1	1	0	0	0.0%	0.0%	10	10

6d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Negative Control	1	1	1	1	1	1	1	1	1	1
5		1	1	1	1	1	1	1	1	1	1
10		1	1	1	1	1	1	1	1	1	1
20		1	1	1	1	1	1	1	1	1	1
40		1	1	1	1	1	1	1	1	1	1
60		1	1	1	1	1	1	1	1	0	1
80		0	1	1	1	1	1	0	1	1	1
100		1	1	1	1	1	1	1	1	1	1

CETIS Analytical Report

Report Date: 09 Feb-11 17:20 (p 2 of 2)
Test Code: 11063a | 17-1586-0743

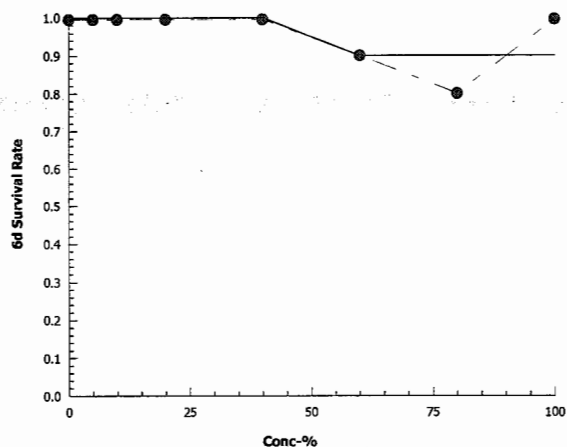
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 06-7520-1693 Endpoint: 6d Survival Rate
Analyzed: 09 Feb-11 17:05 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.0
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Feb-11 17:20 (p 1 of 2)
Test Code: 11063a | 17-1586-0743

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 20-8319-6722	Endpoint: Reproduction	CETIS Version: CETISv1.8.0
Analyzed: 09 Feb-11 16:58	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 03-7225-7749	Test Type: Reproduction-Survival (7d)	Analyst: Krysta Banack
Start Date: 29 Jan-11 11:00	Protocol: EC/EPS 1/RM/21	Diluent: Perrier Water
Ending Date: 04 Feb-11 12:00	Species: Ceriodaphnia dubia	Brine:
Duration: 6d 1h	Source:	Age:
Sample ID: 08-2902-6478	Code: 3169F0AE	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 28 Jan-11	Source: Hatfield	
Sample Age: 35h	Station: Mixture 1	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1.639E+09	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	0.1826	0.1546	0.2432	547.6	411.1	647
IC10	0.3985	0.333	0.5456	250.9	183.3	300.3
IC15	0.6539	0.539	0.9216	152.9	108.5	185.5
IC20	0.9559	0.7769	1.389	104.6	72	128.7
IC25	1.313	1.052	1.97	76.16	50.76	95.1
IC40	2.826	2.157	4.707	35.39	21.24	46.35
IC50	4.35	3.209	22.22	22.99	4.5	31.16

Reproduction Summary

			Calculated Variate						
Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Negative Control	10	16.1	10	23	1.433	4.533	28.15%	0.0%
5		10	6.3	1	10	1.096	3.466	55.01%	60.87%
10		10	7.1	0	13	1.215	3.843	54.12%	55.9%
20		10	9.1	6	11	0.4583	1.449	15.92%	43.48%
40		10	0	0	0	0	0		100.0%
60		10	0	0	0	0	0		100.0%
80		10	0	0	0	0	0		100.0%
100		10	0	0	0	0	0		100.0%

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Negative Control	18	11	23	19	21	16	10	10	17	16
5		6	7	3	8	9	10	8	10	1	1
10		6	6	13	10	6	3	7	11	0	9
20		9	10	11	8	10	8	10	6	10	9
40		0	0	0	0	0	0	0	0	0	0
60		0	0	0	0	0	0	0	0	0	0
80		0	0	0	0	0	0	0	0	0	0
100		0	0	0	0	0	0	0	0	0	0

CETIS Analytical Report

Report Date: 09 Feb-11 17:20 (p 2 of 2)
Test Code: 11063a | 17-1586-0743

Ceriodaphnia 7-d Survival and Reproduction Test

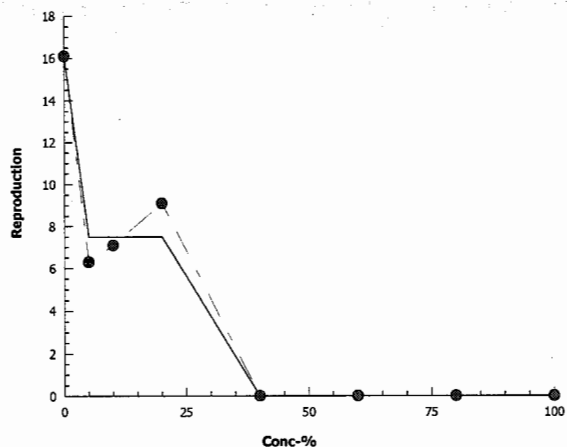
Nautilus Environmental

Analysis ID: 20-8319-6722
Analyzed: 09 Feb-11 16:58

Endpoint: Reproduction
Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.0
Official Results: Yes

Graphics



Ceriodaphnia dubia Summary Sheet

Client: Hotfield
Work Order No.: 11 066

Start Date/Time: Jan 30/11 @ 11:52
Set up by: KLS

Sample Information:

Sample ID: Mixtured 2
Sample Date: Jan 28/11
Date Received: Jan 28/11
Sample Volume: 2 x 2 L

Test Organism Information:

Broodstock No.: 011811
Age of young (Day 0): <24-h (within 12-h)
Avg No. young in first 3 broods of previous 7 d: 28
Mortality (%) in previous 7 d: 0
Individual female # used ≥ 8 young on test day: 1, 2, 4, 5, 6, 7, 8, 10

NaCl Reference Toxicant Results:

Reference Toxicant ID: Cd 63
Stock Solution ID: 10 NaCl
Date Initiated: Jan 29/11

7-d LC50 (95% CL): 1.7 (1.3 - 2.3) g/L NaCl
7-d IC50 (95% CL): 1.1 (0.9 - 1.4) g/L NaCl

7-d LC50 Reference Toxicant Mean (2SD Range): 1.8 (1.4 - 2.3) g/L NaCl CV (%): 12
7-d IC50 Reference Toxicant Mean (2SD Range): 1.2 (0.9 - 1.5) g/L NaCl CV (%): 13

Test Results:

	Survival	Reproduction
LC50 %(v/v) (95% CL)	<u>> 100</u>	
IC25 %(v/v) (95% CL)		<u>3.5 (2.2 - 10.5) AC</u>
IC50 %(v/v) (95% CL)		<u>16.1 (13.1 - 20.8)</u>

40 (24 - 10.8)

Reviewed by: A. Torg

Date reviewed: March 25, 2011

Chronic Freshwater Toxicity Test

Initial and Final Water Quality Measurements

Client: Hatfield
 Sample ID: mixture 2 (8:1)
 Work Order #: 11066

Start Date & Time: Jan 30 2011 2:11:51
 Stop Date: Feb 6 2011 2:11:51
 Test Species: Ceriodaphnia dubia

% (v/v) Concentration Control	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	22.2	26.0	24.0	24.0	24.0	26.0	24.0	25.0	24.0	25.0	25.0	20.0	25.0	25.0
DO (mg/L)	2.2	7.9	6.5	7.3	8.0	7.1	8.4	7.1	8.2	7.1	8.1	7.1	7.9	6.7
pH	8.1	8.0	8.1	7.8	8.2	7.9	8.1	8.0	8.2	8.0	8.2	7.9	8.1	7.9
Cond. (µS/cm)	219	228		222		223		222		225		225		235
Initials	~	KLB		KLB		KLB		KLB		KLB		~		~

Concentration 5	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	26.0	24.0	24.0	24.0	26.0	24.0	24.0	24.0	25.0	24.0	25.0	25.0	25.5
DO (mg/L)	7.8	7.8	6.5	7.4	7.8	7.2	8.2	7.0	8.2	7.0	7.1	7.0	7.9	6.5
pH	8.1	8.0	8.2	7.9	8.2	7.9	8.1	7.8	8.2	7.9	8.2	7.9	8.1	7.9
Cond. (µS/cm)	343	340		321		326		353		329		334		348
Initials	~	KLB		KLB		KLB		KLB		KLB		~		~

Concentration 40	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.0	26.0	24.0	24.0	24.0	26.0	24.5	25.0	24.5	25.0	25.0	25.0	25.0	25.5
DO (mg/L)	7.8	7.6	6.7	7.4	7.8	7.2	8.0	7.1	8.2	7.0	7.1	7.0	7.8	6.3
pH	8.3	8.0	8.5	8.0	8.4	7.9	8.2	7.8	8.6	8.2	8.4	7.9	8.3	7.9
Cond. (µS/cm)	916	940		941		928		897		973		945		915
Initials	~	KLB		KLB		KLB		KLB		KLB		~		~

Concentration 100	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.5	26.0	24.0	24.0	24.0	26.0	24.5	25.5	24.5	25.0	25.5	25.0	25.0	25.5
DO (mg/L)	7.9	7.0	6.8	7.3	7.6	7.2	7.9	7.1	8.2	7.0	7.1	6.5	7.8	5.9
pH	8.5	7.9	8.8	8.1	8.5	8.0	8.3	7.9	8.9	8.1	8.5	8.0	8.4	7.7
Cond. (µS/cm)	1895	1870		1873		1869		1887		1886		1900		1885
Initials	~	KLB		KLB		KLB		KLB		KLB		~		~

	Control	100 % (v/v)		
Hardness*	100	500		
Alkalinity*	86	110		

* mg/L as CaCO₃

Analysts: KLB, Am

Reviewed by: AR

Date reviewed: March 24, 2011

Sample Description: ① light yellow - den

Comments: Broodboard Used: 01811

Chronic Freshwater Toxicity Test
C. dubia Reproduction Data

Client: Hatfield
Sample ID: Mixture 2
Work Order: 11016

Start Date & Time: Jan 30 2011 @ 12:00 PM
Stop Date & Time: Feb 6 2011 @ 14:00
Set up by: KLB/Ans

Concentration: Control											Concentration: 5											Concentration: 10												
Days	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	A	B	C	D	E	F	G	H	I	J	Init	
1	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	/	KLB
2	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	/	KLB
3	/	/	/	/	/	/	/	4	20	4	KLB	/	/	/	/	/	/	/	3	3	/	KLB	/	/	/	/	/	/	/	/	/	/	/	KLB
4	2	/	30	/	/	3	/	/	/	4	KLB	/	/	/	/	/	/	/	/	/	4	KLB	/	/	4	4	/	3	/	/	3	4	/	KLB
5	4	5	/	5	/	/	2	7	5	7	KLB	4	6	4	3	5	6	2	2	2	2	KLB	4	4	/	6	6	4	4	2	5	2	/	KLB
6	4	5	4	5	4	6	6	7	9	/	~	3	4	5	8	5	4	6	/	/	/	~	4	5	4	/	3	/	/	4	/	/	~	
7	/	8	8	6	8	9	9	/	/	/	~	6	4	4	/	/	6	/	5	8	5	~	/	7	4	5	5	/	5	5	/	6	~	
8																																		
Total	15	18	15	16	12	18	17	18	17	15	~	13	14	13	8	10	16	8	13	11	~	8	16	12	15	14	7	9	11	8	12	~		

Days	Concentration: 20											Init	Concentration: 40											Init	Concentration: 60											Init
	A	B	C	D	E	F	G	H	I	J	A		B	C	D	E	F	G	H	I	J	A	B		C	D	E	F	G	H	I	J				
1	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB				
2	/	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	KLB	/	/	/	/	/	/	/	/	/	/	KLB				
3	✓	✓	✓	✓	✓	✓	✓	2	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB				
4	✓	2	3	4	✓	✓	✓	3	3	✓	KLB	✓	✓	✓	✓	X	✓	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB				
5	4	✓	✓	X	3	3	2	3	3	4	KLB	3	2	4	5	✓	3	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB				
6	✓	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	✓	3	3	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
7	5	5	6	✓	✓	5	✓	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
8				✓																																
Total	9	10	9	4	3	3	7	8	9	4	✓	3	2	4	10	0	3	6	2	0	0	✓	0	✓										✓		

Days	Concentration: 80											Init	Concentration: 100											Init	Concentration:											Init
	A	B	C	D	E	F	G	H	I	J	A		B	C	D	E	F	G	H	I	J	A	B		C	D	E	F	G	H	I	J				
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB															
2	X	✓	✓	✓	✓	✓	✓	✓	✓	X	KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB															
3		✓	✓	✓	✓	✓	✓	✓	✓		KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB															
4		✓	✓	✓	✓	X	✓	✓	✓		KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB															
5		✓	✓	✓	✓		✓	✓	✓		KLB	✓	✓	✓	✓	✓	✓	✓	✓	✓	KLB															
6		✓	✓	✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
7		✓	✓	✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
8																																				
Total	0	5	5	5	5	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0															

Notes: X = mortality.

Sample Description: ①

Comments: Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

Reviewed by: A. Tong

Date reviewed: March 24, 2011

CETIS Analytical Report

Report Date: 24 Mar-11 16:46 (p 1 of 2)
Test Code: 11066b | 08-0216-2913

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 11-6431-9337	Endpoint: Reproduction	CETIS Version: CETISv1.8.0
Analyzed: 24 Mar-11 16:46	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 01-6136-4903	Test Type: Reproduction-Survival (7d)	Analyst: Krysta Banack
Start Date: 30 Jan-11 11:15	Protocol: EC/EPS 1/RM/21	Diluent: Perrier Water
Ending Date: 06 Feb-11 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 7d 3h	Source:	Age:
Sample ID: 11-7008-1972	Code: 45BE08B4	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 28 Jan-11	Source: Hatfield	
Sample Age: 59h	Station: Mixture 2	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	2.025E+09	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	0.3779	0.2763	0.6173	264.7	162	361.9
IC10	0.8985	0.6289	1.616	111.3	61.89	159
IC15	1.616	1.079	3.231	61.89	30.95	92.68
IC20	2.604	1.653	7.782	38.4	12.85	60.48
IC25	3.966	2.386	10.85	25.21	9.212	41.9
IC40	12.66	8.251	15.71	7.9	6.367	12.12
IC50	16.13	12.3	20.8	6.201	4.809	8.127

Reproduction Summary

Calculated Variate

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Negative Control	10	16.1	12	18	0.6046	1.912	11.88%	0.0%
5		10	11.6	8	16	0.8327	2.633	22.7%	27.95%
10		10	11.2	7	16	0.9978	3.155	28.17%	30.43%
20		10	6.6	3	10	0.8844	2.797	42.38%	59.01%
40		10	3	0	10	0.9888	3.127	104.2%	81.37%
60		10	0	0	0	0	0		100.0%
80		10	0	0	0	0	0		100.0%
100		10	0	0	0	0	0		100.0%

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Negative Control	15	18	15	16	12	18	17	18	17	15
5		13	14	13	8	10	16	8	10	13	11
10		8	16	12	15	14	7	9	11	8	12
20		9	10	9	4	3	3	7	8	9	4
40		3	2	4	10	0	3	6	2	0	0
60		0	0	0	0	0	0	0	0	0	0
80		0	0	0	0	0	0	0	0	0	0
100		0	0	0	0	0	0	0	0	0	0

CETIS Analytical Report

Report Date: 24 Mar-11 16:46 (p 2 of 2)

Test Code: 11066b | 08-0216-2913

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 11-6431-9337

Endpoint: Reproduction

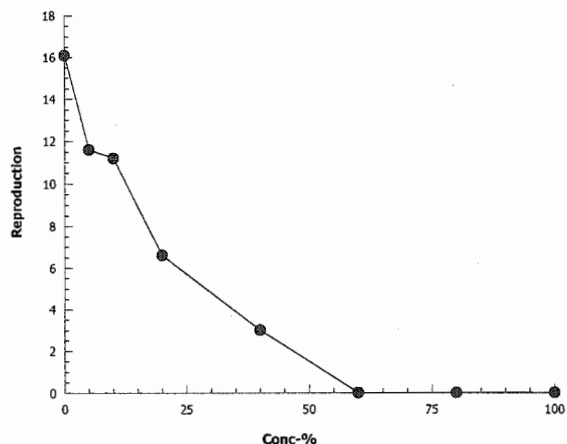
CETIS Version: CETISv1.8.0

Analyzed: 24 Mar-11 16:46

Analysis: Linear Interpolation (ICPIN)

Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Feb-11 17:17 (p 1 of 2)
Test Code: 11066b | 08-0216-2913

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 12-1557-5387	Endpoint: 7d Survival Rate	CETIS Version: CETISv1.8.0
Analyzed: 09 Feb-11 17:17	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 01-6136-4903	Test Type: Reproduction-Survival (7d)	Analyst: Krysta Banack
Start Date: 30 Jan-11 11:15	Protocol: EC/EPS 1/RM/21	Diluent: Perrier Water
Ending Date: 06 Feb-11 14:00	Species: Ceriodaphnia dubia	Brine:
Duration: 7d 3h	Source:	Age:
Sample ID: 11-7008-1972	Code: 45BE08B4	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 28 Jan-11	Source: Hatfield	
Sample Age: 59h	Station: Mixture 2	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1.328E+09	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	14.2	12.35	69.29	7.043	1.443	8.094
EC10	60	15.21	N/A	1.667	N/A	6.573
EC15	100	18.69	N/A	1	N/A	5.352
EC20	>100	N/A	N/A	<1	N/A	N/A
EC25	>100	N/A	N/A	<1	N/A	N/A
EC40	>100	N/A	N/A	<1	N/A	N/A
EC50	>100	N/A	N/A	<1	N/A	N/A

7d Survival Rate Summary

Calculated Variate(A/B)

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Negative Control	10	1	1	1	0	0	0.0%	0.0%	10	10
5		10	1	1	1	0	0	0.0%	0.0%	10	10
10		10	1	1	1	0	0	0.0%	0.0%	10	10
20		10	0.9	0	1	0.1	0.3162	35.14%	10.0%	9	10
40		10	0.8	0	1	0.1333	0.4216	52.7%	20.0%	8	10
60		10	1	1	1	0	0	0.0%	0.0%	10	10
80		10	0.7	0	1	0.1528	0.483	69.01%	30.0%	7	10
100		10	1	1	1	0	0	0.0%	0.0%	10	10

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Negative Control	1	1	1	1	1	1	1	1	1	1
5		1	1	1	1	1	1	1	1	1	1
10		1	1	1	1	1	1	1	1	1	1
20		1	1	1	0	1	1	1	1	1	1
40		1	0	1	1	0	1	1	1	1	1
60		1	1	1	1	1	1	1	1	1	1
80		0	1	1	1	1	0	1	1	1	0
100		1	1	1	1	1	1	1	1	1	1

CETIS Analytical Report

Report Date: 09 Feb-11 17:17 (p 2 of 2)
Test Code: 11066b | 08-0216-2913

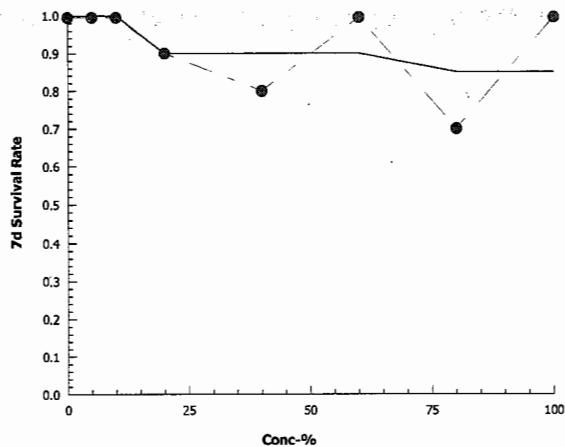
Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID: 12-1557-5387 Endpoint: 7d Survival Rate
Analyzed: 09 Feb-11 17:17 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.0
Official Results: Yes

Graphics



APPENDIX B - *Lemna minor* Toxicity Test Data

Lemna minor Summary Sheet

Client:

Hatfield

Work Order No.:

11067

Start Date:

Jan 28, 2011

Set up by:

KLB

Sample Information:

Sample ID:

Mixture 1

Sample Date:

Jan 28/11

Date Received:

Jan 28/11

Sample Volume:

2x20L

Test Organism Information:

Culture Date:

Jan 19/11

Age of culture (Day 0):

9

>8X growth in APHA?:

yes 27 Fronds day 7

KCI Reference Toxicant Results:

Reference Toxicant ID:

Lm 60

Date Initiated:

Jan 19/11

7-d No. of Fronds IC50 (95% CL):

3.6 (2.6 - 4.5)

7-d No. Fronds IC50 Reference Toxicant Mean (2 SD Range):

3.7 (2.8 - 5.0) CV (%):

15.3

Test Results:

	Number of Fronds	Dry Weight
IC25 %(v/v) (95% CL)	<u>> 97</u>	<u>> 97</u>
IC50 %(v/v) (95% CL)	<u>> 97</u>	<u>> 97</u>

Reviewed by:

A. Terry

Date reviewed:

March 24, 2011

Plant Growth Inhibition Toxicity Test Water Quality Measurements

Client: H&Fild Setup by: KLB, ASD
 Sample ID: mixture 1 (4:1) Test Date: Jan 28 2011
 Work Order No.: 11067 Test Species: Lemna minor *red bearers*
 Culture Source: UTCC # 490
 Test Culture Age: 9 days > 8X Growth? (Y/N): Yes (27 fronds)
 Light Intensity Range: 4100 - 4300 Date Measured: Jan 28 11

Day	0	1	2	3	4	5	6	7
Shelf Temp (°C)	24.5	25.5	26.0	26.0	26.0	26.0	25.0	27.0
Initials	KLB	m	m	KLB	KLB	KLB	KLB	KLB

Sample Characteristics

Temperature (°C) 24.0 Aeration? 20 min
 DO (mg/L) 7.8
 pH 8.9
 Conductivity (µS) 2780

Concentration % (v/v)	Temperature (°C)		pH		Conductivity (µS)
	Day 0	Day 7	Day 0	Day 7	0 h
Control	25.5	28.5 ^{KLB}	8.3	9.4	861
1.5	24.5	26.5 ^{KLB}	8.2	9.1	906
3.05	24.5	27.0	8.3	8.9	956
6.1	24.5	26.5	8.4	9.1	1046
12.1	24.5	26.5	8.5	9.2	1224
24.2	24.5	26.5	8.8	9.0	1565
48.5	24.5	27.0	9.0	8.9	2210
97	24.5	27.0	9.1	8.8	3410
Initials	~	KLB	~	KLB	~

Thermometer: Calibrated Thermometer Cond. Meter: C-1 pH meter: pH-1

Sample Description: Clear

Comments: _____

Reviewed: A. Teng Date Reviewed: March 24, 2011

Lemna minor Toxicity Test Data Sheet - 7-d Frond Counts

Client: Hatfield
 Sample ID: mixture 1
 Work Order #: 11067

Start Date: Jan 28 2011
 Termination Date: Feb 4 2011
 Test set up by: KLB, AWB

Concentration	Rep	No. of fronds		Chlorosis	Necrosis	Yellow	Abnormal size	Gibbosity	Single fronds	Root destruction	Loss of buoyancy	Comments	Initials
		Day 0	Day 7										
Control	A	6	69										KLB
	B		80										
	C		77										
	D		69										
1.5	A		84										
	B		129										
	C		99										
	D		81										
3.05	A		99										
	B		77										
	C		112										
	D		98										
6.1	A		121										
	B		111										
	C		97										
	D		111										
12.1	A		139										
	B		142										
	C		94										
	D		140										
24.2	A		127										
	B		132										
	C		140										
	D	✓	106										

Comments: _____

Reviewed by: A. Long

Date Reviewed: March 24, 2011

Lemna minor Toxicity Test Data Sheet - 7-d Frond Counts

Client: Hatfield
 Sample ID: mixture 1
 Work Order #: 11067

Start Date: Jan 28 2011
 Termination Date: Feb 4 2011
 Test set up by: KLB, AWS

0% (V) Concentration	Rep	No. of fronds		Chlorosis	Necrosis	Yellow	Abnormal size	Gibbosity	Single fronds	Root destruction	Loss of buoyancy	Comments	Initials
		Day 0	Day 7										
48.5	A	6	126										KLB
	B	1	138										
	C	1	117										
	D	1	109										
97	A	1	113										
	B	1	141										
	C	1	121										
	D	1	140										
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												

Comments: _____

Reviewed by: A. Teng

Date Reviewed: March 24, 2011

7-d Lemna minor Weight Data Sheet

Client:

Sample ID:

Work Order #

Hatfield

Mixture 1

11067

Start Date:

Termination Date:

Jan 28 2011

Feb 4 2011

Concentration	Rep	Pan No.	Pan weight (mg)	Pan + plant (mg)	Initials
Control	A	1	1309.12	1315.52	YLB
	B	2	1304.47	1311.04	
	C	3	1292.60	1299.85	
	D	4	1312.25	1318.65	
1.5	A	5	1304.11 ^{Purple}	1310.97 ①	
	B	6	1298.33	1308.95	
	C	7	1310.80	1319.99	
	D	8	1305.17	1314.99	
3.05	A	9	1313.51	1322.93	
	B	10	1308.28	1314.86	
	C	11	1297.28	1307.12	
	D	12	1291.04	1299.94	
6.1	A	13	1312.75	1322.84	
	B	14	1288.14	1298.85	
	C	15	1313.01	1321.74 ②	
	D	16	1291.69	1302.45	
12.1	A	17	1289.81	1304.18	
	B	18	1303.18	1316.85	
	C	19	1288.86	1297.62	
	D	20	1312.10	1325.66	
24.2	A	21	1315.15	1326.85	
	B	22	1308.50	1321.26 ③	
	C	23	1304.66	1316.49	
	D	24	1308.35	1319.02	
48.5	A	25	1305.66	1320.95	
	B	26	1306.97	1324.25	
	C	27	1307.25	1318.44	
	D	28	1305.21	1316.93	✓

Comments:

① low weight = 1310.64 ② low weight = 1321.70 ③ low weight = 1321.69

Reviewed by:

Date Reviewed:

A. Tong

March 24, 2011

7-d Lemna minor Weight Data Sheet

Client: HetAld
 Sample ID: Mixture 1
 Work Order #: 11067

Start Date: Jan 28 2011
 Termination Date: Feb 4 2011

0/2 (1/1)

Concentration	Rep	Pan No.	Pan weight (mg)	Pan + plant (mg)	Initials
97	A	29	1299.41	1314.72	YLB
	B	30	1307.26	1322.47	
	C	31	1297.41	1310.60	
	D	32	1298.43	1313.36	
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				

Comments:

Reviewed by:

A. Terry

Date Reviewed: March 24, 2011

CETIS Analytical Report

Report Date: 09 Feb-11 15:56 (p 1 of 2)
Test Code: 11067a | 01-3402-0664

Lemna Growth Inhibition Test

Nautilus Environmental

Analysis ID: 17-1959-8257	Endpoint: Frond Count	CETIS Version: CETISv1.8.0
Analyzed: 09 Feb-11 15:55	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 14-8278-7197	Test Type: Lemna Growth	Analyst: Krysta Banack
Start Date: 28 Jan-11	Protocol: EC/EPS 1/RM/37	Diluent:
Ending Date: 04 Feb-11	Species: Lemna minor	Brine:
Duration: 7d 0h	Source: UTCC #490	Age: 9 d
Sample ID: 20-5730-8353	Code: 7AA008C1	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 28 Jan-11	Source: Hatfield	
Sample Age: N/A	Station: Mixture 1	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	241544450	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>97	N/A	N/A	<1.031	N/A	N/A
IC10	>97	N/A	N/A	<1.031	N/A	N/A
IC15	>97	N/A	N/A	<1.031	N/A	N/A
IC20	>97	N/A	N/A	<1.031	N/A	N/A
IC25	>97	N/A	N/A	<1.031	N/A	N/A
IC40	>97	N/A	N/A	<1.031	N/A	N/A
IC50	>97	N/A	N/A	<1.031	N/A	N/A

Frond Count Summary

			Calculated Variate						
Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Negative Control	4	67.75	63	74	2.81	5.62	8.3%	0.0%
1.5		4	92.25	75	123	10.98	21.96	23.81%	-36.16%
3.05		4	90.5	71	106	7.24	14.48	16.0%	-33.58%
6.1		4	104	91	115	4.933	9.866	9.49%	-53.51%
12.1		4	122.8	88	136	11.6	23.2	18.9%	-81.18%
24.2		4	120.3	100	134	7.261	14.52	12.08%	-77.49%
48.5		4	116.5	103	132	6.225	12.45	10.69%	-71.96%
97		4	122.8	107	135	6.981	13.96	11.37%	-81.18%

Frond Count Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Negative Control	63	74	71	63
1.5		78	123	93	75
3.05		93	71	106	92
6.1		115	105	91	105
12.1		133	136	88	134
24.2		121	126	134	100
48.5		120	132	111	103
97		107	135	115	134

CETIS Analytical Report

Report Date: 09 Feb-11 15:56 (p 2 of 2)
Test Code: 11067a | 01-3402-0664

Lemna Growth Inhibition Test

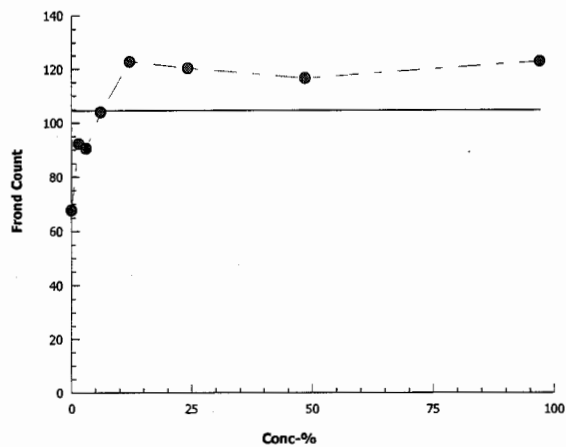
Nautilus Environmental

Analysis ID: 17-1959-8257
Analyzed: 09 Feb-11 15:55

Endpoint: Frond Count
Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.0
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Feb-11 15:56 (p 1 of 2)
Test Code: 11067a | 01-3402-0664

Lemna Growth Inhibition Test

Nautilus Environmental

Analysis ID: 02-8606-1810	Endpoint: Total Dry Weight-mg	CETIS Version: CETISv1.8.0
Analyzed: 09 Feb-11 15:55	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 14-8278-7197	Test Type: Lemna Growth	Analyst: Krysta Banack
Start Date: 28 Jan-11	Protocol: EC/EPS 1/RM/37	Diluent:
Ending Date: 04 Feb-11	Species: Lemna minor	Brine:
Duration: 7d 0h	Source: UTCC #490	Age: 9 d
Sample ID: 20-5730-8353	Code: 7AA008C1	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 28 Jan-11	Source: Hatfield	
Sample Age: N/A	Station: Mixture 1	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	2.001E+09	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>97	N/A	N/A	<1.031	N/A	N/A
IC10	>97	N/A	N/A	<1.031	N/A	N/A
IC15	>97	N/A	N/A	<1.031	N/A	N/A
IC20	>97	N/A	N/A	<1.031	N/A	N/A
IC25	>97	N/A	N/A	<1.031	N/A	N/A
IC40	>97	N/A	N/A	<1.031	N/A	N/A
IC50	>97	N/A	N/A	<1.031	N/A	N/A

Total Dry Weight-mg Summary

Calculated Variate

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Negative Control	4	6.655	6.4	7.25	0.2023	0.4047	6.08%	0.0%
1.5		4	9.122	6.86	10.62	0.8089	1.618	17.73%	-37.08%
3.05		4	8.685	6.58	9.84	0.7275	1.455	16.75%	-30.5%
6.1		4	10.07	8.73	10.76	0.4727	0.9455	9.39%	-51.35%
12.1		4	12.6	8.82	14.37	1.274	2.549	20.22%	-89.41%
24.2		4	11.89	10.67	12.76	0.463	0.9261	7.79%	-78.66%
48.5		4	13.87	11.19	17.28	1.456	2.913	21.0%	-108.4%
97		4	14.66	13.19	15.31	0.4966	0.9931	6.77%	-120.3%

Total Dry Weight-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Negative Control	6.4	6.57	7.25	6.4
1.5		6.86	10.62	9.19	9.82
3.05		9.42	6.58	9.84	8.9
6.1		10.09	10.71	8.73	10.76
12.1		14.37	13.67	8.82	13.56
24.2		11.7	12.76	12.43	10.67
48.5		15.29	17.28	11.19	11.72
97		15.31	15.21	13.19	14.93

CETIS Analytical Report

Report Date: 09 Feb-11 15:56 (p 2 of 2)
Test Code: 11067a | 01-3402-0664

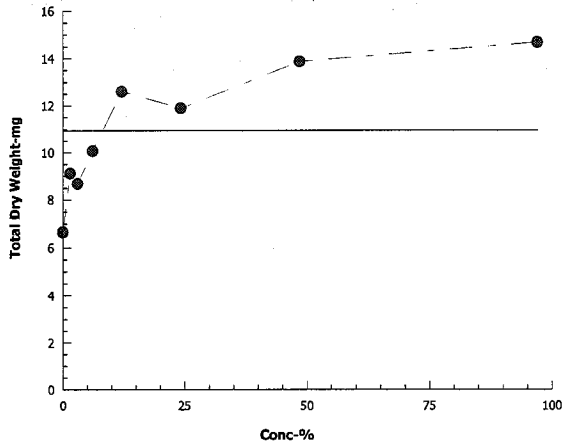
Lemna Growth Inhibition Test

Nautilus Environmental

Analysis ID: 02-8606-1810 Endpoint: Total Dry Weight-mg
Analyzed: 09 Feb-11 15:55 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.0
Official Results: Yes

Graphics



Lemna minor Summary Sheet

Client: Hatfield
Work Order No.: 11067

Start Date: Jan 28, 2011
Set up by: KLB

Sample Information:

Sample ID: Mixture 2
Sample Date: Jan 28/11
Date Received: Jan 28/11
Sample Volume: 2x20L

Test Organism Information:

Culture Date: Jan 19/11
Age of culture (Day 0): 9
>8X growth in APHA?: yes 27 fronds day 7

KCI Reference Toxicant Results:

Reference Toxicant ID: Lm 60
Date Initiated: Jan 19/11
7-d No. of Fronds IC50 (95% CL): 3.6 (2.6 - 4.5)

7-d No. Fronds IC50 Reference Toxicant Mean (2 SD Range): 3.7 (2.8 - 5.0) CV (%): 153

Test Results:	Number of Fronds		Dry Weight	
	IC25 %(v/v) (95% CL)	> 97	IC25 %(v/v) (95% CL)	> 97
	IC50 %(v/v) (95% CL)	> 97	IC50 %(v/v) (95% CL)	> 97

Reviewed by: A. Teng

Date reviewed: March 24, 2011

Plant Growth Inhibition Toxicity Test Water Quality Measurements

Client: Hetfield Setup by: KLB, ASD
 Sample ID: Mixture 2 (8:1) Test Date: Jan 28 2011
 Work Order No.: 11067 Test Species: Lemna minor Blue bearers
 Culture Source: UTCC # 490
 Test Culture Age: 9 days > 8X Growth? (Y/N): Yes (27 fronds)
 Light Intensity Range: 4100 - 4300 Date Measured: Jan 28/11

Day	0	1	2	3	4	5	6	7
Shelf Temp (°C)	24.5	25.5	26.0	26.0	26.0	26.0	25.0	27.0
Initials	KLB	~	~	KLB	KLB	KLB	KLB	KLB

Sample Characteristics

Temperature (°C) 24.0
 DO (mg/L) 7.7
 pH 8.5
 Conductivity (µS) 1895

Aeration? 20 min
24.0
8.5
9.1
2410
KLB

Concentration % (v/v)	Temperature (°C)		pH		Conductivity (µS)
	Day 0	Day 7	Day 0	Day 7	0 h
Control	25.5	27.0	8.3	9.3	861
1.5	24.5	27.0	8.2	9.0	895
3.05	24.0	27.0	8.3	9.0	924
6.1	24.0	27.0	8.4	8.8	979
12.1	24.0	27.0	8.5	9.0	1091
24.2	24.0	27.0	8.8	9.0	1301
48.5	24.0	27.0	9.0	9.1	2390 1699 ^{KLB}
97	24.0	27.0	9.1	9.1	2410
Initials	~	KLB	~	KLB	~

Thermometer: Calibrated Thermometer Cond. Meter: C-1 pH meter: pH-1

Sample Description: Clear

Comments: _____

Reviewed: A. Teng Date Reviewed: March 24, 2011

Lemna minor Toxicity Test Data Sheet - 7-d Frond Counts

Client: Hatfield
 Sample ID: mixture 2
 Work Order #: 11067

Start Date: Jan 28 2011
 Termination Date: Feb 4 2011
 Test set up by: KLS, AWB

% (V/V) Concentration	Rep	No. of fronds		Chlorosis	Necrosis	Yellow	Abnormal size	Gibbosity	Single fronds	Root destruction	Loss of buoyancy	Comments	Initials
		Day 0	Day 7										
Control	A	6	83										KLB
	B		62										
	C		68										
	D		87										
1.5	A		73										
	B		81										
	C		65										
	D		82										
3.05	A		102										
	B		110										
	C		105										
	D		73										
6.1	A		75										
	B		96										
	C		99										
	D		86										
12.1	A		86										
	B		100										
	C		129										
	D		140										
24.2	A		113										
	B		124										
	C		86										
	D	✓	110										

Comments: _____

Reviewed by: A. Tong

Date Reviewed: March 24, 2011

Lemna minor Toxicity Test Data Sheet - 7-d Frond Counts

Client: Hatfield
 Sample ID: mixture 2
 Work Order #: 11067

Start Date: Jan 28 2011
 Termination Date: Feb 4 2011
 Test set up by: KLB, awp

Concentration	Rep	No. of fronds		Chlorosis	Necrosis	Yellow	Abnormal size	Gibbosity	Single fronds	Root destruction	Loss of buoyancy	Comments	Initials
		Day 0	Day 7										
48.5	A	6	131										KLB
	B		106										
	C		141										
	D		91										
97	A		83										↓
	B		76										
	C		139										
	D		131										
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												

Comments: _____

Reviewed by: A. Tong

Date Reviewed: March 24, 2011

7-d Lemna minor Weight Data Sheet

Client:

Sample ID:

Work Order #

Hatfield

Mixture 2

11067

Start Date:

Termination Date:

Jan 28 2011

Feb 4 2011

Concentration	Rep	Pan No.	Pan weight (mg)	Pan + plant (mg)	Initials
Control	A	1	1300.81	1308.45	KLR
	B	2	1300.08	1306.25	
	C	3	1306.89	1313.30 ①	
	D	4	1313.07	1320.93	
1.5	A	5	1308.20	1315.36	
	B	6	1312.83	1320.73	
	C	7	1312.06	1317.68	
	D	8	1312.22	1320.34	
3.05	A	9	1321.74	1330.81	
	B	10	1305.14	1315.47	
	C	11	1314.26	1324.57 ②	
	D	12	1310.56	1318.10	
6.1	A	13	1308.81	1316.08	
	B	14	1310.52	1320.23	
	C	15	1308.42	1317.46	
	D	16	1308.33	1317.20	
12.1	A	17	1304.85	1312.73	
	B	18	1313.77	1323.86	
	C	19	1299.23	1311.96	
	D	20	1311.78	1325.57	
24.2	A	21	1308.42	1319.24	
	B	22	1312.34	1324.29	
	C	23	1319.58	1328.80	
	D	24	1307.63	1319.23	
48.5	A	25	1310.21	1324.07	
	B	26	1310.16	1321.19 ③	
	C	27	1312.69	1327.28	
	D	28	1309.48	1318.12	

Comments:

① leweigh = 1313.65 ② leweigh = 1324.21 ③ 1321.09

Reviewed by:

Date Reviewed:

A. Terry

March 24, 2011

7-d Lemna minor Weight Data Sheet

Client:

HctField

Sample ID:

Mixture 2

Start Date:

Jan 28 2011

Termination Date:

Feb 4 2011

Work Order #:

11067

9/2 (J/J)

Concentration	Rep	Pan No.	Pan weight (mg)	Pan + plant (mg)	Initials
97	A	29	1306.72	1318.45	KLB
	B	30	1308.05	1320.25	↓
	C	31	1306.07	1323.48	
	D	32	1305.37	1319.50	
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				

Comments:

Reviewed by:

A. Terry

Date Reviewed:

March 24, 2011

CETIS Analytical Report

Report Date: 09 Feb-11 15:55 (p 1 of 2)
Test Code: 11067b | 01-1544-3984

Lemna Growth Inhibition Test

Nautilus Environmental

Analysis ID: 18-8027-6706	Endpoint: Frond Count	CETIS Version: CETISv1.8.0
Analyzed: 09 Feb-11 15:54	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 07-7819-4315	Test Type: Lemna Growth	Analyst: Krysta Banack
Start Date: 28 Jan-11	Protocol: EC/EPS 1/RM/37	Diluent:
Ending Date: 04 Feb-11	Species: Lemna minor	Brine:
Duration: 7d 0h	Source: UTCC #490	Age: 9d
Sample ID: 03-5204-2099	Code: 14FBBC73	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 04 Feb-11	Source: Hatfield	
Sample Age: N/A	Station: Mixture 2	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1.034E+09	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>97	N/A	N/A	<1.031	N/A	N/A
IC10	>97	N/A	N/A	<1.031	N/A	N/A
IC15	>97	N/A	N/A	<1.031	N/A	N/A
IC20	>97	N/A	N/A	<1.031	N/A	N/A
IC25	>97	N/A	N/A	<1.031	N/A	N/A
IC40	>97	N/A	N/A	<1.031	N/A	N/A
IC50	>97	N/A	N/A	<1.031	N/A	N/A

Frond Count Summary

Calculated Variate

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Negative Control	4	69	56	81	5.958	11.92	17.27%	0.0%
1.5		4	69.25	59	76	3.966	7.932	11.45%	-0.36%
3.05		4	89	67	104	8.256	16.51	18.55%	-28.99%
6.1		4	83	69	93	5.431	10.86	13.09%	-20.29%
12.1		4	107.8	80	134	12.52	25.04	23.24%	-56.16%
24.2		4	103.8	80	118	8.25	16.5	15.9%	-50.36%
48.5		4	111.3	85	135	11.43	22.87	20.55%	-61.23%
97		4	101.3	70	133	16.17	32.34	31.94%	-46.74%

Frond Count Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Negative Control	77	56	62	81
1.5		67	75	59	76
3.05		86	104	99	67
6.1		69	90	93	80
12.1		80	94	123	134
24.2		107	118	80	110
48.5		125	100	135	85
97		77	70	133	125

CETIS Analytical Report

Report Date: 09 Feb-11 15:55 (p 2 of 2)
Test Code: 11067b | 01-1544-3984

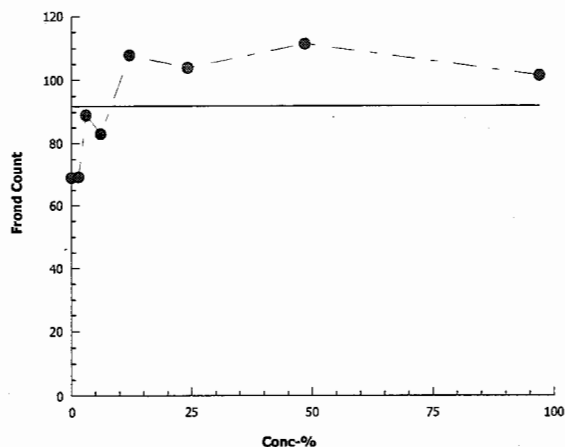
Lemna Growth Inhibition Test

Nautilus Environmental

Analysis ID: 18-8027-6706 Endpoint: Frond Count
Analyzed: 09 Feb-11 15:54 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.0
Official Results: Yes

Graphics



CETIS Analytical Report

Report Date: 09 Feb-11 15:55 (p 1 of 2)
Test Code: 11067b | 01-1544-3984

Lemna Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-2626-0683	Endpoint: Total Dry Weight-mg	CETIS Version: CETISv1.8.0
Analyzed: 09 Feb-11 15:54	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes
Batch ID: 07-7819-4315	Test Type: Lemna Growth	Analyst: Krysta Banack
Start Date: 28 Jan-11	Protocol: EC/EPS 1/RM/37	Diluent:
Ending Date: 04 Feb-11	Species: Lemna minor	Brine:
Duration: 7d 0h	Source: UTCC #490	Age: 9d
Sample ID: 03-5204-2099	Code: 14FBBC73	Client: Hatfield
Sample Date: 28 Jan-11	Material: Water Sample	Project:
Receive Date: 04 Feb-11	Source: Hatfield	
Sample Age: N/A	Station: Mixture 2	

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1.614E+09	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>97	N/A	N/A	<1.031	N/A	N/A
IC10	>97	N/A	N/A	<1.031	N/A	N/A
IC15	>97	N/A	N/A	<1.031	N/A	N/A
IC20	>97	N/A	N/A	<1.031	N/A	N/A
IC25	>97	N/A	N/A	<1.031	N/A	N/A
IC40	>97	N/A	N/A	<1.031	N/A	N/A
IC50	>97	N/A	N/A	<1.031	N/A	N/A

Total Dry Weight-mg Summary

Calculated Variate

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Negative Control	4	7.02	6.17	7.86	0.4267	0.8533	12.16%	0.0%
1.5		4	7.215	5.68	8.12	0.5513	1.103	15.28%	-2.78%
3.05		4	9.327	7.6	10.33	0.6468	1.294	13.87%	-32.87%
6.1		4	8.722	7.27	9.71	0.517	1.034	11.85%	-24.25%
12.1		4	11.12	7.88	13.79	1.332	2.663	23.94%	-58.44%
24.2		4	10.9	9.22	11.95	0.607	1.214	11.14%	-55.23%
48.5		4	12.03	8.64	14.59	1.366	2.732	22.71%	-71.37%
97		4	13.87	11.73	17.41	1.29	2.58	18.6%	-97.54%

Total Dry Weight-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Negative Control	7.64	6.17	6.41	7.86
1.5		7.16	7.9	5.68	8.12
3.05		9.07	10.33	10.31	7.6
6.1		7.27	9.71	9.04	8.87
12.1		7.88	10.09	12.73	13.79
24.2		10.82	11.95	9.22	11.6
48.5		13.86	11.03	14.59	8.64
97		11.73	12.2	17.41	14.13

CETIS Analytical Report

Report Date: 09 Feb-11 15:55 (p 2 of 2)
Test Code: 11067b | 01-1544-3984

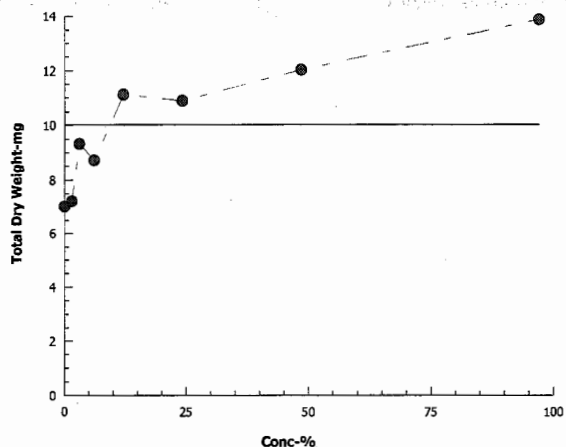
Lemna Growth Inhibition Test

Nautilus Environmental

Analysis ID: 05-2626-0683 Endpoint: Total Dry Weight-mg
Analyzed: 09 Feb-11 15:54 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.0
Official Results: Yes

Graphics



APPENDIX C - Rainbow Trout Toxicity Test Data

Rainbow Trout Summary Sheet

Client: Hartfield

Start Date/Time: Jan 31/11 @ 1630h

Work Order No.: 11065

Test Species: Oncorhynchus mykiss

Sample Information:

Sample ID: Mixture 1

Sample Date: Jan 28/11

Date Received: Jan 28/11

Sample Volume: 2220 L

Other: —

Dilution Water:

Type: Dechlorinated Municipal Tap Water

Hardness (mg/L CaCO₃): 12

Alkalinity (mg/L CaCO₃): 6

Test Organism Information:

Batch No.: 111810

Source: Trout Lake Lodge

No. Fish/Volume (L): 10/10L

Loading Density: 0.45

Mean Length ± SD (mm): 38 ± 3

Range: 33-44

Mean Weight ± SD (g): 0.45 ± 0.13

Range: 0.30-0.74

SDS Reference Toxicant Results:

Reference Toxicant ID: RT66

Stock Solution ID: 10510

Date Initiated: Dec 16/10

96-h LC50 (95% CL): 5.0 (4.3-5.6)

Reference Toxicant Mean (2SD Range): 5.2 (4.4-6.1)

Reference Toxicant CV (%): 8.5

Test Results: The 96-hr LC50 > 100% S/V

Reviewed by: A. Terry

Date reviewed: March 24, 2011

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: Hatfield
 Sample I.D. Mixture 1
 W.O. # 11065
 RBT Batch #: 11810
 Date Collected/Time: Jan 28 / 11 4M
 Date Setup/Time: Jan 31 / 11 @ 1630
 Sample Setup By: JAB

D.O. meter: DO-1
 pH meter: pH-1
 Cond. Meter: C-1

Number Fish/Volume: 10/10L
 7-d % Mortality: 0.2%
 Total Pre-aeration Time (mins): 30
 Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Yes

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.5	/	14.5
pH	9.4		9.4
D.O. (mg/L)	9.9		9.9
Cond. (µS/cm)	2710		2710

Concentration <u>0.2 (1/2)</u>	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Control				10	10	10	10	14.0	14.0	14.0	14.0	14.0	9.9	10.0	10.0	9.9	9.9	7.1	6.9	7.1	7.1	7.0	30	34
6.25				10	10	10	10	14.0	14.0	14.0	14.0	14.0	9.8	10.0	9.9	10.1	9.9	8.2	7.1	7.2	7.3	7.2	287	292
12.5				10	10	10	10	14.0	14.0	14.0	14.0	14.0	10.0	9.8	9.9	9.8	9.8	8.8	7.2	7.3	7.4	7.4	432	438
25				10	10	10	10	14.0	14.0	14.0	14.5	14.0	9.9	9.9	9.9	9.8	9.8	9.1	7.4	7.5	7.6	7.5	800	807
50				10	10	10	10	14.5	14.0	14.0	14.5	14.5	9.8	9.9	9.7	9.7	9.6	9.2	7.7	7.7	7.7	7.8	1469	1479
100				10	10	10	10	14.5	14.0	14.0	14.5	14.5	9.9	9.8	9.9	9.8	9.8	9.4	8.0	8.0	7.9	7.8	2710	2740
Initials				JAB	KSL	JAB	JAB	JAB	JAB	KSL	JAB	JAB	JAB	JAB	KSL	JAB	JAB	JAB	JAB	KSL	JAB	JAB	JAB	JAB

Sample Description/Comments: very slight orange tint in highest concentration, clear

Fish Description at 96? All fish appear ok

Other Observations: _____

Reviewed by: A. Long Date Reviewed: March 24, 2011

Rainbow Trout Summary Sheet

Client: Hatfield

Start Date/Time: Jan 31/11 @ 1615h

Work Order No.: 11065

Test Species: Oncorhynchus mykiss

Sample Information:

Sample ID: Mixture 2

Sample Date: Jan 28/11

Date Received: Jan 28/11

Sample Volume: 2+20L

Other: —

Dilution Water:

Type: Dechlorinated Municipal Tap Water

Hardness (mg/L CaCO₃): 12

Alkalinity (mg/L CaCO₃): 6

Test Organism Information:

Batch No.: 111810

Source: Trout Lake Lodge

No. Fish/Volume (L): 10/10L

Loading Density: 0.50

Mean Length ± SD (mm): 39 ± 3

Range: 34-43

Mean Weight ± SD (g): 0.50 ± 0.13

Range: 0.31-0.69

SDS Reference Toxicant Results:

Reference Toxicant ID: RT66

Stock Solution ID: 10510

Date Initiated: Dec 16/10

96-h LC50 (95% CL): 5.0 (4.3-5.6)

Reference Toxicant Mean (2SD Range): 5.2 (4.4-6.1)

Reference Toxicant CV (%): 8.5

Test Results: The 96-hr LC50 > 100% V/V

Reviewed by: A. Teng

Date reviewed: March 24, 2011

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: Hatfield
 Sample I.D. Mixture 2
 W.O. # 11065
 RBT Batch #: 11810
 Date Collected/Time: Jan 28/11 AM
 Date Setup/Time: Jan 31/11 @ 1615
 Sample Setup By: JAB

D.O. meter: DO-1
 pH meter: pH-1
 Cond. Meter: C-1

Number Fish/Volume: 10/10L
 7-d % Mortality: 0.2%
 Total Pre-aeration Time (mins): 30
 Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Yes

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.5		14.0
pH	9.2		9.2
D.O. (mg/L)	9.8		9.9
Cond. (µS/cm)	2060		2070

Concentration % V/V	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Ctrl				10	10	10	10	14.0	14.5	14.5	14.0	14.5	10.0	10.0	10.1	10.0	9.9	7.1	7.0	7.0	7.1	7.0	30	35
6.25				10	10	10	10	14.0	14.5	14.5	14.0	14.5	10.0	10.0	9.9	10.0	9.9	7.6	7.1	7.1	7.2	7.1	197	201
12.5				10	10	10	10	14.0	14.5	14.5	14.0	14.5	10.2	9.9	9.8	9.8	9.4	8.5	7.1	7.1	7.3	7.2	333	339
25				10	10	10	10	14.0	14.5	14.5	14.0	14.5	10.0	10.0	9.8	9.7	9.7	8.9	7.3	7.4	7.5	7.3	610	618
50				10	10	10	10	14.0	14.5	14.5	14.0	14.5	9.9	10.0	9.7	9.9	9.9	8.2	7.6	7.8	7.8	7.7	1106	1117
100				10	10	10	10	14.0	14.5	14.0	14.0	14.5	9.9	10.0	9.8	10.0	9.7	9.2	7.9	8.0	8.0	7.9	2070	2070
Initials				JAB	KJL	JAB	JAB	JAB	JAB	KJL	JAB	JAB	JAB	JAB	KJL	JAB	JAB	JAB	JAB	KJL	JAB	JAB	JAB	JAB

Sample Description/Comments: Slight orange, clear

Fish Description at 96? All remaining fish appear ok

Other Observations: _____

Reviewed by: A. Teng

Date Reviewed: March 24, 2011

Rainbow Trout Summary Sheet

Client: Matfield

Start Date/Time: Jan 31/11 @ 1630h

Work Order No.: 11065

Test Species: Oncorhynchus mykiss

Sample Information:

Sample ID: Mixture 1 - Prairie Creek

Sample Date: Jan 28/11

Date Received: Jan 28/11

Sample Volume: 2x20L

Other: —

Dilution Water:

Type: Prairie Creek Water
Dechlorinated Municipal Tap Water TAB
Hardness (mg/L CaCO₃): 12 TAB 300
Alkalinity (mg/L CaCO₃): 6 TAB 224

Test Organism Information:

Batch No.: 111810

Source: Trout Lake Lodge

No. Fish/Volume (L): 10/10L

Loading Density: 0.48

Mean Length ± SD (mm): 39 ± 3

Range: 33-44

Mean Weight ± SD (g): 0.48 ± 0.13

Range: 0.33-0.72

SDS Reference Toxicant Results:

Reference Toxicant ID: RT66

Stock Solution ID: 10510

Date Initiated: Dec 16/10

96-h LC50 (95% CL): 5.0 (4.3-5.6)

Reference Toxicant Mean (2SD Range): 5.2 (4.4-6.1)

Reference Toxicant CV (%): 8.5

Test Results: The 96-hr LC50 > 100% v/v

Reviewed by: A. Eng

Date reviewed: March 24, 2011

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: Hatfield
 Sample I.D. Mixture 1 - Prairie Creek
 W.O. # 11065
 RBT Batch #: 111810
 Date Collected/Time: Jan 28/11 @ AM
 Date Setup/Time: Jan 31/11 @ 1630h
 Sample Setup By: JAB

D.O. meter: DO-1
 pH meter: pH-1
 Cond. Meter: C-1

Number Fish/Volume: 10/10L
 7-d % Mortality: 0.2%
 Total Pre-aeration Time (mins): 30 mins
 Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Yes

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.5	/	14.5
pH	9.4		9.4
D.O. (mg/L)	9.9		9.9
Cond. (µS/cm)	2710		2710

Concentration % (v/v)	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Control				10	10	10	10	14.0	14.0	14.0	14.0	14.5	9.9	9.9	10.0	10.1	9.8	8.0	8.1	8.3	8.3	8.3	584	587
6.25				10	10	10	10	14.0	14.0	14.0	14.0	14.5	9.9	10.0	10.0	10.1	9.8	8.1	8.1	8.2	8.2	8.2	731	739
12.5				10	10	10	10	14.0	14.0	14.0	14.0	14.5	9.9	9.9	9.9	9.9	9.8	8.2	8.1	8.2	8.2	8.2	845	854
25				10	10	10	10	14.0	14.0	14.0	14.0	14.5	9.9	9.9	10.0	10.2	9.8	8.5	8.0	8.2	8.2	8.1	1136	1148
50				10	10	10	10	14.5	14.0	14.0	14.0	14.5	9.7	9.7	9.9	10.0	9.8	8.8	8.1	8.2	8.2	8.1	1675	1694
100				10	10	10	10	14.5	14.0	14.0	14.0	14.5	9.9	9.9	9.9	10.0	9.8	9.4	8.0	8.0	7.9	7.8	2710	2740
Initials				JAB	KJL	JAB	JAB	JAB	JAB	KJL	JAB	JAB	JAB	JAB	KJL	JAB	JAB	JAB	JAB	KJL	JAB	JAB	JAB	JAB

Sample Description/Comments: Clear, very slight orange

Fish Description at 96? All remaining fish appear ok

Other Observations: _____

Reviewed by: A. Terry Date Reviewed: March 24, 2011

Rainbow Trout Summary Sheet

Client: Hatfield

Start Date/Time: Jan 31/11 @ 1615h

Work Order No.: 11065

Test Species: Oncorhynchus mykiss

Sample Information:

Sample ID: Mixture 2-Prairie Creek

Sample Date: Jan 28/11

Date Received: Jan 28/11

Sample Volume: 240L

Other: —

Dilution Water:

Type: Prairie Creek Water
~~Dechlorinated Municipal Tap Water JAB~~
Hardness (mg/L CaCO₃): 12 JAB 300
Alkalinity (mg/L CaCO₃): 6 JAB 224

Test Organism Information:

Batch No.: 111810

Source: Trout Lake Lodge

No. Fish/Volume (L): 10/10L

Loading Density: 0.48

Mean Length ± SD (mm): 38 ± 3

Range: 34-43

Mean Weight ± SD (g): 0.48 ± 0.11

Range: 0.34-0.72

SDS Reference Toxicant Results:

Reference Toxicant ID: RT66

Stock Solution ID: 10510

Date Initiated: Dec 16/10

96-h LC50 (95% CL): 5.0 (4.3-5.6)

Reference Toxicant Mean (2SD Range): 5.2 (4.4-6.1)

Reference Toxicant CV (%): 8.5

Test Results: The 96-hr LC50 >100% (v/v)

Reviewed by: A. Teng

Date reviewed: March 24, 2011

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: Hatfield
 Sample I.D. Mixture 2 - Prairie Creek
 W.O. # 11065
 RBT Batch #: 11810
 Date Collected/Time: Jan 28/11 @ AM
 Date Setup/Time: Jan 31/11 @ 1615h
 Sample Setup By: JAB

D.O. meter: DO-1
 pH meter: pH-1
 Cond. Meter: C-1

Number Fish/Volume: 10/10L
 7-d % Mortality: 0.2%
 Total Pre-aeration Time (mins): 30
 Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Yes

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.5		14.0
pH	9.2		9.2
D.O. (mg/L)	9.8		9.9
Cond. (µS/cm)	2060		2070

Concentration % v/v	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Ctrl				10	10	10	10	14.0	14.5	14.0	14.0	14.5	9.9	9.8	9.8	10.0	9.9	8.1	8.1	8.2	8.3	8.2	582	587
6.25				10	10	10	10	14.0	14.5	14.0	14.0	14.5	9.8	9.7	9.9	9.9	9.9	8.1	8.0	8.2	8.2	8.1	670	698
12.5				10	10	10	10	14.0	14.5	14.0	14.0	14.5	9.8	9.9	9.9	9.9	9.9	8.2	8.1	8.2	8.2	8.1	760	768
25				10	10	10	10	14.0	14.5	14.0	14.0	14.5	9.7	9.9	9.9	9.9	9.8	8.4	8.0	8.2	8.2	8.1	934	941
50				10	10	10	10	14.0	14.5	14.0	14.0	14.5	9.9	9.9	9.9	9.8	9.7	8.7	8.0	8.1	8.2	8.0	1319	1330
100				10	10	10	10	14.0	14.5	14.0	14.5	14.5	9.9	9.9	9.8	9.9	9.9	9.2	7.9	8.0	7.9	7.9	2070	2070
Initials				JAB	KSL	JAB	JAB	JAB	JAB	KSL	JAB	JAB	JAB	JAB	KSL	JAB	JAB	JAB	JAB	KSL	JAB	JAB	JAB	JAB

Sample Description/Comments: Slight orange, clear

Fish Description at 96? All remaining fish appear ok

Other Observations: _____

Reviewed by: A. Teng

Date Reviewed: March 24, 2011

APPENDIX D - *Daphnia magna* Toxicity Test Data

Daphnia magna Summary Sheet

Client: Hodgson
Work Order No.: 71069

Start Date/Time: Feb 1 / 11 @ 1400L
Test Species: D. magna
Set up by: KLB

Sample Information:

Sample ID: Mixture 1
Sample Date: Jan 28/11
Date Received: Jan 28/11
Sample Volume: 2 L

Test Organism Information:

Broodstock No.: 011911 A
Age of young (Day 0): < 24 hours
Avg No. young per brood in previous 7 d: 17
Mortality (%) in previous 7 d: 0
Days to first brood: 8

NaCl Reference Toxicant Results:

Reference Toxicant ID: DM 66
Stock Solution ID: 10 NaCl
Date Initiated: Jan 24/11
48-h LC50 (95% CL): 4.2 (3.7 - 4.8) g/L NaCl
Reference Toxicant Mean (2SD Range): 4.0 (3.6 - 4.3) g/L NaCl
Reference Toxicant CV (%): 5

Test Results: The 48-h LC50 is estimated @ 89% (1/1) w/ 95% CL @ 6.5 and 100% (1/1)

Reviewed by: A. Teng

Date reviewed: March 25, 2011

Freshwater Acute 48 Hour Toxicity Test Data Sheet

Client: Ygt Field
 Sample ID: Mixture 1 (4:1)
 Work Order No.: 11004

Start Date/Time: Feb 1 2011 2:00h
 No. Organisms/volume: 10/200mL
 Test Organism: D. magna
 Set up by: KLB

DO meter: DO-1 pH meter: pH-1 Conductivity meter: C-1

Concentration % (v/v)	Number of Live Organisms Rep	24		48	No. Immobilized	Temperature (°C)			Dissolved oxygen (mg/L)			pH			Conductivity (µS/cm)	
		24	48			0	24	48	0	24	48	0	24	48	0	48
Control	A	10	10	0		20.0	20.5	20.0	8.7		8.9	8.0		8.1	359	406
	B															
	C															
	D															
6.25	A	10	9	0		20.0	20.5	20.0	8.7		8.8	8.3		8.0	324	571
	B															
	C															
	D															
12.5	A	10	10	0		20.0	20.5	20.0	8.8		8.8	8.5		8.0	688	742
	B															
	C															
	D															
25	A	10	10	0		20.0	20.6	20.0	8.8		8.9	8.50		8.0	997	1065
	B															
	C															
	D															
50	A	10	10	0		20.0	20.5	20.0	8.8		8.9	8.50		8.0	1590	1693
	B															
	C															
	D															
100	A	10	4	0		20.0	20.6	20.0	8.8		9.0	8.50		8.1	2710	2920
	B															
	C															
	D															
Technician Initials																

Hardness*		Alkalinity*	
Conc.	(mg/L as CaCO3)		
Control (MHW)	100	74	
Highest conc.	470	100	

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		20.0
DO (mg/L)	8.8	added KLB	8.8
pH	9.2	Added 0.1M HCl after dilutions were made	8.5
Cond (µS/cm)	2710		2710

Sample Description: clear

0 Adjusted to pH 8.5 with 0.1M HCl after dilutions were made

Comments: Batch# 0411A 7-d previous # young/brood: 17 Day of 1st Brood: 8 Previous 7-d % Mortality: 0

Reviewed by: A. Terry Date reviewed: March 24, 2011

CETIS Analytical Report

Report Date: 24 Mar-11 16:43 (p 1 of 1)
Test Code: 11064 | 01-9925-2974

Daphnia magna 48-h Acute Survival Test

Nautilus Environmental

Analysis ID: 17-8561-1589	Endpoint: Survival Rate	CETIS Version: CETISv1.8.0
Analyzed: 24 Mar-11 16:32	Analysis: Trimmed Spearman-Kärber	Official Results: Yes
Batch ID: 00-6731-0545	Test Type: Survival	Analyst: andy dieward
Start Date: 01 Feb-11 14:00	Protocol: EC/EPS 1/RM/14	Diluent:
Ending Date: 03 Feb-11 15:05	Species: Daphnia magna	Brine:
Duration: 49h	Source:	Age:
Sample ID: 14-5936-7144	Code: 56FC2CE8	Client: Hatfield
Sample Date: 28 Jan-11	Material: Effluent	Project:
Receive Date: 28 Jan-11	Source: Hatfield	
Sample Age: 4d 14h	Station: Mixture 1	

Trimmed Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	40.00%	1.948	0.06715	88.64	65.06	120.8

Survival Rate Summary

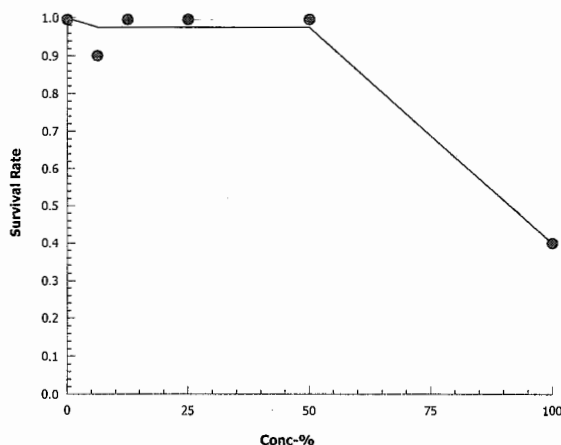
Calculated Variate(A/B)

Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Negative Control	1	1	1	1	0	0	0.0%	0.0%	10	10
6.25		1	0.9	0.9	0.9	0	0	0.0%	10.0%	9	10
12.5		1	1	1	1	0	0	0.0%	0.0%	10	10
25		1	1	1	1	0	0	0.0%	0.0%	10	10
50		1	1	1	1	0	0	0.0%	0.0%	10	10
100		1	0.4	0.4	0.4	0	0	0.0%	60.0%	4	10

Survival Rate Detail

Conc-%	Control Type	Rep 1
0	Negative Control	1
6.25		0.9
12.5		1
25		1
50		1
100		0.4

Graphics



Daphnia magna Summary Sheet

Client:

Hatfield
91064

Work Order No.:

Start Date/Time:

Feb 1 / 11 @ 14 05Z

Test Species:

D. magna

Set up by:

KLB

Sample Information:

Sample ID:

Mixture 2

Sample Date:

Jan 28/11

Date Received:

Jan 28/11

Sample Volume:

2 L

Test Organism Information:

Broodstock No.:

011911 A

Age of young (Day 0):

< 24 hours

Avg No. young per brood in previous 7 d:

17

Mortality (%) in previous 7 d:

0

Days to first brood:

8

NaCl Reference Toxicant Results:

Reference Toxicant ID:

DM 66

Stock Solution ID:

10 NaCl

Date Initiated:

Jan 24/11

48-h LC50 (95% CL):

4.2 (3.7 - 4.8) g/L NaCl

Reference Toxicant Mean (2SD Range):

4.0 (3.6 - 4.3)

g/L NaCl

Reference Toxicant CV (%):

5

Test Results:

The 48-h LC50 is estimated @ $> 100 \mu\text{g/L}$ (4/11)

Reviewed by:

A. Tong

Date reviewed:

March 24, 2011

Freshwater Acute 48 Hour Toxicity Test Data Sheet

Client: Ygt Acid
 Sample ID: Mixture 2 (f.i.)
 Work Order No.: 11064

Start Date/Time: Jan Feb 1 2011 01405h
 No. Organisms/volume: 10/200mL
 Test Organism: D. magna
 Set up by: KLB

DO meter: DO-1 pH meter: pH-1 Conductivity meter: C-1

Concentration % (v/v)	Number of Live Organisms Rep	24		48	Temperature (°C)			Dissolved oxygen (mg/L)			pH			Conductivity (µS/cm)	
		24	48		0	24	48	0	24	48	0	24	48	0	48
Control	A	10	10	0	20.0	20.5	20.0	8.7		8.9	8.0		8.1	359	406
	B														
	C														
	D														
6.25	A	10	8	0	20.0	20.5	20.0	8.7		9.0	8.3		8.0	472	515
	B														
	C														
	D														
12.5	A	10	9	0	20.0	20.5	20.0	8.7		8.9	8.5		8.0	571	621
	B														
	C														
	D														
25	A	10	9	0	20.0	20.5	20.0	8.8		8.9	8.50		8.0	781	844
	B														
	C														
	D														
50	A	10	8	0	20.0	20.5	20.0	8.8		8.9	8.50		8.1	1126	1208
	B														
	C														
	D														
100	A	10	9	0	20.0	20.5	20.0	8.8		9.0	8.50		8.1	1881	2040
	B														
	C														
	D														
Technician Initials		~	KLB	KLB	KLB	~	KSL	KLB		KSL	KLB		KSL	KLB	KSL

Hardness*		Alkalinity*	
Conc.	(mg/L as CaCO3)		
Control (MHW)	100	74	
Highest conc.	500	110	

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		20.0
DO (mg/L)	8.8		8.8
pH	9.3	added 0.1M HCl after dilutions were made	8.5
Cond (µS/cm)	1881		1881

Sample Description: clear ^① Adjusted to pH 8.5 with 0.1M HCl after dilutions were made

Comments: Batch# 011944 7-d previous # young/brood: 17 Day of 1st Brood: 8 Previous 7-d % Mortality: 0

Reviewed by: A. Tong Date reviewed: March 24, 2011

Daphnia magna Summary Sheet

Client: Hatfield
Work Order No.: 11069

Start Date/Time: Feb 1 / 11 @ 1330L
Test Species: D. magna
Set up by: KLB

Sample Information:

Sample ID: Mixture 1 (dubbed w/ Prairie Creek water)
Sample Date: Jan 28/11
Date Received: Jan 28/11
Sample Volume: 2 L

Test Organism Information:

Broodstock No.: 01211A
Age of young (Day 0): < 24 hours
Avg No. young per brood in previous 7 d: 20
Mortality (%) in previous 7 d: 0
Days to first brood: 9

NaCl Reference Toxicant Results:

Reference Toxicant ID: DM 66
Stock Solution ID: 10 NaCl
Date Initiated: Jan 21/11
48-h LC50 (95% CL): 4.2 (3.6 - 4.8) g/L NaCl
Reference Toxicant Mean (2SD Range): 4.0 (3.6 - 4.3) g/L NaCl
Reference Toxicant CV (%): 5

Test Results: The 48-h LC50 is estimated @ 7.120 % (1/1)

Reviewed by: A. Torg

Date reviewed: March 24, 2011

Freshwater Acute 48 Hour Toxicity Test Data Sheet

Client: Hatfield
Sample ID: Mixture 1 (4:1)
Work Order No.: 11064

Start Date/Time: KLB Jan Feb 1 2011 1330h
No. Organisms/volume: 10/200mL
Test Organism: D. magna
Set up by: KLB

DO meter: DO-1 pH meter: pH-1 Conductivity meter: C-1

Concentration ① % (v/v)	Number of Live Organisms Rep	24		48	No. Immobilized 48	Temperature (°C)			Dissolved oxygen (mg/L)			pH			Conductivity (µS/cm)	
		24	48			0	24	48	0	24	48	0	24	48	0	48
Control	A	10	10	0	0	20.0	20.5	20.5	8.9		8.9	8.0	8.2	8.3	359	598
	B															
	C															
	D															
6.25	A	10	3	0	0	20.0	20.5	20.0	8.9		9.0	8.3		8.3	704	747
	B															
	C															
	D															
12.5	A	10	4	0	0	20.0	20.5	20.0	8.9		9.0	8.4		8.4	826	884
	B															
	C															
	D															
25	A	10	7	0	0	20.0	20.6	20.0	8.9		9.0	8.5		8.4	1119	1197
	B															
	C															
	D															
50	A	10	10	0	0	20.0	20.5	20.0	8.9		9.1	8.5	②	8.4	1536	1628
	B															
	C															
	D															
100	A	10	10	0	0	20.0	20.5	20.0	8.9		9.1	8.5	②	8.2	2710	2940
	B															
	C															
	D															
Technician Initials		~	KLB	KLB		KLB	~	KLB	KLB		KLB	KLB		KLB	KLB	KLB

Hardness*		Alkalinity*	
Conc.	(mg/L as CaCO ₃)	Conc.	(mg/L as CaCO ₃)
Control (MLHW) KLB	300 KLB	74	224 KLB
Highest conc.	470	100	

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		20.0
DO (mg/L)	8.9		8.9
pH	9.3	added 0.1M HCl after dilutions were made	8.5
Cond (µS/cm)	2710		2710

Sample Description: clear

Comments: Batch#: 01121A 7-d previous # young/brood: 20 Day of 1st Brood: 9 Previous 7-d % Mortality: 0

Reviewed by: A. Teng Date reviewed: March 24, 2011

① diluted w/ Prairie Creek Water
② Adjusted pH to 8.5 with diluted HCl solution as made

Daphnia magna Summary Sheet

Client: Hatfield
Work Order No.: 71064

Start Date/Time: Feb 1 / 11 @ 1345L
Test Species: D. magna
Set up by: KLB

Sample Information:

Sample ID: Mixture 2 (diluted w/ Prairie Creek water)
Sample Date: Jan 28 / 11
Date Received: Jan 28 / 11
Sample Volume: 2 x 20L

Test Organism Information:

Broodstock No.: 011211A
Age of young (Day 0): < 24 hours
Avg No. young per brood in previous 7 d: 20
Mortality (%) in previous 7 d: 0
Days to first brood: 9

NaCl Reference Toxicant Results:

Reference Toxicant ID: DM 66
Stock Solution ID: 10 NaCl
Date Initiated: Jan 21 / 11
48-h LC50 (95% CL): 4.2 (3.7 - 4.8) g/L NaCl
Reference Toxicant Mean (2SD Range): 4.0 (3.6 - 4.3) g/L NaCl
Reference Toxicant CV (%): 5

Test Results: The ^{48h} 96h LC50 was estimated @ >100% (u/u)

Reviewed by: A. Tong

Date reviewed: March 24, 2011

Freshwater Acute 48 Hour Toxicity Test Data Sheet

Client: Hgt Field
Sample ID: Mixture 2 (2:1)
Work Order No.: 11064

Start Date/Time: Feb 1 2011 13:5h
No. Organisms/volume: 10/200mL
Test Organism: D. magna
Set up by: KLB

DO meter: DO-1 pH meter: pH-1 Conductivity meter: C-1

Concentration % (v/v)	Number of Live Organisms Rep	No. of Live Organisms		No. Immobilized	Temperature (°C)			Dissolved oxygen (mg/L)			pH			Conductivity (µS/cm)	
		24	48		48	0	24	48	0	24	48	0	24	48	0
Control	A	10	10	0	20.0	20.5	20.5	8.9		8.9	8.08		8.3	385	598
	B														
	C														
	D														
6.25	A	10	5	0	20.0	20.6	20.5	8.8		9.0	8.3		8.3	652	693
	B														
	C														
	D														
12.5	A	10	6	0	20.0	20.6	20.0	8.9		9.1	8.3		8.4	719	774
	B														
	C														
	D														
25	A	10	10	0	20.0	20.6	20.0	8.9		9.1	8.5		8.4	867	924
	B														
	C														
	D														
50	A	10	10	0	20.0	20.6	20.0	8.9		9.2	8.5		8.4	1186	1293
	B														
	C														
	D														
100	A	10	10	0	20.0	20.6	20.0	8.9		9.1	8.5		8.2	1867	2040
	B														
	C														
	D														
Technician Initials		~	KLB	KLB	KLB	~	KLB	KLB		KLB	KLB		KLB	KLB	KLB

Hardness*		Alkalinity*	
Conc.	(mg/L as CaCO3)	Conc.	(mg/L as CaCO3)
Control (AM-HAD) KLB	100	74	224
Highest conc.	500	110	

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		20.0
DO (mg/L)	8.9		8.9
pH	9.2	Added 0.1M HCl after dilutions were made	8.5
Cond (µS/cm)	1867		1867

Sample Description: clear

Comments: Batch#: 0121A 7-d previous # young/brood: 20 Day of 1st Brood: 9 Previous 7-d % Mortality: 0

Reviewed by: A. Tong Date reviewed: March 24, 2011

① diluted w/ Prairie Creek Water
② Adjusted pH to 8.5 with 0.1M HCl after dilutions were made

Daphnia magna Summary Sheet

Client: Hudfield
Work Order No.: 91064

Start Date/Time: Feb 1 / 11 @ 1020h
Test Species: D. magna
Set up by: KLS

Sample Information:

Sample ID: mine Water
Sample Date: Jan 28/11
Date Received: Jan 28/11
Sample Volume: 2 L

Test Organism Information:

Broodstock No.: Q1121 A
Age of young (Day 0): < 24 hours
Avg No. young per brood in previous 7 d: 20
Mortality (%) in previous 7 d: 0
Days to first brood: 9

NaCl Reference Toxicant Results:

Reference Toxicant ID: DM 66
Stock Solution ID: 10 NaCl
Date Initiated: Jan 21/11
48-h LC50 (95% CL): 4.2L 3.7 - 4.8 g/L NaCl
Reference Toxicant Mean (2SD Range): 4.0L 3.6 - 4.3 g/L NaCl
Reference Toxicant CV (%): 5

Test Results: 100% survival in the undiluted 100% (w/v) @ 48h

Reviewed by: A. Terry

Date reviewed: March 24, 2011

Freshwater Acute 48 Hour Toxicity Test Data Sheet

Client: Hatfield
 Sample ID: Mine Water
 Work Order No.: 11064

Start Date/Time: Feb 11 @ 1020h
 No. Organisms/volume: 10/200mL
 Test Organism: D. magna
 Set up by: KLB

DO meter: DO-1 pH meter: pH-1 Conductivity meter: C-1

Concentration % (V/V)	Number of Live Organisms Rep	24		48	Temperature (°C)			Dissolved oxygen (mg/L)			pH			Conductivity (µS/cm)	
		24	48		0	24	48	0	24	48	0	24	48	0	48
Control	A	10	10	0	20.0	20.5	20.5	8.7		8.8	8.0		8.1	359	405
	B	10	10	0											
	C	10	10	0											
	D														
100	A	10	10	0	20.0	20.5	19.5	8.6		8.7	8.1		8.1	1200 280	1128
	B	10	10	0											
	C	10	10	0											
	D														
	A														
	B														
	C														
	D														
	A														
	B														
	C														
	D														
	A														
	B														
	C														
	D														
Technician Initials		~	KLB	KLB	KLB	~	KLB	KLB		KLB	KLB		KLB	KLB	KLB

Hardness*		Alkalinity*	
Conc.	(mg/L as CaCO ₃)		
Control (MHW)	100	74	
Highest conc.	550	82	

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		
DO (mg/L)	8.6		
pH	8.1		
Cond (µS/cm)	280		

Sample Description: clear

Comments: Batch#: 011211A 7-d previous # young/brood: 20 Day of 1st Brood: 9 Previous 7-d % Mortality: 0

Reviewed by: A. Teng Date reviewed: March 24, 2011

W.O.#: 11064

Hardness and Alkalinity Datasheet

[illegible]

Notes: ① Diluted to 100ml with DI water

Reviewed by:

A. Teng

Date Reviewed:

March 24, 2011