DE BEERS GROUP OF COMPANIES

June 10, 2014

File:L020

Simon Toogood Environmental Assessment Officer Mackenzie Valley Review Board Box 938, #200 Scotia Centre 5102-50th Avenue Yellowknife, NT, X1A 2N7

Dear Mr. Toogood

Re: De Beers Canada Inc.'s Response to Hearing Undertakings for the Snap Lake Water Licence Amendment Environmental Assessment (EA1314-02)

De Beers Canada Inc. ("De Beers") provides the following responses to undertakings arising from the Environmental Assessment Hearings on June 5 and 6th, 2014. The undertaking responses are listed in the order that they were received during the proceedings.

1. De Beers to provide the Review Board with chapters six and seven of the Aquatic Effect Monitoring Program (AEMP) Design report.

A copy of the AEMP redesign from January 2014 is attached separately to this submission.

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2. De Beers to provide the Review Board with a complete list of commitments made by De Beers during this environmental assessment.

#	Commitment	Reference
1	De Beers will continue to monitor the areas downstream of the project and report annually in the AEMP and Environmental Agreement reports on the water quality results.	De Beers response to technical submissions, April 30 2014 See Environmental Assessment (EA) hearings commitments 3 and 7 for additional information.
2	De Beers will document community visits particularly information on the perception of Snap Lake and water quality, and submit to the Boards.	De Beers response to technical submissions, April 30 2014
3	De Beers will continue to conduct regional water quality monitoring as it has since 1999, and to report on the regional water quality three times a year reports to the MVLWB, a summary annual water license report to the MVLWB, and the annual AEMP report, as well as reporting to Aboriginal groups in the annual Environmental Agreement report. De Beers will also share data with the GNWT and Aboriginal Affairs and Northern Development Canada and communities as part of regional cumulative effects monitoring.	De Beers response to technical submissions, April 2014. See commitments 1 and 7 for additional information.
4	De Beers is committed to protecting aquatic ecosystem function within Snap Lake.	April 15 2014 Technical Session
5	De Beers commits to developing a site specific water quality objective (SSWQO) that is achievable and protective of the aquatic environment.	April 15 2014 Technical Session
6	De Beers commits to staying below an approved SSWQO and adopting appropriate mitigation to achieve this value.	April 16, 2014 Technical Session

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#	Commitment	Reference
7	De Beers will continue to define the range of natural variability within the impacted area of the Snap Lake Watershed through the AEMP.	June 5, 2014 EA Hearing See commitments 1 and 3 for additional information.
8	De Beers will undertake monitoring downstream at the inlet of MacKay Lake as a component of the AEMP.	June 5, 2014 EA Hearing
9	De Beers will provide draft summaries of community meetings held during May, by June 23, 2014.	June 5, 2014 EA Hearing
10	De Beers will hold meetings as appropriate to update stakeholders on progress toward mitigation measure development and implementation.	June 6, 2014 EA Hearing

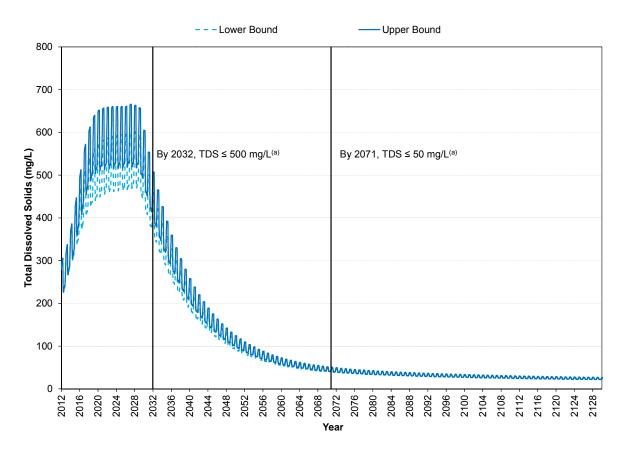
3. De Beers to provide the Review Board with a graph of total dissolved solids in Snap Lake for closure and post closure for the scenario that the water quality objective is set at 684 mg/L.

The Snap Lake Site Model was used to predict long-term concentrations of total dissolved solids (TDS) in Snap Lake after Mine closure for "mitigated" scenarios (i.e., the end-of-pipe TDS concentration was set equal to a constant value of 684 milligrams per litre [mg/L] from January 1, 2015 to January 1, 2029) (Figure 1). Concentrations of TDS in Snap Lake were modelled conservatively, which means they were assumed not to undergo chemical reactions or physical processes other than dilution. Modelling TDS as a conservative parameter was demonstrated to be appropriate based on model calibration (i.e., a comparison of model results to monitored data from 2004 to 2012; De Beers 2013). After Mine closure, TDS concentrations in Snap Lake were predicted to rapidly decrease, with a 90 percent (%) reduction in concentration within approximately 30 years. By 2032 and 2071, TDS concentrations in Snap Lake were predicted to be less than or equal to 500 and 50 mg/L in both scenarios, respectively (Figure 1). By 2130, the end of the model simulation period, TDS concentrations in Snap Lake were predicted to be less than 25 mg/L.

DE BEERS CANADA INC. SUITE 300, 5120-49th STREET, YELLOWKNIFE, NT X1A 1P8 TEL 1 (867) 766-7300 FAX 1 (867) 766-7347 www.debeersgroup.com/canada



Figure 1. Predicted Whole-lake Average Total Dissolved Solids Concentrations in Snap Lake, 2012 to 2130, "Mitigated" Scenarios



Reference

De Beers. (De Beers Canada Inc.). 2013. Snap Lake Hydrodynamic and Water Quality Model Report. Submitted to the Mackenzie Valley Land and Water Board. Yellowknife, NWT, Canada.

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4. De Beers to provide the Review Board with the report of copepod toxicity testing and the report of the Daphnia magna toxicity testing, results three to five.

Please see attached the laboratory reports of toxicity testing for three tests of *Daphnia magna* and one copepod, *Cyclops vernalis* as well as interpretation of these results as it relates to an appropriate site-specific water quality objective for Snap Lake.

The new results as reported by the laboratory are added to the results of previous studies in Figure 2.

Figure 2. Results of additional toxicity testing of *D.magna and C.vernalis*.

⁻ est Species	Endpoint	[TDS]
Ceriodaphnia dubia (water flea)*	IC10/IC20	560/778
Daphnia magna (water flea)	IC20 (geomean, n=5)	>1,099
Chironomus dilutus (insect larvae)	IC10	>1,379
Pseudokirchneiiella subcapitata (alga)	IC10	>1,474
Cyclops vernalis (copepod)*	IC20	>1,508
Brachionus calvciflorus (rotifer)	IC20	>1,474
Navicula pelliculosa (diatom)	IC10	>1,487
Lake Trout	Dry fertilization LC20 fry survival IC20 fry weight and length (growth) Wet fertilization LC20 fry survival IC20 fry weight and length	991 >1,490 >1,484 >1,484
Arctic Grayling	<u>Dry fertilization L</u> C20 fry survival IC20 fry weight and length (growth) <u>Wet fertilization L</u> C20 fry survival IC20 fry weight and length	>1,419 >1,419 >1,414 >1,414



In closing De Beers thanks the Review Board for the opportunity to participate in the environmental assessment process. De Beers appreciates the Review Board's efforts to undertake the review process for this water licence amendment in an efficient and timely manner.

Sincerely,

DE BEERS CANADA INC.

Balac

Erica Bonhomme Environment Manager Snap Lake Mine

Attachments

DE BEERS CANADA INC. SUITE 300, 5120-49th STREET, YELLOWKNIFE, NT X1A 1P8 TEL 1 (867) 766-7300 FAX 1 (867) 766-7347 www.debeersgroup.com/canada



DATE June 10, 2014

PROJECT No. 14-1349-0003/1500/1503

- **TO** Erica Bonhomme, Snap Lake Environmental Manager De Beers Canada Inc.(DBCI)
- CC Tasha Hall and Alison Snow (Golder); Alexandra Hood (DBCI)

FROM Peter M. Chapman

EMAIL pmchapman@golder.com

ADDITIONAL DAPHNIA MAGNA 21-DAY TDS TOXICITY TEST RESULTS

1.0 BACKGROUND AND INTRODUCTION

Golder Associates Ltd (Golder 2013) developed a total dissolved solids (TDS) benchmark for aquatic life for Snap Lake based on a literature review, problem formulation, and site-specific toxicity tests with phytoplankton, zooplankton, benthic invertebrates, and fish species representative of aquatic receptors in Snap Lake. Most species tested showed no adverse effects at TDS concentrations greater than (>) 1,400 milligrams per litre (mg/L); however, two daphnid species were more sensitive to TDS and showed adverse effects at lower TDS concentrations. Although daphnids comprise an average of approximately 2 percent (%) of the zooplankton community in Snap Lake, a conservative site-specific water quality objective (SSWQO) of 684 mg/L was proposed based on the IC20 (20% inhibition concentration) from a single *Daphnia magna* 21-day (d) toxicity test performed by Nautilus Environmental (Burnaby, BC) and reported in Golder (2013).

The results of the TDS testing, including the proposed TDS SSWQO, were presented to interested parties, including regulatory agencies and representatives of Aboriginal communities, on January 6, 2014 in Yellowknife, Northwest Territories (NWT). There was discussion following the presentation regarding the repeatability of the tests.

As a result of the discussion regarding test repeatability, De Beers Canada Inc (De Beers) requested that Golder repeat the 21-day *D. magna* test that provides the basis for the proposed TDS SSWQO. A previous technical memorandum (Golder 2014) provided the methods and results from this repeat testing (Test 2 performed by Nautilus Environmental), which resulted in an IC20 of > 1,477 mg/L, and discussed the results relative to the proposed SSWQO.

Given the very different results from these two tests, it was suggested by reviewing parties at the Technical Session for the Snap Lake Water Licence Amendment (April 15 to 16, 2014 in Yellowknife) that an additional test should be conducted for a total of three, one of which should be conducted by a different toxicity testing laboratory. In response, De Beers requested Golder to commission three additional 21-day *D. magna* tests (two tests to be performed by Nautilus Environmental and one by HydroQual Laboratories [Calgary, AB]), for a total of five tests.

The present technical memorandum provides the methods and results from this repeat testing and discusses the results relative to the proposed SSWQO.



2.0 METHODS

Synthetic lake water samples were prepared, with the same ratio of major ions in Snap Lake but at a nominal TDS concentration of 1,500 mg/L. The samples were prepared by Nautilus Environmental, the same laboratory that prepared samples for previous TDS testing reported in Golder (2013, 2014); a portion of sample was shipped to HydroQual for testing. The synthetic lake water was analysed for its ionic composition to assess concentrations of the major ions and to calculate TDS concentrations. Results of those analyses determined that the calculated TDS concentrations for the three synthetic lake water samples were very close to the target nominal concentration of 1,500 mg/L: 1,510 mg/L for Test 3; 1,435 mg/L for Test 4; and, 1,460 mg/L for Test 5.

21-d *D. magna* survival and reproduction toxicity tests were conducted by Nautilus Environmental (Tests 3 and 4) and HydroQual Laboratories (Test 5) following ASTM (2004) procedures. The Nautilus Environmental data reports are provided as Attachments 1 (Test 3) and 2 (Test 4). The HydroQual Laboratories data report is provided as Attachment 3 (Test 5). All data reports include the chemical analyses for TDS in the synthetic lake water samples.

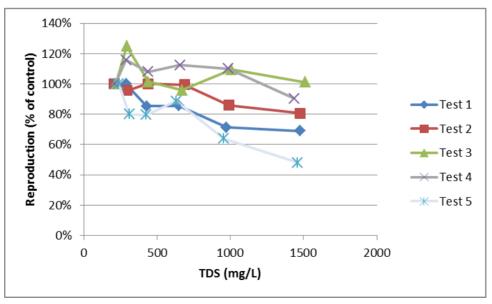
3.0 RESULTS

As is apparent from Figure 1, all five *D. magna* toxicity tests produced a similar dose-response. However, the 20% inhibition concentration (IC20) differed as follows:

- Test 1 IC20 684 mg/L TDS;
- Test 2 IC20 >1,477 mg/L TDS;
- Test 3 IC20 >1,510 mg/L TDS;
- Test 4 IC20 >1,435 mg/L TDS;
- Test 5 IC20 > 733 mg/L TDS.

As noted in the previous Technical Memorandum (Golder 2014) regarding Tests 1 and 2, the flatness of the dose-response explains these differences, which are not unreasonably large (Cherr et al. 1994).

Figure 1 Concentration-Response for Five Daphnia magna Snap Lake TDS Toxicity Tests



TDS= total dissolved solids; mg/L= milligrams per litre.



4.0 RELEVANCE TO THE SNAP LAKE TDS SSWQO

The Canadian Council of Ministers of the Environment (CCME 2007; Part II, Section 1-10 and 1-11) states "Multiple comparable records for the same endpoint are to be combined by the geometric mean of these records to represent the averaged species effects endpoint." CCME (2007, Part II, Section 3.1-2) similarly states, twice, "If there is more than one comparable record for a preferred endpoint, then the species effects endpoint is to be represented by the geometric mean of these records."

Previous SSWQOs developed for the Ekati Diamond Mine followed the above approach. Specifically, in cases where more than one acceptable value was available for an individual species endpoint, the values were combined using the geometric mean to produce a single value for each species (Elphick et al. 2011; Ekati 2012a,b,c). This approach was specifically applied to daphnid toxicity data in Elphick et al. (2011) and Ekati (2012c)

The geometric mean of the five IC20 values (Tests 1 to 5) for *D. magna* is >1,099 mg/L TDS. Based on CCME (2007) and previous precedent in the NWT, the value of 1,099 mg/L could reasonably be considered as a Snap Lake TDS SSWQO.

5.0 CLOSURE

We trust that this technical memorandum provides you with the information you require at this time. Should you have any questions, or require further information, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Prepared by:

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Peter M Chapman, PhD Principal, Senior Environmental Scientist

PMC/CAM/me

Att.

Reviewed by:

lathy of MCPluson .

Cathy A McPherson, BSc Senior Environmental Scientist



6.0 REFERENCES CITED

- ASTM (American Society for Testing and Materials). 2004. Standard Guide for Conducting *Daphnia magna* Life-Cycle Toxicity Tests. Method: E1193 - 97 (Reapproved 2012). In: Annual Book of ASTM Standards. Volume 11.06. Biological Effects and Environmental Fate; Biotechnology, Water and Environmental Technology. Philadelphia, PA, USA.
- CCME (Canadian Council of Ministers of the Environment). 2007. A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life. Winnipeg, MB, Canada.
- Cherr G, Dinnel P, Caldwell R, Cardwell R, Chapman PM. 1994. West Coast Marine Species Chronic Protocol Variability Study: Criteria for Acceptable Variability of Marine Chronic Toxicity Test Methods. Washington State Biomonitoring Science Advisory Board Report No. 1. Washington Department of Ecology, Olympia, WA, USA.
- Ekati (Ekati Diamond Mine). 2012a. Ekati Diamond Mine Site Specific Water Quality Objective for Molybdenum. Yellowknife, NWT, Canada.
- Ekati. 2012b. Ekati Diamond Mine Site Specific Water Quality Objective for Potassium. Yellowknife, NWT, Canada.
- Ekati. 2012c. Ekati Diamond Mine Site Specific Water Quality Objective for Nitrate. Yellowknife, NWT, Canada.
- Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environ Toxicol Chem 30: 239-246.
- Golder (Golder Associates Ltd). 2013. Development of Total Dissolved Solids (TDS) Benchmark for Aquatic Life for Snap Lake. Prepared for De Beers Canada Inc, Yellowknife, NWT, Canada.
- Golder. 2014. Second *Daphnia magna* 21-day TDS Toxicity Test Results. Prepared for De Beers Canada Inc, Yellowknife, NWT, Canada. April 11, 2014.



ATTACHMENT 1 NAUTILUS ENVIRONMENTAL DATA REPORT: Test 3





Golder Associates Ltd. ATTN: Dr. Peter Chapman 200 – 420 West Hastings Street Vancouver, BC V6B 1L1 Report Date: April 7, 2014 Work Order: 14122

Data report

Species: *Daphnia magna* Protocol: ASTM E1193 - 97

Table 1.Results for the 21-d Daphnia magna life-cycle toxicity test.

Sample ID	Sample Date	21-d IC20 mg/L TDS
TDS blend	Laboratory prepared	>1510

The tests met performance criteria and there were no deviations from the test methods. The results presented here relate only to the sample tested.

Jeslin Wijaya, B.Sc. Laboratory Biologist

Reviewed By: James Elphick, R.P.Bio Senior Reviewer

Daphnia magna Summary Sheet

Client: Work Order No.:	Golder 14122		Start Date/Time: <u>March</u> 14 , 2014 @ 1400 Test Species: <u>Daphnia magna</u> Set up by: <u>JIN</u>	ih
Sample Information Sample ID: Sample Date: Date Received: Sample Volume:	TDS March 12/14 (Made î March 12/14 (Made în 2012 ³¹⁰ 401		Test Validity Criteria: ≥70% survival in the control treatment(s) Average of ≥60 young/adult produced in the con No ephippia were produced in the control treat WQ Ranges: T (°C) = 20 ± 2; DO (mg/L) = 3.0 to 9.4; pH = 6	ment(s)
Test Organism Info	rmation:			
Broodstock No.: Age of young (Day 0 Avg No. young per b Mortality (%) in previ Days to first brood:	rood in previous 7 d:	021214 <24 h 18 0 10		
NaCI Reference To	kicant Results:			
Reference Toxicant Stock Solution ID: Date Initiated: 48-h LC50 (95% CL)	13 Na 03 March 12/14)	 	

Reference Toxicant Mean and Historical Range: 4.0 (3.7 - 4.4) g/L NaCL Reference Toxicant CV (%): 4

Version 1.0; Issued February 19, 2014

The 21-d LCSO is > 1516 mg/L TDS. Test Results: > 1516 m9/L TOS . The 21-01 1C 20 is Jou ret Date reviewed: Reviewed by: Nautilus Environmental Summary of test conditions for the Daphnia magna life-cycle toxicity test.

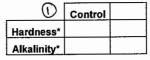
Test organism	Daphnia magna
Test organism source	In-house culture
Test organism age	<24-h old neonates
Test type	Static-renewal
Test duration	21 days
Test chamber	250-mL glass beaker
Test solution volume	100 mL
Test concentrations (mg/L TDS)	Five concentrations, plus laboratory control
Number of replicates	10
Control/dilution water	Moderately hard water
	(hardness 80-100 mg/L CaCO ₃)
Test solution renewal	Three times weekly
Test temperature	$20 \pm 2^{\circ}C$
Number of organisms/chamber	1
Feeding	Daily, with Pseudokirchneriella subcapitata and
	digested yeast, cerophyll and trout chow
Light intensity	400 to 800 lux
Photoperiod	16 hours light/8 hours dark
Aeration	None
Test protocol	ASTM E1193 - 97
Test endpoints	Survival and reproduction
Test acceptability criterion for controls	\geq 70% survival; average of \geq 60 young per surviving control female
Reference Toxicant	Sodium Chloride
Test Start/End Date	March 14, 2014/ April 4, 2014
	Sodium Chloride

References

ASTM. 2004. Standard Guide for Conducting *Daphnia magna* Life-Cycle Toxicity Tests. Method:
E1193 - 97 (Reapproved 2004). In: Annual Book of ASTM Standards. Volume 11.06.
Biological Effects and Environmental Fate; Biotechnology, Water and Environmental Technology, American Society for Testing and Materials. Philadelphia, PA.

21-d Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

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DO (mg/L)	8.7	8.6	8.4	8.1	8.5	9.0	8.5	8.1	8.7	8.5	8.6	8.2	9.1	8.3	8.7	8.5	8.8			8.2	Hardness*	
pH	7.8	7.9	7.8	7.8	7.7	7.5	7.5	75	7.6	7.7	8.0	7.4	7.6	7.4	7.6	7.7	7.7		WC /	7.4	Alkalinity*	
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	DO (mg/L)		8.6	8.0	8.2	8.9	9.1	8.9	7.9	8.5	8.4	8.8	8.2	9.1	8.4	8.1	9.6	8.5			3.4		
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	DO (mg/L)	8.5	3.5 8.5 8.9		8.2	9.0	9.1	9.0	7.9	8.2	8.2	8.8	8.3	9.0	8.4	8.0	8.6	8.5		3	8.4	-
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DO (mg/L)	8.5			8.3	9.1	9.0	9.1	7.9	8.2	8.2	8.7	8.3	9.0	8.4	8.0	8.6	8.5	\square	SW	P.5	C
pH	7.5	7.6	7.6	7.5	7.5	7.5	7.4	7.3	7.2	7.4	7.4	7.2	7.3	7.5	7.3	7.4	7.4		\backslash	7.5	
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21-d Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

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DO (mg/L)	8.5	8.4	8.9	8.3	9.1	9.1		7.9	8.2	8.2	8.9	8.3	9.0	8.4	8.1	8.7	8.6	$\overline{\}$		8.5	Hardness*		
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DO (mg/L)	8.5	8.5	9.0	8.3	9.1	9.1	9.1	8.0	8.0	8-1	9.0	8.3	9.1	84	8.1	8.6	8.9			8.5			
pH	7.7 7.8 7.8 7.8 7.7			7.7	7.7	7.6	7.4	7.4	7.6	7.6	7.4	7.6	7.6	7.7	7.6	7.6	WG		7.7				
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Concentration	0																					
	init.	old	new	old	new	old	new	old	new	old	new	old	new	old	new	old	new	old	new	final	Analysts:	
Temp (°C)																					Reviewed by:	
DO (mg/L)						1.1															Date reviewed:	
рН																:					,	
Cond. (µS)																						
Initials																						

1500 mg/L TDS made

JW, AWD, BTL JOU

21-d Chronic Freshwater Toxicity Test Daphnia magna Reproduction Data

older	
DS	
4122	
Í	Golder DS 4122

Start Date & Time:	Marc	n 14/14	6	1400h	
Stop Date & Time:	APTIL	4/14	@	1330h	

Analysts:	JW,	AWD	

Days	Conce	ntration	1: (Control								Conce	ntratior	n: 2	96 mg/	L TOS						
Days	A	В	C	D	E	F	G	Н		J	Init	Α	В	С	D	E	F	G	H		J	Init
1			<u> </u>		\langle	\leq		/	/		m		<u> </u>			\langle			\sim		/	×
2		\langle	<u> </u>		\langle	\square	/			\langle	m			/	/		/		\langle	\langle	/	m
3		\checkmark	~	<u> </u>	~	 ✓ 	~	 			JW	\checkmark	~	~	~	~		\sim	\sim	~	\sim	JIN
4	\checkmark	~	\checkmark	~	~	~	\checkmark	 ✓ 	~	~	JW	~	~	~	~	~	~	~	~	\checkmark	~	JW
5	~	~	~	 ✓ 	<u>~</u>	~		~	\sim	~	JW	~	~	~		 	 ✓ 	~	\checkmark	~	~	WU
6	\sim		~	\checkmark		~		~	\checkmark	\checkmark	<u>MC</u>	<u> </u>	~			~	×	~	<u>~</u>	~	\checkmark	JW
7				~	<u> </u>	\checkmark	V	\checkmark			JW	<u> </u>	\sim	<u> </u>		\sim		\checkmark		~	\checkmark	JW
8			/	$ \leq $					/	. /	as.	/	\leq			/	<u> </u>			/	\sim	5
9	JW/	1			/						m											m
10	27/4	26	22	22	17	12	^{3N} 1820		19	24	JW	18	17	21	21	21	16	18	20	22	24	JW
11	\checkmark	~	~	<u> </u>	✓	9	<u> </u>	└ ✓		~	JW	<u> </u>	~	~	~	~	<u> </u>	~	~	<u> </u>	<u> </u>	JW
12		~	~	 ✓ 		22	✓		~	~	JW	\checkmark	<u> </u>	~	~	\checkmark	✓	~	\sim	~	<u> </u>	JW
13	14	20	27	23	28	~	27	29	24	26	JW	29	24	22	28	28	23	27	25	29	28	JW_
14	10				×	\checkmark	~	~	1		JW	\checkmark				 ✓ 	4	~			<u> </u>	JW
15	$\angle /$		4		<u> </u>	/	1/				40		/									A
16	4		/			7	4			<u> </u>	A-	26	21				1	/	/		25	a
17	26	14	15	×		22	<u>✓</u>	14	19	17	JW	2	\checkmark	19	24	25	27	22	25	22	~	JW
18	~	<u> </u>	1 ×		 		<u> </u>	<u> </u>	<u> </u>		JW		<i>✓</i>		\checkmark	~	~			<u> </u>	\checkmark	JW
19	<u> </u>	<i>.</i>			····-	28				\checkmark	JW	29		~	~	~	~		<i>」</i>			JW
20	25	16	11.			\mathbf{X}	28	15	18	2	JW	<u> </u>	27	28	28	26	26	30	32	24	30	JW
21	~	~	\checkmark	1		27	~	<u> </u>	~	~	SM	\checkmark	~		~	\checkmark	\checkmark	\checkmark	\checkmark	~	\sim	SM
Total	99	76	75	45 [×]	45×	127	JW AS	77	81	8	SW	104	90	90	101	100	96	97	102	97	FOI	MC
Notes:	X = mo	rtality.					75			88 Previo Avg. y	us Broc oung/da	od aphnid:	18		-		Previo % m	ous 7-d ortality:	0			
Brood	Source	:	02121	4 A						# Days	to 1st	Brood:	(0				-					
Samp Comm	e Desci ients:	ription:		1500	mgil -	ros m	ade în	- house	Man	ch 12/	14.											
Reviewed by:									I	Date rev	viewed:		An	r.7	(14							

21-d Chronic Freshwater Toxicity Test Daphnia magna Reproduction Data

Client:	Golder	
Sample ID:	TDS	
Work Order:	14122	

Start Date & Time: March 14/14 @ 1400h Stop Date & Time: April 4/14 @ 1330h

Stop Date & Time: <u>April 4 / 14 @ 1330</u> Analysts: JW, AWD

_	Concer	ntration	: 444	MGIL	TDS							Conce	ntration	:	667 N	19/LTI)S					
Days	Α	В	С	D	E	F	G	Н	1	J	Init	A	В	С	D	E	F	G	H	I	J	Init
1		1		/					//	1	p					7,			<u> </u>	/	\sim	\square
2			1				/		/		~			1	/	/						m
3	$\mathbf{\langle}$		~	~	\checkmark	\sim	~	· ·	~	~	JW	~	~	~		\checkmark	\checkmark	\sim	>	~	~	JW
4	~	\checkmark	\checkmark	~	~	~	~	`	<	\checkmark	JN	\checkmark		~	~	 	~	~	\checkmark	\checkmark	~	SW
5	~		~			\checkmark	>	>	>	~	JW	\sim	>	~	X	~	 ✓ 	 ✓ 	~	~	 ✓ 	JW
6		>	\checkmark	\checkmark	~	\checkmark	~	~	~	\checkmark	Jin	~	\checkmark	~	×	~	~	<u> </u>	<u>~</u>	~	 	JW
7	<		 				\checkmark	~	\sim	~	JW		\checkmark			\checkmark	~		\checkmark	<u> </u>	~	JW
8		./.			./						p	/	<u> </u>	<u> </u>			<u> </u>				/	the second
9			/		/			\square			m		<	\sim			$1 \leq 1 \leq$		/			m
10	19	5	\checkmark	10	23	9	\checkmark	23	20	17	JW	24	25	21		27	25	19	17	24	\checkmark	JW
11	~	11	19	~	~	~	\sim	~	\checkmark	 ✓ 	30	\checkmark	\checkmark	\checkmark		<u> </u>	\checkmark	\sim	<u> </u>	<u> </u>	<u> </u>	JW
12	~	10	~	 ✓ 	~	\checkmark	13	✓	~	~	JW	\sim	\sim	~		~	~		~ JW			JW
13	31	×	~	20	29	~	~	~	Z 3	27	JW	29	31	28	 	28	~	√	2916		16	JW
14	\checkmark	<u> </u>	13		1/		1	27	~		JW						21		~	24		JW
15	/		<u> </u>			X	/								<u> </u>							AD
16	25	22					16			20	~			26	<u> </u>	24			24		16	\wedge
17	~	<u> </u>	21	18	21			28	24	<u> </u>	WC	30	7×	 ✓ 		<u> </u>	12	X		20	~	SN VC
18		~	5	<u> </u>	~~					27	JW WC		- 1		\vdash	$\overrightarrow{}$		<u> </u>		Ť	27	JW
19	~	26		-	30	-{	23	-	26	27	•••	-		-	+	-				29	<u></u>	SW
20	32		33	26	30	\vdash		32	<u>2</u> 6	$\overline{\checkmark}$	WC WC	28		34		33	31	+	30	~		JW
21		<u> </u>		<u> </u>			<u> </u>	– ×	⊢~́	~	1.100			×		<u> </u>						- 30-
Total	107	74	86	74	103	۹*	52	IID	93	91	SM	""	63 [×]	109	OX	112	89	19*	97	97	59	SIN
Notes	X = mo	rtality.								Previo Avg. y	us Broo oung/d	od aphnid:	18	-	_			ous 7-d ortality:	0			
Brood	Source	: :	02121							# Days	to 1st	Brood:					_					
•	le Desc nents:	ription:		1500	M91L	TOS N	nade î	n - hous	e Mai	ich 12/	14											
Revie	wed by:			(Joh	_							I	Date re	viewed:	l	Ap	r. 4	114			

21-d Chronic Freshwater Toxicity Test Daphnia magna Reproduction Data

Client:	Golder	
Sample ID:	TOS	
Work Order:	14:22	

Concentration:

в

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22

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Days

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10

11

12

13

14

15

16

17

18

19

20

21

Total

Start Date & Time: March 14/14 @ 1400h

Stop Date & Time: Apríl 4 / 14 @ 1330h

 \checkmark

88

 \checkmark

86

/ AWD

~

37

<

91

 \checkmark

102

~

102

Analysts: JW

1000 M9/L TOS **Concentration:** 1900 MG/L TDS С D E F G н Init В С Ε F G Н J Init J Α D p / to / m ~ $\overline{\checkmark}$ \checkmark V < < $\overline{}$ ~ $\sqrt{}$ < \checkmark \checkmark JW \checkmark \checkmark \checkmark ~ \checkmark JW \checkmark \checkmark $\overline{}$ ~ ~ < < ~ $\overline{}$ $\overline{}$ SW V ~ Ś ~ $\overline{\checkmark}$ \checkmark < $\overline{}$ < Ś JW WC < ~ \checkmark < Ś $\overline{}$ < \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark ~ \checkmark ~ ~ \checkmark \checkmark $\overline{}$ $\overline{}$ \checkmark / ~ $\overline{\mathbf{v}}$ JW ~ ~ $\overline{}$ JN < < \checkmark \checkmark \checkmark \checkmark ~ \checkmark \checkmark 1 Ś Ś \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark ~ JW \checkmark \checkmark ~ \checkmark \checkmark \checkmark \checkmark \sim JW A A> / 1 7 / 1 / 1 / A B 24 18 19 < \checkmark 22 17 22 20 13 20 13 22 21 14 22 JW JW 20 18 JW ~ ~ ~ < $\overline{\checkmark}$ $\overline{\checkmark}$ SN $\overline{\checkmark}$ \checkmark \checkmark / \checkmark \checkmark \checkmark \checkmark ~ \checkmark \checkmark \checkmark ī 16 $\overline{\checkmark}$ 11 Ś \leq 7 \checkmark JW $\overline{\checkmark}$ 7 $\overline{\checkmark}$ $\overline{\checkmark}$ ~ ~ ~ <u>
</u> V JW \checkmark 22 23 24 2 28 30 23 23 19 28 18 21 20 15 22 Ś \checkmark JW 29 \checkmark 21 \checkmark \checkmark \checkmark \checkmark \checkmark 5 JW ~ 1 ζ < Ś \checkmark \checkmark ~ JW 1 10 / 1 / X / A 1 28 22 22 17 1 m 入 26 27 26 JW 20 ~ 19 14 ~ ~ \checkmark JW 13 21 22 20 ~ 20 ~ $\overline{}$ ~ \checkmark ~ × \checkmark ~ ~ JW < Ś Ś ~ \checkmark \checkmark JW \checkmark \checkmark \checkmark J $\overline{}$ \checkmark 24 < 5 \checkmark JW ~ 1 $\overline{}$ 1 $\overline{}$ 33 $\overline{\checkmark}$ JN \checkmark 28 38 32 27 33 27 32 28 32 31 SΩ \sim 34 Š 22 35 \checkmark \checkmark

Notes: X = mortality.		Previous Brood Avg. young/daphnid: ⁽ 8	Previous 7-d % mortality:O
Brood Source:	021214 A	# Days to 1st Brood: ^{[D})
Sample Description: Comments:	1500 mg/L TDS made in-house	March 12/14	
Reviewed by:	Joh	Date reviewed:	Apr. 4/14

SW

SW

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71

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79

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104

38×

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92

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108

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JW

JW

CETIS Analytical Report

Report Date: **Test Code:**

Daphnia Magna 21-Day Life Cycle Test

Daphnia Magn	na 21-Day Life Cycle	Test		Nautilus Environmental				
Analysis ID: Analyzed:	17-0774-0673 04 Apr-14 14:28	Endpoint: Analysis:	Survival Rate Linear Interpolation (ICPIN)	CETIS Ver Official Re				
Batch ID: Start Date: Ending Date: Duration:	19-3235-7899 14 Mar-14 14:00 04 Apr-14 13:30 20d 23h	Test Type: Protocol: Species: Source:	Survival-Reproduction ASTM E1193-97 (1997) Daphnia magna In-House Culture	Analyst: Diluent: Brine: Age:	Jeslin Wijaya Mod-Hard Synthetic Water <24h			
Sample ID: Sample Date: Receive Date: Sample Age:		Code: Material: Source: Station:	4B5F4A1B Total Dissolved Solids Golder TDS	Client: Project:	Golder			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	500192	200	Yes	Two-Point Interpolation

Point Estimates

Level	mg/L	95% LCL	95% UCL	
LC5	527.1	325.4	N/A	
LC10	638.6	362.3	N/A	LC20 and LC50 are >1510 based on average of
LC15	>1516	N/A	N/A	
LC20	>1516	N/A	N/A	measured TDS at initiation and termination
LC25	>1516	N/A	N/A	
LC40	>1516	N/A	N/A	
LC50	>1516	N/A	N/A	

Survival Rate Summary											
C-mg/L 🛈	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	в
217.5	Negative Control	10	0.8	0	1	0.1333	0.4216	52.7%	0.0%	8	10
292.3		10	1	1	1	0	0	0.0%	-25.0%	10	10
435		10	0.9	0	1	0.1	0.3162	35.14%	-12.5%	9	10
666.4		10	0.7	0	1	0.1528	0.483	69.01%	12.5%	7	10
1002.6		10	0.8	0	1	0.1333	0.4216	52.7%	0.0%	8	10
1516		10	0.9	0	1	0.1	0.3162	35.14%	-12.5%	9	10

Survival Rate Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
217.5	Negative Control	1	1	1	0	0	1	1	1	1	1
292.3		1	1	1	1	1	1	1	1	1	1
435		1	1	1	1	1	0	1	1	1	1
666.4		1	0	1	0	1	1	0	1	1	1
1002.6		0	1	1	1	1	1	0	1	1	1
1516		1	1	1	0	1	1	1	1	1	1

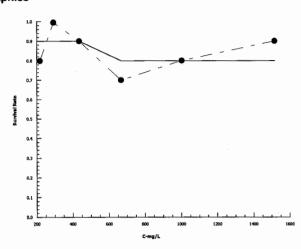
Survival Rate Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
217.5	Negative Control	1/1	1/1	1/1	0/1	0/1	1/1	1/1	1/1	1/1	1/1
292.3		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
435		1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1
666.4		1/1	0/1	1/1	0/1	1/1	1/1	0/1	1/1	1/1	1/1
1002.6		0/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
1516		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1

() TDS measurements are based on Day O chemistry.

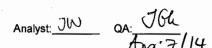
000-469-187-2

CETIS Ana	lytical Report	Report Date: Test Code:	07 Apr-14 09:03 (p 2 of 2) 14122 06-4698-8065		
Daphnia Mag	na 21-Day Life Cycle	Test			Nautilus Environmental
Analysis ID:	17-0774-0673	Endpoint:	Survival Rate	CETIS Version:	CETISv1.8.7
Analyzed:	04 Apr-14 14:28	Analysis:	Linear Interpolation (ICPIN)	Official Results:	Yes
Graphics					



Daphnia Magn Analysis ID: Analyzed: Batch ID:	na 21-Day Life C											
Analyzed:		ycle lest							Na	utilus Env	ironmenta	
	06-0581-7059	En	dpoint:	Reproduction	<u> </u>		CET	IS Version:	CETISv1	.8.7		
Batch ID:	07 Apr-14 9:02	An	alysis:	Linear Interpo	lation (ICPI	N)	Offic	Official Results: Yes				
	19-3235-7899	Те	st Type:	Survival-Repr	oduction		Ana	yst: Jes	lin Wijaya			
Start Date:	14 Mar-14 14:0	0 Pr	otocol:	ASTM E1193	-97 (1997)		Dilu	ent: Moo	d-Hard Syntl	hetic Water		
Ending Date:	04 Apr-14 13:30	0 S p	ecies:	Daphnia mag	na		Brin	e:				
Duration:	20d 23h	Sc	urce:	In-House Cult	ure		Age	: <24	lh			
Sample ID:	12-6453-6091	Co	de:	4B5F4A1B			Clie	nt: Gol	der			
Sample Date:	12 Mar-14	Ma	aterial:	Total Dissolve	ed Solids		Proj	ect:				
Receive Date:	12 Mar-14	Sc	urce:	Golder								
Sample Age:	62h	St	ation:	TDS								
Linear Interpo	lation Options											
X Transform	Y Transform		ed	Resamples	Exp 95		hod					
_og(X+1)	Linear	40	3923	200	Yes	Two	-Point Interp	olation				
Point Estimate	es											
_evel mg/L			L									
C5 364	324	N/A			_					_		
C10 >1516		N/A					les are		-			
C15 >1516		N/A N/A		averag	re meas	sured T	DS at	toot i	initiat	-ion a		
C20 >1510		11/7			•		DD ut	LEBL			na	
	5 N/A	N/A		termin	ation		20 ac				na	
		N/A N/A		termin	ation	area r				21011 a	na	
C40 >1516	6 N/A	n/a n/a n/a		termin	ation			LEBU		21011 a	na	
C40 >1516 C50 >1516	6 N/A 6 N/A	N/A		termin		alculated Va				a	<u> </u>	
C40 >1516 C50 >1516 Reproduction	6 N/A 6 N/A	N/A	Mean	termin Min				CV%	%Effect		<u> </u>	
C40 >1516 C50 >1516 Reproduction C-mg/L () C	6 N/A 6 N/A Summary	N/A N/A	Mean 78.8		C	alculated Va	ariate					
C40 >1516 C50 >1516 Reproduction C C-mg/L I C 217.5 N 292.3 I I	6 N/A 6 N/A Summary control Type	N/A N/A Count 10 10	78.8 98.4	Min 45 90	Ca Max 127 107	alculated Va Std Err 7.561 1.759	ariate Std Dev 23.91 5.562	CV% 30.34% 5.65%	%Effect 0.0% -24.87%			
C40 >1516 C50 >1516 Reproduction C C-mg/L 10 C 217.5 N 292.3 435	6 N/A 6 N/A Summary control Type	N/A N/A Count 10 10 10	78.8 98.4 79.9	Min 45 90 9	C: Max 127 107 110	alculated Va Std Err 7.561 1.759 9.65	ariate Std Dev 23.91 5.562 30.52	CV% 30.34% 5.65% 38.19%	%Effect 0.0% -24.87% -1.4%			
IC40 >1516 IC50 >1516 Reproduction C C-mg/L ① C 217.5 N 292.3 435 666.4	6 N/A 6 N/A Summary control Type	N/A N/A Count 10 10 10 10	78.8 98.4 79.9 75.6	Min 45 90 9 0	Ca Max 127 107 110 112	Std Err 7.561 1.759 9.65 12.54	Std Dev 23.91 5.562 30.52 39.64	CV% 30.34% 5.65% 38.19% 52.43%	%Effect 0.0% -24.87% -1.4% 4.06%			
C40 >1516 C50 >1516 Reproduction C C-mg/L ① C 217.5 N 292.3 135 366.4 1002.6	6 N/A 6 N/A Summary control Type	N/A N/A 10 10 10 10 10 10	78.8 98.4 79.9 75.6 86.2	Min 45 90 9 0 41	Ca Max 127 107 110 112 108	Std Err 7.561 1.759 9.65 12.54 7.261	Std Dev 23.91 5.562 30.52 39.64 22.96	CV% 30.34% 5.65% 38.19% 52.43% 26.64%	%Effect 0.0% -24.87% -1.4% 4.06% -9.39%			
C40 >1516 C50 >1516 Reproduction C-mg/L () C 217.5 N 292.3 435 566.4 1002.6 1516	6 N/A 6 N/A Summary control Type legative Control	N/A N/A Count 10 10 10 10	78.8 98.4 79.9 75.6	Min 45 90 9 0	Ca Max 127 107 110 112	Std Err 7.561 1.759 9.65 12.54	Std Dev 23.91 5.562 30.52 39.64	CV% 30.34% 5.65% 38.19% 52.43%	%Effect 0.0% -24.87% -1.4% 4.06%			
IC40 >1516 IC50 >1516 Reproduction Image: Complete the second	6 N/A 6 N/A Summary control Type legative Control Detail	N/A N/A 10 10 10 10 10 10	78.8 98.4 79.9 75.6 86.2 79.8	Min 45 90 9 0 41 37	Ca Max 127 107 110 112 108 104	alculated Va Std Err 7.561 1.759 9.65 12.54 7.261 7.789	Std Dev 23.91 5.562 30.52 39.64 22.96 24.63	CV% 30.34% 5.65% 38.19% 52.43% 26.64% 30.86%	%Effect 0.0% -24.87% -1.4% 4.06% -9.39% -1.27%			
C40 >1516 C50 >1516 Reproduction C C-mg/L 1 C 217.5 N 292.3 435 366.4 1002.6 1516 Reproduction C C-mg/L C C	6 N/A 6 N/A Summary control Type legative Control	N/A N/A 10 10 10 10 10 10	78.8 98.4 79.9 75.6 86.2	Min 45 90 9 0 41 37	Ca Max 127 107 110 112 108	Std Err 7.561 1.759 9.65 12.54 7.261	Std Dev 23.91 5.562 30.52 39.64 22.96	CV% 30.34% 5.65% 38.19% 52.43% 26.64%	%Effect 0.0% -24.87% -1.4% 4.06% -9.39%	Rep 9 81		
C40 >1516 C50 >1516 Reproduction C C-mg/L (1) C 217.5 N 292.3 435 366.4 1002.6 1516 Reproduction C-mg/L C 217.5 N	6 N/A 6 N/A Summary control Type legative Control Detail control Type	N/A N/A 10 10 10 10 10 10 10 Rep 1	78.8 98.4 79.9 75.6 86.2 79.8 Rep 2	Min 45 90 9 0 41 37 Rep 3	Ca Max 127 107 110 112 108 104 Rep 4	alculated Va Std Err 7.561 1.759 9.65 12.54 7.261 7.789 Rep 5	Std Dev 23.91 5.562 30.52 39.64 22.96 24.63	CV% 30.34% 5.65% 38.19% 52.43% 26.64% 30.86% Rep 7	%Effect 0.0% -24.87% -1.4% 4.06% -9.39% -1.27% Rep 8	Rep 9	Rep 10	
C40 >1516 C50 >1516 Reproduction C C-mg/L ① C 217.5 N 292.3 435 666.4 1002.6 1516 C Reproduction C C C-mg/L C C 217.5 N 292.3	6 N/A 6 N/A Summary control Type legative Control Detail control Type	N/A N/A 10 10 10 10 10 10 10 10 99	78.8 98.4 79.9 75.6 86.2 79.8 Rep 2 76	Min 45 90 9 0 41 37 Rep 3 75	Ca Max 127 107 110 112 108 104 Rep 4 45	alculated Va Std Err 7.561 1.759 9.65 12.54 7.261 7.789 Rep 5 45	ariate Std Dev 23.91 5.562 30.52 39.64 22.96 24.63 Rep 6 127	CV% 30.34% 5.65% 38.19% 52.43% 26.64% 30.86% Rep 7 75	%Effect 0.0% -24.87% -1.4% 4.06% -9.39% -1.27% Rep 8 77	Rep 9 81	Rep 10 88	
C40 >1516 C50 >1516 Reproduction C C-mg/L 1 C 217.5 N 292.3 435 666.4 1002.6 1516 C 217.5 Reproduction C C C-mg/L C 217.5 X217.5 N 292.3 435 35 35	6 N/A 6 N/A Summary control Type legative Control Detail control Type	N/A N/A 10 10 10 10 10 10 10 10 10 99 104	78.8 98.4 79.9 75.6 86.2 79.8 Rep 2 76 90	Min 45 90 9 0 41 37 Rep 3 75 90	Ca Max 127 107 110 112 108 104 Rep 4 45 101	alculated Va Std Err 7.561 1.759 9.65 12.54 7.261 7.789 Rep 5 45 100	Std Dev 23.91 5.562 30.52 39.64 22.96 24.63 Rep 6 127 96	CV% 30.34% 5.65% 38.19% 52.43% 26.64% 30.86% Rep 7 75 97	%Effect 0.0% -24.87% -1.4% 4.06% -9.39% -1.27% Rep 8 77 102	Rep 9 81 97	Rep 10 88 107	
IC40 >1516 IC50 >1516 Reproduction C C-mg/L ① C 217.5 N 292.3 435 666.4 1002.6 1516 Reproduction C-mg/L C	6 N/A 6 N/A Summary control Type legative Control Detail control Type	N/A N/A 10 10 10 10 10 10 10 10 10 99 104 107	78.8 98.4 79.9 75.6 86.2 79.8 Rep 2 76 90 74	Min 45 90 9 0 41 37 Rep 3 75 90 86	Ca Max 127 107 110 112 108 104 Rep 4 45 101 74	alculated Va Std Err 7.561 1.759 9.65 12.54 7.261 7.789 Rep 5 45 100 103	ariate Std Dev 23.91 5.562 30.52 39.64 22.96 24.63 Rep 6 127 96 9	CV% 30.34% 5.65% 38.19% 52.43% 26.64% 30.86% Rep 7 75 97 52	%Effect 0.0% -24.87% -1.4% 4.06% -9.39% -1.27% Rep 8 77 102 110	Rep 9 81 97 93	Rep 10 88 107 91	

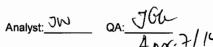
() TDS measurements are based on day o chemistry.



CETIS Ana	alytical Report			Report Date: Test Code:	07 Apr-14 09:02 (p 2 of 14122 06-4698-80 Nautilus Environment			
Daphnia Mag	na 21-Day Life Cycl	e Test						
Analysis ID: Analyzed:	06-0581-7059 07 Apr-14 9:02	Endpoint: Analysis:	Reproduction Linear Interpolation (ICPIN)	CETIS Version: Official Results:	CETISv1.8.7 Yes			
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------600

500 C-mg/L



W.O.#: 14122

Hardness and Alkalinity Datasheet

			Alkalinity				Hardnes	S		
Sample ID	Sample Date	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO ₃)		nple ume -)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	Technici
MHW	March 12/14	50	3.5	3.6	68		50	5.0	100	JW
MHW	March 17/14	50	3.5	3.6	68	ę	50	5.0	100	JN
MHW	March 19/14	50	3.6	3.7	70		50	5.0	GOI	JW
MHW	March 21/14	50	3.7	3.8	72		50	5.0	100	ωc
MHW	March 27/14	50	3.7	3.8	72		50	5.0	100	WC
MHW	March 29/14	50	3.6	3.7	70		50	5.0	(OD	SC
1500 mg/L TDS	March 14/14	50	5.0	5.1	98		100	8.9	890	50
										-
					м. Политични страници стр					

Notes: 1) Diluted to 100 mL w/ DI H20.

JGL

Reviewed by:

Apr. 4/14 Date Reviewed:



Chemistry at test initiation

NAUTILUS ENVIRONMENTAL

ATTN: Jeslin Wijaya 8664 Commerce Court Imperial Square Lake City Burnaby BC V5A 4N7 Date Received:14-MAR-14Report Date:21-MAR-14 17:26 (MT)Version:FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1432679

Project P.O. #: NOT SUBMITTED Job Reference: C of C Numbers: 1

C of C Numbers: Legal Site Desc:

Janie L

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L1432679 CONTD.... PAGE 2 of 4 21-MAR-14 17:26 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

					Vers	ion: FINAL
	Sample ID Description Sampled Date Sampled Time	L1432679-1 Water 14-MAR-14	L1432679-2 Water 14-MAR-14	L1432679-3 Water 14-MAR-14	L1432679-4 Water 14-MAR-14	L1432679-5 Water 14-MAR-14
	Client ID	CONTROL	296 MG/L TDS	444 MG/L TDS	667 MG/L TDS	1000 MG/L TDS
Grouping	Analyte					
WATER						
Physical Tests	Total Dissolved Solids (mg/L)	209	361	529	783	1140
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	76.9	21.7	32.1	45.6	73.7
	Chloride (Cl) (mg/L)	2.25	147	218	339	515
	Sulfate (SO4) (mg/L)	97.6	26.3	38.2	58.8	84
Total Metals	Calcium (Ca)-Total (mg/L)	16.6	61.6	91.8	138	204
	Magnesium (Mg)-Total (mg/L)	13.7	7.08	10.7	15.8	23.6
	Potassium (K)-Total (mg/L)	2.8	3.0	4.5	6.5	9.8
	Sodium (Na)-Total (mg/L)	38.4	34.3	52.5	80.9	122

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

				versi	011.	FINAL
	Sample ID Description Sampled Date Sampled Time	L1432679-6 Water 14-MAR-14 1500 MG/L TDS				
	Client ID	1300 MG/E 123				
Grouping	Analyte					
WATER						
Physical Tests	Total Dissolved Solids (mg/L)	1790				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	111				
	Chloride (Cl) (mg/L)	772				
	Sulfate (SO4) (mg/L)	135				
Total Metals	Calcium (Ca)-Total (mg/L)	304				
	Magnesium (Mg)-Total (mg/L)	37.4				
	Potassium (K)-Total (mg/L)	15.0				
	Sodium (Na)-Total (mg/L)	186				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments: QC Type Description Parameter Qualifier Applies to Sample Number(s) Matrix Spike Calcium (Ca)-Total MS-B L1432679-1, -2, -3, -4, -5, -6 **Qualifiers for Individual Parameters Listed:** Qualifier Description MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. Test Method References: ALS Test Code Matrix **Test Description** Method Reference** ALK-COL-VA Water Alkalinity by Colourimetric (Automated) EPA 310.2 This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method. ANIONS-CL-IC-VA Water Chloride by Ion Chromatography APHA 4110 B. This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". ANIONS-SO4-IC-VA Water Sulfate by Ion Chromatography APHA 4110 B. This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Total Metals in Water by ICPOES EPA SW-846 3005A/6010B **MET-TOT-ICP-VA** Water This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B). APHA 2540 C - GRAVIMETRIC **TDS-VA** Water Total Dissolved Solids by Gravimetric This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA Chain of Custody Numbers: 1 **GLOSSARY OF REPORT TERMS** Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For

applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Nautilus Environmental



						8	British Columbia B664 Commerce Cour										
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Contact	Jeslin Wijaya			Conta	. —	lin Wijaya			F								
Phone	604-420-8773			Phon	e _604	1-420-8773		Ε	siur	E	E .	용	ge				۲, I
Email	jeslin@nautilu	senvironmenta	al.com	Email	j <u>es</u>	lin@nautilusenvironmental.com		Calcium	Magnesium	Sodium	Potassiu	Chloride	Sulphate				ei
				CONTAINER	NO. OF			U S	al M	al Sc	aiP	al C	al Si	Alkalinity			Rec
SAMPLE ID	DATE	TIME	MATRIX	ТҮРЕ	CONTAINERS	COMMENTS		Total	Total	Total	Total	Total	Total	Alk	Ê		
1 Control	14-Mar-14		Water	125mL & 1L	2			x	x	x	x	x	x	x	x		
2 296 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			x	x	x	x	x	x	x	x		
3 444 mg/L TDS	14-Mar-14		Water	125mL & 1L	2	· · · · · · · · · · · · · · · · · · ·	·	×	x	x	x	x	x	x	x		
4 667 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			x	x	x	x	x	x	x	x		
5 1000 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			×	x	x	x	x	x	x	x		
6 1500 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			×	x	x	x	x	x	x	x		
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SPECIAL COMMENTS/IN	STRUCTIONS : 2	1-d <i>D. magna</i>	chronic test. D	ay 0. All		RECEIVED BY (COURIER)		ŀ		R	ECEI	/ED B	Y (LA	BORA	TORY	0	
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Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.



NAUTILUS ENVIRONMENTAL

ATTN: Jeslin Wijaya 8664 Commerce Court Imperial Square Lake City Burnaby BC V5A 4N7 Date Received:04-APR-14Report Date:10-APR-14 14:31 (MT)Version:FINAL

Client Phone: 604-420-8773

Certificate of Analysis

L1440078

NOT SUBMITTED

Lab Work Order #:

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

Janie Ja

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L1440078 CONTD.... PAGE 2 of 4 10-APR-14 14:31 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

				Vers	ion: FINAL
Sample ID Description Sampled Date Sampled Time Client ID	L1440078-1 Water 04-APR-14 CONTROL MHW	L1440078-2 Water 04-APR-14 296 MG/L TDS	L1440078-3 Water 04-APR-14 444 MG/L TDS	L1440078-4 Water 04-APR-14 667 MG/L TDS	L1440078-5 Water 04-APR-14 1000 MG/L TDS
Analyte					
	209	444	626	897	1250
Alkalinity, Total (as CaCO3) (mg/L)	80.8	22.1	33.7	47.5	80.2
	2.20	149	227	343	518
	97.7	26.8	39.5	60.2	90
Calcium (Ca)-Total (mg/L)	16.8	59.5	89.7	136	205
Magnesium (Mg)-Total (mg/L)	13.7	7.28	11.0	16.8	25.2
Potassium (K)-Total (mg/L)	2.4	2.8	4.3	6.5	9.8
Sodium (Na)-Total (mg/L)	33.8	34.5	51.9	78.2	119
	Description Sampled Date Sampled Time Client ID Analyte Total Dissolved Solids (mg/L) Alkalinity, Total (as CaCO3) (mg/L) Chloride (Cl) (mg/L) Sulfate (SO4) (mg/L) Calcium (Ca)-Total (mg/L) Magnesium (Mg)-Total (mg/L) Potassium (K)-Total (mg/L)	Description Sampled Date Sampled Time Client IDWater 04-APR-14 CONTROL MHWAnalyteControl MHWTotal Dissolved Solids (mg/L)209 80.8Alkalinity, Total (as CaCO3) (mg/L)80.8Chloride (Cl) (mg/L)2.20 97.7Sulfate (SO4) (mg/L)97.7Calcium (Ca)-Total (mg/L)16.8Magnesium (Mg)-Total (mg/L)13.7Potassium (K)-Total (mg/L)2.4	Description Sampled Date Sampled Time Client IDWater 04-APR-14 296 MG/L TDSAnalyteCONTROL MHWWater 04-APR-14 296 MG/L TDSAnalyte209444 444Total Dissolved Solids (mg/L)209444 80.8Chloride (Cl) (mg/L)2.20149 97.7Sulfate (SO4) (mg/L)97.726.8 59.5Magnesium (Mg)-Total (mg/L)13.77.28 2.8Potassium (K)-Total (mg/L)2.42.8	Description Sampled Date Sampled Time Client IDWater 04-APR-14Water 04-APR-14Water 04-APR-14Analyte296 MG/L TDS444 MG/L TDSAnalyte209444626Alkalinity, Total (as CaCO3) (mg/L)209444626Alkalinity, Total (as CaCO3) (mg/L)2.20149227Sulfate (SO4) (mg/L)97.726.839.5Calcium (Ca)-Total (mg/L)16.859.589.7Magnesium (Mg)-Total (mg/L)13.77.2811.0Potassium (K)-Total (mg/L)2.42.84.3	Sample ID Description Sampled Date Sampled Time Client ID L1440078-1 Water 04-APR-14 L1440078-2 Water 04-APR-14 L1440078-3 Water 04-APR-14 L140078-3 Water 04-APR-14 L140078-3 Water 04-APR-14 L140078-3 Water 04-APR-14 L140078-3 Water 04-APR-14 L14078-3 Water 04-APR-14 L1407-3 Water 04-APR-14 <th< td=""></th<>

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT Version: FINAL L1440078-6 Sample ID Description Water Sampled Date 04-APR-14 Sampled Time 1500 MG/L TDS Client ID Grouping Analyte WATER **Physical Tests** Total Dissolved Solids (mg/L) 1950 Alkalinity, Total (as CaCO3) (mg/L) Anions and 111 Nutrients Chloride (Cl) (mg/L) 774 Sulfate (SO4) (mg/L) 134 **Total Metals** Calcium (Ca)-Total (mg/L) 299 Magnesium (Mg)-Total (mg/L) 37.1 Potassium (K)-Total (mg/L) 14.8 Sodium (Na)-Total (mg/L) 179

L1440078 CONTD.... PAGE 3 of 4 10-APR-14 14:31 (MT)

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Type Description		Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike		Calcium (Ca)-Total	MS-B	L1440078-1, -2, -3, -4, -5, -6
Matrix Spike		Magnesium (Mg)-Total	MS-B	L1440078-1, -2, -3, -4, -5, -6
Qualifiers for Individ	ual Parameters	Listed:		
Qualifier Desc	ription			
MS-B Matri	x Spike recovery	could not be accurately calculated d	ue to high analyte	background in sample.
est Method Referen	ces:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automa	ated)	EPA 310.2
This analysis is carried colourimetric method.	d out using proce	dures adapted from EPA Method 310	0.2 "Alkalinity". Tot	tal Alkalinity is determined using the methyl orange
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography		APHA 4110 B.
		dures adapted from APHA Method 4 Determination of Inorganic Anions by		atography with Chemical Suppression of Eluent ohy".
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography		APHA 4110 B.
		dures adapted from APHA Method 4 Determination of Inorganic Anions by		natography with Chemical Suppression of Eluent oby".
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES		EPA SW-846 3005A/6010B
American Public Healt States Environmental	h Association, ar Protection Agend	nd with procedures adapted from "Te cy (EPA). The procedures may involve	st Methods for Eva ve preliminary sam	ation of Water and Wastewater" published by the aluating Solid Waste" SW-846 published by the United uple treatment by acid digestion, using either hotblock of a - optical emission spectrophotometry (EPA Method
TDS-VA	Water	Total Dissolved Solids by Gravime	tric	APHA 2540 C - GRAVIMETRIC
				Is are determined gravimetrically. Total Dissolved Solids vaporating the filtrate to dryness at 180 degrees celsius
* ALS test methods may	incorporate mod	difications from specified reference m	ethods to improve	performance.
The last two letters of th	ne above test coo	de(s) indicate the laboratory that perfe	ormed analytical a	nalysis for that test. Refer to the list below:
Laboratory Definition	Code Labor	atory Location		
VA	ALS E	NVIRONMENTAL - VANCOUVER, B	RITISH COLUMBI	IA, CANADA
hain of Custody Numl	pers:			
applicable tests, surroga mg/kg - milligrams per k	d that is similar ir ates are added to ilogram based o	o samples prior to analysis as a chec		r naturally in environmental samples. For

mg/kg wwt - milligrams per kilogram based on wet weight of sample. mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR). N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Short Holding Time

Rush Processing LI440078

British Columbia

8664 Commerce Court Burnaby, British Columbia, Canada V5A 4N3 Phone 604.420.8773

Date Apr 4/14 Page 1 of 1

Sample Collection By:										l	ANAL	YSES	REQL	JIRED)		
Report to:				Invoice	To:												Receipt Temperature (°C)
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SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF	COMMENTS		Total	Total	Total	Total	Total	Total	Alkalinity	tos		
CONTROL MHW	April 4 / 14		water	125 ML & 1L	2			×	×	×	×	×	×	×	×		
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ISOD MOIL TOS	April 4/14	-	Water ·	125 ML & 1L	2			×	X	×	X	×	X	×	X		
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							╴╟║║										
			· · · · ·				- 41 80		L144	4007	8-CC	DFC	11 6 610	18 810			
PROJECT INFOR	MATION	5	SAMPLE RECE		··-	RELINQUISHED BY (CLIENT)	-									.)	
		<u>,</u>	(Signature) (Time)			(Signature) (Time))				
Client:		Total No.	of Containe	Sat made	Mar-	(SOOh (Date)		(Drinted	1 Name)							(Date	·
PO No.:	_	Received (Good Conditio	on?	(Printed Name) JESIIN WID			Venator	i Norinej					•		(0000	,
Shipped					(Company)			(Company)									
Via:		制品質的目的によるな分析等	방법 문화 문제 문제		1	Environmental.					an ana.						·
special comments	: 21-d D		hronic test	· All sample	(Signature)	RECEIVED BY (COURIER)		(Signati	MUNCS	89€° R	ECEN	VED B	Y (L	BOR/	ATORY	ໃ	alsonile)) I
	are not	preserved.			(Signature)	(1808)		999) ³	٦/(A illingit	No	γ^{4}	F	64	(5		5.80
					(Printed Name)	(Date)		(Printed	l I Name)		 		iliante os			(Date	>
					(5-11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-			(Compa	101/1								s <u>⊗</u>
					(Company)										۰		·

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Day 0 - March 14, 2014													
Nominal TDS	mg/L	Control	296	444	667	1000	1500						
Alkalinity	mg/L	76.9	21.7	32.1	45.6	73.7	111						
Cl	mg/L	2.25	147	218	339	515	772						
SO4	mg/L	97.6	26.3	38.2	58.8	84	135						
Ca	mg/L	16.6	61.6	91.8	138	204	304						
Mg	mg/L	13.7	7.08	10.7	15.8	23.6	37.4						
К	mg/L	2.8	3	4.5	6.5	9.8	15						
Na	mg/L	38.4	34.3	52.5	80.9	122	186						
Calculated TDS	mg/L	217.5	292.3	435.0	666.4	1002.6	1516.0						
Day 21 - April 4, 2014 Nominal TDS mg/L Control 296 444 667 1000 1500													
Nominal TDS	mg/L	Control	296	444	667	1000	1500						
Alkalinity	mg/L	80.8	22.1	33.7	47.5	80.2	111						
Cl	mg/L	2.2	149	227	343	518	774						
SO4	mg/L	97.7	26.8	39.5	60.2	90	134						
Са	mg/L	16.8	59.5	89.7	136	205	299						
Mg	mg/L	13.7	7.28	11	16.8	25.2	37.1						
К	mg/L	2.4	2.8	4.3	6.5	9.8	14.8						
Na	mg/L	33.8	34.5	51.9	78.2	119	179						
Calculated TDS	mg/L	215.1	293.1	443.6	669.2	1015.1	1504.5						
Average TDS	mg/L	216.3	292.7	439.3	667.8	1008.9	1510.3						

ATTACHMENT 2 NAUTILUS ENVIRONMENTAL DATA REPORT: Test 4





Golder Associates Ltd. ATTN: Peter Chapman 200 – 420 West Hastings Street Vancouver, BC V6B 1L1 Report Date: May 2, 2014 Work Order: 14123

Data report

Species: *Daphnia magna* Protocol: ASTM E1193 - 97

Table 1.Results for the 21-d Daphnia magna life-cycle toxicity test.

Sample ID	Sample Date	21-d IC20 mg/L TDS
TDS	Laboratory prepared	>1435

The test met performance criteria and there were no deviations from the test methods. The results presented here relate only to the sample tested.

Jeslin Wijaya, B.Sc. Laboratory Biologist

Reviewed By: James Elphick, R.P.Bio Senior Reviewer

Daphnia magna Summary Sheet

Client: Work Order No.:	Gader 14123	Start Date/Time: Test Species: Set up by:	
Sample Information			e control treatment(s)
Sample ID: Sample Date:	TDS March 24/14 (Made in-house)		ng/adult produced in the control produced in the control treatment(s)
Date Received:	March 24/14 (Made in-house)	WQ Ranges:	sourced in the control treatment(3)
Sample Volume:	1 X 20 L) (mg/L) = 3.0 to 9.4; pH = 6 to 8.5
Test Organism Info	ormation:		

Broodstock No.:	031214 A
Age of young (Day 0):	<24 h
Avg No. young per brood in previous 7 d:	19
Mortality (%) in previous 7 d:	0
Days to first brood:	9

NaCl Reference Toxicant Results:

Dm 117	
14 NA OI	
April 3, 2014	
3.9 (2.8.5.5)	g/LNaCL
	14 NG OI April 3 , 2014

Reference Toxicant Mean and Hist	torical Range: 4.0 (3.7 - 4.4)	g/L NaCL
Reference Toxicant CV (%):	Ч	

Test Results:	The 21-d LC 50 is 7 1435 mg/L TDS.	
	The 21-0 IC 20 is > 1435 mg/L TOS.	
Reviewed by:	JGU Date reviewed: May 1/14	-

Summary of test conditions for the Daphnia magna life-cycle toxicity test.

olus laboratory control
er
′L CaCO₃)
rchneriella subcapitata and
hyll and trout chow
rs dark
ction
rage of ≥60 young per ale
l 18, 2014
1

References

ASTM. 2004. Standard Guide for Conducting *Daphnia magna* Life-Cycle Toxicity Tests. Method:
E1193 - 97 (Reapproved 2004). In: Annual Book of ASTM Standards. Volume 11.06.
Biological Effects and Environmental Fate; Biotechnology, Water and Environmental Technology, American Society for Testing and Materials. Philadelphia, PA.

21-d Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Sample ID: Work Order #:	Gold TDS 14123			-			Stop Date &	& Time: Mara & Time: <u>Aprîl</u> Decies: Daphni	ch 28 / 14 (18 / 14 @ ia magna	2 1230h	
						Days					
Concentration Control	0 Init.	3 old new	5 old new	old new	10 old new	12 old new	14 old new	17 old new	19 old new	old new final	
Temp (°C)	19.0	20.0 20.0	21.0 20.0		20.0 20.0	20,0 19.5	20.0 21.0	20.0 19.5	20.0 20.0	155	Control
DO (mg/L)	9.1	8.5 8.7	9.2 8.8	8.6 8.7	8.3 8.7	8.1 8,6	8.4 8.6	7.7 8.5	8.1 8.7	88	Hardness*
pH	7.6	7.4 7.6	7.5 7.7	7.7 7.6	7.7 7.8	7.67.7	7.5 7.5	7.4 7.6	7.4 7.5	JUN 7.6	Alkalinity*
Cond. (µS)	355	352	349	352	356	356	349	351	356	381	* mg/L as CaCO3
Initials	JW	JW	JW	JW	SIN	MU	JW	UC	JW	A	-
						Days					
Concentration	0	3	5	F	10	12	14	17	19	21	Sample 1500 M9/L
296 mg/L TDS	init.	old new	old new	old new	old new	old new	old new	old new	old new	old new final	Description: TDS made
Temp (°C)		20.0 19.5	21.0 21.0	20.0 20.0	20.0 22.0	20.0 19.5		20.0 21.0	20.0 21.0	165	In-house on March 24/14
DO (mg/L)	9.3	8.4 8.4	9.0 8.6	8,7 8.6	8.5 8.2	8.2 8.8	8.5 9.0	7.9 8.4	8-1 8.8	300 2.9	
pH	7.3	7.0 7.2	7.2 7.1	7.3 7.2	7.4 7.2	7.27.3	7.2 7.2	7.1 7.2	7.2 7.2	34	
Cond. (µS)	604	613	602	808	809	609	611	606	615	617	
Initials	JW	JW	WC	JW	JW	me	JW	JW	SC		
										1	1
						Days					
Concentration	0	3	5	F	10	12	14	17	19	21	Comments: D Please refer
444 MO/L TDS	init.	old new	old new	old new	old new	old new	old new	old new	old new	old new final	to Hardness & alkalinity
Temp (°C)	19.0		21.0 21.0	20.0 20.0	20.0 22.0	20.0 19.5	20.0 22.0		20.0 21.0	185	datasheet.
DO (mg/L)	9.3	8.4 8.4	9.0 8.6	8.7 8.7	8.5 8.2	8,2910	8.4 8.9	8.0 8.5	8.1 9.1	PR UC	· · · · · · · · · · · · · · · · · · ·
pH	7.2	7.0 7.2	7.2 7.2	7.3 7.2	7.3 7.3	7.2 7.3	7.2 7.2	7.1 7.2	7.2 7.2	73	
Cond. (µS)	875	878	872	875	884	880	878	879	887	912	
Initials	ЗM	UC	JW	JW	JW	MU	UC	UU I	UT	$\backslash h$	
							· · · · ·				1
	ŀ					Days			<u> </u>		
Concentration	0	3	5	7	10	12	14	17	19	21	CLARY LAT
667 mg/L TDS	init.	old new	old new.	old new	old new	old new	old new	old new	old new	old new final	Analysts:
Temp (°C)	19.0	20.0 20.0	21.0 21.0	20.0 20.0	20.0 22.0	20.0 19.5	20.0 21.0	20.0 21.0	20.0 21.0	IFA	Analysts: JW, YYL, AWD Reviewed by: JGL Date reviewed: May 1/14
DO (mg/L)	9.3	8.5 8.5	8.9 8.6	8,7 9.0	8.6 8.2	8.3 9.0		7.9 8.7	8.2 8.9	JUN 29	Date reviewed: May 1/14
pH	7.3	7.2 7.4	7.3 7.4	7.4 7.4	7.4 7.4	1.5 7.4		7.3 7.3	7.5 7.4	7.3	
Cond. (µS)	1292	1300	1296	1293	1302	1305	1294	1273	1286	1309	
Initials	JM	JW	WC .	JW	SM	M	JW	UC	JM	In	1

•

21-d Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Sample ID:	TDS											Sto	p Date &	k Time:	Aprîl	18/	14 @ 14 @			
Work Order #:	14123					•							Test Sp	ecies:	Daphni	ia magn	a			
Concentration	0		3		5		7	1)	Da 12		1	ų	17	1		9	\mathbf{X}		21
1000 mg/L TDS	init.	old	new	old	пеж	old	new	old	new	old	new-		new	old	new	old	new	blo	пеж	final
Temp (°C)	19.0	20.0	20.0	21.0	21.0	20.0	19.0	20.0	20.0	20.0	19.5	20.0	21.0	20.0	21.0	20.0	21.0			185
DO (mg/L)	۹.3	8.5	8.5	9.0	8.7	8.7	9.0	8.6	8.3	8.3	8.9	8.5	8.8	7.9	8.7	8.2	8.9	\backslash	Le le	4,9
pН	7.5	7.3	7.5	7.6	7.5	7.5	7.5	7.6	7.5	7.5	7.6	7.4	7.5	7.4	7.4	7.9	7.4		\backslash	77
Cond. (µS)	1890	18	399	18	980	18	85	18	95	19	01	1 18	888	18	85	19	16			1915
Initials	JW	3	\mathbf{w}	J	\sim	3	N	JI	2	w	V	J	Ν	IC	N	JI	2			¥

1	Control	
Hardness*		
Alkalinity*		

* mg/L as CaCO3

6

											Da	ays											
	Concentration	0	10	;		5	-	7	1C)		12	11	+	1	7	1	9	\mathbf{N}		21	Sample	1500 M9/L
1	1500 mg/L TDS	init.	old	new	old	пеж	old	new	old	new	old	new	old	new	old	new	old	new	òld	new	final	Description:	TDS made
	Temp (°C)	19.0	20.0	20.0	21.0	21.0	20,0	19.0	20.0	22.0	200	20.0	20.0	21.0	20.0	21.0	20.0	21.0			18-5	in-house or	March 24/14
	DO (mg/L)	9.3	8.9	8.5	8.9	8.7	8.7	8.9	ي.8	8.2	8,3	8.8	8.5	8.8	8.1	8.9	8.2	8.9		SUD	69		
	pН	7.5	7.3	7.5	7.6	7.5	7,6	7.6	7.7	7.6	7.7	7.6	7.4	7.5	7.4	7.4	1.5	7.5		$\left[\right]$	73		
	Cond. (µS)	2730	27	40	2	140	27	20	27	60	27	50	27	730	2=	730	2	40			2520		
[Initials	JW	J	3	J	10	36	Ň	J	W	Ś	12		SW	J	ŝ	5	と			Y		

										Da	iys										
Concentration	0																				to Hardness & alkalinity
	init.	old	new	old	new	old	пеж	old	new	final	to Hardness & alkalinity										
Temp (°C)																					datasheet ·
DO (mg/L)		-																			
рН																					
Cond. (µS)																					
Initials																					

	Days																					
Concentration	0																					
	init.	old	new	old	пеw	old	new	final	Analysts:	JW, ML, AWP												
Temp (°C)																					Reviewed by:	JOUL AWP
DO (mg/L)																					Date reviewed:	May 1/4
рН																						· • • • •
Cond. (µS)																						
Initials																						

21-d Chronic Freshwater Toxicity Test Daphnia magna Reproduction Data

Client:	Golder	
Sample ID:	TDS	
Work Order:	14123	

Start Date & Time:	March 28/14@ 1200h
Stop Date & Time:	Apríl 18/14 @ 1230h
	JW, AND, YYL

David	Concer	ntration	: 0	Introl								Conce	ntration	: 296	mg/L	TDS						
Days	A	B	С	D	E	F	G	H	l	J	Init	Α	В	С	D	E	F	G	Н	·	J	Init
1				/				//			~		/			//						As
2					1			/			A		/									13
3	\checkmark	4	~~	\checkmark	~	í~	<u>´</u> ✓	\checkmark	\sim		JW	~	~	<u>~</u>	~		~	~	~	<u>`</u> ~	\sim	JN
4	<u> </u>	Ś	~	<u> </u>	~	V	~	~	<u> </u>	~	JW	5	\checkmark	×	<u> </u>	~	\checkmark	~	\checkmark	~	~	JW
5	<u> </u>	\checkmark	~	~	<u> </u>	~	~	\checkmark	~	~	JUV	× .	~	<u>✓</u>	\checkmark	\checkmark	~	~	~	V -	\checkmark	JW
6		/	/	/	/	/	/		\leq	/	me			<	<u> </u>	<u> </u>	<u> </u>		\leq		-	m
7	<		1	/	4						me	-										m
8					\leq	$ \land $					A											1
9				/	/						<u>~</u>		4		/							
10	14	15	14	15	13	12	12	13	14	12	JW	15	4	17	13	٩	15	14	12	<u>із</u>	14	NC.
11	~	\checkmark	~					 ✓ 	<u> </u>		W	V	+~		~	~					19	
12 13	23	-28	~	21	24	22	15	23	┝╭┞	23	JW	22	25	28	23	19	24	22	25	19	17	JN
13	13	10	24	21	24	22	19 V	20	- V	25	JW			20	23		~4	14	25	~	$\overline{\mathbf{x}}$	JW
14	~	~	~	~~~		~~		· ·	× .	-		<u> </u>	\sim		~	~		~		-	~	/D
16	30	19	22	15	3	27	18	25	30	25	5	35	40	36	25	X	27	29	30	34	36	
17	~		~	$\overline{\mathbf{v}}$		<u> </u>	~	$\overline{\checkmark}$	\sim		วพิ	1	~	~	~		~	~	~	~	~	we
18	~	~	~	~	~	\checkmark		~	~		JW	~			1				a	~	37	JW
19	35	29	31		31	28	26	15	28	~	WC	31	40	37	31		36	19	10	37		JW
20	<i>.</i>	~	~	\checkmark	~	~	~	~	~	~	JW	×.	~		~		~	~	~	~	~	JN
21		/	/							/	A	/		1						/	/	A
Total	102	90	91	51	99	89.	71	76	79	60	SW	103	<u>"</u>	118	92	28	102	83	86	103	106	WC
	X = mo Source	-	03/2/1	τ A						Avg. y	us Broc oung/da s to 1st l	aphnid:					Previo % mo	us 7-d ortality:	0	- [. -		
Sampi Comr	le Desci ients:	ription:		1500	mg/L	tos m	ade în	-house	on													
Reviewed by: JOL													I	Date rev	/iewed:	/	hay	1/14	t			

21-d Chronic Freshwater Toxicity Test Daphnia magna Reproduction Data

Client:	Golder
Sample ID:	TDS
Work Order:	14123

Start Date & Time:	March 28/14@	1200h
Stop Date & Time:	Aprîl 18/14 @	1230h
Analysts:	JW, AWD, YYL	

Days Concentration: 444 mg/L TDS													Concentration: 667 M9/L TDS										
Days	Α	В	C	D	E	F	G	H		J	Init	A	В	С	D	E	F	G	Η	I	J	Init	
1		//							/ /	· /	m		///	1/	//			/ /				A	
2		_/									/n			· /				/			1 and the second	r	
3	\checkmark	~	>	\sim	\checkmark	\checkmark	\checkmark	>	\checkmark	1	JW		\sim	\langle	~	5	Š	<	5	\sim	\sim	JN	
4	$\sim 10^{10} \rm e^{-1}$	~	\sim	\checkmark	· 🖌	\checkmark	V	\sim		✓ .	JW		\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	.~	~	JW	
5	\checkmark	~	~	~	~	<u> </u>	<u> </u>	~	\checkmark	\checkmark	JW	~	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	~	~	\checkmark	\checkmark	JN	
6	/	/	/		/	/	/	/	/	/	win	/	/	/	-	<		<	_		\sim	me	
7			1	/ /	4	1	<u> </u>		-	1	YML	-	/	-	<	-	-		-		-	me	
8	/	/	/		/			/		/	m		- /	. /			\leq	$\langle \ $	/	$\langle \rangle$		An	
9				4	/	/		/		~				-			/			/	_	<u>m</u>	
10	_8	10	16	\checkmark	\checkmark	12	14	12	12	8	50	13	JWH 9	11	12	10	12	~	~	10	10	JW	
11	\checkmark	~	\checkmark	\checkmark	<u> </u>	\checkmark		~	\checkmark	~	JW	~	\checkmark	V V	\checkmark	~		<u> </u>	\checkmark	\checkmark	\checkmark	JN	
12	19	/	/	9	10	/	~		~	22	Yun	~	-	~	~	~	~	10	16	3	15	m	
13	\checkmark	22	15	<u> </u>	~	21	23	15	21	~	ŴĊ	24	24	20	21	21	23	~	<u> </u>	2/19	~	WC.	
14	~	<u> </u>	\checkmark	~	~	~	 	~	~~~		WC	~	~	~	~ ~	~	542351	~	~	~	~	JW	
15			6	~							AD			<u> </u>		<u> </u>						m	
16	34	36	31	8	1	28	34	28	_27	35	19-	34	32	34	26	28	32	16	29	14	25	n	
17	\checkmark	~	<u> </u>	<u> </u>	16	<u> </u>		~	~	<u>~</u>	50	~	~	\checkmark	\checkmark	<u> </u>	~	<u> </u>	\sim	<u> </u>	 	W	
18	27	\checkmark		\checkmark	24	<u> </u>		\checkmark	<u> </u>		JW	×	\checkmark	~		<u> </u>	\checkmark	26	28,	\sim	<u> </u>	JW	
19	<u> </u>	36	35	25	<u>`</u>	36	35	35	38	35	JW	37	35	37	26	37	27	<u> </u>		30	30	JW.	
20		~	~		~	<u> </u>	~	<u> </u>	<u> </u>	~	MC	V	~	~	 			<u> </u>	\checkmark	~	<u> </u>	JN	
21		/				/					A>	\sim	\sim	\sim	\sim			19	27		_	A	
Total	88	104	97	42	50	97	106	90	98	100	SM	108	100	102	85	96	94	Ħ	100	73	80	Ĵ	
Notes: X = mortality.Previous Bro Avg. young/or													19				Previo % mo	us 7-d ortality:	0				

Brood Source:	U31214 A

Days to 1st Brood: 9

Sample Description: 1500 mg/L TDS made in-house on March 24, 2014

Joh

Comments:

Reviewed	by:		

May 1/14 Date reviewed: _

21-d Chronic Freshwater Toxicity Test Daphnia magna Reproduction Data

Client:	Golder	
Sample ID:	TDS	
Work Order:	14123	

Start Date & Time:	March	28 (14	@	1200h
--------------------	-------	------	----	---	-------

Stop Date & Time: Aprîl 18 / 14 @ 1230h Analysts: JW, AWD, YYL

Davis	Concer	ntration	: 10	on add	JIL TOS	,						Concentration: ISOO M9/L TDS										
Days	A	В	С	D	E	F	G	Н	1	J	Init	A	В	С	D	E	F	G	Н		J	Init
1	~	/ /		ϵ		1	1			1	A		- (//		- /				/	/	A
2	/				\Box			$\langle \rangle$			m											A
3	\checkmark	~~	\checkmark	\checkmark	~	\checkmark	~	~	~	~	JW	~	\checkmark	\sim	\checkmark	~	>	~	\checkmark			JN
4	\sim	\checkmark	\sim	✓	~	~	>	~	~	~	JW	\sim	~	 ✓ 	\checkmark	~	>	\checkmark	\checkmark	\checkmark	~	JW
5	\checkmark	\checkmark	>	 ✓ 	\checkmark	\checkmark	\checkmark	\checkmark	<i>✓</i>	~	ЗW	~	~	~	\checkmark	\checkmark	\sim	~	 ✓ 	<u>~</u>	\checkmark	JW
6	/	/	/	/	/	/	/	/		/	MAL	/	-			-	/	<u> </u>	/	<		inn
7	6		1	4	/		\sim				ML	/	/		4	_		/	1			Mr
8								/			100		-/		/	$\langle \rangle$		\leq	/		\leq	A-2
9	_		/	/	/				/		m			/								\sim
10	\checkmark	13	12	11	13	12	11	9	9	11	JW	11	13	13	 	~	<u> </u>	\sim	~	~	14	SW
11	~	\checkmark	<u> </u>			\checkmark		\checkmark	\checkmark	\checkmark	JW	<u> </u>	\checkmark	\checkmark	\leq	<u> </u>	\checkmark	13	<u> </u>	<u> </u>	<u> </u>	JW
12	18			/	<u> </u>			<u> </u>		-	me	~		~	5	~	16	~	~	<u>~</u>	25	me
13	~	18	25	25	24	26	24	18	22	20	JW	21	26	28		_8	<u> </u>	28	1	5	<u> </u>	SIG SI
14	~	~	~	V	_	\sim	~	×	~	V	JW		~		20	~	<u>~</u>		. ~		~	
15		/	25							<u> </u>	k	~						20				45
16	33	28	35	32	30	25	26	28	35	23	5	26	31	39		11	32	30	21	7	23	SW
17	30					- V - V	~			15	JW	1	$\overline{\checkmark}$	<u> </u>	32	<u> </u>	27		22	~	~~	JW
18	<u>∽</u> 0	37	42	16	29	15	22	36	~	Ĭq	JW JW	30	21×	26	~	<u> </u>	- <u>-</u>	37	22	7	26	JW
19 20	XX	<u>9</u> 7	72	10	29			30	~		JW	<u> </u>	211	-29-	Auto	~		37			<u> 20</u>	JW
20	22						-7		۲×		A				36 7						$\mathbf{\dot{>}}$	A
- 21		<u> </u>				<i>r</i>								<u> </u>							<u> </u>	
Total	801	96	114	84	96	78	83	୧୲	66	73	JW	88	91	106	93	19	75	108	43	19	88	JN
Notes	X = mo	rtality.									us Broc oung/da	od aphnid:	19		-		Previo % mo	us 7-d ortality:	ð			
Brood	Source	:	03121									Brood:	9									
	le Desci ients:	ription:	on:																			
Reviewed by: JOL												I	Date rev	viewed:		Mai	74	14				

	Analytical F	Report						eport Date: est Code:	30	Apr-14 10:2 14123 19	26 (p 1 of 2 9-0880-455
Daphnia	Magna 21-Day	Life Cycle 1	est						Na	utilus Env	ironmenta
Analysis	D: 08-7858-	3833	Endpoint:	Survival Rate			c	ETIS Version	CETISv1	.8.7	
Analyze	d: 30 Apr-14	10:25	Analysis:	Linear Interpo	lation (ICPI	N)	0	fficial Results	: Yes		
Batch ID): 19-5330-0	0029	Test Type:	Survival-Repr	oduction		A	nalyst: Jes	lin Wijaya		
Start Da			Protocol:	ASTM E1193					d-Hard Syntl	hetic Water	
-	Date: 18 Apr-14	12:30	Species:	Daphnia mag				rine:			
Duratio	n: 21d 1h		Source:	In-House Cult	ure		A	ge: <24	lh		
Sample	ID: 13-7452-	0752	Code:	51ED85B0			С	lient: Go	lder		
-	Date: 24 Mar-14		Material:	Total Dissolve	ed Solids		P	roject:			
	Date: 24 Mar-1	4	Source:	Golder							
Sample	Age: 4d 12h		Station:	TDS							
inear l	nterpolation Opt	tions									
K Trans		sform	Seed	Resamples	Exp 95		ethod				
Log(X+1) Linear		853492	200	Yes	T\	wo-Point Int	erpolation			144
Point Es	stimates										
Level	mg/L 95%	LCL 95%	UCL								
LC5	1118 259.										
_C10	1436 1064										
_C15	>1435 N/A	N/A									
_C20	>1435 N/A	N/A									
_C25 _C40	>1435 N/A >1435 N/A	N/A N/A									
_C50	>1435 N/A	N/A									
	I Rate Summary				Calc	ulated Va	riate(A/B)				
C-mg/L	Control Typ		nt Mean	Min	Max	Std Er		ev CV%	%Effect	Α	в
210.1	Negative Co		1	1	1	0	0	0.0%	0.0%	10	10
288.5	nogutito et	10	0.9	o O	1	0.1	0.3162		10.0%	9	10
435.9		10	1	1	1	0	0	0.0%	0.0%	10	10
655.8		10	1	1	1	0	0	0.0%	0.0%	10	10
987.2		. 10	1	1	1	0	0	0.0%	0.0%	10	10
1435.5		10	0.9	0	1	0.1	0.3162	35.14%	10.0%	9	10
Surviva	I Rate Detail										
C-mg/L	Control Typ	-	1 Rep 2	2 Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
210.1	Negative Co	ontrol 1	1	1	1	1	1	1	1	1	1
288.5		1	1	1	1	0	1	1	1	1	1
435.9		1	1	1	1	1	1	1	1	1	1
655.8		1	1	1	1	1	1	1	1	1	1
987.2		1	1	1	1	1	1	1	1	1	1
1435.5		1	0	1	1	1		1	1	1	1
	Rate Binomials										
C-mg/L	Control Ty				Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
210.1 288.5	Negative C		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
		1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1
		1/1 1/1	1/1 1/1	1/1 1/1	1/1	1/1	1/1	1/1	1/1	1/1 1/1	1/1
35.9			1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
435.9 555.8						4/4	4./4	4/4	1/4	1/1	4/4
135.9		1/1 1/1	1/1 0/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1	1/1 1/1

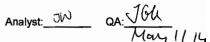
Analyst:_JW_ QA:JUL May 1/14

CETIS Ana	alytical Report				Report Date: Test Code:	30 Apr-14 10:26 (p 2 d 14123 19-0880-4	
Daphnia Mag	na 21-Day Life Cycle	e Test				Nautilus Environme	ntal
Analysis ID: Analyzed:	08-7858-8833 30 Apr-14 10:25	Endpoint: Analysis:	Survival Rate Linear Interpolation (ICPIN)		CETIS Version: Official Results:	CETISv1.8.7 Yes	
Graphics							
1.0 0.9 0.0 0.7 0.7 0.7 0.7 0.7 0.7	•						
0.4				•			

800 C-mg/L

+ Datas

CETIS™ v1.8.7.16



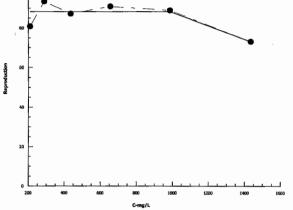
	S Ana	lytical Repo	ort					•	ort Date: Code:	30 /	Apr-14 10:2 14123 19	
Daphn	ia Magn	a 21-Day Life C	ycle Tes	t						Na	utilus Env	
Analys Analyz		03-3877-5780 30 Apr-14 10:20		ndpoint: nalysis:	Reproduction Linear Interpol	ation (ICPIN	1)		S Version:		.8.7	
Batch	ID:	19-5330-0029	Т	est Type:	Survival-Repro	oduction		Anal	yst: Jes	lin Wijaya		
Start D	ate:	28 Mar-14 12:0	0 Р	rotocol:	ASTM E1193-	97 (1997)		Dilue	ent: Moo	d-Hard Synth	netic Water	
Ending	g Date:	18 Apr-14 12:30) s	pecies:	Daphnia magr	a		Brine	e:			
Durati	on:	21d 1h	S	ource:	In-House Cult	ure		Age:	<24	h		
Samp	e ID:	13-7452-0752	с	ode:	51ED85B0			Clier	nt: Gol	der		
		24 Mar-14	M	laterial:	Total Dissolve	d Solids		Proj	ect:			
Receiv	ve Date:	24 Mar-14	S	ource:	Golder				,			
Sampl	e Age:	4d 12h	S	tation:	TDS							
Linear	interpo	lation Options										
X Tran		Y Transform		eed	Resamples	Exp 95%						
Log(X-	-1)	Linear	9	83847	200	Yes	Two	-Point Interp	olation			
Point	Estimate	es										
Level	mg/L	95% LCL		CL								
IC5	1100	369.8	N/A									
IC10	1226	832.6	N/A									
IC15	1366	1051	N/A									
IC20	>1435		N/A									
IC25	>1435		N/A									
IC40	>1435		N/A									
IC50	>1435		N/A									
-		Summary					alculated Va				-	
C-mg/		ontrol Type	Count	Mean		Max	Std Err	Std Dev	CV%	%Effect		
210.1		egative Control	10	80.8	51	102	5.249	16.6	20.54%	0.0%		
288.5 435.9			10 10	93.5 87.2	28 42	118 106	8.089 7.105	25.58 22.47	27.36% 25.77%	-15.72% -7.92%		
435.9 655.8	-		10	90.9	42 71	108	4.065	12.85	25.77% 14.14%	-12.5%		
987.2			10	90.9 88.9	66	100	4.065	12.05	14.14%	-12.5%		
1435.5	~		10	73	19	108	10.66	33.7	46.17%	9.65%		
	duction	Detail										
C-mg/		ontrol Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 1
210.1		egative Control	102	90	91	51	99	89	71	76	79	60
288.5		-	103	114	118	92	28	102	83	86	103	106
435.9			88	104	97	42	50	97	106	90	98	100
400.0			108	100	102	85	96	94	71	100	73	80
435.3 655.8 987.2			108	96	114	84	96	78	83	91	66	73

.

Analyst:______

QA: JOLL May 1/14

CETIS Ana	alytical Report			Report Date: Test Code:	30 Apr-14 10:26 (p 2 of 2) 14123 19-0880-4559
Daphnia Mag	na 21-Day Life Cycle	e Test			Nautilus Environmental
Analysis ID: Analyzed:	03-3877-5780 30 Apr-14 10:26	Endpoint: Analysis:	Reproduction Linear Interpolation (ICPIN)	CETIS Version: Official Results:	CETISv1.8.7 Yes
Graphics					
100	•				



Analyst: JW

0A: 16h

W.O.#:_14123_____

Hardness and Alkalinity Datasheet

			Alkalinity					Hardnes	S	
Sample ID	Sample Date	Sample Volume (mL)	(mL) 0.02N HCL/H ₂ SO ₄ used to pH 4.5	(mL) of 0.02N HCL/H ₂ SO ₄ used to pH 4.2	Total Alkalinity (mg/LCaCO₃)		Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness (mg/L CaCO ₃)	Technician
1500 mg/L TDS	March 24/14	50	3.1	3.2	60		100	10.8	1080	JW
MHW	March 27/14	50	3.7	3.8	72		50	5.0	100	
	March 29/14	50	3.5	3.6	68		50	5.0	100	
	Apríl 2/14	50	3.6	3.7	-TO		50	5.0	100	
	Aprîl 7 /14	50	3.7	3.8	72		50	5.0	10D	
	April 10/14	\$	3.7	3.8	72		50	5.0	100	
\rightarrow	April 14/14	\$O	3.6	3.7	70		50	5.0	100	4
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fr.						-				
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Reviewed by:		Ċ	164		Date Revie	ewed.		hay	1/14	
itenoined by:			<u> </u>				• <u>•</u> •••			



NAUTILUS ENVIRONMENTAL ATTN: Jeslin Wijaya 8664 Commerce Court Imperial Square Lake City Burnaby BC V5A 4N7 Date Received:28-MAR-14Report Date:03-APR-14 13:29 (MT)Version:FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #: L1437653

Project P.O. #: Job Reference: C of C Numbers:

5: 1

NOT SUBMITTED



Janie J

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L1437653 CONTD.... PAGE 2 of 4 03-APR-14 13:29 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

					Vers	ion: FINAL
	Sample ID Description Sampled Date Sampled Time	L1437653-1 Water 28-MAR-14	L1437653-2 Water 28-MAR-14	L1437653-3 Water 28-MAR-14	L1437653-4 Water 28-MAR-14	L1437653-5 Water 28-MAR-14
	Client ID	CONTROL	296 MG/L TDS	444 MG/L TDS	667 MG/L TDS	1000 MG/L TDS
Grouping	Analyte					
WATER						
Physical Tests	Total Dissolved Solids (mg/L)	199	361	531	790	1000
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	74.0	19.5	29.0	41.3	65.6
	Chloride (Cl) (mg/L)	2.2	142	225	344	507
	Sulfate (SO4) (mg/L)	96.6	25.7	35.3	57.0	88.2
Total Metals	Calcium (Ca)-Total (mg/L)	17.0	62.0	92.3	137	202
	Magnesium (Mg)-Total (mg/L)	14.1	7.56	11.3	17.0	25.0
	Potassium (K)-Total (mg/L)	2.4	2.8	4.1	6.1	9.0
	Sodium (Na)-Total (mg/L)	32.5	33.2	49.2	74.9	110

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

				versi	<u> </u>	FINAL
	Sample ID	L1437653-6				
	Description	Water				
	Sampled Date Sampled Time	28-MAR-14				
	Client ID	1500 MG/L TDS				
Grouping	Analyte					
WATER						
	Total Dissolved Solids (mg/L)					
Physical Tests		1740				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	64.9				
	Chloride (Cl) (mg/L)	741				
	Sulfate (SO4) (mg/L)	131				
Total Metals	Calcium (Ca)-Total (mg/L)	285				
	Magnesium (Mg)-Total (mg/L)	37.3				
	Potassium (K)-Total (mg/L)	13.4				
	Sodium (Na)-Total (mg/L)	163				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments: QC Type Description Parameter Qualifier Applies to Sample Number(s) Matrix Spike Chloride (CI) MS-B L1437653-1, -2, -3, -4, -5, -6 **Qualifiers for Individual Parameters Listed:** Qualifier Description MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. **Test Method References:** ALS Test Code Matrix **Test Description** Method Reference** ALK-COL-VA Water Alkalinity by Colourimetric (Automated) EPA 310.2 This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method. CI -COI -VA Water Chloride by Colorimetric APHA 4500 F, CHI ORIDE This analysis is carried out using procedures adapted from APHA Method 4500 E "Chloride". Chloride is determined using the ferricyanide colourimetric method. **MET-TOT-ICP-VA** Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B). SO4-TUR-VA Water Sulfate(SO4) by Turbidity APHA 4500-SO4 E. SULFATE This analysis is carried out using procedures adapted from APHA Method 4500-SO4 "Sulfate". Sulfate is determined using the turbidimetric method.

TDS-VA Water Total Dissolved Solids by Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

APHA 2540 C - GRAVIMETRIC

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample. mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

TESTING LOCATION (Please Circle)

Chain of Custody

Nau	t
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Rush Processing

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ish Columbia : Commerce Court aby, British Columbia, Canada VSA 4N3 1e 604.420.8773

Date 03/28/14_Page 1_of_1

Sample Collection By:	· L	1437653	5	, k		-					ANAL	YSES	REQ	JIRE	<u> </u>			
Report to:				Invoice	e To:					Γ								្ច
Company	Nautilus Envir	onmental		Comp	pany	Nautilus Environmental												e e
Address	8664 Commer			- Addro		8664 Commerce Court												atu -
City/State/Zip	Burnaby, BC V	/5A 4N7		City/		Burnaby, BC V5A 4N7												Der
Contact	Jeslin Wijaya			Conta	_	Jeslin Wijaya			F									em l
Phone	604-420-8773	1		Phon	e	604-420-8773		ε	esiur	F	un di	ę	ate					Ц Ц
Email	jeslin@nautilu	isenvironmenta	al.com	_ Emai	il .	jeslin@nautilusenvironmental.com		Calcium	Magnesium	Sodium	Potassium	Chloride	Sulphate	≥				Receipt Temperature (°C)
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF	COMMENTS		Total C	Total M	Total S	Total P	Total C	Total S	Alkalinity	TDS			Re
Control	28-Mar-14		Water	125mL & 1L	2			×	· · · ·			<u> </u>						
296 mg/L TDS	28-Mar-14		Water	125mL & 1L	2				×	×	×	<u>×</u>	X	<u>×</u>	<u>×</u>			
444 mg/L TDS	28-Mar-14	1	Water	125mL & 1L	2			X	x	x	X	×	<u>×</u>	x	x			
a 667 mg/L TDS	28-Mar-14		Water	125mL & 1L	2			x x	x	<u>×</u>	x	<u>×</u>	<u>×</u>	<u>x</u>	x			
5 1000 mg/L TDS	28-Mar-14		Water	125mL & 1L	2				x	×	x	X	<u>×</u>	×	x			
6 1500 mg/L TDS	28-Mar-14		Water	125mL & 1L	2		<u> </u>	X	x	×	×	X	×	<u>×</u>	<u>×</u>			
7			1					×		×	<u>×</u>	. ×	×	<u> </u>	X			
8																		
a								-										· ·
0		·																
PROJECT INFO	RMATION	s	AMPLE RECEI	1 [PT	<u>-</u>	RELINQUISHED BY (CLIENT)				RE		UISH	ED B	 У (СО		R)		L
Client:		Total No.	of Containers	5	(Signature)	(_{Пте)}	(Signatu	re)							(Tia	ne)	
PO No.:		Received G	iood Conditio	n?	(Printed Name) Jeslin		Date) 고망/ (나	(Printed								(Dai	te)	
Shipped Via:			est Schedule		(Company) Nautilus	Environmental company	Inc .	(Compa	γ)									
SPECIAL COMMENTS/IN samples are not preserv	ISTRUCTIONS: 2	1-d <i>D. magna</i>	chronic test. D	ay 0. All		RECEIVED BY (COURIER)						/ED B						
					(Signature)	(Time)	(Signatu	re)	[C	pr	~2	8	16:	5	(tin >	ne)	
					(Printed Name)	()	Date)	(Printed	Name)		18.	~2 9 q	, ,	-		(Dai	te)	
					(Company)			(Compa	ıy)									
					1			1										

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.



NAUTILUS ENVIRONMENTAL ATTN: Jeslin Wijaya

8664 Commerce Court Imperial Square Lake City Burnaby BC V5A 4N7

Date Received: 23-APR-14 Report Date: 29-APR-14 14:02 (MT) Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #:

Project P.O. #: Job Reference: C of C Numbers:

10204 OAM10

L1446494

1

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L1446494 CONTD.... PAGE 2 of 4 29-APR-14 14:02 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

					Vers	ion: FINAL
	Sample ID Description Sampled Date Sampled Time Client ID	L1446494-1 Water 18-APR-14 CONTROL	L1446494-2 Water 18-APR-14 296 MG/L TDS	L1446494-3 Water 18-APR-14 444 MG/L TDS	L1446494-4 Water 18-APR-14 667 MG/L TDS	L1446494-5 Water 18-APR-14 1000 MG/L TDS
Grouping	Analyte					
WATER						
Physical Tests	Total Dissolved Solids (mg/L)	210	381	560	775	1120
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	80.5	19.8	30.8	43.1	66.3
	Chloride (Cl) (mg/L)	2.77	150	228	334	514
	Sulfate (SO4) (mg/L)	96.5	27.3	40.1	59.3	89
Total Metals	Calcium (Ca)-Total (mg/L)	15.9	60.8	89.1	135	203
	Magnesium (Mg)-Total (mg/L)	13.0	6.98	10.3	15.6	23.9
	Potassium (K)-Total (mg/L)	2.9	2.7	3.9	6.0	9.2
	Sodium (Na)-Total (mg/L)	31.6	32.4	47.3	75.0	115

ALS ENVIRONMENTAL ANALYTICAL REPORT

	ALS ENVIRONME	NIAL AN	ALTIICAL	NEFU	Vers	ion: FINA
	Sample ID Description Sampled Date Sampled Time Client ID	L1446494-6 Water 18-APR-14 1500 MG/L TDS				
	Analyte					
VATER						
Physical Tests	Total Dissolved Solids (mg/L)	1750				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	63.8				
	Chloride (CI) (mg/L)	772				
	Sulfate (SO4) (mg/L)	138				
otal Metals	Calcium (Ca)-Total (mg/L)	289				
	Magnesium (Mg)-Total (mg/L)	36.2				
	Potassium (K)-Total (mg/L)	13.9				
	Sodium (Na)-Total (mg/L)	174				

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Reference Information

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Test Method References:

	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
This analysis is carried ou colourimetric method.	ut using proce	dures adapted from EPA Method 310.2 "Alkalinity	y". Total Alkalinity is determined using the methyl orange
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
		dures adapted from APHA Method 4110 B. "Ion O Determination of Inorganic Anions by Ion Chroma	Chromatography with Chemical Suppression of Eluent tography".
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
		dures adapted from APHA Method 4110 B. "Ion 0 Determination of Inorganic Anions by Ion Chroma	Chromatography with Chemical Suppression of Eluent tography".
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
States Environmental Pro	otection Agend	y (EPA). The procedures may involve preliminar	or Evaluating Solid Waste" SW-846 published by the United y sample treatment by acid digestion, using either hotblock or lasma - optical emission spectrophotometry (EPA Method
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
This analysis is carried or	ut using proce	dures adapted from APHA Method 2540 "Solids"	. Solids are determined gravimetrically. Total Dissolved Solids
This analysis is carried ou (TDS) are determined by	ut using proce filtering a sam	dures adapted from APHA Method 2540 "Solids"	. Solids are determined gravimetrically. Total Dissolved Solids d by evaporating the filtrate to dryness at 180 degrees celsius.
This analysis is carried or (TDS) are determined by * ALS test methods may inc	ut using proce filtering a sam corporate mod	dures adapted from APHA Method 2540 "Solids" ple through a glass fibre filter, TDS is determined ifications from specified reference methods to im	. Solids are determined gravimetrically. Total Dissolved Solids d by evaporating the filtrate to dryness at 180 degrees celsius.
This analysis is carried or (TDS) are determined by * ALS test methods may inc	ut using proce filtering a sam corporate mod above test co	dures adapted from APHA Method 2540 "Solids" ple through a glass fibre filter, TDS is determined ifications from specified reference methods to im	. Solids are determined gravimetrically. Total Dissolved Solids d by evaporating the filtrate to dryness at 180 degrees celsius. prove performance.
This analysis is carried or (TDS) are determined by * ALS test methods may inc The last two letters of the	ut using proce filtering a sam corporate mod above test co de Labor	dures adapted from APHA Method 2540 "Solids" ple through a glass fibre filter, TDS is determined ifications from specified reference methods to im de(s) indicate the laboratory that performed analy	Solids are determined gravimetrically. Total Dissolved Solids d by evaporating the filtrate to dryness at 180 degrees celsius. prove performance. ytical analysis for that test. Refer to the list below:
This analysis is carried or (TDS) are determined by * ALS test methods may in The last two letters of the Laboratory Definition Co	ut using proce filtering a sam corporate moc above test co de Labor ALS E	dures adapted from APHA Method 2540 "Solids" ple through a glass fibre filter, TDS is determined ifications from specified reference methods to im de(s) indicate the laboratory that performed analy atory Location	Solids are determined gravimetrically. Total Dissolved Solids d by evaporating the filtrate to dryness at 180 degrees celsius. prove performance. ytical analysis for that test. Refer to the list below:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Nautilus Environmental

TEETING LOCATION (Diagon Circle)

Short Holding Time

Rush Processing

British Columbia 8664 Commerce Court Burnaby, British Columbia, Canada V5A 4N3 Phone 604.420.8773 Fax 604.357.1361 **Chain of Custody**

Date Apr 23/14 Page 1 of 1

L1446494-COFC

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Sai	L14404	194-COFC								4	ANAL	YSES	REQU				
Report 1	to:			i	Invoice							1					Receipt Temperature (°C)
Comp	any	Nautilus Enviro	nmental		Comp		utilus Environmental										E E
Addre	ess	8664 Commerce	e Court	<u> </u>	Addre		54 Commerce Court										E .
City/S	State/Zip	Burnaby, BC V	5A 4N7		City/S	City/State/Zip Burnaby, BC V5A 4N7										1	in D a
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Phone	e	604-420-8773			Phone		1-420-8773	ξ	resi	Ę	ssiu	ride	hate				đ
Email	l	jestin@nautilus	senvironmenta	l.com	Email	jes	lin@nautilusenvironmental.com	gi	Magr	Sodi	Pota	Chloi	Sulpl	lity			ିକ୍ର
SAMP	LE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS	Total Calcium	Total Magnesium	Totał Sodium	Total Potassium	Total Chloride	Total Sulphate	Alkalinity	Sar	_	
Con	trol	18-Apr-14		Water	125mL & 1L	2		x	x	x	x	x	x	x	x		
296 mg	/L TDS	18-Apr-14		Water	125mL & 1L	2		x	x	x	x	x	x	x	x_		
444 mg	/L TDS	18-Apr-14		Water	125mL & 1L	2		×	x	х	x	x	x	x	x		10,0,0
	/L TDS	18-Apr-14		Water	125mL & 1L	2		x	x	x	x	x	x	x	x		
1000 m	g/L TDS	18-Apr-14		Water	125mL & 1L	2		x	x	x	x	x	x	x	x		_1415
1500 m	g/L TDS	18-Apr-14		Water	125mL & 1L	2		x	x	x	x	x	x	x	x		
								_									
							All samples are preserved										A Contraction of the second se
																	ilan ar
PROJ	ECT INFORM	ATION	Si	AMPLE RECE	PT	RELINQUISHED BY (CLIENT)			RELINQUISHED BY (COURIER)								
Client:	421		Total No.	of Container		(Signature) (Time) (Signature) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)				(Time)							
PO No.:	10204 0	DAM10	Received G	ood Conditio	n?		(Date))aya April 23/14		-							(Date)	
Shipped Via:				(Company) Nautílus	Environmental.	(Compa	ιny) 	1 7 17									
		TRUCTIONS : 2:	1-d <i>D. magna</i>	chronic test. D	ay 21. All		RECEIVED BY (COURIER)		<u> </u>	R	ECEN	/ED B	Y (LA	BOR	ATOR		
samples are not preserved.			(Signature) (Time) (Signature)			(Time) 915											
				(Printed Name)	(Date)	Anr 23				3							
						(Company)		(Comp	iny)	i i i i i i i i i i i i i i i i i i i		j. j	georage,		Aur II	2.3%	te l'al comp
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Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Day 0 - March 28, 2014											
	Control	296	444	667	1000	1500					
<i>x</i>											
Alkalinity	74	19.5	29	41.3	65.6	64.9					
Cl	2.2	142	225	344	507	741					
SO4	96.6	25.7	35.3	57	88.2	131					
Са	17	62	92.3	137	202	285					
Mg	14.1	7.56	11.3	17	25	37.3					
К	2.4	2.8	4.1	6.1	9	13.4					
Na	32.5	33.2	49.2	74.9	110	163					
TDS	209.2	284.96	434.6	660.78	980.56	1409.64					

	Day 21 - April 18, 2014										
	Control	296	444	667	1000	1500					
Alkalinity	80.5	19.8	30.8	43.1	66.3	63.8					
Cl	2.77	150	228	334	514	772					
SO4	96.5	27.3	40.1	59.3	89	138					
Са	15.9	60.8	89.1	135	203	289					
Mg	13	6.98	10.3	15.6	23.9	36.2					
К	2.9	2.7	3.9	6	9.2	13.9					
Na	31.6	32.4	47.3	75	[.] 115	174					
TDS	210.97	292.06	437.18	650.76	993.88	1461.38					
Average TDS	210.085 🗸	288.51	· ⁄ 435.89	√ 655.77	✓ 987.22	∽1435.51 ✓					

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ATTACHMENT 3 HYDROQUAL LABORATORIES DATA REPORT: Test 5





Golder Associates Ltd. ATTN: Peter Chapman 200 – 420 West Hastings Street Vancouver, BC V6B 1L1 Report Date: May 31, 2014 Work Order: 14123

Data report

Species: *Daphnia magna* Protocol: ASTM E1193 - 97

Table 1.Results for the 21-d Daphnia magna life-cycle toxicity test.

Sample ID	Sample Date	21-d IC20 mg/L TDS (95% CL)		
TDS blend	Laboratory prepared	732.5 (381.7 – 1040)		

This test was conducted by Hydroqual Ltd., Calgary, AB. The test met performance criteria and there were no deviations from the test methods. The results presented here relate only to the sample tested.

Jeslin Wijaya, B.Sc. Laboratory Biologist

Reviewed By: James Elphick, R.P.Bio Senior Reviewer



ATTN: James Elphick Nautilus Environmental Company Inc. 8664 Commerce Court Burnaby, BC Canada V5A 4N7 Received: Report Date: Version: 2014/03/26, 1100 2014/05/08 FINAL

HydroQual Test Report

Client: Reference: Billing: NAU104 14-0395 not given

Technical Lead

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



Daphnia magna (21-d LC50/IC25) Test Report

Client: NAU104

Reference: 14-0395-01

Contents
Result Summary......1
Test Conditions......2

Test Data......4 Comments/Statistics..8

QA/QC.....9

Result Summary

Client: Nautilus Environmental Company Inc.

Sample: 1500 mg/L TDS

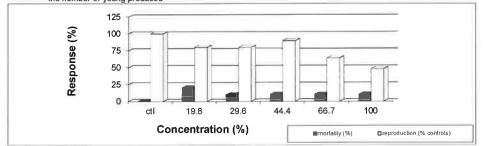
Collection: collected on 2014/03/24 Receipt: received on 2014/03/26 at 1100 by C. Quinteros Containers: received 2 x 20L pails at 11 °C, in good condition with no seals and no initials Description: type: water, collection method: not given

Test: started on 2014/03/28; ended on 2014/04/18

Result:

-	Endpoint (21-day)	Value	Confidence L lower	Confidence Limits (95%) l lower upper		Method Calculated
– Acute: (survival)	LC25 LC50	>100 >100			% %	could not be calculated could not be calculated
Chronic: (fecundity)	IC25 IC50	50 100	35 71	65 >100	% %	2P Linear 2P Linear

Notes: LCx & ICx, concentrations lethal or inhibitory to 'x' percent of the test population; fecundity, reproduction as the number of young produced



The test data and results are authorized and verified correct.

Technical Lea

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Daphnia magna (21-d LC50/IC25) Test Report

Client: NAU104 **Test Conditions** Reference: 14-0395-01 Method: Standard Guide for Conducting Daphnia magna Life-Cycle Toxicity Tests. ASTM International Standard E1193-97 (Reapproved 2012) Test type: Daphnia Survival and Reproduction Static Renewal Test Species: Daphnia magna Age: <24 hours old Organism source: in-house cultures Stock Mortality: 0% Culture Brood Data: 11 days to first brood 27 neonates per average brood Organism observations: No unusual behavior, appearance or treatment of test organisms was noted prior to or during the test. All first-generation mortality was recorded on the day it was observed. Sample initial chemistry: pH: 7.4; EC: 2650 (µS/cm); DO: 8.0 (mg/L); temperature: 11 °C hardness (mg CaC03/L): 89; colour: colourless; odour: odourless Sample storage: 4 ± 2°C in darkness Test vessel: 120 mL plastic vessels Test volume: 100 mL Sample pre-treatment: The sample was not filtered or pH adjusted prior to or during testing The sample was pre-aerated for 0 minutes (rate of 37.5 ± 12.5 mL/min.L-1) The hardness of the sample was not adjusted (mg CaCO3/L) prior to or during testing Control water: Moderately hard reconstituted water (1.92 g NaHCO₃, 1.20 g CaSO₄·2H₂O, 1.20 g MgSO₄, 0.08 g KCl per 20L) supplemented with vitamin B_{12} (2 µg/L), Na2SeO3 (5 µg/L) and 10% (v/v) Perrier water. Dilution water: Deionized reverse osmosis water The average hardness of the control water was 112 mg CaCO₃/L Test concentrations: 5 concentrations (19.8, 29.6, 44.4, 66.7, 100% (v/v) plus a negative control) Test replicates: Ten replicates per treatment, 1 daphnid per replicate Renewal: 3 times weekly Feeding: Daily (a combination of yeast, alfalfa powder, fermented trout chow and the green alga Pseudokirchneriella subcapitata) Aeration: None Measurements: pH, conductivity, dissolved oxygen, temperature, hardness and alkalinity Mg, Na, K, Ca, SO4, and Cl at test initiation and termination Lighting: Cool white fluorescent lights; 400-800 lux at surface Photoperiod: 16h light:8h dark Test temperature: 20 ± 2°C

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Test Conditions

Endpoints: Survival, 21-d LC50 (with 95% confidence limits) Reproduction, 21-d IC25 (with 95% confidence limits) Test endpoints were bracketed by at least 1 test concentration (except for <19.8% or >100 %)

Test validity: The control had 100% survival (must be ≥70%) Number of young per adult in the control treatment in 21 days was 183 (must be ≥ 60).

Reference toxicant: 48-h test with NaCl initiated March 24, 2014; current results (48-h LC50 and 95% confidence limits) = 0.74 (0.71 - 0.77) log (g/L NaCl)

Note: Outlined sections are protocol deviations explained on the comment page

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Daphnia magna (21-d LC50/IC25) Test Report

Test Data

Client: NAU104 Reference: 14-0395-01

Date	Day	Time	Technicians		
2014/03/28	0	1030	H. Stewart		
2014/03/29	1	1115	C. Quinteros/A. Pounden		
2014/03/30	2	0940	J. Poole		
2014/03/31	3	1015	N. Fernie		
2014/04/01	4	1100	C. Bryant		
2014/04/02	5	0810	A. Pounden		
2014/04/03	6	1145	A. Pounden		
2014/04/04	7	0950	C. Quinteros		
2014/04/05	8	1100	C. Quinteros		
2014/04/06	9	1500	J. Rodriguez		
2014/04/07	10	1130	C. Bryant		
2014/04/08	11	0930	C. Quinteros		
2014/04/09	12	1500	C. Bryant		
2014/04/10	13	1600	C. Quinteros		
2014/04/11	14	1200	C. Bryant		
2014/04/12	15	1610	A. Pounden		
2014/04/13	16	1240	N. Fernie		
2014/04/14	17	1330	C. Bryant		
2014/04/15	18	1140	C. Quinteros		
2014/04/16	19	1445	C. Quinteros		
2014/04/17	20	1200	N. Fernie		
2014/04/18	21	1400	J. Rodriguez		

Chemistry Summary Tables:

New Solutions										
Conc. %	ctl	19.8	29.6	44.4	66.7	100				

Average Values										
pН	7.9	7.7	7.5	7.5	7.7	7.7				
cond.	383	595	855	1230	1763	2734				
DO	8.1	8.2	8.1	8.1	8.1	8.1				
temp.	18.9	18.8	18.7	18.8	18.8	18.8				

Coefficients of Variation										
pН	3	2	2	2	2	2				
cond.	8	4	1	1	2	2				
DO	3	3	2	3	2	3				
temp.	3	2	3	2	2	2				

Old Solutions									
ctl	19.8	29.6	44.4	66.7	100				

		Average	Values		
7.9	7.7	7.6	7.6	7.8	7.9
481	677	934	1334	1974	3242
8.1	8.0	8.0	7.9	7.8	7.8
18.0	18.3	18.6	18.6	18.4	18.7

	Coefficients of Variation									
3	5	3	2	2	2					
12	5	6	6	9	11					
6	4	4	4	4	4					
0	3	4	4	3	3					

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Daphnia magna (21-d LC50/IC25) Test Report

Test Data

Client: NAU104 Reference: 14-0395-01

Biology (number of young produced):

0	ctl	19.8	29.6	44.4	66.7	100	old #, number of	29.6	44.4	66.7	100
eplicate				lay 1		<u>*</u> *		da	y 5		
1	0	0	0	0	0	0	0 0	0	0	0	0
2 [0	0	0	0	0	0	0 0	0	0	0	0
3 [0	0	0	0	0	0	0 0	0	0	0	0
4 [0	0	0	0	0	0	0 0	0	0	0	0
5	0	0	0	0	0	0	0 0	0	0	0	0
6	0	0	0	0	0	0	0 0	0	0	0	0
7 [0	0	0	0	0	0	0 0	0	0	0	0
8	0	0	0	0	0	0	0 0	0	0	0	0
9	0	0	0	0	0	0	0 0	0	0	0	0
10 [0	0	0	0	0	0	0 0	0	0	0	0
				lay 2)		y 6		
1	0	0	0	0	0	0	0 0	0	0	0	0
2	0	0	0	0	0	0	0 0	0	0	0	0
3 [0	0	0	0	0	0	0 0	0	0	0	0
4	0	0	0	0	0	0	0 0	0	0	0	0
5	0	0	0	0	0	0	0 0	0	0	0	0
6 [0	0	0	0	0	0	0 0	0	0	0	0
7	0	0	0	0	0	0	0 0	0	0	0	0
8	0	0	0	0	0	0	0 0	0	0	0	0
9	0	0	0	0	0	0	0 0	0	0	0	0
10	0	0	0	0	0	0	0 0	0	0	0	0
			C	lay 3					y 7		
1 [0	0	0	0	0	0	0 0	0	0	0	0
2	0	0	0	0	0	0	0 0	0	0	0	0
3 [0	0	0	0	0	0	0 0	0	0	0	0
4	0	0	0	0	0	0	0 0	0	0	0	0
5 [0	0	0	0	0	0	0 0	0	0	0	0
6	0	0	0	0	0	0	0 0	0	0	0	0
7	0	0	0	0	0	0	0 0	0	0	0	0
8	0	0	0	0	0	0	0 0	0	0	0	0
9 [0	0	0	0	0	0	0 0	0	0	0	0
10 [0	0	0	0	0	0	0 0	0	0	0	0
-				lay 4					y 8		
1	0	0	0	0	0	0	0 0	0	0	0	0
2	0	0	0	0	0	0	0 0	0	0	0	0
3	0	0	0	0	0	0	0 0	0	0	0	0
4	0	0	0	0	0	0	0 0	12	0	0	0
5	0	0	0	0	0	0	0 0	0	18	0	0
6	0	0	0	0	0	0	0 0	0	0	0	0
7	0	0	0	0	0	0	0 11	0	0	0	0
8	0	Ő	0	0	Õ	0	0 0	0	27	0	0
9	0	0	0	0	0	0	0 0	0	0	0	0
10	0	0	0	0	0	0	0 0	0	0	0	0

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						т	est Data					Client: N		
	Dista		2002000			-	, dead; bold		n haa laf ii			Referen	ce: 14-0	395-01
dose (%)	ctl	19.8	29.6	44.4	66.7	100	, dead, bold	tti di	19.8	29.6	44.4	66.7	100	
replicate	ULI	10.0		lay 9	00.7	100		ou	10.0		/13	00.7	100	1
1	0	0		12	0	0		0	0	36	0	19	49	r i
2	0	0	10	24	0	0	-	ō	46	0	0	40	0	
3	15	0	32	33	13	0	-	38	55	-	0	0	-	ł
4	0	21	0	41	21	0		0	46	39	Ő	0	0	
5	0	0	18	0	36	0	-	0	49	0	0	0	20	f .
6	Ő	Ő	35	28	38	0		0	54	0	0	0	42	
7	0	0	26	36	32	19		ŏ	0	0	0	0	39	1
8	0	0	18	0	39	15		0	48	Ő	0	0	13	÷
9	0	0	31	29	24	0		0	42	30	0	0	0	1
10 F	0	ō	21	14	0	0		ŏ	0	26	29	41	ŏ	1
L	•			ay 10	Ū			<u> </u>	•	day			•	1
1	0	0	30	0	0	18		59	47	0	0	0	0	1
2	0	25	0	0	30	20		0	0	0	0	0	0	t
3	0	0	0	0	0	0		0	0		0	Ō		1
4	26	27	35	0	0	5		58	0	0	0	0	0	1
5	0	21	0	Ő	Ő	19		57	0	0	32	Ō	22	1
6	0	33	0	0	0	25		44	0	36	0	0	0	1
7	25	0	0	0	0	3		49	0	0	Ō	0	Ō	1
8	0	21	0	0	0	0		47	0	0	Ō	0	0	1
9	25	21	0	0	0	28		50	0	0	0	0	49	
10	0	0	0	23	24	0		0	0	0	0	0	0	1
	•	Ů		ay 11			<u></u>	<u> </u>			15			1
1 F	18	33	0	0	0	0		0	0	0	26	0	0	Î.
2	30	0	0	0	0	0		0	0	0	29	0	0	1
3	0	0	0	0	0	0		61	0		34	31		1
4	0	0	0	0	0	0		0	0	0	39	33	0	1
5	23	0	0	41	0	0		0	0	31	0	32	0	1
6	31	0	2	0	0	0		0	0	0	44	0	0	1
7	0	0	0	0	0	0		0	45	0	30	22	0	1
8	24	0	0	0	0	0		0	0	28	38	36	0	ĺ
9	0	0	0	0	0	0		0	0	0	32	0	0	1
10	34	0	0	0	0	0		63	0	0	0	0	0	1
			d	ay 12						day	/ 16			41 22
1 [0	0	0	49	0	0		0	0	0	0	22	0]
2	0	0	35	41	0	0		0	0	48	0	34	0]
3	0	0	37	33	38	- 345		54	2	3 4 5	0	2	•]
4	0	0	0	49	39	0		0	0	4	0	0	0	
5	0	0	36	0	41	0		0	60	0	0	0	0]
6	0	0	46	46	0	0		0	0	0	0	0	0]
7	Õ	37	30	40	40	0		0	0	32	0	11	0]
8	0	0	40	45	39	0		0	0	0	0	0	30]
9 [0	0	0	43	37	0		0	0	40	0	27	0]
10	0	0	0	0	0	0		0	0	37	0	2	0	

Our liability is limited to the cost of the test requested, The test results only relate to the sample as received. No liability in whole or In part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



Client: NAU104
Reference: 14-0395-01

Test Data

	Biolog	gy (#, y	oung p	roduced	l; 0, no y	oung; -	, dead; bol	d #, nu	mber of y	oung th	e organ	ism had	on the c	lay it died)
dose (%)	ctl	19.8	29.6	44.4	66.7	100		ctl	19.8	29.6	44.4	66.7	100	

dose (%)	ctl	19.8	29.6	44.4	66.7	100	ct
replicate				ay 17			
	0	41	27	0	0	31] 0
1 2	0	36	0	142	0	0	71
3 4	0	5		0	0	(H)	68
4	53	0	31	0	0	0	91
5	54	0	0	44	0	36	72
6	0	42	48	0	0	44	65
7	53	0	0	0	0	9	10
8	0	46	0	0	0	0	0
9	61	45	0	0	0	47	0
10	0	24	0	40	38	0	43
			d	ay 18			
1	48	0	0	0	0	0	
2	53	0	0	100 C	0	8	
3	0	i.	(#)	46	0	V#:	
4	0	0	0	49	43	0	
5	0	0	51	0	0	0	
6	45	0	0	31	1	0	
7	0	41	0	42	0	0	
8	49	0	0	45	0	0	
9	0	0	0	0	0	0	
10	37	0	0	0	0	0	
			d	ay 19			,
1 [0	0	0	38	0	0	
2	0	0	43	85	0	0	
3 4	0	- 14 C	22/	0	34	- 14 - L	
4	0	32	58	0	0	0	
5	0	27	0	0	0	0	ð
6 7	0	0	0	0		0	
7	0	0	47	0	37	0	
8	0	0	44	0	41	0	
9 [0	0	55	34	0	0	
10	0	0	0	0	0	0	
-			d	ay 20			
1	0	0	44	0	17	52	
2	0	57	0		40	0	
3 4	36	•		0	0		
4 [0	0	0	0	0	26	
5 6	0	0	0	36	0	0	
6	0	54	45	0	•	0	
7	0	0	0	0	0	0	
8	0	60	0	0	0	23	
9 [0	58	0	0	30	0	
10 [0	0	43	0	0	0	

ctl	19.8	29.6	44.4	66.7	100
		day	/ 21		
0	55	0	39	0	0
71	0	0	<u> </u>	0	0
68	•		36	0	5
91	47	0	27	0	0
72	0	2	0	0	48
65	0	38	41	0	47
102	0	0	22	0	29
0	0	0	29	0	0
0	0	0	0	0	63
43	51	0	37	49	0
	0 71 68 91 72 65 102 0 0	0 55 71 0 68 - 91 47 72 0 65 0 102 0 0 0 0 0	day 0 55 0 71 0 0 68 - - 91 47 0 72 0 2 65 0 38 102 0 0 0 0 0 0 0 0	day 21 0 55 0 39 71 0 0 - 68 - - 36 91 47 0 27 72 0 2 0 65 0 38 41 102 0 0 22 0 0 0 29 0 0 0 0	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

Our liability is limited to the cost of the test requested, The test results only reliate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



Daphnia magna (21-d LC50/IC25) Test Report

Client: NAU104 Reference: 14-0395-01

dose (%)	ctl	19.8	29.6	44.4	66.7	100
replicate						
Day		Num	ber of C	Organism	ns Alive	
0	10	10	10	10	10	10
1 [10	10	10	10	10	10
2	10	10	10	10	10	10
3	10	10	10	10	10	10
4	10	10	10	10	10	10
5	10	10	10	10	10	10
6 [10	10	10	10	10	10
7	10	10	10	10	10	10
8	10	10	10	10	10	10
9	10	10	10	10	10	10
10	10	10	10	10	10	10
11	10	10	10	10	10	9
12	10	10	9	10	10	9
13	10	10	9	10	10	9
14	10	10	9	10	10	9
15	10	10	9	10	10	9
16	10	10	9	9	10	9
17	10	9	9	9	9	9
18	10	9	9	9	9	9
19	10	9	9	9	9	9
20	10	9	9	9	9	9
21	10	8	9	9	9	9

		Р	ercent l	Mortality	(%)	
mean	0	20	10	10	10	10

Replicate	Total Young Produced by Each Adul	t

phoato			ing i roo	autobu by	Euon7 (aune
1	125	176	137	164	58	150
2	154	164	136	94	144	28
3	272	62	69	182	118	0
4	228	173	167	205	136	31
5	206	157	138	153	109	145
6	185	183	250	190	38	158
7	229	123	135	170	142	99
8	120	175	130	157	155	81
9	136	166	156	138	118	187
10	177	75	127	143	154	0

Hardness

larune	33	
Day	cti	100
0	128	725
21	127	821

dose (%)	ctl	19.8	29.6	44.4	66.7	100
replicate						
Day		Dail	y Young	Product	on	
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	11	12	45	0	0
9	15	21	191	217	203	34
10	76	148	65	23	54	118
11	160	33	2	41	0	0
12	0	37	224	346	234	0
13	38	340	131	29	100	163
14	364	47	36	32	0	71
15	124	45	59	272	154	0
16	54	62	161	0	98	30
17	221	239	106	84	38	167
18	232	41	51	213	43	8
19	0	59	247	72	112	0
20	36	229	132	36	87	101
21	512	153	40	231	49	187
Total	1832	1465	1457	1641	1172	879

	Young Per Adult								
mean	183	147	146	164	117	88			
sd				31.11					
cv(%)	27.602	29.933	30.904	18.958	34.03	79.82			

Youn	g Produ	ction as a	a Percen	t of Con	trols
100	80	80	90	64	48

Alkalinity

incomincy.						
Day [ctl	19.8	29.6	44.4	66.7	100
0	111	44	55	63	78	89
21	129	28	39	48	63	73

Our toblity is limited to the cost of the test requested. The test results only relate to the sample as received. No tability in whole or in part is assumed for the collection, handling or transport of the sample application or interpretation of the test data or results.



Daphnia magna (21-d LC50/IC25) Test Report

Chemistry:

Test Data

Client: NAU104 Reference: 14-0395-01

66.7

100

			New	Solutions	6					
dose %	ctl	19.8	29.6	44.4	66.7	100				
Day	Day pH (units)									
0	7.6	7.5	7.3	7.3	7.3	7.4				
3	7.9	7.7	7.5	7.5	7.7	7.7				
5	7,9	7,6	7.5	7.5	7.7	7.8				
7	8.1	7.7	7.6	7.8	7.9	7,8				
10	8.3	8,1	7.9	7.8	7.9	7,9				
12	7.7	7.6	7.4	7.5	7.7	7.7				
14	7.6	7.5	7.4	7.5	7.7	7,8				
17	7,8	7.7	7.5	7.5	7.7	7.7				
19	7.8	7,5	7.3	7.5	7.7	7.7				
21										
		С	onducti	vity (µS/	cm)					
0	353	549	850	1218	1739	2640				
3	390	610	862	1241	1766	2800				
5	390	571	859	1241	1770	2800				
7	427	604	854	1231	1766	2770				
10	431	603	847	1200	1723	2690				
12	361	608	859	1234	1760	2760				
14	353	613	854	1227	1739	2750				
17	374	597	856	1237	1811	2690				
19	366	596	853	1238	1790	2710				
21										
		Dis	solved (Oxygen ((mg/L)					
0	8.0	8.0	8.0	8.0	8.0	8.0				
3	8.3	8.3	8.3	8.3	8.3	8.4				
5	8.1	8.5	8.4	8.6	8.3	8.5				
7	8.1	8,1	8.1	8.2	8.1	8,1				
10	8.3	8.3	8.3	8.2	8.2	8,1				
12	7.7	7.8	7.9	7.9	7.9	8.0				
14	7.9	7,8	7.8	7.8	7.7	7.7				
17	8.3	8.3	8.1	8.0	8.0	7.9				
19	8.3	8,3	8.2	8.1	8.0	8.0				
21				i li	1					

	Temperature (°C)								
0	19	19	19	19	19	19			
3	18	18	18	18	18	18			
5	20	19	18	18	18	19			
7	19	19	19	19	19	19			
10	19	19	19	19	19	19			
12	19	19	19	19	19	19			
14	19	19	19	19	19	19			
17	18	18	18	19	19	19			
19	19	19	19	19	19	18			
21									

		pH (u	inits)		
8.1	8.0	7.7	7.6	7.7	8.0
8.0	7.4	7.4	7.6	7.9	8.0
8.0	7.7	7.6	7.6	7.9	8.0
8,2	8.2	7.9	7.8	7.9	8.0
8,3	8.2	7,8	7.8	7.8	7.9
8.0	7.9	7.7	7,7	7.8	8.0
7.8	7.6	7.5	7,5	7.6	7.7
7.7	7,1	7.2	7.4	7.6	7.7
7.4	7,3	7.3	7.4	7.7	7.8

Old Solutions

29.6 44.4

19.8

ctl

Conductivity (µS/cm)

			V 10	7	
494	653	872	1232	1826	3200
468	660	888	1280	1867	3110
429	657	894	1259	1862	2990
557	717	1008	1405	2280	4050
580	734	955	1405	1862	3220
458	687	955	1330	1902	3200
408	675	978	1341	1956	2870
435	641	873	1262	1919	3020
503	671	985	1492	2290	3520

Dissolved Oxygen (mg/L) 8.8 8.5 8.3 8.1 7.9 7.9 8.2 8.4 8.3 8.3 8.1 8.4 7.7 7.7 8.1 8.1 8.0 7.9 8.2 8.2 8.2 8.2 8.1 8.0 8.9 8.4 8.3 8.2 8.1 8.0 7.8 7.7 7.7 7,6 7.6 7.6 7.5 7.7 7.7 7.8 7.8 7.6 8.0 7.8 7.6 7.4 7.4 7.4 7.6 7.5 7.5 7.5 7.5 7.4

Temperature (°C)

18	18	19	19	19	19
18	18	18	18	18	18
18	19	19	20	19	19
18	18	18	18	18	18
18	18	18	18	18	18
18	18	18	18	18	19
18	18	18	18	18	19
18	19	20	19	19	19
18	19	19	19	19	19

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or In part is assumed to the collection, handling or transport of the sample, application or interpretation of the test data or results.



Daphnia magna (21-d LC50/IC25) Test Report

Comments/Statistics

Client: NAU104 Reference: 14-0395-01

Test Result Comments: The top concentration tested (100%) is equal to 1500 mg/L TDS

Data Analysis: Endpoints for mortality could not be calculated. No effect occurred.

Endpoints for reproduction were calculated using a Non-Linear Regression model (2P Linear) with CETIS v. 1.8.7.15

Protocol Deviations: None

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HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1 Tel (403) 253-7121 (ax (403) 252-9363 <u>www.hydroaual.ca</u>



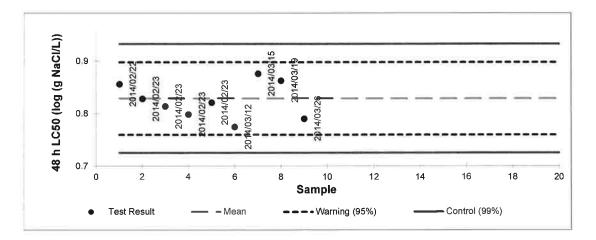
Quality Assurance Information

 Test Method: Daphnia Static Acute Test (LC50, 5 treatments plus a control) HydroQual Test Method: WTR-ME-016
 Reference: Biological Test Method: Reference Method for Determining the Acute Lethality of Effluents to Daphnia magna, 1990. Environment Canada, EPS 1/RM/14. including May 1996 and December 2000 ammendments.

Test Organism:		Test Design:	
test species:	Daphnia magna	vol. of test vessel (mL):	500
culture source:	in-house	toxicant:	sodium chloride
original culture source:	Environment Canada	test volume (mL):	150
days to first brood:	11	replicates per treatment:	1
mean brood size:	27	neonates per replicate:	10
ephippia in stock culture:	no	volume per neonate (mL):	15
age of test organisms:	<24 hours old	samples preaerated:	no
culture mortality (%):	7%	hardness adjustment:	no
dissolved oxygen:	40-100% saturation	temperature (°C):	20
light level (water surface):	400-800 lux (cool white)	photoperiod:	16h light:8h dark
control/dilution water:	Moderately hard reconstitu	uted water supplemented with vi	tamin B ₁₂ (2 µg/L),
	Na ₂ SeO ₃ (5 µg/L) and 10%	% (v/v) Perrier water,	

Current Test toxicant Sodium chloride (NaCI) started on 2014/03/24 ended on 2014/03/26 log (g NaCI/L); geometric mean Result (LC50 @ 48h) 0.74 Confidence Limits (95%) lower 0.71 upper 0.77 **Historical Values** 0.78 0.03 5.2 mean sd cv(%): lower upper warning limits (±2 sd) 0.71 0.85 (95% confidence limits) control limits (±3 sd) 0.68 0.88 (99% confidence limits)

notes: sd, standard deviation; cv, coefficient of variance Comments: None



The test data and results are authorized and verified correct.

Technical Lead

Our liability is limited to the cost of the test requested on the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results in part or in whole.

HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1 tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca

CETIS Analytical Report

Report Date: 02 Jun-14 11:09 (p 1 of 2) Test Code:

-..... _

Daphnia Magn	a 21-Day Life Cycle	Test			Nautilu	us Environmental
Analysis ID: Analyzed:	16-8998-4372 02 Jun-14 11:07	Endpoint: Analysis:	Reproduction Nonlinear Regression		ETIS Version: CETISv1.8.7 fficial Results: Yes	
Batch ID: Start Date: Ending Date: Duration:	15-0506-0997 28 Mar-14 18 Apr-14 21d 0h	Test Type: Protocol: Species: Source:	Survival-Reproduction ASTM E1193-97 (1997) Daphnia magna	D B	nalyst: Jeslin Wijaya iluent: rine: ge:	
Sample ID: Sample Date: Receive Date: Sample Age:	24 Apr-14	Code: Material: Source: Station:	26C36 Total Dissolved Solids Golder Total Dissolved Solids		lient: Golder roject:	
Non-Linear Re Model Functio	gression Options		X Transform	Y Transform	Weighting Function	PTBS Function
3P Log-Gompe	ertz EV [Y=A*exp(log)	(0.5)(X/D)^C)]	None	None	Normal [W=1]	Off [Y*=Y]

Iters	Log LL	AICc	BIC	Adj R2	Optimize	F Stat	Critical	P-Value	Decision(a:5%)
14	-262	530.4	536.3	0.2272	Yes	1.454	2.776	0.2373	Non-Significant Lack of Fit

Point Estimates

Level	mg/L	95% LCL	95% UCL	
IC5	294.7	N/A	618.2	
IC10	460.2	104.2	708.2	
IC15	601.9	250.1	885.3	
IC20	732.5	381.7	1040	
IC25	857.3	525.6	1168	
IC40	1223	922.2	1541	
1C50 Jh	- 1478		~-1997~ `	> 1460

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(a:5%)
A	172.8	22.8	128.1	217.5	7.576	<0.0001	Significant Parameter
С	1.615	1.117	-0.5749	3.804	1.445	0.1538	Non-Significant Parameter
D	1478	244.7	998.3	1958	6.039	<0.0001	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	46475.28	46475.28	1	19.35	<0.0001	Significant
Lack of Fit	10236.86	3412.285	3	1.454	0.2373	Non-Significant
Pure Error	126694.8	2346.2	54			
Residual	136931.7	2402.31	57			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(a:5%)
Variances	Bartlett Equality of Variance	6.22	11.07	0.2854	Equal Variances
	Mod Levene Equality of Variance	1.99	2.386	0.0949	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9797	0.9605	0.4150	Normal Distribution
	Anderson-Darling A2 Normality	0.3837	2.492	0.4001	Normal Distribution

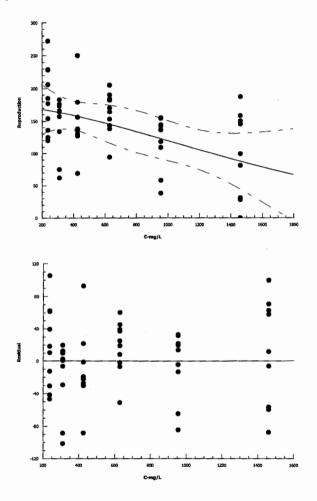
C-mg/L Control Type Count Mean Min Max Std Err Std Dev CV% %Effect 236.9 Negative Control 10 183.2 120 272 15.99 50.57 27.6% 0.0% 309.6 10 146.5 62 183 13.71 43.36 29.6% 20.03%
309.6 10 146.5 62 183 13.71 43.36 29.6% 20.03%
425.8 10 145.7 69 250 14.5 45.85 31.47% 20.47%
628.8 10 162.3 94 205 10.12 32.02 19.73% 11.41%
954.9 10 117.2 38 155 12.61 39.88 34.03% 36.03%
1460.1 10 87.9 0 187 22.19 70.16 79.82% 52.02%

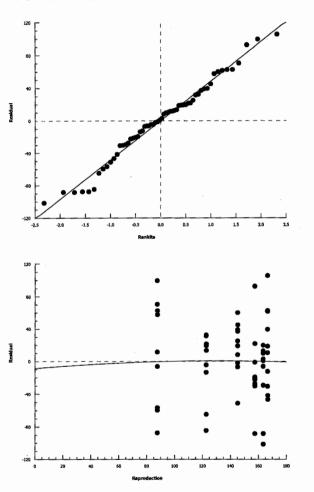
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CETIS An	alytical Repo	ort					•	oort Date: t Code:			09 (p 2 of 2) 1-1262-4315
Daphnia Ma	gna 21-Day Life C	ycle Te	est						N	autilus Env	vironmental
Analysis ID: Analyzed:	16-8998-4372 02 Jun-14 11:0		•	Reproduction Nonlinear Re				FIS Version cial Result		1.8.7	
Reproductio	on Detail										
C-mg/L	Control Type	Rep 1	1 Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
236.9	Negative Control	125	154	272	228	206	185	229	120	136	177
309.6		176	164	62	173	157	183	134	175	166	75
425.8		137	136	69	179	138	250	135	130	156	127
628.8		164	94	182	205	153	190	170	184	138	143
954.9		58	144	118	136	109	38	142	155	118	154
1460.1		150	28	0	31	145	158	99	81	187	0

Graphics

3P Log-Gompertz EV [Y=A*exp(log(0.5)(X/D)^C)]







Your C.O.C. #: A065110

Attention:HOLLY STEWART

HYDROQUAL LABS #4, 6125 - 12 STREET SE CALGARY, AB CANADA T2H 2K1

> Report Date: 2014/04/29 Report #: R1559518 Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B431882

Received: 2014/04/23, 11:44

Sample Matrix: Water # Samples Received: 6

		Date	Date		
Analyses	Quantity	Extracted	Analyzed	Laboratory Method	Analytical Method
Chloride by Automated Colourimetry	6	N/A	2014/04/29	AB SOP-00020	SM 4500 CI-G
Elements by ICP - Total	6	2014/04/24	2014/04/24	AB SOP-00042	EPA 200.7
Sulphate by Automated Colourimetry	6	N/A	2014/04/29	AB SOP-00018	SM 4500 SO4-E

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Gum MM Carmen McKay 29 Apr 2014 15:42:09 -06:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager. Carmen McKay, Project Manager Email: CMcKay@maxxam.ca Phone# (403) 291-3077

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



HYDROQUAL LABS

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		JL0800	JL0801		JL0802		JL0803		JL0804	JL0805		
Sampling Date												
COC Number		A065110	A065110		A065110		A065110		A065110	A065110		
	Units	CTL	296MG/L	RDL	444MG/L	RDL	667MG/L	RDL	1000MG/L	1500MG/L	RDL	QC Batch
Anions												
Dissolved Sulphate (SO4)	mg/L	93	28	1.0	42 (1)	2.0	59	1.0	89	150	1.0	7467909
Dissolved Chloride (Cl)	mg/L	4.8	160	1.0	210 (1)	2.0	310 (1)	2.0	500 (1)	800 (1)	5.0	7467903
RDL = Reportable Detection L	RDL = Reportable Detection Limit											
(1) Detection limits raised due	e to dilu	ition to bring	analyte withi	n the	calibrated ra	nge.						

 Page 2 of 7

 Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue NaEs T2E 6P2
 Telephone (403) 291-3077
 Fax (403) 291-9468



HYDROQUAL LABS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		JL0800	JL0801	JL0802	JL0803	JL0804	JL0805		
Sampling Date									
COC Number		A065110	A065110	A065110	A065110	A065110	A065110		
	Units	CTL	296MG/L	444MG/L	667MG/L	1000MG/L	1500MG/L	RDL	QC Batch
Elements									
Total Calcium (Ca)	mg/L	30	58	84	130	190	290	0.30	7462469
Total Magnesium (Mg)	mg/L	13	7.4	11	16	24	39	0.20	7462469
Total Potassium (K)	mg/L	2.2	2.8	4.1	6.1	9.2	15	0.30	7462469
Total Sodium (Na)	mg/L	28	32	47	71	110	170	0.50	7462469
RDL = Reportable Detectio	n Limit								



HYDROQUAL LABS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1 20.0°C

Results relate only to the items tested.

Maxxam

HYDROQUAL LABS

QUALITY ASSURANCE REPORT

QA/QC				Date				
Batch	Init	QC Type	Parameter	Analyzed	Value	Recovery	Units	QC Limits
7462469	STI	Matrix Spike	Total Calcium (Ca)	2014/04/24		95	%	80 - 120
			Total Magnesium (Mg)	2014/04/24		96	%	80 - 120
			Total Potassium (K)	2014/04/24		96	%	80 - 120
			Total Sodium (Na)	2014/04/24		NC	%	80 - 120
7462469	STI	Spiked Blank	Total Calcium (Ca)	2014/04/24		93	%	80 - 120
			Total Magnesium (Mg)	2014/04/24		97	%	80 - 120
			Total Potassium (K)	2014/04/24		97	%	80 - 120
			Total Sodium (Na)	2014/04/24		94	%	80 - 120
7462469	STI	Method Blank	Total Calcium (Ca)	2014/04/24	<0.30		mg/L	
			Total Magnesium (Mg)	2014/04/24	<0.20		mg/L	
			Total Potassium (K)	2014/04/24	<0.30		mg/L	
			Total Sodium (Na)	2014/04/24	<0.50		mg/L	
7462469	STI	RPD	Total Calcium (Ca)	2014/04/24	0.1		%	20
			Total Magnesium (Mg)	2014/04/24	NC		%	20
			Total Potassium (K)	2014/04/24	NC		%	20
			Total Sodium (Na)	2014/04/24	0.5		%	20
7467903	ZI	Matrix Spike	Dissolved Chloride (Cl)	2014/04/29		106	%	80 - 120
7467903	ZI	Spiked Blank	Dissolved Chloride (Cl)	2014/04/29		102	%	80 - 120
7467903	ZI	Method Blank	Dissolved Chloride (Cl)	2014/04/29	<1.0		mg/L	
7467903	ZI	RPD	Dissolved Chloride (Cl)	2014/04/29	NC		%	20
7467909	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2014/04/29		106	%	80 - 120
7467909	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2014/04/29		106	%	80 - 120
7467909	ZI	Method Blank	Dissolved Sulphate (SO4)	2014/04/29	<1.0		mg/L	
7467909	ZI	RPD	Dissolved Sulphate (SO4)	2014/04/29	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.



HYDROQUAL LABS

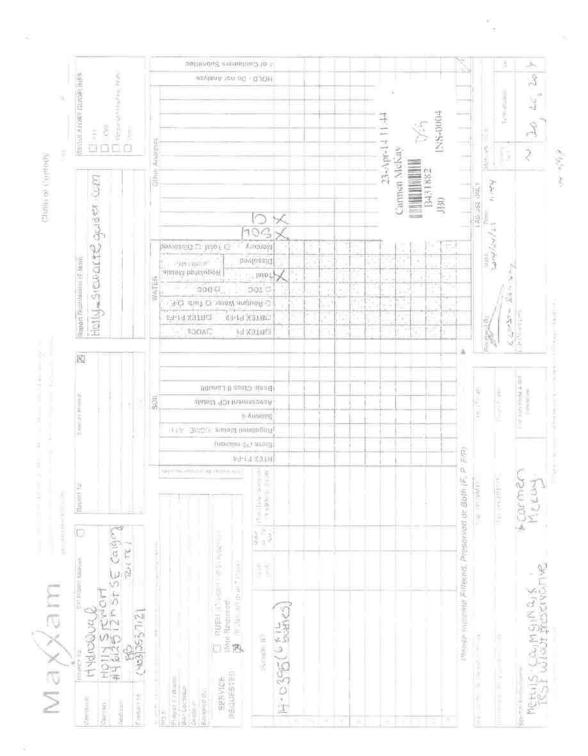
VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Peng Liang, Analyst II

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- 17

Second second field and second second



Your Project #: 14-0395 Your C.O.C. #: A019281

Attention:HOLLY STEWART

HYDROQUAL LABS #4, 6125 - 12 STREET SE CALGARY, AB CANADA T2H2K1

> Report Date: 2014/04/04 Report #: R1546686 Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B425216 Received: 2014/03/31, 15:10

Sample Matrix: Water # Samples Received: 6

		Date	Date		
Analyses	Quantity	Extracted	Analyzed	Laboratory Method	Analytical Method
Chloride by Automated Colourimetry	6	N/A	2014/04/04	AB SOP-00020	SM 4500 CI-G
Elements by ICP - Total	6	2014/04/03	2014/04/03	AB SOP-00042	EPA 200.7
Sulphate by Automated Colourimetry	6	N/A	2014/04/04	AB SOP-00018	SM 4500 SO4-E

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

A.Gradon 04 Apr 2014 14:40:26 -06:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager. Anna Gordon, Project Manager Email: AGordon@maxxam.ca Phone# (403) 291-3077

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HYDROQUAL LABS Client Project #: 14-0395

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		JE9961	JE9962		JE9963		JE9964		JE9965	JE9966		
Sampling Date												
COC Number		A019281	A019281		A019281		A019281		A019281	A019281		
	Units	CTL	296 MG/L	RDL	444 MG/L	RDL	667 MG/L	RDL	1000 MG/L	1500 MG/L	RDL	QC Batch
Anions												
Dissolved Sulphate (SO4)	mg/L	87	29	1.0	41 (1)	2.0	58	1.0	90	140	1.0	7440973
Dissolved Chloride (Cl)	mg/L	3.8	160	1.0	210 (1)	2.0	320 (1)	2.0	490 (1)	740 (1)	5.0	7440967
RDL = Reportable Detection	Limit											
(1) Detection limits raised du	ue to dilu	tion to bring	analyte withi	n the	calibrated ra	nge.						

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468



HYDROQUAL LABS Client Project #: 14-0395

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		JE9961	JE9962	JE9963	JE9964	JE9965	JE9966		
Sampling Date									
COC Number		A019281	A019281	A019281	A019281	A019281	A019281		
	Units	CTL	296 MG/L	444 MG/L	667 MG/L	1000 MG/L	1500 MG/L	RDL	QC Batch
Elements								_	
Total Calcium (Ca)	mg/L	28	57	85	130	190	280	0.30	7439641
Total Magnesium (Mg)	mg/L	12	7.1	11	16	24	35	0.20	7439641
Total Potassium (K)	mg/L	2.0	2.6	4.0	6.0	9.0	14	0.30	7439641
Total Sodium (Na)	mg/L	26	32	46	69	100	150	0.50	7439641
RDL = Reportable Detectio	n Limit								



HYDROQUAL LABS Client Project #: 14-0395

GENERAL COMMENTS

Each temperature is the average	of up to three cooler	temperatures taken at receipt

Package 1 13.3°C

Results relate only to the items tested.



HYDROQUAL LABS Client Project #: 14-0395

QUALITY ASSURANCE REPORT

QA/QC				Date				
Batch	Init	QC Type	Parameter	Analyzed	Value	Recovery	Units	QC Limits
7439641	SRT	Matrix Spike	Total Calcium (Ca)	2014/04/03		NC	%	80 - 120
			Total Magnesium (Mg)	2014/04/03		95	%	80 - 120
			Total Potassium (K)	2014/04/03		95	%	80 - 120
			Total Sodium (Na)	2014/04/03		NC	%	80 - 120
7439641	SRT	Spiked Blank	Total Calcium (Ca)	2014/04/03		93	%	80 - 120
			Total Magnesium (Mg)	2014/04/03		93	%	80 - 120
			Total Potassium (K)	2014/04/03		94	%	80 - 120
			Total Sodium (Na)	2014/04/03		90	%	80 - 120
7439641	SRT	Method Blank	Total Calcium (Ca)	2014/04/03	<0.30		mg/L	
			Total Magnesium (Mg)	2014/04/03	<0.20		mg/L	
			Total Potassium (K)	2014/04/03	<0.30		mg/L	
			Total Sodium (Na)	2014/04/03	<0.50		mg/L	
7439641	SRT	RPD	Total Calcium (Ca)	2014/04/03	1.2		%	20
			Total Magnesium (Mg)	2014/04/03	0.2		%	20
			Total Potassium (K)	2014/04/03	0.3		%	20
			Total Sodium (Na)	2014/04/03	0.2		%	20
7440967	ZI	Matrix Spike	Dissolved Chloride (Cl)	2014/04/04		103	%	80 - 120
7440967	ZI	Spiked Blank	Dissolved Chloride (Cl)	2014/04/04		99	%	80 - 120
7440967	ZI	Method Blank	Dissolved Chloride (Cl)	2014/04/04	<1.0		mg/L	
7440967	ZI	RPD	Dissolved Chloride (Cl)	2014/04/04	NC		%	20
7440973	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2014/04/04		107	%	80 - 120
7440973	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2014/04/04		102	%	80 - 120
7440973	ZI	Method Blank	Dissolved Sulphate (SO4)	2014/04/04	<1.0		mg/L	
7440973	ZI	RPD	Dissolved Sulphate (SO4)	2014/04/04	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.



HYDROQUAL LABS Client Project #: 14-0395

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

21

Peng Liang, Analyst II

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 Dote Anno Statistica. + ++/ 03/31 15 10 barlomiti 🗆 (eto) 🗆 5 - 5 - 5 USZOLAGU Report Demonstron (Thain) Jach " Ż sina Tupis upaR 1910.5 Right Constant antibio Constant and the State of the Stat Vell by Ville га хатар 4 llithneu II aselO pias8 1005305-000 SOIL alsieM qOLInemasessi P Viruites (TAL BMOO) sløteM befølupeR (nerairn 67) eveil Pleuse indicate Filtered, Preserved or Both (F. P., F/P) BTEX F1-F4 impante alla series and series and Preference and parts THOM + CI Date Repaired: Date Repaired: HUDDAR 15 L 7 Dates or flepsif Address HALF REPORT OF THE WERE Thi Maxxam 14-0845 6 ARRIGERS HILL STUDY 11 Sta Simple ID E SERVICE REQUESTED: ALL LAND Control insi-VE 5010 - iterature addrine a

Page 7 of 7

		Day 0 - Marc	h 28, 2014	HYDROQUA	NL		
Target TDS	mg/L	Control	296	444	667	1000	1500
Alkalinity	mg/L	111	44	55	63	78	89
Cl	mg/L	3.8	160	210	320	490	740
SO4	mg/L	87	29	41	58	90	140
Са	mg/L	28	57	85	130	190	280
Mg	mg/L	12	7.1	11	16	24	35
К	mg/L	2	2.6	4	6	9	14
Na	mg/L	26	32	46	69	100	150
TDS (calculated)	mg/L	225.4	314.1	430	636.8	949.8	1412.4
		Day 21 - Apri	-	-		1000	4500
Target TDS	mg/L	Control	296	444	667	1000	1500
Alkalinity	mg/L	129	28	39	48	63	73
Cl	mg/L	4.8	160	210	310	500	800
SO4	mg/L	93	28	42	59	89	150
Ca	mg/L	30	58	84	130	190	290
Mg	mg/L	13	7.4	11	150	24	39
K	mg/L	2.2	2.8	4.1	6.1	9.2	15
Na	mg/L	2.2	32	47	71	110	170
INd	iiig/ L	20	52	47	/1	110	170
TDS (calculated)	mg/L	248.4	305	421.5	620.9	960	1507.8
Average TDS	mg/L	236.9	309.55	425.75	628.85	954.9	1460.1



DATE June 10, 2014

PROJECT No. 14-1349-0003/1500/1503

- **TO** Erica Bonhomme, Snap Lake Environmental Manager De Beers Canada Inc.(DBCI)
- CC Tasha Hall and Alison Snow (Golder); Alexandra Hood (DBCI)

FROM Peter M. Chapman

EMAIL pmchapman@golder.com

COPEPOD TDS TOXICITY TEST RESULTS

Please find attached the Nautilus Environmental report on toxicity testing conducted with the copepod species, *Cyclops vernalis*, exposed to synthetic lake water intended to simulate Snap Lake TDS conditions. Note that, although this specific species of copepod is not found in Snap Lake, the genus *Cyclops* is present in Snap Lake.

The copepod test was conducted as a 20-day (d) test, with survival and growth (length) the endpoints measured. The IC20 (i.e., 20% inhibitory effect concentration) for growth effects derived from testing with this copepod species was > 1,508 mg/L. These findings of no effects at the highest tested TDS concentrations mirror those determined previously for algae, diatoms, rotifers, insect larvae, Lake Trout, and Artic Grayling (Golder 2013). As reported separately (Golder 2014), *Daphnia magna* (waterfleas) also showed no effects at the highest tested TDS concentrations in three of five 21-d tests performed to assess effects on survival and reproduction.

The combined findings from all site-specific toxicity testing conducted to date indicate that the fish and the food chain upon which they depend in Snap Lake will not likely be adversely affected by TDS concentrations of up to 1,000 mg/L and possibly higher.

We trust that this technical memorandum and attachment provide you with the information you require at this time. Should you have any questions, or require further information, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Prepared by:

Peter M Chapman, PhD Principal, Senior Environmental Scientist

PMC/CAM/me

Att.

Reviewed by:

lathy A. MCPleson .

Cathy A McPherson, BSc Senior Environmental Scientist



REFERENCES CITED

- Golder (Golder Associates Ltd). 2013. Development of Total Dissolved Solids (TDS) Benchmark for Aquatic Life for Snap Lake. Prepared for De Beers Canada Inc, Yellowknife, NWT, Canada.
- Golder. 2014. Additional *Daphnia magna* 21-day TDS Toxicity Test Results. Prepared for De Beers Canada Inc, Yellowknife, NWT, Canada. June 10, 2014.



ATTACHMENT 1

NAUTILUS ENVIRONMENTAL DATA REPORT: COPEPOD Cyclops vernalis





Evaluation of the sensitivity of a copepod, *Cyclops vernalis*, to total dissolved solids

Final Report

Report date: June 9, 2014

Submitted to:

Golder Associates Burnaby, BC

8664 Commerce Court Burnaby, BC V5A 4N7

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1.0 INTRODUCTION

Nautilus Environmental conducted a toxicity test for Golder Associates Ltd. (Golder) to evaluate the effects of a site-specific mixture of Total Dissolved Solids (TDS) on a freshwater copepod, *Cyclops vernalis*. This species has not been widely used in toxicity testing before and standard methods for evaluating sensitivity of freshwater copepods have not been established. Consequently, test method development was necessary to establish appropriate endpoints for this test species. The test method evaluated survival and growth over a 20-day exposure period as primary endpoints from the test. A low rate of reproduction was also observed in the test; however, this endpoint exhibited a relatively high degree of variability unrelated to TDS exposure and was therefore not used for establishing effect levels in the test.

This report describes the results of these toxicity tests. Copies of laboratory data sheets are provided in Appendix A. Results of analytical chemistry are provided in Appendix B.

2.0 METHODS

2.1 Synthetic lake water and test solution preparation

The composition of the synthetic lake water used for the study was based on concentrations of major ions present in Snap Lake. The synthetic lake water was prepared by dissolving reagent-grade sodium, potassium, calcium, and magnesium salts (i.e., NaCl, KCl, MgCl₂.6H₂O, MgSO₄, CaCl₂.2H₂O, and NaHCO₃) in reverse osmosis-treated (RO) water. The nominal TDS concentration of the synthetic lake water was 1,500 mg/L, with individual ions present in ratios representative of the current site-specific receiving environment conditions.

Dilutions of the synthetic lake water were then prepared using deionized water and with a 0.67 times dilution factor to achieve a nominal concentration series of 1,500, 1,000, 667, 444, and 296 mg TDS/L. The test solutions were analyzed for ionic composition by ALS Laboratory Group (Burnaby, BC) to verify the concentrations of the major ions, which were then used to calculate TDS concentrations. One batch of the highest concentration of the TDS solutions (i.e., 1,500 mg/L) was prepared prior to the test and was used for preparing dilutions throughout the test.

Actual measured TDS concentrations presented in this report were calculated from measured concentrations of ionic constituents (a spreadsheet showing these TDS calculations and the ALS analytical reports are provided in Appendix B).

2.2 Toxicity tests

Copepods were initially obtained from Boreal Science, St Catharines, ON, on January 28, 2014, and were identified as *Cyclops* sp. The species was subsequently identified as *Cyclops vernalis* by a taxonomist (Fraser Environmental, North Vancouver, BC) from a subsample of organisms collected from the culture and preserved in ethanol.

The culture was maintained at 22±1°C under a 16:8 h light-dark photoperiod. Culture water was prepared by reconstituting deionized water with reagent grade salts to achieve moderately hard water (80 to 100 mg/L as CaCO₃); this is the same water type that is used in the laboratory for culturing *Daphnia magna*. The culture was held in 1-L beakers and fed three times per week with a mixture of cells of a green alga, *Pseudokirchneriella subcapitata*, and digested yeast, cerophyll, and trout chow (dYCT). The cuture water was provided with gentle aeration and the water was replaced weekly.

Once the culture was stable and reproduction appeared to be consistently occurring, nauplii of <0.2 mm size were obtained by gently filtering through a Nitex screen.

Survival and growth tests were conducted using *C. vernalis* according to test conditions summarized in Table 1. The test was conducted using four replicates for each test concentration and ten <0.2 mm nauplii in each test container. The test containers were 375 mL glass jars containing approximately 300 mL of test solution. A screen-tube was placed in each jar; screen tubes were comprised of 1.5 inch inside diameter Plexiglass cylinders with a piece of 25 μ m Nitex screen sandwiched between pieces of the Plexiglass cylinder (Figure 1). The test organisms were placed in the screen tube, above the Nitex screen. This apparatus was designed to enable water changes to occur without disturbing or losing the test organisms since the test solution could be drawn down by syphoning the water from the glass jar, outside of the screen tube.

The test organisms were observed daily, at which time mortalities were recorded and removed. In cases where an egg sac was observed on a female copepod, the female was removed from the test container using a glass pipette and isolated in test solution in a 20 mL glass test tube so that number of nauplii produced could be assessed; the adults were monitored daily, and nauplii were typically released from the egg sac within two to three days.

The test was terminated after twenty days, at which time the final survival rate was recorded and the adult copepods were preserved in ethanol. Length, from the tip of the rostrum to the end of the pleopods was measured the following day using a dissecting microscope with a calibrated ocular micrometer. Since male copepods of this species are smaller than females, the gender of the individuals was recorded so that growth of male and female copepods could be evaluated separately.



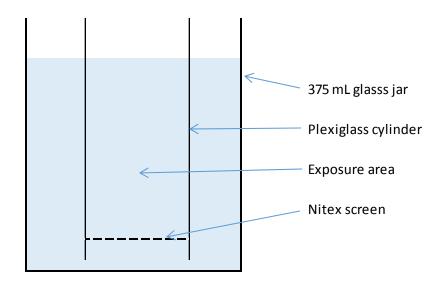


Table 1.	Summary of test conditions: <i>Cyclops vernalis</i> survival and growth test.
I WOIC II	Summary of test contantions. Cyclops contanto survival and grow in test.

Test type	Static renewal (weekly for the first week and twice weekly thereafter)
Endpoints	Survival and growth
Organism source	In-house culture, originally obtained from Boreal
-	Science, St. Catharines, ON
Organism age	<24 hr old nauplii
Feeding	Pseudokirchneriella subcapitata and digested yeast,
-	cerophyll, and trout chow (dYCT)
Test chamber	375 mL glass jar
Test volume	250 mL
Test temperature	22 ± 1°C
Control/Dilution water	Moderately hard reconstituted water
Number of organisms/replicate	10
Number of replicates	4
Photoperiod	16 hours light/8 hours dark
Aeration	None
Test protocol	Developed in house

2.3 QA/QC

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

- Negative controls to ensure that appropriate testing performance criteria are met;
- Use of appropriate species, life stage, and test methods to meet the study objectives;
- Appropriate number of replicates to allow the 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 sample 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 that the data are of good quality and are scientifically defensible prior to release to the client.

3.0 RESULTS AND DISCUSSION

Results of the toxicity test are shown in Table 2 and are discussed below on the basis of measured TDS concentrations. Survival in the test solutions ranged from 60 to 78% in the various concentrations. No mortalities were observed until day 13 of the exposure, with occasional mortalities being observed in all replicates and test concentrations over the following seven days. Cannibalism may have contributed to mortalities that were observed during the last week of the test, since *C. vernalis* adults are increasingly carnivorous. Consequently, the growth endpoint from the test provides the most robust measure of the potential effects on the test organisms.

For both male and female copepods, growth of copepods was generally similar to the control in the lowest (295 mg/L) and highest (1,508 mg/L) test concentrations, with higher growth rates being observed in the 441, 666, and 1,008 mg/L concentrations. Thus, there was no adverse effects relative to the control in any of the test concentrations, with optimal growth rates being achieved between 441 and 1,008 mg/L TDS (Figure 2). The data reported here for length exhibited a high degree of consistency between replicates, with coefficients of variation of approximately 6% for females and 10% for males.

A low rate of reproduction was observed in the test, indicating that the copepods had reached maturity. However, only six female copepods produced nauplii during the test: three in control replicates; and, one in each of the 293, 441, and 1,008 mg/L TDS solutions; brood sizes for these six females ranged from 8 to 16 nauplii. In addition, three females in a control replicate, and one in the each of the 441, 666, and 1,508 mg/L TDS concentrations were holding eggs at the end of the test. The rate of reproduction was too low to evaluate any differences between concentrations.

Collectively, the data from this test indicate no evidence of adverse effects on *C. vernalis* growth relative to the control in concentrations of up to 1,508 mg/L TDS (the IC20). Optimal growth rates occurred at concentrations between 441 and 1,008 mg/L TDS.

Concentration ((mg/L TDS)	Survival (%)	Female length (mm)	Male length (mm) (mean ± SD)		
Nominal	Measured	(mean ± SD)	(mean ± SD)			
Control		78 ± 5	1.00 ± 0.06	0.72 ± 0.09		
296	295	63 ± 17	0.97 ± 0.10	0.74 ± 0.15		
444	441	73 ± 10	1.14 ± 0.06	0.91 ± 0.09		
667	666	70 ± 10	1.24 ± 0.06	0.93 ± 0.05		
1000	1008	60 ± 8	1.13 ± 0.07	0.94 ± 0.07		
1500	1508	60 ± 8	0.94 ± 0.04	0.71 ± 0.06		
Test endpoint						
LC50		>1508				
IC20			>1508	>1508		
IC50			>1508	>1508		

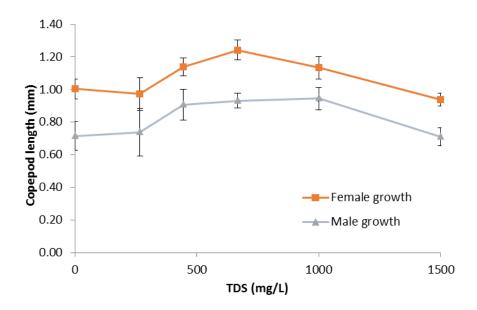
Table 2. Test results for the *Cyclops vernalis* test with TDS.

Inhibition Concentration.

LC = Lethal Concentration.

SD = Standard Deviation.

Figure 2.	Length (mean ± SD) of male and female <i>Cyclops vernalis</i> after 20 day exposure to
	TDS.



3.1 QA/QC

This test organism has not been widely used in toxicity testing programs and, consequently, a standard test methodology and database of reference toxicant test results was not available for use in this test. Regardless, the data presented here produced a high degree of consistency between replicates for growth. Survival in the test concentrations ranged from 60 to 78% even though they may have been adversely affected by cannibalism towards the end of the test. Regardless, the test produced data that can be used to assess the potential for effects associated with Snap Lake TDS.

APPENDIX A - Cyclops vernalis Toxicity Test Data

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

. . . .

Client: Sample ID: Work Order #:	Clar TDS	ler ,				Start Date & Time: <u>in Arch 21/14 ac</u> Stop Date & Time: <u>Apn1 10/14 ac 140</u> Test Species: <u>Coriedaphnia dubia</u> Cyclo EMM								on	sh nalis
<u> </u>							. r Da				/	remm			
			~		~	eyma :	Da Da	4		5					
Concentration	0	Contraction of Contraction	sid		ald		3 010	-					6	final	
control	init.	pla	pew	old	pew V2,0	ołd	new		new	old	new	old	new	Znnary	
Temperature (°C)			22.3		0415		22.0	22.0	$ \rightarrow $	22.0	-	22.0	$\vdash H \vdash$		
DO (mg/L)	8.6				<u> </u>	<u> </u>	\vdash	-					//	\vdash	
рН	7.5		[]	-X									V		
Cond. (µS/cm)	361	//		/				/		T 0 + 1 0				/	
Initials	Emm	A	1	<u>~</u>		EM	m_{-}	Emm		EMN	<u></u>	<u>Em</u> r	η	Y	
													Vennh		
TOS							Dā	ays				T		/	r -
Concentration	0		1 pld	2	del.	almer :	3 jch	4		5	AND IN PROPERTY		6	7/	1
296mg/L	init.	old	new	, Dła	pew	old	new	a second s	new	old	new	old	new	final	Y
Temperature (°C)	20.5		m	1	2200		22.0	22.0		22.0	_/	20		K/	1
DO (mg/L)	87														
рН	7.3												\swarrow		
Cond. (µS/cm)	601					-							/		
Initials	Emm		Ar .	ſ		EM	m	Emm		Emr	n	FM	m	\checkmark	
							•						,	/	em
TOS							Da	ays							
Concentration	0		1 12	~ 2	olto	em	3 24.10	4		5			6	7	1
444 mail TOS	init.	oft	pew	CORRECT ADDRESS SALARY MANY	pew	old	new	old	new	old	new	old	new	final	V
Temperature (°C)	20.5		223		no		22.0	22.0	/	22.0	1	220			
DO (mg/L)	8.7										7		\overline{V}	$ \top $	
pH	7.3			\mathbf{X}			/				/		/		
Cond. (µS/cm)	873	1						17		1				7	1
Initials	Emm		Ar	ħ		Em	m	Emm		EM	n	/Fm	m	1	1
	<u> </u>							1.1.1			,	/		/	em
				_			Da	ays						1	
Concentration	0		1 old	2	ad	ever	3 dd	4		5			6	h	
667mg/LTDS	init.	old	new	Contract of the second s	new	oto	a construction and a second	old	new /	old	new	old	new	final	/
Temperature (°C)			220		20		22.0		/	22.0		22.0	17		1/
DO (mg/L)	8.6						1				1		1/		Y
pH	73						/				/		\vee	-/	i
	289				1							17	4	1	
Initials	Emm		m	[^]		ĒM	m	Emm		EM	\overline{n}	Emr	Y.	1	1
	MURT	1										/		l	1
	MH	(1)													
		ntrol		1						Analysi	s:	AUDI	mm		
Hardness*	100	5								-					
Alkalinity*	70)					-			Review	ed by:	JRE			
* mg/L as CaCO3		,							0	Date rev	iewed:				-
WQ Ranges: T (°C)	= 25 ± 1;														
Sample Description	:	_150	00 W	g/L	TDS	s m	ade	-in-h	xui	sc M	arch	12	14_		-
	_														
Comments:	Brood	board U	ised:												-
Version 1.2 Issued Jar	26.2011											Na	utilus Envi	onmental	

page la

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Sample ID: Work Order #:	Gold TDS	der	Stop Date & Time:									March 21/14 a 1630h April 10/14 a 1400h Geriodaphnia dubia Cyclops vernall emm					
	Days													em			
0			4		2		3	1	4		5	1	6	6	1		
Concentration	0		1				T		1	old	new	old	new	final	/		
1000mg/LTDS	init.	old	newat		new	old	new	old	new		new	120	TIEW //	/	(
	20.5	22.2	22.7	223	\vdash	22.0		22.0	\vdash	22.0	-/-	21.0					
DO (mg/L)	8.0						<u> </u> /		V	·	\bigvee	<u> </u>	¥—	-/			
рН	7.3		Ľ				1		1		1		1	-/			
Cond. (µS/cm)	882	/		/										1/			
Initials	Emm		~	n –		EMM EMM			n	FMM / EMM /							
	er er													em			
	Days																
Concentration	0		1		2	3			4		5		6	7			
1500mg/LTPS	init.	old	new	old	new	old	new	old	new	old	new	old	new	final .	Г		
	20.5	2220		22.0		22.0	/	220		22.0		22.0	1	1			
		600		Une		11.0	\vdash	02.0		anv	\vdash	12.0	-//	<u> </u>			
	<u>8.6</u> 7.3	<u> </u>	\swarrow				¥—-		f		¥						
pH		\vdash		\vdash		\vdash			1	├/	.,		¥——				
	2740					1	100				10						
Initials t	mm	<u> </u>	<u> </u>	M		Ŧm	WY	EMM	b	1 FM	vn	<u>Z</u> M	m.	٧			
Concentration							Da	ays									
	0				2	3		4		5			6	7			
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final			
Temperature (°C)																	
DO (mg/L)																	
pH																	
Cond. (µS/cm)									1		· · · · · · · · · · · · · · · · · · ·						
Initials								<u> </u>		-							
Induis		I		I				I		L				I	I		
	[
Concentration	0	Г	1			Days 3 4						1	6	7			
Concentration	· ····································		Types and a designed	2		a second second				5							
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final			
Temperature (°C)								<u></u>									
DO (mg/L)									<u> </u>					L			
рН											i						
Cond. (µS/cm)							-										
Initials																	
									_								
		ntroi								Analys	ts:	Augt	mm				
Hardness*	160	2								7							
Alkalinity*	70)	,							Reviewed by: JRE							
* mg/L as CaCO3										Date rev	viewed:						
WQ Ranges: T (°C) =	= 25 ± 1;	; DO (m	g/L) = 3	.3 to 8.4	4 (mg/L) ; pH =	6 to 8.5	5									
Sample Description	:							-									
Comments:	Brood	board U	sed:														
Version 1.2 Issued Jan	26, 2011											Na	utilus Envir	ronmental			

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Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client:	Edder					Sta	rt Date &	& Time:	ma	rch2	114	all	301-)
Sample ID:	_TDS					Sto	p Date &			2n1	10/14	ally	ach	
Work Order #:							Test Sp	pecies:	Coriod	aphnia	dubia g	ACIO	os ve	rnalis
		<u>, </u>				ar .		$\overline{\Omega}$	t	<u>~~</u>		-	17	
		6,90	7 ,	er .	2		ays	<u></u>		<u> </u>		2	IC	
Concentration	0 /	<u>/</u>	2			<u> </u>		4		5		3'	7/	
CONATrol	init. old	new	old	new	old	new	old	new	old	new		new	final	
Temperature (°C)	/ 22.0	20.5	225		205		22.0		122.5	22.0	22.5		22.0	
DO (mg/L)	1 6.9	8.6							6.1	8.5				· .
pH	1 167.2	7.4							74	7.9				
Cond. (µS/cm)	35				/				\$5		1		1	
Initials	Ēm		~ ~		<u>^</u>	<u> </u>	EM	m	EMI		EMN	1	FIM M.	
		<u></u>	<u> </u>		/	•							741A	
	<i>t</i>	2	-1	ur.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			a		Δ		1		
O	P ²	1 en	70		0	n Da	~	<u>م</u>	I	<u> </u>	T 1		12	
Concentration	0	<u>^</u>		1		Lotation and	Contraction and the other	And the second second second	D Set Gauge Anderson San	1	CONTRACTOR OF STREET	8		old
	init./ old	new		new	old	new	old	new	old	new	old	new	final	em
Temperature (°C)	/ 22.0		2n5		vrb	/_	22.0			22.0	125		22.0	
DO (mg/L)	/ 7.0	8.0	$ \downarrow $				ļ,	\swarrow	6.4	8.4		·	- /	
pH	/ 6.8	7.2							7.2	7.4				
Cond. (µS/cm)	6	0	/		/				60		1		/	
Initials	EM	m	F		~		Em	\overline{n}	EM	m	EMM	1	EMM	
	/		b			-								
	k	2 .2"	Ŧ	em	8	Ju Di	ays	9		0	1		12	
Concentration	0 /	/	Ź		. ,	1		A.		5		8	1	
444	init/ old	new	old r	new	old	new	old	new	old	new	old	new	finat	old
Temperature (°C)	/ 21.5	710			225	1	22.0		22.5	22.0	22.5		220) em
DO (mg/L)	1 6.8	8.4				/			6.4	8.6				/
pH	1 6.8	18						r	7.2	7.4			- /	
Cond. (µS/cm)	88								88					
Initials	Em						Em	M	EM		FMM	^	Emn	
Initials		<u>ur)</u>	<u>~</u>		m		TIM		TIM	[r]	Cru		EIN J	
		6	-1	m	0			0		A	1	1	-17	
0		2 am			D			<u>q</u>	1	0	T		<u>l</u> a	
Concentration	0	/	<u> 7</u>	2 10.212	, j	/	-	4		5	4		7	0101
66-7	init./ old	new		new	old	new	old	new	old		old	new	final	en
Temperature (°C)	/ 21.5	21.5	22-		22,6	-	22.0				22,5		12.0	
DO (mg/L)	16.T	8.6	-A				ļ,		6.2		<u> </u>			
рН	6.9	6.8					\square			74				
Cond. (µS/cm)	/ 120	17							128	0	/			
Initials	Em	r-1	<u> </u>	-	A)	EM	m	Em	m	FMM	<u>າ</u>	FMM	
/														
								-						
	Control								Analys	sts:	RUDE	mm		
Hardness*	100													
Alkalinity*	70		·							ved by:		E		
* mg/L as CaCO3									Date rev	viewed:				
WQ Ranges: T (°C) =		ng/L) = 3	3.3 to 8.4 (I	mg/L)	; pH =	6 to 8.5	5							
Sample Description														
Comments:	Broodboard L	Jsed:									· · · ·			
Version 1.2 Issued Jan	26, 2011		21.								Nat	utilus Enviro	onmental	

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Sample ID: Work Order #:	Gol	der S	-					p Date	& Time: & Time: pecies:	GC	aphnia	21/1L 5/14 d ubia	1 au lu	10a	malis
·····							0		6	emi	m		·	-1-7-	1
			2 10		7.er	· · · · · · · · · · · · · · · · · · ·	S of Di	ays	_1_		<u> </u>	<u>l</u> .	·	1g	
Concentration	0 /		1		<u>z</u>		<u>s</u>		4		<u>\$</u>		ĝ	1	201
1000	init.	old	new	old	new	and the second second second	new	old	new	old	new	old	new	finet	m
Temperature (°C)	_/_	21.5	21.0	226		25		22.0		12.5	22.0	22.5		22.0	
DO (mg/L)	↓/	167	8.6				1		1	6.1	8.5	\downarrow	1	+ /	
рН	/	6.9	73		<u>/</u>					73	7.4			-/	
Cond. (µS/cm)	<u>/</u>		90					ľ		18=	79	<u> </u>		/	
Initials /		thu1	η			^	·	EMI	<u>m</u>	l Em	m_{-}	EM	m	EMP	p
			, ,		-		~		~					<u> </u>	
			2.0		t en		S ^y Di	ays	9	1	0			ld	
Concentration	0	1	1		2		<u>s </u>		Á		<u>B</u>		<u>x</u>	h	-10
1500	init. /	old	new	old	new	old	new	old	new	old	new	old	new		ald
Temperature (°C)		21.5	21.0	226		no		22.0		125	220	22,5		22.0	
DO (mg/L)		7.0	9.5						<u>/</u>	6.0	8.5				
pH		6.9	72							7.4	7.3				
Cond. (µS/cm)	/		<u> </u>	/				/			70				
Initials	<u>y</u>	FM	m		~	M	·	EM	m	En	m	EM	m	Emm	
· · · · · · · · · · · · · · · · · · ·	· · · · · ·				·									-	r
							Da	ays							
Concentration	0		1		2		3		4		5		6	7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)															
DO (mg/L)						_			ļ						
рН															
Cond. (µS/cm)															
Initials				L			-								
															1
							Da	ys							
Concentration	0	123 17 20 18 and a state	1		2	_	3		4		5		6	7	
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)															
DO (mg/L)															
рН															
Cond. (µS/cm)															
Initials															
									1						
Hendras-*		ntrol							-	Analys	sts:	AWDIE	mm_		
Hardness*	100								-	Deview		JRI			
Alkalinity* * mg/L as CaCO3	70		l						J .	Review Date rev	ved by: viewed:				
WQ Ranges: T (°C) =	= 25 ± 1	DO (m	a/L) = 3	.3 to 8.4	1 (ma/l	.) : nH =	6 to 8.5				nemeu.				
Sample Description		, - (m	J) = U			-, p , r , -	2 10 010								
	-	1													
Comments:	Brood	board U	sed:												
Version 1.2 Issued Jan	26, 2011											Na	utilus Envi	ronmental	

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client:	Go	der	•				Star	t Date &	& Time:	march	21/14	a) It	<i>ъ</i> 0	
Sample ID:	10	5				_	Sto	p Date &	& Time:					
Work Order #:						/		Test Sp	pecies:	G eriodaphn	ia dubia		s verna	<i>ilis</i>
				L)		16	em		Ferr	emm		· ·		r
	13	1	4 0	_H	15	13	Da	ays I	t er	8,0	r 10	gen	20~	
Concentration	1	d	13		zer		6 "		4	15		ø	7	
control	inte	old	new	old	new	old	new	old	new	old ne	w old	new	final	
Temperature (°C)	22.5	22.0	21.0	225		no		22.5		22.5 201			125	
DO (mg/L)		6.6	7.0				\sim			6.2 8.5			0.1	
pH	17	27	7.8						7	7.27.	3 /	1 1	5	
Cond. (µS/cm)	17	35	55	\square						356		7	68	
Initials	Emm	Em	m		-		<u></u>	EMN	1	EMM	EM		min	
				,									,	
mg/LTDS	13	14	ł	14	5)	6 Da	ays	17	18	1	9	20	
Concentration	00	a .	1		2		8	r	4	5		g	ħ	
296	ipit:	old	new	old	new	old	new,	old	new	old ne	w old	new	final	
Temperature (°C)	22.5		22.0	225		mó		22.5		22.5 21.			125	
DO (mg/L)	7	6.5	7.8				/		1	64 8.4			5.2	
pH	1	7.1	7.2	7			r		<u> </u>	7.2 7.1			14	
Cond. (µS/cm)	1	1.2				1	ł. <u></u>	1	I	1,4			29	
Initials	EMM	EM	m	ĥ		M		Emr	n	EMM	Ēħ	m	mm	
			<u> </u>	· ·										
mg/LTDS	13	. 14	4		5		b Da	ays (17	18	1	9	20	
Concentration	N G	d	*		2	r	8		4	5		6	20	
444	inte	old	new	old	new	old	new	old	new	old ne	w old	new,	final	
Temperature (°C)	22.0	22.5	22.0	22		ns		22.5	1/2	25 21.		/ //	22.5	
DO (mg/L)	17	6.4	77				1		1	62 8.4			6.3	
pН		73	7.2		1				1	7.3 7.5	5 /		73	
Cond. (µS/cm)	/	89	0							889			105	
Initials	EMM	EM	m		A	F	-	EMI	m	EMM	En	nn t	thn	
	,													
mailtes	13	.	14	t	5	1	6 Da	iys	17	18		19	26	
Concentration	. 8	ja,	٢`		Ź		ช		A	5		ø	7	
66t e	ipit.	old	new	old	new	old	new	old	new	old ne	w old		final	
Temperature (°C)	12.5	225	144	ma		226		225		22.5 21.	0 22.0	1	2.5	
DO (mg/L)	1	65	1.3							6.3 8.4		1	2.2	
рН		7.2	73						ſ	7.3 7.6	2 /	=	7.4	
Cond. (µS/cm)	/	132	Ч							1309		1	341	
Initials	EMM	FM	in		M	~	-	EMI	n	FMM	FW	1m E	mmy	
	,													
							_							
		troi								Analysts:	AWDIE	mm_		
Hardness*	100										-	<u></u>		
Alkalinity* * mg/L as CaCO3	70								」	Reviewed I		RE		
WQ Ranges: T (°C) :	= 25 + 1.		a/l) = 2	3 to 8	1 (mall) · n4 -	6 to 9 5		L	Date reviewe	u:			
Sample Description		10 (11	9'L) - J	.0 10 0.4	- (ing/L	/, pn -	0 10 0.0							
Campie Besonption														
Comments:	Broodt	board U	sed:											
Version 1.2 Issued Jan	26, 2011										Na	utilus Enviror	mental	

Chronic Freshwater Toxicity Test Initial and Final Water Quality Measurements

Client: Sample ID: Work Order #:	Gad TOS					• •	Stop	o Date	& Time: & Time: pecies:	Apri	(`10/1' aphnia e	4 a	1400k Cyplon) ps ver	nalis
mg/LTDS	13	- 10	Hor	11	2.5	14	⊃ n∕ Da	vs	For		8 or		9. em	20	bmr.
Concentration	0 0	k j			Ž Č		8		A		5		6	7	
1000	init	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)		22.5	120	no		225		225		22.5	21.0	22.0		2nrs	
DO (mg/L)	1	67	7.9					11.5		6.1	8.4		\square	6-1	
pH		7.0	7.3						1	7.2	7.8		1	13	
Cond. (µS/cm)	1		\$3	1		1		17		191				1925	
Initials	Emm	EW			An	h		ŧm	M	EMN	Ň	tm	m	EMM	
			- 1						1						
Mg/LTDS	13		14		15	1	b Da	ays	17		18		9	10	
Concentration	mr o ch	þ	*		2		8		A		5		6	77	
1500 "	inft.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	125	22.5	120	226		256		22.5	/	225	21.0	22.0		22.5	
DO (mg/L)	[]/	6.4	7.9							6.1	83			6.0	
рН		7.2	7.4						X	7.2	77			7.7	
Cond. (µS/cm)			50							27	90	/		2890	2
Initials	FMM	EM	\m		r	A	>	En	nm	EM	<u>m</u>	EM	\sim)	EMM	ħ
			•								•				1
		····						ays			,			1	-
Concentration	ol	2 : 10.1110000000000000000000000000000000	1		2		3		4		5		6	7	
	Jinit	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	<u>p17</u>									 		<u> </u>	· ·		{
DO (mg/L)	+ A					<u> </u>				<u> </u>					
pH	+ / -					<u> </u>									4
Cond. (µS/cm)	Hooka.														1
Initials	EMM	[1
	T^{+}						D	ays							1
Concentration	1/0		1	<u> </u>	2		3	ay 5	4		5		6	7	1
Concentration	/ init.	old	new	old	new	old	new	old	new	old	new	old	new	final	
Temperature (°C)	125	OIG	ine tr	Old	EIGHT.	Ultu		UIG	HOL	UIU.	110-55	- Crist		******	
DO (mg/L)			-						<u> </u>				1		1
pH			1												.
Cond. (µS/cm)					L								. l		1
Initials															1
															1
									_						
<u></u>	Co	ntrol								Analys	sts:	AWD,	EMM		-
Hardness*	- 12	<u> </u>		•											-
Alkalinity*	17	0		·							wed by:		RE		-
* mg/L as CaCO3	- 05 + 4		· · · · · ·	24- 0	A (m = !!	\	6 40 9 4			Date re	viewed:				-
WQ Ranges: T (°C) Sample Description		; DO (m	ig/∟) = 3		+ (mg/L); pn =	0 10 0.5	,							
Sample Description															-
Comments:	Brood	board l	Jsed:												
										1212					-
Version 1.2 Issued Jan	26, 2011											N	autilus Envi	ironmental	

Embryo-Alevin-Fry Toxicity Test Daily Mortality

Client: Sample ID: Work Order #:	<u> </u>						Start Date & Time: <u>March 21/14 as 16300</u> Stop Date: <u>April 10/14 as 1400</u> Test Species: <u>Cy clups Vernalis</u>									
					- No.	$a \parallel u$	le e	ma		·····	I					
(mg/L TOS)		- - -	Day of	Test	-No.	of Mo	rtaliti	-1-	Total	Total	Total No.	Total				
	Rep	Ø	Y	2	7	Y	F	E	Dead Fish	Undeveloped	Fry	Exposed				
Concentration									FISN							
	A	10	i0	10	10	ND	10	10								
	B C		+	++-	++—			┼╂								
actual d	D	++-		++-			++-									
control	A	\vdash		┼┼─	++-		+	┼╂╼								
	B	++	+-	++-	+		++	┼╂─								
	C	-		┼╂─	+	┼╫╌	+	++								
296	D	\vdash	┢╌┠──	┝╋	┼┼╋┈	-	┼┼	┼╂━								
290	A	-+	++-	++	┼╌┼╌╴		+ +	┿╌╋╼╸								
	B	$\left \right $	+	┼╌╉╌	+	 	┼╌┼	┼╌╂─								
	C	$\left \right $			+ +	┝┼┨╴	+	++								
444	D			+		++										
<u> </u>	A				+	┝┼╴┨	┿	┼╋╌		Y.						
	B	0 +								· · · · · · · · · · · · · · · · · · ·						
111	c							 -		ą ,						
667	D						+ +	++		· · · · · · · · · · · · · · · · · · ·						
667	A				┝╌╂╴	++		++								
	B	\vdash														
1000	C						++	++								
1000	D						+									
	Α							++-								
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	Α		1													
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	С															
	D									÷						
	Α									5-						
	В									1						
	С															
	D									-						
Tech Initials		A	A	TIMM	(mr.	EMM	Thm.	EMM								
		`														
Comments:	_(ソミ	5001-	of	SOIN	lost	· thi	2 5/	de hole							
			_													
	JF	न १						-		8 June	2014					
Reviewed by:							-	Date	reviewed:							
Version 1.0; Issued November 5, 2013									Nautilus En	vironmental						
		, 201	-													

page 1 of 3

page 2 of 3

Cyclops vernalis

Embryo-Alevin-Fry Toxicity Test

Client:
Sample ID:
Work Order #:

Gader	
TDS	
na	

Start Date & Time:	march 21/14 as 1630
	April 10/14 a 400
Test Species:	Cyclops Verhalls

			Day of	f Test	- No	of Mo	rtalitie	26	Total				1
(mall)		8					13	14-	Dead	Total	Total No.	Total	
(mg/L) TDS	Rep	A	81	1910	10	N'	Ø	N	Fish	Undeveloped	Fry	Exposed	
	A	5	0	0	6	6	6	õ			Dav	HD CO	13
	B		<u> </u>	1	1Y	ĬD	03	0			- Fe	15 11	D
	c		++-			He	0.	0				<u> </u>	1
control	D					10	0	O.				b. ull	
	A						0	10	w			repR	1
	В	\square					0	de	D			8	
201	С						0	1				n	
296	D					enu	0	0				MAPA	
444	Α				B	E	03	0				10	1
Inn	B		++	\square			B	<u> </u>					-
444	C D	1	++		\square	H-	0						-
		_	<u> </u>	0	0	1	0	2					4
667	A B	3	0			0	0	0,					1
667	C	2	0	0	0	Ø2	0	0					1
	D	1	1	Ť	1	1	0	Ĭ					1
		0	6	+			ŏ	0					1
1000	В		L				0	2					
10-	C	D	Ø				h	Ö,	ham	×		Day 13	vep D
	D				Ð		Br	03	ľ			1 11	
	A						1	Ø					
1500	В						2	V					
150	С		/	\square			0		· · · ·				
	D	V	<u> </u>	J	J	1	0	3					
	A												
	B C							<u> </u>					
	D												
	A		-										
	B												
	С												
	D												
Tech Initials		A	~	EMM	ŧmm	EMM	EMM	ĦMN					
		_								2 I format			
Comments:) <u>'</u>	ép	1000	50	26	9 1	Ister .	I female	w/egg	<u>s</u>	
				yew	ng I	esea	xd	¥ ca	Inted				
					<u> </u>			-					
Deviewed by	, L	JRE				Date reviewed: 8 June 2014							
Reviewed by:						-	Date	eviewed:	· · · · · · · · · · · · · · · · · · ·			-	
Version 1.0; Issued November 5, 2013										Nautilus En	vironmental		

Graps vemalis

Embryo-Alevin-Fry Toxicity Test Daily Mortality

Client:	_Gc	Ide	(Sta		e & Time:	harch 21 april 10/	14a	630
Sample ID:	_10	<u>)5</u>				-			top Date:	april 10/	MDIM)0
Work Order #:		Na	/			-		lest	Species:	Cyclops	verhalls	
-												
(mall)		0	Day of	Test	- No.	of Mo	rtalitie	s	Total	T - 4 - 1	Tatal Na	Tatal
(mg/L) TDS		3	B	17.	10				Dead	Total Undeveloped	Total No.	Total Exposed
TDS	Rep	15	16	17	MB	19	20		Fish	Ondeveloped	weadult	
	Α	\bigcirc	0	ØZ		ØÓ	ØØ				8	
	В	1	<u>}_</u>	O'	2	1	00			,	1+0000	
Cantrul	C	}		enn 1	00		Jon C	ľ			8	bay19 16 top D
	D A			P	2	QE					H O	16 HOD
0.01	B			H	F	HX-	0				8	
296	c			6	15	ŏ	10				4	
	D			ØŠ	10	ĬŎ	ŏ				4	
	Α			0	0	V	00				8	
444	В			0	2	0	0				7	
	0			0		0	O				8	
	D	1		0	0	$\frac{1}{2}$					8	
117	A B		-1		<u> </u>	\vdash	\mathcal{L}				8 Bor	ъ.
667	C		0	2	0	0	\bigcirc				1	
	D	N		0	0	Ĭ	NO				Ť.	
	Α			1	Ø	Ø	2					
1000	В			2	0	Ø	0				6	
	C			0	3	Ø	1				5	
	D			0	0	0				······	b	
1500	A B			0	H -	0	0			ar 1 - 184 f Hand F 184 (1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 -	5	
1500	C		+	ĬŤ	li	0	0			e	- 97	
	D	Y	У.	Ö	i	0	$\overline{\Omega}$				70	
	Α											
	В											
	C											
	D											
	A B											
	c											
	D											
Tech Initials		fub	AWD	#mm	EMM	FMM	Bhn-					
,	~											
Comments:		fe	mal	eu	<u>i e</u>	<u>ags</u>						
	-2)	ter		eve	Leas		Jan	ng,	, <u>cant</u>	PO		
	<u>(3</u>)		Ų	<u> n</u> (Serve	<u>n 0</u>	<u> </u>	<u>+</u>			
Reviewed by:		JRE	5					Date r	eviewed:	8 June	2014	
Version 1.0; Issued N	lovembe	r 5, 201:	3						-		Nautilus En	vironmental

Concentration (mg/L TDS)	Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
Control - 0	A1	1.02	f		B1	1.03	f	15 yng
	A2	1.06	f	39 eggs	B2	0.98	f	
	A4	0.84	f		B3	0.74	f	
	A6	1	f		B5	1	f	
	A8	0.92	f		B6	1.15	f	4 eggs
	A3	0.8	m		B4	0.58	m	
	A5	0.62	m		B7	0.83	m	
	A7	0.63	m		B8	dead		
	A9	dead			B9	dead		
	A10	dead			B10	dead		
	AVG	0.86125				0.901428571		
	Fem	0.968			Fem	0.98		
	Mal	0.683333333	_		Mal	0.705		
	Ratio	63%			Ratio	71%		
	Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
	C1	1.01	f	comments.	D1	1.25	f	16 yng
	C1 C2	1.01	f		D1 D2	1.31	f	
	C2 C3		f		D2 D3		f	11 yng
		0.82	f	10 ores	D3 D7	0.8	-	
	C4	1		19 eggs		1.12	f	
	C6	0.95	f		D8	1	f	
	C7	1.05	f		D4	0.9	m	
	C5	0.74	m		D5	0.72	m	
	C8	0.53	m		D6	0.9	m	
	C9	dead			D9	dead		
	C10	dead			D10	dead		
	AVG	0.89				1.00		
	Fem	0.975			Fem	1.096		
	Mal	0.635			Mal	0.84		
	Ratio	75%			Ratio	63%		
296	Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
	A1	1.02	f		B1	0.8	f	
	A3	1.05	f		B2	1	f	
	A4	1.1	f		B3	1.05	f	
	A5	1.05	f		B4	1.02	f	
	A7	1.02	f		B5	1.2	f	
	A2	0.82	m		B6	1.05	f	8 young
	A6	0.82	m		B7	0.78	m	- / 0
	A8	dead			B8	0.85	m	
	A9	dead			B9	dead		
	A3	dead	+		B10	dead		
	AIU	0.982857143			510	0.96875		
		-	+		For			
	Fem Mal	1.048 0.82	+		Fem Mal	1.02 0.815		
		-	_					
	Ratio	71%	£ /		Ratio	75%	£ /	
	Rep	Length (mm)	f/m	comments:	Rep	Length (mm)		comments:
	C1	0.7	f		D1	1	f	
	C3	0.8	f		D3	1.05	f	
	C4	0.98	f		D4	0.92	f	
	C2	0.52	m	ļ	D5	1.05	f	
	C5	dead	_		D6	1.08	f	
	C6	dead			D7	0.88	f	
	C7	dead			D2	0.8	m	
	C8	dead			D8	dead		
	C9	dead			D9	dead		
	C10	dead			D10	dead		1
		0.75	1	1	1	0.968571429		
	AVG	0.75						
	AVG Fem				Fem	0.996666667		
	AVG Fem Mal	0.826666667			Fem Mal	0.996666667 0.8		

Control	Mean	SD
Survival	77.5%	5.0%
Growth	0.913	0.060
Female growth	1.005	0.061
Male growth	0.716	0.088
Ratio	67.9%	6.4%

296 mg/L TDS Survival 62.5% 17.1% Growth 0.918 0.112 Female growth 0.973 0.100 Male growth 0.739 0.146 Ratio 76.8% 6.2%

Λ	Λ	Λ
-	-	_

Rep	Length (mm)		comments:	Rep	Length (mm)	f/m	comments:
A1	1.1	f	10 young	B2	1.12	f	
A2	1.08	f	~20 eggs	B4	1.25	f	
A3	1.02	f		B5	1.12	f	
A6	1.25	f		B7	1.1	f	
A7	0.8	f		B1	0.88	m	
A8	1.12	f		B3	0.9	m	
A4	0.8	m		B6	0.98	m	
A5	0.75	m		B8			
A9	dead			B9	dead		
A10	dead			B10	dead		
AVG	0.99				1.05		
Fem	1.061666667			Fem	1.1475		
Mal	0.775			Mal	0.92		
Ratio	75%			Ratio	57%		
Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
C1	0.95	f		D2	1.2	f	
C2	1.2	f		D4	1.23	f	
C5	1.15	f		D5	1.3	f	
C6	1.18	f		D6	1.05	f	
C7	1.25	f		D1	0.89	m	
C3	0.98	m		D3	1	m	
C4	1	m		D7	dead		
C8	1	m		D8	dead		
C9	dead	-		D9	dead		1
C10	dead			D10	dead		
AVG	1.08875			510	1.111666667		
Fem	1.146			Fem	1.195		
Mal	0.993333333			Mal	0.945		
Ratio	63%			Ratio	67%		
Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
A2	1.22	f	connents.	B1	n/a	.,	*jar broken
A3	1.28	f		B2	n/a		jui broken
44 44	1.35	f		B3	n/a		
A5	1.12	f		B4	n/a		
A6	1.12	f		B5	n/a		
A0 A8	1.4	f	ł	B5 B6	n/a		
40 A1	0.98	m		B7	n/a		
	-					_	
A7	0.8	m		B8	n/a		
A9	dead	_		B9	n/a	_	
A10	dead			B10	n/a	_	
-	1.175	_		+	n/a	_	
Fem	1.27	_		+		_	
Mal	0.89			D. ··		_	
Ratio	0.75			Ratio			
Rep	Length (mm)	f/m	comments:	Rep	Length (mm)		comments:
C1	1.2	f		D4	1.22	f	~ 18 eggs
C2	1.12	f		D5	1.22	f	
C3	1.05	f		D6	1.3	f	
C4	1.3	f		D7	1.4	f	
C5	1.2	f		D1	0.88	m	
C6	0.98	m		D2	0.9	m	
C7	dead			D3	1	m	
C8	dead			D8	dead		
C9	dead			D9	dead		
C10	dead			D10	dead		
AVG	1.141666667			1	1.131428571		
Fem	1.174			Fem	1.285		
Mal	0.98			Mal	0.926666667		

444 mg/L TDS	Mean	SD
Survival	72.5%	9.6%
Growth	1.060	0.053
Female growth	1.138	0.055
Male growth	0.908	0.094
Ratio	65.3%	7.5%

667 mg/L TDS Survival

Female growth

Male growth

Growth

Ratio

70.0%

1.149

1.243

0.932

71.8%

10.0%

0.023

0.060

0.045

13.4%

667

Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
A1	1.15	f		B2	1.02	f	
A2	1.12	f		B3	1.3	f	
A4	1.32	f		B4	1.25	f	
A6	1.02	f		B6	1.32	f	
A3	0.95	m		B1	0.97	m	
A5	1.05	m		B5	0.9	m	
A7	0.98	m		B7	dead		
A8	dead			B8	dead		
A9	dead			B9	dead		
A10	dead			B10	dead		
AVG	1.084285714				1.126666667		
Fem	1.1525			Fem	1.2225		
Mal	0.993333333			Mal	0.935		
Ratio	57%			Ratio	67%		
Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
C1	1.38	f		D2	1.04	f	
C2	1	f		D3	1.12	f	
C3	0.97	f		D4	0.95	f	
C4	0.91	f	ſ	D5	1.25	f	11 yng
C5	0.85	m		D6	1.11	f	
C6	dead			D1	1	m	
C7	dead			D7	dead		
C8	dead			D8	dead		
C9	dead			D9	dead		
C10	dead			D10	dead		
AVG	1.022				1.078333333		
Fem	1.065			Fem	1.094		
Mal	0.85			Mal	1		
Ratio	80%			Ratio	83%		
Rep	Length (mm)	f/m	comments:	Rep	Length (mm)	f/m	comments:
A1	1.05	f.,	~ 13 eggs	B1	0.8	f	
A2	0.95	f	13 6883	B2	0.78	f	
A5	0.95	f		B3	1	f	
A6	1	f		B4	0.95	f	
A3	0.75	m		B5	0.95	f	
A4	0.8	m		B6	dead	-	* all females
A7	dead			B7	dead		un remaies
A8	dead			B8	dead		
A8 A9	dead			B9	dead		
A10	dead			B10	dead		
AVG	0.916666667			010	0.896		
	0.9875			Fem	0.896		
Fem Mal	0.775	_		Mal	0.090		
Ratio	67%			Ratio	100%		
		f/m	commonte		-	f/~	commonte
Rep C1	Length (mm)	f/m	comments:	Rep D1	Length (mm) 1.05	f/m f	comments:
	0.98	f				f	
C4	0.75			D2	0.95		
C5	0.9	f		D3	0.8	f	
C6	1.02	f		D5	0.97		
C7	0.97	f		D4	0.62	m	+
C2	0.72	m		D6	0.72	m	ļ
C3	0.65	m		D7	dead		ļ
C8	dead			D8	dead	_	
C9	dead			D9	dead		
C10	dead			D10	dead		
AVG	0.855714286				0.851666667		
Fem	0.924			Fem	0.9425		
				1	0.07		
Mal Ratio	0.685 71%			Mal Ratio	0.67 67%		

1000 mg/L TDS	Mean	SD
Survival	60.0%	8.2%
Growth	1.078	0.043
Female growth	1.134	0.070
Male growth	0.945	0.069
Ratio	71.8%	12.1%

1500 mg/L TDS Survival

Female growth

Male growth

Growth

ratio

60.0%

0.880

0.938

0.710

76.2%

8.2%

0.032

0.038

0.057

16.0%

1500

Notes

М

Eggs Unhatched eggs observed at test termination

Young Neonates that hatched during exposure

Male

Ratio Ratio of females:males in the test cotainer

APPENDIX B – Analytical Chemistry



NAUTILUS ENVIRONMENTAL ATTN: Jeslin Wijaya 8664 Commerce Court Imperial Square Lake City Burnaby BC V5A 4N7 Date Received:14-MAR-14Report Date:21-MAR-14 17:26 (MT)Version:FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #:

NOT SUBMITTED

1

L1432679

Job Reference: C of C Numbers: Legal Site Desc:

Project P.O. #:

Janie Ja

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Environmental 🐊

www.alsglobal.com

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L1432679 CONTD.... PAGE 2 of 4 21-MAR-14 17:26 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

			Vers	Version: FINAL		
	Sample ID Description Sampled Date Sampled Time	L1432679-1 Water 14-MAR-14	L1432679-2 Water 14-MAR-14	L1432679-3 Water 14-MAR-14	L1432679-4 Water 14-MAR-14	L1432679-5 Water 14-MAR-14
	Client ID	CONTROL	296 MG/L TDS	444 MG/L TDS	667 MG/L TDS	1000 MG/L TDS
Grouping	Analyte					
WATER						
Physical Tests	Total Dissolved Solids (mg/L)	209	361	529	783	1140
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	76.9	21.7	32.1	45.6	73.7
	Chloride (Cl) (mg/L)	2.25	147	218	339	515
	Sulfate (SO4) (mg/L)	97.6	26.3	38.2	58.8	84
Total Metals	Calcium (Ca)-Total (mg/L)	16.6	61.6	91.8	138	204
	Magnesium (Mg)-Total (mg/L)	13.7	7.08	10.7	15.8	23.6
	Potassium (K)-Total (mg/L)	2.8	3.0	4.5	6.5	9.8
	Sodium (Na)-Total (mg/L)	38.4	34.3	52.5	80.9	122

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

				versi	011.	FINAL
	Sample ID Description Sampled Date Sampled Time	L1432679-6 Water 14-MAR-14 1500 MG/L TDS				
	Client ID	1300 MG/E 123				
Grouping	Analyte					
WATER						
Physical Tests	Total Dissolved Solids (mg/L)	1790				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	111				
	Chloride (Cl) (mg/L)	772				
	Sulfate (SO4) (mg/L)	135				
Total Metals	Calcium (Ca)-Total (mg/L)	304				
	Magnesium (Mg)-Total (mg/L)	37.4				
	Potassium (K)-Total (mg/L)	15.0				
	Sodium (Na)-Total (mg/L)	186				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments: QC Type Description Parameter Qualifier Applies to Sample Number(s) Matrix Spike Calcium (Ca)-Total MS-B L1432679-1, -2, -3, -4, -5, -6 **Qualifiers for Individual Parameters Listed:** Qualifier Description MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. Test Method References: ALS Test Code Matrix **Test Description** Method Reference** ALK-COL-VA Water Alkalinity by Colourimetric (Automated) EPA 310.2 This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method. ANIONS-CL-IC-VA Water Chloride by Ion Chromatography APHA 4110 B. This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". ANIONS-SO4-IC-VA Water Sulfate by Ion Chromatography APHA 4110 B. This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Total Metals in Water by ICPOES EPA SW-846 3005A/6010B **MET-TOT-ICP-VA** Water This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B). APHA 2540 C - GRAVIMETRIC **TDS-VA** Water Total Dissolved Solids by Gravimetric This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA Chain of Custody Numbers: 1 **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Nautilus Environmental



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1 Control	14-Mar-14		Water	125mL & 1L	2			x	x	x	x	x	x	x	x		
2 296 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			x	x	x	x	x	x	x	x		
3 444 mg/L TDS	14-Mar-14		Water	125mL & 1L	2	· · · · · · · · · · · · · · · · · · ·	·	×	x	x	x	x	x	x	x		
4 667 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			x	x	x	x	x	x	x	x		
5 1000 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			×	x	x	x	x	x	x	x		
6 1500 mg/L TDS	14-Mar-14		Water	125mL & 1L	2			×	x	x	x	x	x	x	x		
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Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.



NAUTILUS ENVIRONMENTAL ATTN: Emma Marcus 8664 Commerce Court Imperial Square Lake City Burnaby BC V5A 4N7

Date Received: 16-APR-14 Report Date: 23-APR-14 15:10 (MT) Version: FINAL

Client Phone: 604-420-8773

Certificate of Analysis

Lab Work Order #:

NOT SUBMITTED

L1443825

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

Janie J

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



www.alsglobal.com

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L1443825 CONTD.... PAGE 2 of 4 23-APR-14 15:10 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

				Vers	ion: FINAL	
	Sample ID Description Sampled Date Sampled Time Client ID	L1443825-1 Water 11-APR-14 CTRL-0MG/L TDS	L1443825-2 Water 11-APR-14 276 MG/L TDS	L1443825-3 Water 11-APR-14 444 MG/L TDS	L1443825-4 Water 11-APR-14 667 MG/L TDS	L1443825-5 Water 11-APR-14 1000 MG/L TDS
Grouping	Analyte					
WATER	Allalyte					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	73.3	23.6	34.5	48.6	79.8
	Chloride (Cl) (mg/L)	2.35	150	228	337	517
	Sulfate (SO4) (mg/L)	94.5	26.7	39.2	58.8	89
Total Metals	Calcium (Ca)-Total (mg/L)	16.5	61.3	91.2	138	205
	Magnesium (Mg)-Total (mg/L)	13.8	7.55	11.2	17.1	25.5
	Potassium (K)-Total (mg/L)	2.5	2.9	4.3	6.6	9.9
	Sodium (Na)-Total (mg/L)	33.5	35.6	52.5	79.5	119

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID L1443825-6 Description Water Sampled Date 11-APR-14 Sampled Time International Client ID Client ID 1500 MG/L TDS	
Grouping Analyte	
WATER	
Anions and Alkalinity, Total (as CaCO3) (mg/L) 95.6	
Chloride (Cl) (mg/L) 780	
Sulfate (SO4) (mg/L) 136	
Total Metals Calcium (Ca)-Total (mg/L) 295	
Magnesium (Mg)-Total (mg/L) 38.0	
Potassium (K)-Total (mg/L) 14.7	
Sodium (Na)-Total (mg/L) 178	

L1443825 CONTD.... PAGE 3 of 4 23-APR-14 15:10 (MT)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
This analysis is carried ou colourimetric method.	ut using proce	dures adapted from EPA Method 310.2 "Alkalinit	ty". Total Alkalinity is determined using the methyl orange
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
		dures adapted from APHA Method 4110 B. "Ion Determination of Inorganic Anions by Ion Chroma	Chromatography with Chemical Suppression of Eluent atography".
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
5	01	dures adapted from APHA Method 4110 B. "Ion Determination of Inorganic Anions by Ion Chroma	Chromatography with Chemical Suppression of Eluent atography".
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
American Public Health A States Environmental Pro	Association, an otection Agend	nd with procedures adapted from "Test Methods cy (EPA). The procedures may involve prelimina	Examination of Water and Wastewater" published by the for Evaluating Solid Waste" SW-846 published by the United ry sample treatment by acid digestion, using either hotblock or plasma - optical emission spectrophotometry (EPA Method
* ALS test methods may inc	corporate mod	difications from specified reference methods to in	nprove performance.
The last two letters of the	above test co	de(s) indicate the laboratory that performed ana	lytical analysis for that test. Refer to the list below:
Laboratory Definition Co	de Labo	ratory Location	
VA		NVIRONMENTAL - VANCOUVER, BRITISH CO	

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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Nautilus Environmental

TESTING LOCATION (Please Circle)



L1443825-COFC

British Columbia 8664 Commerce Court

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Burnaby, British Columbia, Canada V5A 4N3 Phone 604.420.8773

Chain of Custody

april 15/14

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276 mg/LTDS	April 11/14		1				$ \times \times$	\times	\times \times	\times		
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Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

	[Day 0 - Mar	ch 21, 2014			
mg/L TDS	Control	296	444	667	1000	1500
mg/L						
Alkalinity	76.9	21.7	32.1	45.6	73.7	111
Cl	2.25	147	218	339	515	772
SO4	97.6	26.3	38.2	58.8	84	135
Ca	16.6	61.6	91.8	138	204	304
Mg	13.7	7.08	10.7	15.8	23.6	37.4
К	2.8	3	4.5	6.5	9.8	15
Na	38.4	34.3	52.5	80.9	122	186
Day 0 TDS	217.5	292.3	435.0	666.4	1002.6	1516.0

Day 20 - April 10, 2014											
mg/L TDS	Control	296	444	667	1000	1500					
mg/L											
Alkalinity	73.3	23.6	34.5	48.6	79.8	95.6					
CI	2.35	150	228	337	517	780					
SO4	94.5	26.7	39.2	58.8	89	136					
Ca	16.5	61.3	91.2	138	205	295					
Mg	13.8	7.55	11.2	17.1	25.5	38					
К	2.5	2.9	4.3	6.6	9.9	14.7					
Na	33.5	35.6	52.5	79.5	119	178					
Day 20 TDS	207.1	298.2	447.1	666.2	1013.3	1499.1					
Average TDS	212.3	295.3	441.0	666.3	1008.0	1507.5					