



Results of Wet Weather Chronic Toxicity Testing for the City of Irwindale

❖ Sample Collection Date: January 9, 2018

Prepared for: CASC Engineering & Consulting, Inc.
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Prepared by: Nautilus Environmental
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Report Submitted: January 29, 2018

Data Quality Assurance:

- Nautilus Environmental is accredited in accordance with NELAP by the State of Oregon Environmental Laboratory Accreditation Program (Certificate No. 4053). It is also certified by the State of California Water Resources Control Board Environmental Laboratory Accreditation Program (Certificate No. 1802) and the State of Washington Department of Ecology (Lab ID C552). Specific fields of testing applicable to each accreditation are available upon request.
- All data have been reviewed and verified.
- All test results have met minimum test acceptability criteria under their respective EPA protocols, unless otherwise noted in this report.
- All test results have met internal Quality Assurance Program requirements.

Results verified by: Adrienne Gibor

Introduction

Bioassay testing was performed on one sample from the City of Irwindale, California to evaluate the toxicity of storm water runoff to the water flea (*Ceriodaphnia dubia*). Sampling and testing was conducted to satisfy requirements in the Los Angeles Region MS4 permit (Order No. R4-2012-0175). The sample was collected during a storm event that occurred on January 9, 2018. The toxicity screening test was conducted at Nautilus Environmental (Nautilus) in San Diego, California between January 9 and 16, 2018.

Materials and Methods

Test Material

Test material consisted of one storm water sample collected by CASC Engineering & Consulting, Inc. personnel under the direction of Mr. Ed Suher. The sample was hand delivered to Nautilus on the same day as collection.

Upon arrival at Nautilus, an aliquot of the sample was drawn and water quality parameters of pH, dissolved oxygen (DO), conductivity, salinity, alkalinity, hardness, and temperature were measured and recorded. The sample was stored in the dark at 4° C until used for testing. A summary of the sample collection and receipt times is provided in Table 1.

Table 1. Sample Collection and Receipt Times

Sample ID	Sample Collection Date; Time	Sample Receipt Date; Time
SAWPW-074A	1/9/18; 11:40	1/9/18; 13:50

Chronic Toxicity Methods

Testing was conducted in accordance with methods published in USEPA (2002). Test specifications are summarized in Table 2.

In accordance with permit requirements, chronic toxicity test biological endpoint data was analyzed using the Test of Significant Toxicity (TST) t-test approach specified in the USEPA NPDES TST Implementation Document (USEPA 2010). For this monitoring program, the critical chronic in-stream waste concentration (IWC) is set at 100 percent sample (i.e. no dilution). A pass/fail result is reported per the TST method comparing the 100 percent sample to the lab control. The TST analysis was performed using the Comprehensive Environmental Toxicity Information System™ (CETIS) by Tidepool Scientific Software. The TST method applies a modified t-test that takes into account both the statistical power of the test and magnitude of biological effects in determining the presence of a response. Results are reported as "Pass" if a sample is considered non-toxic according to the TST calculation, or "Fail" if considered toxic according to TST.

Table 2. Chronic *C. dubia* Test Specifications

Test Start Date, Time:	1/9/18, 15:15
Test End Date, Time:	1/16/18, 11:15
Test Organism:	<i>Ceriodaphnia dubia</i> (water flea)
Test Organism Source; Age:	In-house culture; < 8 hours
Lab Control Water:	EPA diluted mineral water (80% deionized water and 20% Perrier®)
Test Concentrations:	100 percent sample; lab control
Endpoints/Protocol:	Survival and Reproduction/ EPA/821/R-02-013, USEPA 2002
Acceptability Criteria:	Mean control survival ≥ 80%; ≥ 60% of surviving females producing 3 or more broods; mean number of offspring ≥ 15 per surviving female.
Statistical Analysis Software/ Analysis:	CETIS™, version 1.8.7.20/ TST Analysis

Results

There were no adverse effects observed in water flea survival or reproduction in both the SAWPW-074A sample; both endpoints passed the TST analysis. A summary of results is presented in Table 3. Complete statistical analyses and raw bench datasheets are provided in Appendix A. Water quality measurements recorded at sample check-in and a copy of the chain of custody form are provided in Appendices B and C, respectively.

Table 3. Summary of *C. dubia* Survival and Reproduction Results

Sample ID (100% sample)	Mean Percent Survival	PE (%)	TST Result (Pass/Fail)	Mean Reproduction (# neonates)	PE (%)	TST Result (Pass/Fail)
Lab Control	100	-	-	18.5	-	-
SAWPW-074A	100	0.0	Pass	24.1	-30	Pass

TST analysis is not appropriate for the *C. dubia* chronic survival endpoint because the test design includes only one organism per replicate. Therefore, the result for the chronic survival endpoint is based on percent effect (PE) compared to control calculated as: ((mean response in control - mean response in sample)/mean response in control) *100. A negative PE indicates better organism performance in the sample compared to that in the control. For the survival endpoint, the TST result is considered a Pass (non-toxic) if PE <25 and a Fail (toxic) if PE ≥ 25.

TST: Pass = sample is non-toxic according to the TST calculation; Fail = sample is toxic according to the TST calculation

Quality Assurance

The sample was received under appropriate conditions and the test was initiated within the 36-hour holding time. Mean control responses met minimum acceptability criteria. Appropriate alpha levels were used for statistical analyses according to the TST Implementation Document guidelines (USEPA 2010). A list of laboratory qualifier codes used on raw data sheets is available in Appendix D.

Results for the monthly reference toxicant test used to monitor laboratory performance and test organism sensitivity are summarized in Table 4. All test acceptability criteria were met. Additionally, the median lethal and median effect concentrations (LC_{50}/EC_{50}) were within two standard deviations (SD) from the historical mean, indicating that the test organisms exhibited typical sensitivity to copper as that historically observed in the Nautilus laboratory. The survival and reproduction control charts for the past 20 reference toxicant tests conducted at Nautilus are presented in Appendix E.

Table 4. Summary of Statistical Results for the Reference Toxicant Test

Test Endpoint	NOEC ($\mu\text{g/L}$ copper)	LC_{50}/EC_{50} ($\mu\text{g/L}$ copper)	Historical LC_{50}/EC_{50} ± 2 SD ($\mu\text{g/L}$ copper)
Survival	50	61.6	67.6 ± 22.9
Reproduction	50	75.2	65.2 ± 21.3

NOEC = the highest concentration tested that results in no observed effect.

LC_{50}/EC_{50} = concentration expected to cause mortality or an adverse effect to 50 percent of the test organisms.

Historical $LC_{50}/EC_{50} \pm 2$ SD = the mean LC_{50} or EC_{50} from the previous 20 tests performed by Nautilus, plus or minus two standard deviations.

References

- Tidepool Scientific Software. 2000-2013. CETIS Comprehensive Environmental Toxicity Information System Software, Version 1.8.7.20.
- USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications under the National Pollutant Discharge Elimination System, (EPA-R-00-003). USEPA Office of Wastewater Management, Washington DC. June 2000.
- USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition (EPA-821-R-02-013). USEPA Office of Water, Washington DC.
- USEPA. 2010. National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document. EPA/833/R-10/003. June 2010.

Appendix A

Raw Data and Statistical Summaries

CETIS Summary Report

Report Date: 22 Jan-18 09:52 (p 1 of 1)
Test Code: 1801-S182 | 05-3180-3375

Ceriodaphnia 3 Brood Survival & Reproduction Test							Nautilus Environmental (CA)				
Batch ID:	04-1445-4794		Test Type:	Reproduction and Survival			Analyst:				
Start Date:	09 Jan-18 15:15		Protocol:	EPA/821/R-02-013 (2002)			Diluent:	Not Applicable			
Ending Date:	16 Jan-18 11:15		Species:	Ceriodaphnia dubia			Brine:	Not Applicable			
Duration:	6d 20h		Source:	In-House Culture			Age:	<8h			
Sample ID:	01-4343-1929		Code:	18-0016			Client:	Aei-Casc Consulting			
Sample Date:	09 Jan-18 11:40		Material:	Stormwater			Project:				
Receive Date:	09 Jan-18 13:50		Source:	Aei-Casc							
Sample Age:	4h (9 °C)		Station:	City of Irwindale							
Comparison Summary											
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method			
00-1651-8841	3 Brood Reproduction		100	>100	NA	5.28%	1	TST-Welch's t Test			
08-5191-7240	3 Brood Survival		100	>100	NA	NA	1	Fisher Exact Test			
Test Acceptability											
Analysis ID	Endpoint		Attribute		Test Stat	TAC Limits		Overlap	Decision		
00-1651-8841	3 Brood Reproduction		Control Resp		18.5	15 - NL		Yes	Passes Acceptability Criteria		
08-5191-7240	3 Brood Survival		Control Resp		1	0.8 - NL		Yes	Passes Acceptability Criteria		
00-1651-8841	3 Brood Reproduction		PMSD		0.05279	0.13 - 0.47		Yes	Below Acceptability Criteria [Ⓐ]		
3 Brood Reproduction Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	10	18.5	16.44	20.56	12	22	0.9098	2.877	15.55%	0.0%
100		10	24.1	22.06	26.14	20	28	0.9	2.846	11.81%	-30.27%
3 Brood Survival Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%
3 Brood Reproduction Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Control	17	20	22	12	20	20	19	17	21	17
100		27	28	21	21	24	23	24	26	20	27
3 Brood Survival Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Control	1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Ⓐ PMSD test acceptability criteria does not apply to TST analysis

CETIS Analytical Report

Report Date: 22 Jan-18 09:31 (p 1 of 1)
Test Code: 1801-S182 | 05-3180-3375

Ceriodaphnia 3 Brood Survival & Reproduction Test Nautilus Environmental (CA)

Analysis ID: 00-1651-8841	Endpoint: 3 Brood Reproduction	CETIS Version: CETISv1.8.7
Analyzed: 22 Jan-18 9:31	Analysis: Parametric Bioequivalence-Two Sample	Official Results: Yes

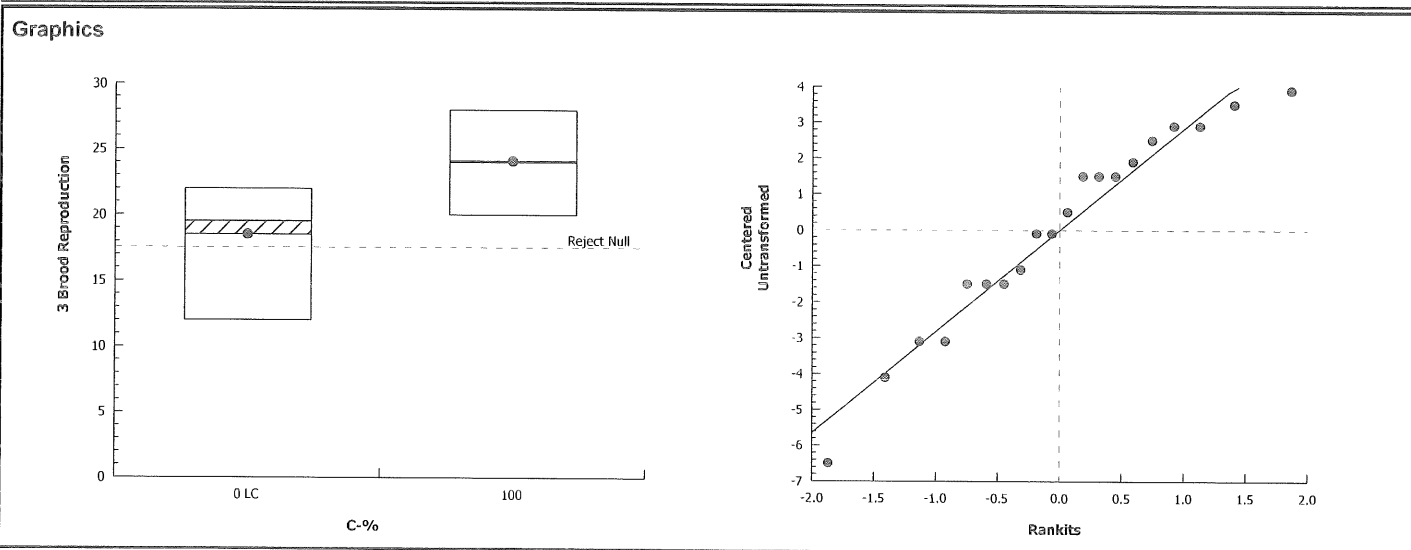
Data Transform	Zeta	Alt Hyp	Trials	Seed	TST b	PMSD	Test Result
Untransformed	NA	C*b < T	NA	NA	0.75	5.28%	Passes 3 brood reproduction

TST-Welch's t Test									
Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:20%)
Lab Control		100*	9.053	0.8647	0.977	16	<0.0001	CDF	Non-Significant Effect

ANOVA Table						
Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	156.8	156.8	1	19.15	0.0004	Significant Effect
Error	147.4	8.188889	18			
Total	304.2		19			

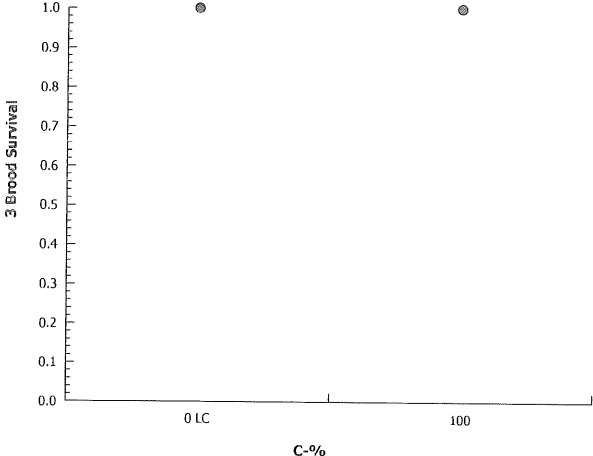
Distributional Tests					
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.022	6.541	0.9747	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9521	0.866	0.4006	Normal Distribution

3 Brood Reproduction Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	10	18.5	16.44	20.56	19.5	12	22	0.9098	15.55%	0.0%
100		10	24.1	22.06	26.14	24	20	28	0.9	11.81%	-30.27%



CETIS Analytical Report

Report Date: 22 Jan-18 09:31 (p 1 of 1)
 Test Code: 1801-S182 | 05-3180-3375

Ceriodaphnia 3 Brood Survival & Reproduction Test						Nautilus Environmental (CA)	
Analysis ID: 08-5191-7240		Endpoint: 3 Brood Survival		CETIS Version: CETISv1.8.7			
Analyzed: 22 Jan-18 9:30		Analysis: Single 2x2 Contingency Table		Official Results: Yes			
Data Transform		Zeta	Alt Hyp	Trials	Seed	Test Result	
Untransformed			C > T	NA	NA	Passes 3 brood survival	
Fisher Exact Test							
Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)	
Lab Control		100	1	1.0000	Exact	Non-Significant Effect	
Data Summary							
C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Control	10	0	10	1	0	0.0%
100		10	0	10	1	0	0.0%
Graphics							
							

Client/Sample ID: CASC Engineering/ City of Irwindale (SAWRN) Start Date/Time: 1/9/2018 1515
 Test Number: 1801-S182 End Date/Time: 1/16/2018 1115

Conc.	Rep	Rand #	Daily Reproduction/ Survival								Total	QC
			1	2	3	4	5	6	7	8		
LC	1	19	0	0	0	4	5	0	8		17	
	2	8	0	0	0	4	0	7	9		20	
	3	9	0	0	0	4	0	8	10		22	
	4	1	0	0	0	4	0	8	10		12	
	5	11	0	0	0	4	0	6	10		20	
	6	10	0	0	0	4	0	7	9		20	
	7	20	0	0	0	4	0	0	9		19	
	8	14	0	0	0	4	5	0	8		17	
	9	12	0	0	0	3	8	0	10		21	
	10	4	0	0	0	4	0	5	8		17	
Tech: ACS RT ACS RT KFP LTP RT			Mean neonates/surviving female (for TAC): 18.5									150

Conc.	Rep	Rand #	Daily Reproduction/ Survival								Total	QC
			1	2	3	4	5	6	7	8		
100	1	3	0	0	0	6	7	0	14		27	
	2	18	0	0	0	5	8	0	15		28	
	3	15	0	0	0	3	6	0	12		21	
	4	16	0	0	0	3	5	0	13		21	
	5	5	0	0	0	4	0	9	11		24	
	6	17	0	0	0	4	5	0	15		23	
	7	7	0	0	0	4	0	7	13		24	
	8	6	0	0	0	3	0	9	14		26	
	9	13	0	0	0	4	7	0	12		20	
	10	2	0	0	0	4	0	9	14		27	14

Conc.	Rep	Rand #	Daily Reproduction/ Survival								Total	QC
			1	2	3	4	5	6	7	8		

Conc.	Rep	Rand #	Daily Reproduction/ Survival								Total	QC
			1	2	3	4	5	6	7	8		

Neonates for each replicate were blocked across concentrations at test initiation

Rep:	1	2	3	4	5	6	7	8	9	10
Board:	150						151		152	
Cup:	15	32	44	49	57	59	54	60	53	9
Rand # QC:	ACS									
Verified By:	CH									
Initiated By:	ACS									
QC'd By:	LTP									

Time Fed/Test Solution Renewed (day):

(0) 1515 (1) 1040 (2) 1415 (3) 1305 (4) 1305 (5) 1215 (6) 1055 (7) —

Notes: d = dead; M = male; LIP = lost in progress; B = 4th brood (only the first 3 broods are included in total)

* = dead neonates observed, but only live neonate counts recorded

QC Check: AC 1/19/18

Final Review: KFP 1/28/18

Freshwater Chronic Bioassay

Water Quality Measurements

Client: CASC Engineering/ City of Irwindale

Test Species: *C. dubia*

Sample ID: SAWPW

Start Date/Time: 1/9/2018 15:15

Test No: 1801-S182

End Date/Time: 1/16/2018 11:15

Concentration	Lab Control							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.14	8.20	8.13	8.08	8.05	8.15	8.12	
DO (mg/L)	7.1	7.7	7.2	7.4	7.1	6.9	7.10	
Cond. (µmhos/cm)	183	190	198	188	194	191	191	
Temp (°C)	25.3	25.4	25.5	25.6	24.3	24.0	25.1	
Final								
pH		8.16	7.97	8.00	8.04	8.14	8.05	8.12
DO (mg/L)		7.9	7.2	7.3	6.4	7.9	8.0	8.4
Temp (°C)		25.3	24.8	24.5	24.1	23.9	24.1	24.3

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.51	7.30	7.41	7.12	7.12	7.08	7.07	
DO (mg/L)	7.4	7.9	6.5	6.9	6.1	6.6	7.10	
Cond. (µmhos/cm)	115	125	130	129	128	129	128	
Temp (°C)	24.6	25.5	25.7	25.6	25.5	24.2	25.1	
Final								
pH		7.80	7.78	7.70	7.13	7.89	7.70	7.70
DO (mg/L)		7.5	7.1	7.2	6.2	7.7	7.8	8.1
Temp (°C)		25.3	24.8	24.5	24.1	23.9	24.1	24.3

Concentration								
Day	0	1	2	3	4	5	6	7
Initial								
pH								
DO (mg/L)								
Cond. (µmhos/cm)								
Temp (°C)								
Final								
pH								
DO (mg/L)								
Temp (°C)								

Concentration								
Day	0	1	2	3	4	5	6	7
Initial								
pH								
DO (mg/L)								
Cond. (µmhos/cm)								
Temp (°C)								
Final								
pH								
DO (mg/L)								
Temp (°C)								

	0	1	2	3	4	5	6	7
Analysts: Initial:	ACS	TN	DM	BO	BO	CH	LTP	—
Final:	—	ACS	ACS	ACS	CG	CH	LTP	ACS
Dilutions made by:	ACS	ACS	ACS	AD	CG	ACS	AD	—
Sample Used (A, B, C):	A	A	A	A	A	A	A	—

Comments: ④ Q19 ACS 1/9/18

Animal Source/Date Received: Internal N/A

Animal Age at Initiation: 28 hrs

Sample Log-in Numbers: A: 18-0016

B: —

C: —

QC Check: AC 1/19/18

Final Review: KFP 1/28/18

Appendix B

Sample Check-In Information

Nautilus Environmental
4340 Vandever Avenue
San Diego, CA 92120

Sample Check-In Information

Client: CASC

Tests Performed: C. dubia chronic

Project: City of Irwindale
Stormwater

Test ID No.(s): 1801-S182 + S183

Sample ID:	1) <u>15AWP-074A</u>	2)	3	4)
Log-in No. (18-xxxx):	<u>0016</u>			
Sample Collection Date & Time:	<u>1/9/18 1140</u>			
Sample Receipt Date & Time:	<u>1/9/18 1350</u>			
Number of Containers & Container Type:	<u>14L cubi</u>			
Approx. Total Volume Received (L):	<u>~4L</u>			
Check-in Temp (°C)	<u>9.0</u>			
Temperature OK? ¹	<u>(Y) N</u>	<u>Y N</u>	<u>Y N</u>	<u>Y N</u>
DO (mg/L)	<u>10.1</u>			
pH (units)	<u>7.54</u>			
Conductivity (µS/cm)	<u>135</u>			
Salinity (ppt)	<u>0.1</u>			
Alkalinity (mg/L) ²	<u>36</u>			
Hardness (mg/L) ^{2,3}	<u>58</u>			
Total Chlorine (mg/L)	<u>0.03</u>			
Technician Initials	<u>RT/AB</u>			

Freshwater Tests:

Control/Dilution Water Source: 8:2 Culligan Other: _____ Alkalinity: 60 Hardness: 85
Additional Control? Y (N) = _____ Alkalinity: _____ Hardness: _____

Marine Tests:

Control/Dilution Water Source: LAB SW ART SW Other: _____ Alkalinity: _____ Salinity: _____
Additional Control? Y N = _____ Alkalinity: _____ Salinity: _____
Sample Salted w/ artificial salt? Y N If yes, target ppt and source? _____
Sample salted w/ brine? Y N If yes, target ppt? _____

Notes ¹ Temperature for sample must be 0-6°C if received >24 hours past collection time.

² mg/L as CaCO₃, ³ Measured for freshwater samples only, NA = Not Applicable

Additional Comments @ KFP Q18 1/28/18

QC Check: AC 1/25/18

Sample Descriptions:

1) light brown, slightly opaque, odorless, light debris

2) _____
3) _____
4) _____

COC Complete? (Y) N

Filtration? (Y) N

Pore Size: 600µm

Organisms or Debris

pH Adjustment? Y (N)

	1	2	3	4	5	6
Initial pH:						
Amount of HCl added:						
Final pH:						

Cl₂ Adjustment? Y (N)

	1	2	3	4	5	6
Initial Free Cl ₂ :						
STS added:						
Final Free Cl ₂ :						

Sample Aeration? Y (N)

	1	2	3	4	5	6
Initial D.O.						
Duration & Rate						
Final D.O.						

Subsamples For Additional Chemistry Required? Y (N)

NH₃ Other: _____

Tech Initials: _____

Final Review: KFP 1/28/18

Appendix C

Chain-of-Custody Form

Appendix D

Qualifier Code Glossary

Glossary of Qualifier Codes:

- Q1 - Temperatures out of recommended range; corrective action taken and recorded in Test Temperature Correction Log
- Q2 - Temperatures out of recommended range; no action taken, test terminated same day
- Q3 - Sample aerated prior to initiation or renewal due to dissolved oxygen (D.O.) levels below 6.0 mg/L
- Q4 - Test aerated; D.O. levels dropped below 4.0 mg/L
- Q5 - Test initiated with aeration due to an anticipated drop in D.O.
- Q6 - Airline obstructed or fell out of replicate and replaced; drop in D.O. occurred
- Q7 - Salinity out of recommended range
- Q8 - Spilled test chamber/ Unable to recover test organism(s)
- Q9 - Inadequate sample volume remaining, 50% renewal performed
- Q10 - Inadequate sample volume remaining, no renewal performed
- Q11 - Sample out of holding time; refer to QA section of report
- Q12 - Replicate(s) not initiated; excluded from data analysis
- Q13 - Survival counts not recorded due to poor visibility or heavy debris
- Q14 - D.O. percent saturation was checked and was $\leq 110\%$
- Q15 - Did not meet minimum test acceptability criteria. Refer to QA section of report.
- Q16 - Percent minimum significant difference (PMSD) was below the lower bound limit for acceptability. This indicates that statistics may be over-sensitive in detecting a difference from the control due to low variability in the data set.
- Q17 - Percent minimum significant difference (PMSD) was above the upper bound limit for acceptability. This indicates that statistics may be under-sensitive in detecting a difference from the control due to high variability in the data set.
- Q18 - Incorrect Entry
- Q19 - Illegible Entry
- Q20 - Miscalculation
- Q21 - Other (provide reason in comments section)
- Q22 - Greater than 10% mortality observed upon receipt and/or in holding prior to test initiation. Organisms acclimated to test conditions at Nautilus and ultimately deemed fit to use for testing.
- Q23 - Test organisms received at a temperature greater than 3°C outside the recommended test temperature range. However, due to age-specific protocol requirements and/or sample holding time constraints, the organisms were used to initiate tests upon the day of arrival. Organisms were acclimated to the appropriate test conditions upon receipt and prior to test initiation.
- Q24 - Test organisms received at salinity greater than 3 ppt outside of the recommended test salinity range. However, due to age-specific protocol requirements and/or sample holding time constraints, the organisms were used to initiate tests upon the day of arrival. Organisms were acclimated to the appropriate test conditions upon receipt and prior to test initiation.

Appendix E

Reference Toxicant Test Control Charts

Ceriodaphnia 3 Brood Survival & Reproduction Test

Nautilus Environmental (CA)

Test Type: Reproduction and Survival

Organism: Ceriodaphnia dubia (Water Flea)

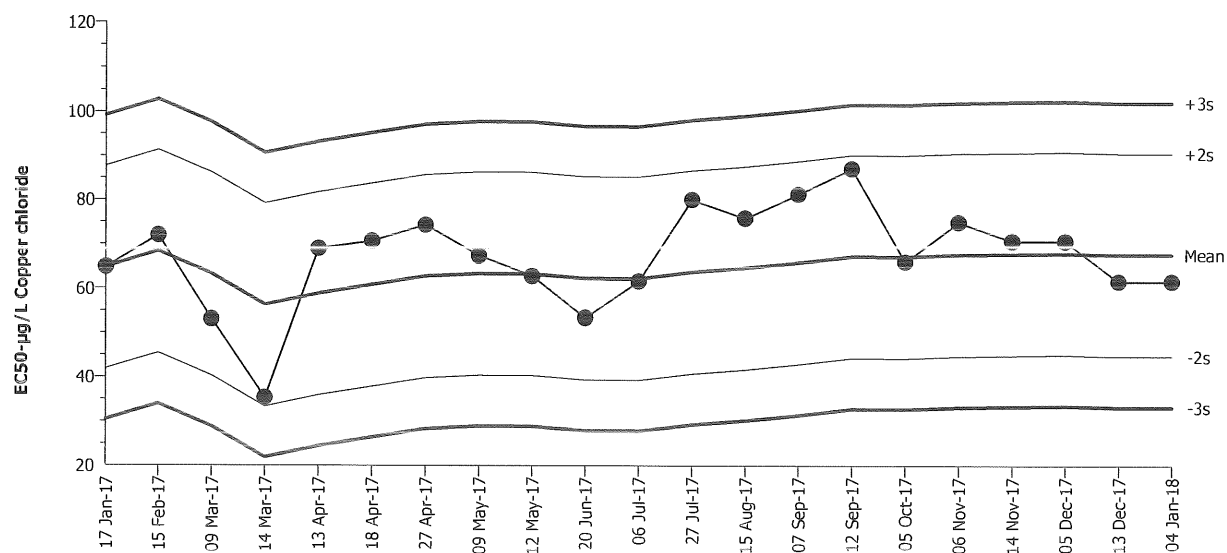
Material: Copper chloride

Protocol: EPA/821/R-02-013 (2002)

Endpoint: 3 Brood Survival

Source: Reference Toxicant-REF

Ceriodaphnia 3 Brood Survival & Reproduction Test



Mean: 67.61

Count: 20

-2s Warning Limit: 44.69

-3s Action Limit: 33.23

Sigma: 11.46

CV: 17.00%

+2s Warning Limit: 90.53

+3s Action Limit: 102

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2017	Jan	17	14:45	64.84	-2.768	-0.2415			01-1152-0058	03-0074-9913
2		Feb	15	14:20	71.98	4.369	0.3812			20-1294-3753	14-8751-6664
3		Mar	9	14:35	53.06	-14.55	-1.27			00-2664-3960	15-9121-5909
4			14	14:40	35.36	-32.25	-2.815	(-)		00-0322-9197	12-5676-7558
5		Apr	13	14:00	68.98	1.372	0.1197			10-2193-0811	05-2866-8260
6			18	15:35	70.71	3.101	0.2706			01-0396-4031	09-4977-4770
7			27	16:10	74.3	6.69	0.5837			00-3800-2885	05-0944-1067
8		May	9	15:45	67.41	-0.2	-0.01745			13-4593-7379	11-1636-4789
9			12	16:40	62.75	-4.864	-0.4245			07-1530-0505	14-6903-6195
10		Jun	20	15:55	53.36	-14.25	-1.244			04-9724-2372	15-2712-6318
11		Jul	6	15:30	61.56	-6.053	-0.5282			00-5734-3308	07-3301-1852
12			27	15:15	80.03	12.42	1.084			15-0666-0519	03-6382-7301
13		Aug	15	15:00	75.79	8.176	0.7134			10-2761-3032	09-7995-7748
14		Sep	7	16:15	81.23	13.62	1.188			11-2156-0054	07-4523-8266
15			12	15:40	87.06	19.45	1.697			19-0665-6460	18-5363-3813
16		Oct	5	14:55	65.98	-1.635	-0.1426			17-3154-0508	10-1789-6301
17		Nov	6	14:25	74.92	7.305	0.6375			08-1437-1142	19-4145-8219
18			14	14:40	70.71	3.101	0.2706			20-4424-3273	00-5337-3364
19		Dec	5	14:50	70.71	3.101	0.2706			09-4101-1139	05-3491-7093
20			13	15:30	61.56	-6.053	-0.5282			13-6649-2625	12-8128-5044
21	2018	Jan	4	14:30	61.56	-6.053	-0.5282			00-2119-4181	11-3310-2458

Ceriodaphnia 3 Brood Survival & Reproduction Test

Nautilus Environmental (CA)

Test Type: Reproduction and Survival

Organism: Ceriodaphnia dubia (Water Flea)

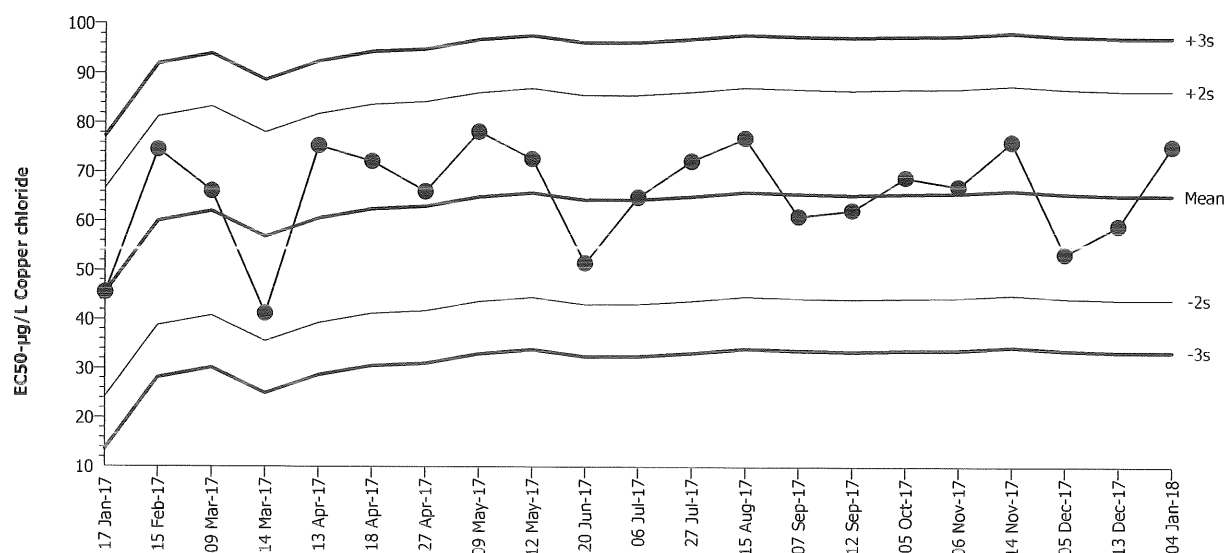
Material: Copper chloride

Protocol: EPA/821/R-02-013 (2002)

Endpoint: 3 Brood Reproduction

Source: Reference Toxicant-REF

Ceriodaphnia 3 Brood Survival & Reproduction Test



Mean: 65.24

Count: 20

-2s Warning Limit: 43.98

-3s Action Limit: 33.35

Sigma: 10.63

CV: 16.30%

+2s Warning Limit: 86.5

+3s Action Limit: 97.13

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2017	Jan	17	14:45	45.5	-19.74	-1.857			01-1152-0058	14-7663-7913
2		Feb	15	14:20	74.57	9.327	0.8774			20-1294-3753	00-1234-3399
3		Mar	9	14:35	66.09	0.852	0.08015			00-2664-3960	20-6108-6701
4			14	14:40	41.2	-24.04	-2.262	(-)		00-0322-9197	20-8392-6767
5		Apr	13	14:00	75.35	10.11	0.9513			10-2193-0811	05-9617-6023
6			18	15:35	72.15	6.906	0.6497			01-0396-4031	13-4649-7409
7			27	16:10	66.03	0.7914	0.07445			00-3800-2885	15-6109-4064
8		May	9	15:45	78.23	12.99	1.222			13-4593-7379	14-0959-6854
9			12	16:40	72.64	7.402	0.6963			07-1530-0505	03-2049-3100
10		Jun	20	15:55	51.43	-13.81	-1.299			04-9724-2372	14-7465-3155
11		Jul	6	15:30	64.89	-0.3464	-0.03259			00-5734-3308	14-0591-4942
12			27	15:15	72.26	7.022	0.6606			15-0666-0519	16-6661-5641
13		Aug	15	15:00	76.89	11.65	1.096			10-2761-3032	12-3756-4198
14		Sep	7	16:15	60.96	-4.28	-0.4026			11-2156-0054	17-1048-4585
15			12	15:40	62.23	-3.006	-0.2828			19-0665-6460	18-2720-6934
16		Oct	5	14:55	68.88	3.644	0.3428			17-3154-0508	17-8088-3800
17		Nov	6	14:25	67.03	1.793	0.1686			08-1437-1142	21-0099-8016
18			14	14:40	76.11	10.87	1.022			20-4424-3273	01-5566-6197
19		Dec	5	14:50	53.28	-11.96	-1.125			09-4101-1139	08-1000-3338
20			13	15:30	59.05	-6.194	-0.5827			13-6649-2625	17-6219-3154
21	2018	Jan	4	14:30	75.21	9.973	0.9382			00-2119-4181	08-7177-9069