

Chronic Toxicity Testing Results for Wyckoff Eagle Harbor Groundwater Treatment Plant

Monitoring Period: March 2019

Prepared for: Jacobs

1100 112th Ave NE Suite 500

Bellevue, WA, 98004

Prepared by: Enthalpy Analytical (formerly Nautilus

Environmental)

4340 Vandever Avenue San Diego, CA 92120

(858) 587-7333

Date Submitted: May 13, 2019

Data Quality Assurance:

- Nautilus Environmental is accredited in accordance with NELAP by the State of Oregon Environmental Laboratory Accreditation Program (ORELAP ID 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 US EPA protocols, unless otherwise noted in this report.
- All tests have met internal Quality Assurance Program requirements.

Results verified by: ______ Eric Green, Project Manager

California

4340 Vandever Avenue San Diego, California 92120 858.587.7333 fax: 619.279.5919

Introduction

A toxicity test was performed using a groundwater composite sample collected on March 19, 2019 from the Wyckoff Eagle Harbor Groundwater Treatment Plant on Bainbridge Island in Washington. This test was performed to satisfy quarterly monitoring requirements according to the project Quality Assurance Project Plan (QAPP 2013). The chronic bioassay was conducted using the bivalve *Mytilus galloprovincialis* (Mediterranean mussel). Testing was performed at Enthalpy Analytical (formerly Nautilus Environmental) located in San Diego, California between March 20 and 22, 2019.

Materials and Methods

The groundwater sample was collected into a low density polyethylene cubitainer by Jacobs personnel, packed in a cooler containing ice, and shipped overnight to Enthalpy. Appropriate chain-of-custody (COC) procedures were employed during collection and transport. Upon arrival at the laboratory, the cooler was opened, the sample inspected, and the contents verified against information on the COC form. Standard water quality parameters were measured and recorded on a sample check-in form and are summarized in Table 1. The sample was stored at 4°C in the dark until used for testing.

Table 1. Sample Information

Sample ID	031919
Nautilus Log-in Number	19-0392
Collection Date; Time	3/19/2019; 0933h
Receipt Date; Time	3/20/2019; 0950h
Receipt Temperature (°C)	2.5
Dissolved Oxygen (mg/L)	8.6
рН	7.47
Conductivity (µS/cm)	11,110
Salinity (ppt)	7.2
Alkalinity (mg/L CaCO ₃)	413
Total Chlorine (mg/L)	0.04
Total Ammonia (mg/L)	1.2

Test Methods

Chronic toxicity testing was conducted according to the method set forth in USEPA (1995). This method is summarized in Table 2.

Table 2. Summary of Methods for the Bivalve Larval Development Test

Test Period	3/20/2019, 1525h to 3/22/2019, 1500h
Test Organism	Mytilus galloprovincialis
Test Organism Source	Mission Bay (San Diego, CA)
Test Organism Age	4 hours post fertilization
Test Duration	48 ± 2 hours
Test Type	Static
Test Chamber, Test Solution Volume	30 mL glass vial, 10 mL
Test Temperature	15 ± 1°C
Dilution Water	Laboratory Seawater (Source: Scripps Institution of Oceanography [SIO] intake)
Additional Control	Brine Control (deionized water and hypersaline brine)
Test Salinity	30 ± 2 ppt
Source of Salinity	Hypersaline brine made by freezing seawater to a salinity of 93.3
Test Concentrations (% sample)	73.5 ^a , 35, 18, 9, 4, and 2%, lab and brine controls
Number of Replicates	5
Photoperiod	16 hours light/8 hours dark
Test Protocol	EPA/600/R-95/136
Test Acceptability Criteria for Controls	≥ 50% mean survival, ≥ 90% mean development rate
Reference Toxicant	Copper sulfate (per project QAPP) ^b
Statistical Software	CETIS™ 1.8.7.20

^a Highest concentration tested due to the addition of hypersaline brine

Results

There were no statistically significant effects observed in any effluent concentration tested for the survival or development endpoint of the bivalve test. This results in a no observed effect concentration (NOEC) of 73.50 (the highest concentration tested) and a chronic toxic unit (TU_c) of less than 1.36 for both endpoints.

Results for the chronic toxicity test are summarized in Tables 3 and 4. Individual statistical summaries for the test and copies of the laboratory bench sheets are provided in Appendix A. The sample check-in sheet and COC form are provided in Appendices B and C, respectively.

Table 3. Summary of Statistical Results for the Chronic Toxicity Tests

Species	Endpoint	NOEC (% effluent)	LOEC (% effluent)	Toxic Unit (TU _c)	EC ₂₅ (% effluent)
Bivalve	Normal Development	73.5	> 73.5	< 1.36	> 73.5
Divalve	Survival	73.5	> 73.5	< 1.36	> 73.5

NOEC = No Observed Effect Concentration

LOEC = Lowest Observed Effect Concentration

Chronic Toxic Unit (TU_c) = 100% sample/NOEC. NOTE: Since 100% sample was not tested, the TU_c value can only be calculated up to the highest concentration tested. If no toxicity is observed at this concentration, the TU_c is reported as less than the calculated value.

Effect Concentration 25 (IC_{25}) = Concentration expected to cause an effect to 25% of the organisms

^b Enthalpy typically uses copper chloride for reference toxicant testing

Table 4. Detailed Results for the Bivalve Development Chronic Toxicity Test

Concentration (% Effluent)	Mean Survival (%)	Mean Normal Development (%)
0 (Brine Control)	97.3	96.4
0 (Lab Control)	99.1	97.9
2	99.0	97.0
4	99.7	98.3
9	99.2	97.5
18	100	97.4
35	97.3	97.8
73.5 ^a	99.0	97.1

^a Highest concentration tested due to the addition of hypersaline brine

Quality Assurance

The sample was received within the required 36-hour holding time, in good condition, and within the appropriate temperature range of 0-6°C. All control acceptability criteria were met and water quality parameters remained within the appropriate ranges throughout the test. Statistical analyses followed standard USEPA flowchart selections. Dose-response relationships were reviewed to ensure the reliability of the results. Based on the dose response observed, the calculated effects concentrations were deemed reliable.

Results for the reference toxicant tests used to monitor laboratory performance and test organism sensitivity are summarized in Table 5. The results for the copper chloride reference toxicant test were within the acceptable range of the mean historical test results plus or minus two standard deviations. However, the results for the copper sulfate reference toxicant test were greater than three standard deviations of the mean historical test results. Reference toxicant warning and control chart limits were recalculated based on the 75th percentile interlaboratory coefficient of variation, as defined in EPA-833-R-00-003, for comparison purposes only, and the effect concentrations were within three standard deviations of the historical means. Copper chloride reference toxicant results are reported in addition to the copper sulfate results as a point of comparison and to provide additional support for the appreciable sensitivity of the test organism batch. It should also be noted that the control chart for copper sulfate is still in development as a full 20-point history is not yet available.

The reference toxicant statistical summaries and laboratory bench sheets are provided in Appendix D. Minor QA/QC issues that were unlikely to have any bearing on the final test results, such as slight temperature deviations, are noted on the data sheets and a list of qualifier codes used on bench data sheets is presented in Appendix E.

Table 5. Reference Toxicant Test Results

Species and Material	Endpoint	EC ₅₀ (μg/L Copper)	Historical mean ± 2 SD (μg/L copper)	CV (%)
Bivalve / Copper	Development Rate	11.9	6.12 ± 1.27	10.4
Sulfate	Survival Rate	29.4	23.6 ± 0.458	0.97
Bivalve / Copper	Development Rate	8.33	7.65 ± 1.85	12.1
Chloride	Survival Rate	29.2	28.0 ± 6.68	11.9

Effect Concentration 50 (EC $_{50}$) = Concentration expected to cause an effect to 50% of the organisms CV = Coefficient of Variation.

References

- CH2MHill. 2013. Quality Assurance Project Plan Groundwater Treatment Plant Operations, Maintenance, Bainbridge, Washington. Prepared for USEPA Region 10 June 5, 2013.
- Standard Guide for Conducting Static Acute Toxicity Tests with Embryos of Four Species of Saltwater Bivalve Molluscs. 1989. ASTM Standard E 724-89.
- Tidepool Scientific Software. 2000-2013. CETIS Comprehensive Environmental Toxicity Information System Software, Version 1.8.7.20.
- USEPA. 1995. Short-Term Method for Estimating the Chronic Toxicity of Effluents and Receiving Waters to the West Coast Marine and Estuarine Organisms. EPA/600/R-95/136. pp. 209-258 and 389-465.
- Washington State Department of Ecology. 2016. Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Publication No. WQ-R-95-80. Revised June 2016

Appendix A
Statistical Summaries and Raw Bench Sheets

CETIS Summary Report

Report Date: Test Code: 03 Apr-19 10:21 (p 1 of 2)

1903-S059 | 01-5343-3513

Bivalve Larva	I Survival and D	evelopm	ent Test		**************************************				Nautilus	Environn	nental (CA)
Batch ID: Start Date: Ending Date: Duration:	02-8063-4317 20 Mar-19 15:29 22 Mar-19 15:00 48h	5 P i	est Type: rotocol: pecies: ource:	Development-S EPA/600/R-95/ Mytilus gallopro Mission Bay	136 (1995)			ie: Froz	ed Natural S en Seawate		
	17-9611-0978 19 Mar-19 09:33 : 20 Mar-19 09:50 30h (2.5 °C)	3 M 0 S	ode: laterial: ource: tation:	19-0392 Effluent Sample Jacobs Wyckoff £ag		oa GWT	Clie Proj	ect:	bs		
Comparison S	Summary	R. C.									
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method			
21-1968-8609 12-4129-7583	•	ate	73.5 73.5	>73.5 >73.5	NA NA		∡ 1.361 ∠ 1.361		ultiple Com _l y-One Rank		
Point Estimat	te Summary										
Analysis ID	Endpoint		Level	%	95% LCL	95% UCL	TU	Method			
15-3713-8684	Development R	ate	EC25 EC50	>73.5 >73.5	N/A N/A	N/A N/A	<1.361 <1.361	Linear Inte	erpolation (IC	CPIN)	
11-8603-6224	Survival Rate		EC25 EC50	>73.5 >73.5	N/A N/A	N/A N/A	<1.361 <1.361	Linear Inte	erpolation (IC	CPIN)	
Test Acceptal	bility										
Analysis ID	Endpoint		Attrib	ute	Test Stat	TAC Limi	its	Overlap	Decision		
15-3713-8684	Development R	ate	Contro	ol Resp	0.9641	0.9 - NL		Yes	Passes Ad	ceptability	Criteria
21-1968-8609	Development R	ate	Contro	ol Resp	0.9641	0.9 - NL		Yes	Passes Ad		
11-8603-6224	Survival Rate		Contro	ol Resp	0.9725	0.5 - NL		Yes	Passes Ad	cceptability	Criteria
12-4129-7583	Survival Rate		Contro	ol Resp	0.9725	0.5 - NL		Yes	Passes Ad	ceptability	Criteria
Development	Rate Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0				·							
	Brine Control	5	0.964	1 0.9461	0.9822	0.9415	0.977	0.0065	0.01453	1.51%	0.0%
0	Brine Control Lab Control	5	0.964 0.978	1 0.9461 8 0.964	0.9822 0.9936	0.9415 0.9646	0.977 0.995	0.0065 0.00532	0.01453 0.0119	1.51% 1.22%	-1.52%
2		5 5	0.964 0.978 0.969	0.9461 0.964 0.955	0.9822 0.9936 0.9845	0.9415 0.9646 0.9545	0.977 0.995 0.9832	0.0065 0.00532 0.005323	0.01453 0.0119 0.0119	1.51% 1.22% 1.23%	-1.52% -0.59%
2		5 5 5	0.964 0.978 0.969 0.982	0.9461 0.964 0.955 0.9739	0.9822 0.9936 0.9845 0.9919	0.9415 0.9646 0.9545 0.9758	0.977 0.995 0.9832 0.9949	0.0065 0.00532 0.005323 0.003227	0.01453 0.0119 0.0119 0.007216	1.51% 1.22% 1.23% 0.73%	-1.52% -0.59% -1.95%
2 4 9		5 5 5 5	0.964 0.978 0.969 0.982 0.974	0.9461 0.964 0.955 0.9739 0.9637	0.9822 0.9936 0.9845 0.9919 0.9861	0.9415 0.9646 0.9545 0.9758 0.9659	0.977 0.995 0.9832 0.9949 0.9848	0.0065 0.00532 0.005323 0.003227 0.004047	0.01453 0.0119 0.0119 0.007216 0.009049	1.51% 1.22% 1.23% 0.73% 0.93%	-1.52% -0.59% -1.95% -1.12%
2 4 9 18		5 5 5 5	0.964 0.978 0.969 0.982 0.974 0.973	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683	0.977 0.995 0.9832 0.9949 0.9848 0.9804	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098	1.51% 1.22% 1.23% 0.73% 0.93% 0.52%	-1.52% -0.59% -1.95% -1.12% -0.97%
2 4 9		5 5 5 5	0.964 0.978 0.969 0.982 0.974	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688	0.9822 0.9936 0.9845 0.9919 0.9861	0.9415 0.9646 0.9545 0.9758 0.9659	0.977 0.995 0.9832 0.9949 0.9848	0.0065 0.00532 0.005323 0.003227 0.004047	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46%
2 4 9 18 35	Lab Control	5 5 5 5 5	0.964 0.978 0.969 0.982 0.974 0.973 0.978	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098	1.51% 1.22% 1.23% 0.73% 0.93% 0.52%	-1.52% -0.59% -1.95% -1.12% -0.97%
2 4 9 18 35 73.5	Lab Control	5 5 5 5 5	0.964 0.978 0.969 0.982 0.974 0.973 0.978	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615 0.01108	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74%
2 4 9 18 35 73.5 Survival Rate	Lab Control	5 5 5 5 5 5 5 5 Count	0.964 0.978 0.969 0.982 0.974 0.973 0.978	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688 0.957	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74%
2 4 9 18 35 73.5 Survival Rate C-%	Lab Control Summary Control Type	5 5 5 5 5 5 5	0.964 0.978 0.969 0.982 0.974 0.973 0.978	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575 95% LCL 5 0.8963	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688 0.957 Min 0.8626	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615 0.01108 Std Dev 0.06143	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% %Effect 0.0%
2 4 9 18 35 73.5 Survival Rate C-%	Summary Control Type Brine Control	5 5 5 5 5 5 5 5 5	0.964 0.9786 0.9696 0.9829 0.9749 0.9739 0.9719 Mean	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575 95% LCL 5 0.8963 2 0.9668	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688 0.957	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956 Std Err 0.02747 0.008791	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615 0.01108 Std Dev 0.06143 0.01966	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 6.32% 1.98%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% %Effect 0.0% -1.92%
2 4 9 18 35 73.5 Survival Rate C-% 0	Summary Control Type Brine Control	5 5 5 5 5 5 5 5 5 5 5	0.964 0.9786 0.9696 0.9829 0.9744 0.9736 0.9715 Mean 0.9726	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575 95% LCL 5 0.8963 2 0.9668 1 0.9718	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688 0.957 Min 0.8626 0.956	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956 Std Err 0.02747	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615 0.01108 Std Dev 0.06143	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 6.32% 1.98% 1.49%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% **Effect* 0.0% -1.92% -1.81%
2 4 9 18 35 73.5 Survival Rate C-% 0 0 2	Summary Control Type Brine Control	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.964 0.978 0.969 0.982 0.974 0.973 0.971 Mean 0.972 0.991	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575 95% LCL 5 0.8963 2 0.9668 1 0.9718 7 0.9876	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985 95% UCL 1 1	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688 0.957 Min 0.8626 0.956 0.967	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956 Std Err 0.02747 0.008791 0.006593	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615 0.01108 Std Dev 0.06143 0.01966 0.01474	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 6.32% 1.98% 1.49% 0.74%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% %Effect 0.0% -1.92% -1.81% -2.49%
2 4 9 18 35 73.5 Survival Rate C-% 0 0 2 4	Summary Control Type Brine Control	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.964 0.978 0.969 0.982 0.974 0.973 0.971 Mean 0.972 0.991 0.990	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575 95% LCL 5 0.8963 2 0.9668 1 0.9718 7 0.9876	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985 95% UCL 1 1	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688 0.957 Min 0.8626 0.956 0.967 0.9835	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827 Max 1 1	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956 Std Err 0.02747 0.008791 0.006593 0.003297	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615 0.01108 Std Dev 0.06143 0.01966 0.01474 0.007372	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 6.32% 1.98% 1.49%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% **Effect* 0.0% -1.92% -1.81%
2 4 9 18 35 73.5 Survival Rate C-% 0 0 2 4 9	Summary Control Type Brine Control	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.964 0.978 0.969 0.982 0.974 0.973 0.971 Mean 0.972 0.991 0.990 0.996	1 0.9461 8 0.964 8 0.955 9 0.9739 9 0.9637 5 0.9672 2 0.9688 3 0.9575 95% LCL 5 0.8963 2 0.9668 1 0.9718 7 0.9876 3 0.971	0.9822 0.9936 0.9845 0.9919 0.9861 0.9798 0.9877 0.985 95% UCL 1 1 1 1	0.9415 0.9646 0.9545 0.9758 0.9659 0.9683 0.9688 0.957 Min 0.8626 0.956 0.967 0.9835 0.9615	0.977 0.995 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827 Max 1 1 1	0.0065 0.00532 0.005323 0.003227 0.004047 0.00228 0.003406 0.004956 Std Err 0.02747 0.008791 0.006593 0.003297 0.007692	0.01453 0.0119 0.0119 0.007216 0.009049 0.005098 0.007615 0.01108 Std Dev 0.06143 0.01966 0.01474 0.007372 0.0172	1.51% 1.22% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 6.32% 1.98% 1.49% 0.74% 1.73%	-1.52% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% *Effect 0.0% -1.92% -1.81% -2.49% -2.03%

Test Code:

Report Date: 03 Apr-19 10:21 (p 2 of 2)

•		**		,
1903-S059	101	1-5343	3-35°	13

							Test Code:	1903-S059 01-5343-3513
Bivalve L	arval Survival and I	Developme	nt Test					Nautilus Environmental (CA)
Developn	nent Rate Detail							
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Brine Control	0.9618	0.9769	0.9635	0.977	0.9415		
0	Lab Control	0.9857	0.995	0.9646	0.977	0.9716		
2		0.9697	0.9794	0.962	0.9545	0.9832		
4		0.9949	0.9797	0.9832	0.9758	0.9809		
9		0.9681	0.9844	0.9659	0.9714	0.9848		
18		0.9683	0.9724	0.9695	0.977	0.9804		
35		0.9688	0.9787	0.9731	0.9882	0.9824		
73.5		0.9795	0.957	0.9747	0.9624	0.9827		
Survival I	Rate Detail							
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Brine Control	0.8626	1	1	1	1		
0	Lab Control	1	1	1	0.956	1		
2		1	1	1	0.967	0.9835		
4		1	1	0.9835	1	1		
9		1	1	1	0.9615	1		
18		1	1	1	1	1		
35		1	1	1	0.9286	0.9341		
73.5		1	1	1	1	0.9505		
Developn	nent Rate Binomials	3						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Brine Control	151/157	211/216	211/219	212/217	177/188		
0	Lab Control	207/210	199/200	191/198	170/174	205/211		
2		192/198	190/194	177/184	168/176	176/179		
4		195/196	193/197	176/179	202/207	205/209		
9		182/188	189/192	198/205	170/175	194/197		
18		183/189	211/217	191/197	212/217	200/204		
35		186/192	184/188	181/186	167/169	167/170		
73.5		191/195	178/186	193/198	205/213	170/173		
Survival I	Rate Binomials							
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Brine Control	157/182	182/182	182/182	182/182	182/182		-
0	Lab Control	182/182	182/182	182/182	174/182	182/182		
2		182/182	182/182	182/182	176/182	179/182		
4		182/182	182/182	179/182	182/182	182/182		
9		182/182	182/182	182/182	175/182	182/182		
18		182/182	182/182	182/182	182/182	182/182		
35		182/182	182/182	182/182	169/182	170/182		
73.5		182/182	182/182	182/182	182/182	173/182		

Analyst: Ja QA: EA4[3][9]

Report Date: Test Code:

03 Apr-19 10:20 (p 1 of 4)

1903-S059 | 01-5343-3513

							Test				
Bivalve Larva	al Survival and [Developme	nt Test			Philippin of the second second second			Nautilus	Environ	mental (CA
Analysis ID: Analyzed:	21-1968-8609 03 Apr-19 10:1		-	velopment R rametric-Cor		tments		IS Version:		8.7	
Data Transfo	rm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	ected)	NA	C > T	NA	NA		1.9%	73.5	>73.5	NA	1.361
Dunnett Mult	iple Comparisor	n Test									
Control	vs C-%		Test Stat	Critical	MSD DF	P-Value	P-Type	Decision	(α:5%)		
Brine Control	2		-0.7989	2.407	0.047 8	0.9781	CDF	Non-Sign	ificant Effect		
	4		-3.048	2.407	0.047 8	1.0000	CDF	Non-Sign	ificant Effect		
	9		-1.569	2.407	0.047 8	0.9980	CDF	Non-Sign	ificant Effect		
	18		-1.263	2.407	0.047 8	0.9945	CDF	Non-Sign	ificant Effect		
	35		-2.112	2.407	0.047 8	0.9997	CDF	Non-Sign	ificant Effect		
	73.5		-1.01	2.407	0.047 8	0.9880	CDF	Non-Sign	ificant Effect		
ANOVA Table	9										
Source	Sum Squ	ares	Mean Sq	uare	DF	F Stat	P-Value	Decision	(α:5%)		
Between	0.011083	06	0.001847	177	6	1.915	0.1133	Non-Sign	ificant Effect		
Error	0.027008	1	0.000964	5749	28						
					0.4						
Total	0.038091	16			34						
		16			34						
Total		16		Test Stat		P-Value	Decision(α:1%)			
Total Distributiona Attribute	Il Tests Test	quality of V	/ariance	Test Stat 2.769		P-Value 0.8373	Decision(Equal Var				
Total Distributiona Attribute	Il Tests Test Bartlett E				Critical			iances			
Total Distributiona Attribute Variances Distribution	Il Tests Test Bartlett E	equality of V		2.769	Critical 16.81	0.8373	Equal Var	iances			
Total Distributiona Attribute Variances Distribution Development	Il Tests Test Bartlett E Shapiro-\	equality of V		2.769	Critical 16.81 0.9146	0.8373	Equal Var	iances	Std Err	CV%	%Effect
Total Distributiona Attribute Variances Distribution Development C-%	Tests Test Bartlett E Shapiro-It Rate Summary	quality of V	mality	2.769 0.9674	Critical 16.81 0.9146	0.8373 0.3754	Equal Var Normal Di	iances stribution	Std Err 0.0065	CV% 1.51%	%Effect
Distributiona Attribute Variances Distribution Development C-% 0	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type	quality of \ Wilk W Nor Count	mality Mean	2.769 0.9674 95% LCL	Critical 16.81 0.9146 95% UCL	0.8373 0.3754 Median	Equal Var Normal Di	iances stribution			
Distributiona Attribute Variances Distribution Development C-% 0 2 4	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type	quality of \ Wilk W Nor Count	Mean 0.9641	2.769 0.9674 95% LCL 0.9461	Critical 16.81 0.9146 95% UCL 0.9822	0.8373 0.3754 Median 0.9635	Equal Var Normal Di Min 0.9415	iances stribution Max 0.977	0.0065	1.51%	0.0%
Distributiona Attribute Variances Distribution Development C-% 0 2 4 9	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type	Count 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637	Critical 16.81 0.9146 95% UCL 0.9822 0.9845	0.8373 0.3754 Median 0.9635 0.9697	Equal Var Normal Di Min 0.9415 0.9545	Max 0.977 0.9832	0.0065 0.005323	1.51% 1.23%	0.0% -0.59%
Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type	Equality of V Wilk W Nor Count 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735	2.769 0.9674 95% LCL 0.9461 0.955 0.9739	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919	0.8373 0.3754 Median 0.9635 0.9697 0.9809	Equal Var Normal Di Min 0.9415 0.9545 0.9758	Max 0.977 0.9832 0.9949	0.0065 0.005323 0.003227	1.51% 1.23% 0.73%	0.0% -0.59% -1.95%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type	Equality of V Wilk W Nor Count 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714	Min 0.9415 0.9545 0.9758 0.9659	Max 0.977 0.9832 0.9949 0.9848	0.0065 0.005323 0.003227 0.004047	1.51% 1.23% 0.73% 0.93%	0.0% -0.59% -1.95% -1.12%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type	Equality of V Wilk W Nor Count 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724	Min 0.9415 0.9545 0.9758 0.9659 0.9683	Max 0.977 0.9832 0.9949 0.9848 0.9804	0.0065 0.005323 0.003227 0.004047 0.002279	1.51% 1.23% 0.73% 0.93% 0.52%	0.0% -0.59% -1.95% -1.12% -0.97%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type	Count 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.9877	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787	Min 0.9415 0.9545 0.9758 0.9659 0.9683 0.9688	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406	1.51% 1.23% 0.73% 0.93% 0.52% 0.78%	0.0% -0.59% -1.95% -1.12% -0.97% -1.46%
Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5 Angular (Cort	Tests Test Bartlett E Shapiro-\ t Rate Summary Control Type Brine Control	Count 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787	Min 0.9415 0.9545 0.9758 0.9659 0.9683 0.9688	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406	1.51% 1.23% 0.73% 0.93% 0.52% 0.78%	0.0% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74%
Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5 Angular (Corl	Tests Test Bartlett E Shapiro-I t Rate Summary Control Type Brine Control	Count 5 5 5 5 5 med Sumr Count 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713 nary Mean 1.383	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688 0.9575 95% LCL 1.336	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787 0.9747 Median 1.378	Min 0.9415 0.9545 0.9758 0.9659 0.9683 0.9688 0.957	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406 0.004956	1.51% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14%	0.0% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5 Angular (Corr C-% 0 2	Tests Test Bartlett E Shapiro-I t Rate Summary Control Type Brine Control	Count 5 5 5 5 5 med Sumn Count 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713 nary Mean 1.383 1.399	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688 0.9575 95% LCL 1.336 1.355	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.985	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787 0.9747 Median 1.378 1.396	Min 0.9415 0.9545 0.9758 0.9659 0.9683 0.9688 0.957	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406 0.004956	1.51% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14%	0.0% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5 Angular (Corr C-% 0 2 4	Tests Test Bartlett E Shapiro-I t Rate Summary Control Type Brine Control	Count 5 5 5 5 5 med Summ Count 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713 nary Mean 1.383 1.399 1.443	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688 0.9575 95% LCL 1.336	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.9877 0.985	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787 0.9747 Median 1.378	Min 0.9415 0.9545 0.9758 0.9659 0.9683 0.9688 0.957 Min 1.326	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827 Max 1.418	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406 0.004956 Std Err 0.017	1.51% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 2.75%	0.0% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% %Effect 0.0%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5 Angular (Corr C-% 0 2 4 9	Tests Test Bartlett E Shapiro-I t Rate Summary Control Type Brine Control	Count 5 5 5 5 5 med Sumr Count 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713 nary Mean 1.383 1.399 1.443 1.414	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688 0.9575 95% LCL 1.336 1.355 1.402 1.377	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.9877 0.985 95% UCL 1.43 1.443	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787 0.9747 Median 1.378 1.396	Min 0.9415 0.9545 0.9545 0.9659 0.9683 0.9688 0.957 Min 1.326 1.356	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827 Max 1.418 1.441	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406 0.004956 Std Err 0.017 0.0158	1.51% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 2.75% 2.53%	0.0% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% %Effect 0.0% -1.14%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5 Angular (Corr C-% 0 2 4 9 18	Tests Test Bartlett E Shapiro-I t Rate Summary Control Type Brine Control	Count 5 5 5 5 5 med Sumr Count 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713 mary Mean 1.383 1.399 1.443 1.414 1.408	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688 0.9575 95% LCL 1.336 1.355 1.402 1.377 1.388	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.9877 0.985 95% UCL 1.43 1.443 1.484	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787 0.9747 Median 1.378 1.396 1.432	Min 0.9415 0.9545 0.9545 0.9659 0.9683 0.9688 0.957 Min 1.326 1.356 1.415	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827 Max 1.418 1.441 1.499	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406 0.004956 Std Err 0.017 0.0158 0.0147	1.51% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 2.75% 2.53% 2.28%	0.0% -0.59% -1.95% -1.12% -0.97% -1.46% -0.74% %Effect 0.0% -1.14% -4.33%
Total Distributiona Attribute Variances Distribution Development C-% 0 2 4 9 18 35 73.5	Tests Test Bartlett E Shapiro-I t Rate Summary Control Type Brine Control	Count 5 5 5 5 5 med Sumr Count 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Mean 0.9641 0.9698 0.9829 0.9749 0.9735 0.9782 0.9713 nary Mean 1.383 1.399 1.443 1.414	2.769 0.9674 95% LCL 0.9461 0.955 0.9739 0.9637 0.9672 0.9688 0.9575 95% LCL 1.336 1.355 1.402 1.377	Critical 16.81 0.9146 95% UCL 0.9822 0.9845 0.9919 0.9861 0.9798 0.9877 0.985 95% UCL 1.43 1.443 1.444 1.451	0.8373 0.3754 Median 0.9635 0.9697 0.9809 0.9714 0.9724 0.9787 0.9747 Median 1.378 1.396 1.432 1.401	Min 0.9415 0.9545 0.9545 0.9659 0.9683 0.9688 0.957 Min 1.326 1.356 1.415 1.385	Max 0.977 0.9832 0.9949 0.9848 0.9804 0.9882 0.9827 Max 1.418 1.441 1.499 1.447	0.0065 0.005323 0.003227 0.004047 0.002279 0.003406 0.004956 Std Err 0.017 0.0158 0.0147 0.01345	1.51% 1.23% 0.73% 0.93% 0.52% 0.78% 1.14% CV% 2.75% 2.53% 2.28% 2.13%	-0.59% -1.95% -1.12% -0.97% -1.46% -0.74% %Effect 0.0% -1.14% -4.33% -2.23%

Analyst: JU QA: EG 4/3/19

Report Date: Test Code: 03 Apr-19 10:21 (p 2 of 4) 1903-S059 | 01-5343-3513

Bivalve Larval Survival and Development Test Nautilus Environmental (CA) Analysis ID: 21-1968-8609 Endpoint: Development Rate **CETIS Version:** CETISv1.8.7 Analyzed: 03 Apr-19 10:18 Analysis: Parametric-Control vs Treatments Official Results: Yes Graphics 1.0 0.06 0.9 0.04 0.8 Development Rate Centered Corr. Angle 0.02 0.6 0.5 0.00 0.4 -0.02 0.3 0.2 -0.04 0.1 0.0 -0.06 0 BC 35 73.5 -2.0 -1.5 -1.0 -2.5 -0.5 0.0 0.5 1.0 1.5 2.0 C-% Rankits

Report Date:

03 Apr-19 10:21 (p 3 of 4)

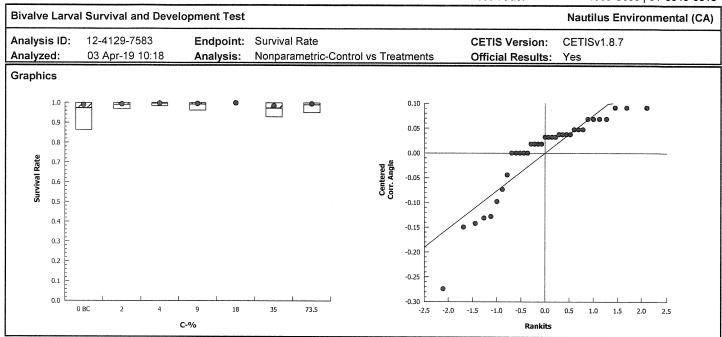
Test Code: 19	03-S059	01-5343-351

												-5343-351
Bivalve Larv	al Survival and [Developme	nt Test							Nautilus	Environn	nental (CA
Analysis ID:	12-4129-7583	En	dpoint: Sur	vival Rate				CET	S Version:	CETISv1.	.8.7	
Analyzed:	03 Apr-19 10:1	18 An	alysis: Nor	parametric-	Control v	s Tr	reatments	Offic	ial Results:	Yes		
Data Transfo	rm	Zeta	Alt Hyp	Trials	Seed			PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	ected)	NA	C > T	NA	NA			3.16%	73.5	>73.5	NA	1.361
Steel Many-C	One Rank Sum T	est										
Control	vs C-%		Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)		
Brine Control	2		26	16	1	8	0.7547	Asymp	Non-Signit	ficant Effect		
	4		28	16	1	8	0.8838	Asymp	Non-Signif	ficant Effect		
	9		28	16	1	8	0.8838	Asymp	Non-Signif	ficant Effect		
	18		30	16	1 :	8	0.9557	Asymp	Non-Signif	ficant Effect		
	35		26	16	1	8	0.7547	Asymp	Non-Signif	ficant Effect		
	73.5		28	16	1	8	0.8838	Asymp	Non-Signif	ficant Effect		
ANOVA Table	e											
Source	Sum Squ	ıares	Mean Squ	iare	DF		F Stat	P-Value	Decision(α:5%)		
Between	0.027994	48	0.0046657	47	6		0.568	0.7522	Non-Signif	ficant Effect		
Error	0.230011	7	0.0082147	'04	28							
Total	0.258006	2			34							
Distributiona	al Tests											
Attribute	Test			Test Stat	Critical		P-Value	Decision(α:1%)			
Variances	Bartlett E	Equality of \	/ariance	115.6	16.81		<0.0001	Unequal \	/ariances			
Distribution	Shapiro-\	Wilk W Nor	mality	0.8242	0.9146		<0.0001	Non-norm	al Distributio	on		
Survival Rate	e Summary											
		C										
C-%	Control Type	Count	Mean	95% LCL	95% UC	L	Median	Min	Max	Std Err	CV%	%Effect
	Brine Control	5	Mean 0.9725	95% LCL 0.8963	95% UC		Median 1	Min 0.8626	Max 1	Std Err 0.02747	CV% 6.32%	%Effect
0												
0 2		5	0.9725	0.8963	1			0.8626	1	0.02747	6.32%	0.0%
0 2 4		5 5	0.9725 0.9901	0.8963 0.9718	1			0.8626 0.967	1	0.02747 0.006593	6.32% 1.49%	0.0% -1.81%
0 2 4 9		5 5 5	0.9725 0.9901 0.9967	0.8963 0.9718 0.9876	1 1 1			0.8626 0.967 0.9835	1 1 1	0.02747 0.006593 0.003296	6.32% 1.49% 0.74%	0.0% -1.81% -2.49%
0 2 4 9 18		5 5 5 5	0.9725 0.9901 0.9967 0.9923	0.8963 0.9718 0.9876 0.971	1 1 1			0.8626 0.967 0.9835 0.9615	1 1 1 1	0.02747 0.006593 0.003296 0.007692	6.32% 1.49% 0.74% 1.73% 0.0%	0.0% -1.81% -2.49% -2.03%
0 2 4 9 18 35		5 5 5 5	0.9725 0.9901 0.9967 0.9923	0.8963 0.9718 0.9876 0.971	1 1 1 1	· · · · · · · · · · · · · · · · · · ·		0.8626 0.967 0.9835 0.9615	1 1 1 1	0.02747 0.006593 0.003296 0.007692 0	6.32% 1.49% 0.74% 1.73%	0.0% -1.81% -2.49% -2.03% -2.83%
0 2 4 9 18 35 73.5		5 5 5 5 5 5 5 5	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901	0.8963 0.9718 0.9876 0.971 1 0.9258	1 1 1 1 1	· · · · · · · · · · · · · · · · · · ·	1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286	1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685	6.32% 1.49% 0.74% 1.73% 0.0% 3.87%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0%
0 2 4 9 18 35 73.5 Angular (Cor	Brine Control	5 5 5 5 5 5 5 5	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901	0.8963 0.9718 0.9876 0.971 1 0.9258	1 1 1 1 1		1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286	1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685	6.32% 1.49% 0.74% 1.73% 0.0% 3.87%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0%
0 2 4 9 18 35 73.5 Angular (Cor	Brine Control	5 5 5 5 5 5 5 5	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901	0.8963 0.9718 0.9876 0.971 1 0.9258 0.9627	1 1 1 1 1 1	EL.	1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286 0.9505	1 1 1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685 0.00989	6.32% 1.49% 0.74% 1.73% 0.0% 3.87% 2.23%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0% -1.81%
0 2 4 9 18 35 73.5 Angular (Cor C-%	Brine Control rrected) Transfor Control Type	5 5 5 5 5 5 5 rmed Sumr	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901 mary	0.8963 0.9718 0.9876 0.971 1 0.9258 0.9627	1 1 1 1 1 1 1 1	CL.	1 1 1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286 0.9505 Min	1 1 1 1 1 1 1 1 1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685 0.00989 Std Err 0.06852	6.32% 1.49% 0.74% 1.73% 0.0% 3.87% 2.23% CV% 10.46%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0% -1.81% %Effect 0.0%
0 2 4 9 18 35 73.5 Angular (Cor C -%	Brine Control rrected) Transfor Control Type	5 5 5 5 5 5 5 5 rmed Sumr Count	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901 mary Mean 1.465 1.486	0.8963 0.9718 0.9876 0.971 1 0.9258 0.9627 95% LCL 1.275 1.402	1 1 1 1 1 1 1 1 95% UC 1.655 1.57	<u> </u>	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286 0.9505 Min 1.191 1.388	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685 0.00989 Std Err 0.06852 0.03027	6.32% 1.49% 0.74% 1.73% 0.0% 3.87% 2.23% CV% 10.46% 4.55%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0% -1.81% %Effect 0.0% -1.44%
0 2 4 9 18 35 73.5 Angular (Cor C -% 0 2	Brine Control rrected) Transfor Control Type	5 5 5 5 5 5 5 rmed Sumr Count 5 5	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901 mary Mean 1.465 1.486 1.515	0.8963 0.9718 0.9876 0.971 1 0.9258 0.9627 95% LCL 1.275 1.402 1.464	1 1 1 1 1 1 1 1 95% UC 1.655 1.57 1.566	CL_	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286 0.9505 Min 1.191 1.388 1.442	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685 0.00989 Std Err 0.06852 0.03027 0.01833	6.32% 1.49% 0.74% 1.73% 0.0% 3.87% 2.23% CV% 10.46% 4.55% 2.71%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0% -1.81% %Effect 0.0% -1.44% -3.43%
0 2 4 9 18 35 73.5 Angular (Cor C-% 0 2 4	Brine Control rrected) Transfor Control Type	5 5 5 5 5 5 5 rmed Sumr Count 5 5	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901 mary Mean 1.465 1.486 1.515 1.502	0.8963 0.9718 0.9876 0.971 1 0.9258 0.9627 95% LCL 1.275 1.402 1.464 1.413	1 1 1 1 1 1 1 1 95% UC 1.655 1.57 1.566 1.591	CL	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286 0.9505 Min 1.191 1.388 1.442 1.373	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685 0.00989 Std Err 0.06852 0.03027 0.01833 0.03206	6.32% 1.49% 0.74% 1.73% 0.0% 3.87% 2.23% CV% 10.46% 4.55% 2.71% 4.78%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0% -1.81% %Effect 0.0% -1.44% -3.43% -2.49%
C-% 0 2 4 9 18 35 73.5 Angular (Cor C-% 0 2 4 9 18 35	Brine Control rrected) Transfor Control Type	5 5 5 5 5 5 5 rmed Sumr Count 5 5	0.9725 0.9901 0.9967 0.9923 1 0.9725 0.9901 mary Mean 1.465 1.486 1.515	0.8963 0.9718 0.9876 0.971 1 0.9258 0.9627 95% LCL 1.275 1.402 1.464	1 1 1 1 1 1 1 1 95% UC 1.655 1.57 1.566	CL_	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.8626 0.967 0.9835 0.9615 1 0.9286 0.9505 Min 1.191 1.388 1.442	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.02747 0.006593 0.003296 0.007692 0 0.01685 0.00989 Std Err 0.06852 0.03027 0.01833	6.32% 1.49% 0.74% 1.73% 0.0% 3.87% 2.23% CV% 10.46% 4.55% 2.71%	0.0% -1.81% -2.49% -2.03% -2.83% 0.0% -1.81% %Effect 0.0% -1.44% -3.43%

Analyst: Ja QA:EGY/3/6

Report Date: Test Code: 03 Apr-19 10:21 (p 4 of 4)

1903-S059 | 01-5343-3513



Report Date:

03 Apr-19 10:21 (p 1 of 2)

Test Code:

1903-S059 | 01-5343-3513

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Analysis ID: 15-3713-8684 Analyzed:

03 Apr-19 10:16

Linear

Endpoint: Development Rate Analysis:

1000

Linear Interpolation (ICPIN)

CETIS Version:

CETISv1.8.7

Official Results:

Yes

Linear interpol	ation Options			
X Transform	Y Transform	Seed	Resamples	Exp 95% CL

1967278

Two-Point Interpolation

Method

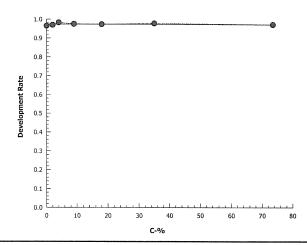
Linear

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC25	>73.5	N/A	N/A	<1.361	NA	NA
EC50	>73.5	N/A	N/A	<1.361	NA	NA

Yes

Development Rate Summary			Calculated Variate(A/B)								
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Brine Control	5	0.9641	0.9415	0.977	0.0065	0.01453	1.51%	0.0%	962	997
2		5	0.9698	0.9545	0.9832	0.005323	0.0119	1.23%	-0.59%	903	931
4		5	0.9829	0.9758	0.9949	0.003227	0.007217	0.73%	-1.95%	971	988
9		5	0.9749	0.9659	0.9848	0.004047	0.00905	0.93%	-1.12%	933	957
18		5	0.9735	0.9683	0.9804	0.002279	0.005097	0.52%	-0.97%	997	1024
35		5	0.9782	0.9688	0.9882	0.003406	0.007616	0.78%	-1.46%	885	905
73.5		5	0.9713	0.957	0.9827	0.004956	0.01108	1.14%	-0.74%	937	965

Graphics



Report Date:

03 Apr-19 10:21 (p 2 of 2)

Test Code:

1903-S059 | 01-5343-3513

Bivalve Larval Survival and Development Te	est
·	

Nautilus Environmental (CA)

Analysis ID: 11-8603-6224 Analyzed: 03 Apr-19 10:16 Endpoint: Survival Rate

CETIS Version: CETISv1.8.7

ulte:	Yes	

Analyzed:	03 Apr-19 10:16	Analysis:	Linear Interpolation (ICPIN)	
Linear Interp	polation Options	WANTED TO THE TOTAL OF THE TOTA		

Official Results: Yes

X	ıranstorm	Y Transfo

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method

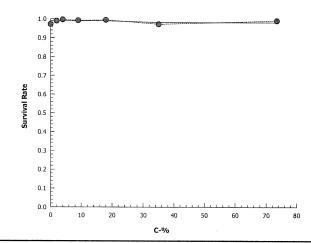
Linear	Linear	675368	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC25	>73.5	N/A	N/A	<1.361	NA	NA
EC50	>73.5	N/A	N/A	<1.361	NA	NA

Survival Rate Summary		Calculated Variate(A/B)									
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Brine Control	5	0.9725	0.8626	1	0.02747	0.06143	6.32%	0.0%	885	910
2		5	0.9901	0.967	1	0.006593	0.01474	1.49%	-1.81%	901	910
4		5	0.9967	0.9835	1	0.003296	0.007371	0.74%	-2.49%	907	910
9		5	0.9923	0.9615	1	0.007692	0.0172	1.73%	-2.03%	903	910
18		5	1	1	1	0	0	0.0%	-2.83%	910	910
35		5	0.9725	0.9286	1	0.01685	0.03767	3.87%	0.0%	885	910
73.5		5	0.9901	0.9505	1	0.00989	0.02211	2.23%	-1.81%	901	910





Analyst: Ja QA: E44/3/9

Report Date:

15 Mar-19 15:31 (p 1 of 1)

Test Code: 1963-5059 01-5343-3513/92535A9

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Start Date: 20 Mar-19 Species: Mytilus galloprovincialis Sample Code: 19-0392 End Date: 22 Mar-19 Protocol: EPA/600/R-95/136 (1995) Sample Source: Jacobs

Sample Date: 19 Mar-19 Sample Station: Wyckoff 6 WTP Material: Effluent Sample

Code Re	ep Pos 61 62 63 64 65 66 67 68 69 70 71 72 73 74	Initial Density	Final Density	#Counted \75 \184 \189 \217 \192 \198 \204 \197 \217	#Normal 170 177 183 212 186 182 191 200 191 211 176 199	Notes 3/29/19
	62 63 64 65 66 67 68 69 70 71 72 73			189 217 192 188 198 204 197 217	183 212 186 182 191 200 191	
	63 64 65 66 67 68 69 70 71 72 73			189 217 192 188 198 204 197 217	183 212 186 182 191 200 191	
	64 65 66 67 68 69 70 71 72 73			217 192 188 198 204 197 217	186 182 191 200 191	
	65 66 67 68 69 70 71 72 73			K1 + 179	186 182 191 200 191	
	66 67 68 69 70 71 72 73			K1 + 179	200 191 211	
	67 68 69 70 71 72 73			K1 + 179	200 191 211	
	68 69 70 71 72 73			K1 + 179	200 191 211	
	69 70 71 72 73			K1 + 179	200 191 211	
	70 71 72 73			K1 + 179	211	
	71 72 73			K1 + 179	211	
	72 73			179	17.1	
	73			0		
				200	199	
	74			198	192	
				196	192	
	75			211	205 184 205	
	76			188	184	
	77			213	205	
	78			219	211	
	79			186	181	
	80			195	191	
	81			210	207	
	82			217	212	
	83	****			205	
	84			T57	151	
	85			197	194	
	86				167	
	87			174	170	
	- 88			188	177	
	89			192	129	
	90	- Parama Parama and a sanggarang panggarang panggarang ang panggarang ang panggarang ang panggarang panggarang		207	202	
	91			17.9	176	
	92				170	
	93	···		1921	190	×
	94			1 1 1 1	193	
	95			14%	168	
	96			217		
	97				198	
	98			1/0	1/7	
	99			198	193	
	100			187	170	
		78 79 80 81 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98	78 79 80 81 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98	78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 93 94 95 96	78	78 79 186 181 80 80 175 191 81 81 210 207 82 82 217 212 83 209 205 84 157 151 85 86 170 167 87 144 170 88 188 177 89 90 207 202 91 179 176 92 179 176 92 179 176 92 93 94 197 197 95 96 216 216 211 97 98 98

Report Date:

15 Mar-19 15:31 (p 1 of 1)

Test Code: 1903-5059 01-5343-3513/92535A9

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Start Date:	20 Mar-19	Species:	Mytilus galloprovincialis	Sample Code:	19-0392
End Date:	22 Mar-19	Protocol:	EPA/600/R-95/136 (1995)	Sample Source:	Jacobs

Sample Station: Wyckoff GWTP Material: Effluent Sample Sample Date: 19 Mar-19

Sample Date	: 19 N	/lar-19)	Material: E	Effluent Sample			Sample Station: Wyckoff 4 who
C-%	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	ВС	1	84					
0	ВС	2	96					
0	ВС	3	78			191	185	PT 3/22/19
0	ВС	4	82					•
0	ВС	5	88					
0	LC	1	81	THE PART OF THE PROPERTY OF THE PARTY OF THE				
0	LC	2	72					
0	LC	3	67			177	170	PT 3/23/19
0	LC	4	87					
0	LC	5	75					
2		1	73					
2		2	93					
2		3	62			166	(60	PT 3/23/19
2		4	95					
2		5	91					
4		1	74					
4		2	94					
4		3	71			160	156	RT 3/23/19
4		4	90					
4		5	83					
9		1	66					
9		2	89	The second secon				
9		3	97			192	184	ZT 3/23/19
9		4	61	774.00.999999999999999999999999999999999				
9		5	85					
18		1	63					
18		2	70					
18		3	69					\$ 3
18		4	64			186	(80	RT 3/23/19
18		5	68					\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
35		1	65					:
35		2	76					
. 35		3	79					
35		4	98			154	(5)	RT 3/23/19
35		5	86					
5 High 74 5 Bille 74 5 5 74	X	1	80					
5 Phy 74/		2	100					
5 Brinc 14 6)	3	99					
5 / 74	I	4	77		*	10/	170	1 C b . 11-
						186	178	KT 3/22/19

QC=B0 @Q18 B0 3/15/19

Marine Chronic Bioassay

Water Quality Measurements

Client: Jacobs Sample ID: Wyckoff Eggle Harbor GWTP Effluent

Test Species: M. galloprovincialis

Sample Log No.: 19-0392

Start Date/Time: 3/20/2019 [525]

End Date/Time: 3/22/2019 1500

Test No.: 1903 - S059

Concentration		Salinity		T	emperatu	re	Diss	solved Ox	ygen		рН	
(% sample)		(ppt)	·		(°C)	·		(mg/L)	·	 	(pH units	
	0	24	48	0	24	48	0	24	48	0	24	48
Lab Control	30.0	24,9	29.8	15.6	15.2	15.1	8.3	7.9	8.0	7.98	8.00	7.94
Brine Control	30.3	30.3	30.3	15.5	15.1	15.0	8.0	7.9	8.1	8.12	8,06	7.97
2	30.0	30.1	30.0	16.0	15.1	14.8	8.2	8,0	8.1	7.96	8.03	799
4	30.1	30.2	30.2	16.0	15,5	15.1	8.2	7.9	8.2	798	8.05	8.01
9	30.1	30.2	30.3	16.0	15.4	15.1	8.2	7.4	8.2	792	8,07	8.07
18	30.1	30.1	30.2	15.9	15.3	15.1	8.2	8.0	8.2	7.85	80.8	8.12
35	30.0	29,9	30.\	15,8	15.5	15.3	8.2	7.9	8.1	7.76	8.11	8.20
73.5 High Brine ®	29.9	29.7	29.8	15.6	15.6	15.2	8.2	7.8	8.2	7.65	8.11	8.26

		0	24	48
Technician Initials:	WQ Readings:	Bo	565	· Bo
	Dilutions made by:	Rn		

Comments:	

0 hrs:

24 hrs:

48 hrs:

QC Check:

Final Review:

Marine Chronic Bioassay

Brine Dilution Worksheet

Project:

JACOBS

Analyst: BO

Sample ID:

Wyckoff Eagle Harbor GWTP EFF.

Test Date: 3/20/2019

Test No:

1903-5059

Test Type: Mussel Development

Salinity of Effluent

7.2

Salinity of Brine

93.3

Date of Brine used: 1/30/2019

Target Salinity

30

Alkalinity of Brine Control: 106 mg/L as CaCO3

Test Dilution Volume

250

Effluent

Brine Control

Salinity Adjustment Factor:

(TS - SE)/(SB - TS) =

0.36

0.47

TS = target salinity

SE = salinity of effluent

SB = salinity of brine

Concentration %	Effluent Volume (ml)	Salinity Adjustment Factor	Brine Volume (ml)	Dilute to: (ml)
Control	NA	NA	NA	250
2	5.0	0.36	1.8	250
4	10.0	0.36	3.6	250
9	22.5	0.36	8.1	250
18	45.0	0.36	16.2	250
35	87.5	0.36	31.5	250
73.5	183.8	0.36	66.2	250

	DI Volume			
Brine Control	139.7	0.47	66.2	250

Total Brine Volume Required (ml): 193.6

QC Check: Eq 4/2/9

Final Review: <u>AC4/17/19</u>

Nautilus Environmental. 4340 Vandever Avenue. San Diego, CA 92120.

Client:	Jacobs-Wyckoff GNTP
Test No.:,	1903-5059
Test Species:	M. gallomovincialis
Animal Source:	Mission Bay
Date Received:	3/5/19 0
Test Chambers:	30 ml shell vial
Sample Volume:	10mL

Start Date/Time: 3/20/2019 End Date/Time: 3/22/2019 Technician Initials: BOIKSIFG

Spawn Information

First Gamete Release Time:

1113

	Sex	Number Spawning
	Male	4
ſ	Female	4

Gamete Selection

Garriete Gelection		
Sex	Beaker Number(s)	Condition (sperm motility, egg density, color, shape, etc.)
Male	1,3,4	apod metility and density
Female 1	ì	Dale yellow color, good dersity, some round
Female 2	2	White color, good density mostly rous
Female 3	3	Ovange color gooddersity, mostlymed

Egg Fertilization Time: 1253

Embryo Stock Selection

Stock Number	% of embryos at 2-cell division stage
Female 1	NIA
Female 2	NIA
Female 3	100%

Stock(s) chosen for testing: ___

Embryo Inoculum Preparation

Target count on Sedgwick-Rafter slide for desired density is 6 embryos

Number Counted:

15	15
18	19
19	18
17	19
19	19

Mean
$$17.8$$
 \times 50 = 890 embryos/ml

Initial Density: 390
I Final Density: 300 Desired Final Density:

(to inoculate with 0.5 ml)

Prepare the embryo inoculum according to the calculated dilution factor. For example, if the dilution factor is 2.25, use 100 ml of existing stock (1 part) and 125 ml of dilution water (1.25 parts).

Time Zero Control Counts

ean % ividing
190%
1 /
7 :

Comments:

QC Check:

Final Review: AC 4/17/19

Appendix B
Sample Check-In Information

Nautilus Environmental 4340 Vandever Avenue San Diego, CA 92120

Client:	\mathcal{C}	AC	085
	. 1	1.	

Sample Check-In Information

Cilent:_					Sampi
Sample ID:	Wyckoff -	031919	Eagle Harber	GWTP	Effluen
Test ID No(s).:	1903-5059	}		Sample Des	scription:

Conselles, Cuto	1R,000e	CESS, N	> DEB
COC Complete (Y/N)	?		
ABC			
Filtration? Y (N))		
Pore Size:	,		
Organisms	or	Debris	
- · 3	٠.		
Salinity Adjustment?			
Test: Mv55el	Source: 8	Targ	jet ppt:ろ
Test:	Source:	Targ	et ppt:
Test:	Source:	Targ	et ppt:
pH Adjustment? Y	(N)		
	A	В	С
Initial pH:			
Amount of HCI added:			
Final pH:	~~		
Cl ₂ Adjustment? Y	(N)		
	A	В	С
Initial Free Cl ₂ :			
STS added:			
Final Free Cl ₂ :			1
Sample Aeration? Y	(N)		
	Α	В	С
Initial D.O.			T
Duration & Rate			
Final D.O.			
			~
Subsamples for Addi		nistry Requir	ed? (Y)
NH3 Other	- \	*****	

Final Review: 8 5/13/19

Sample (A, B, C):	A			
Log-in No. (19-xxxx):	0392			
Sample Collection Date & Time:	3/19/19 0933	And the second s		
Sample Receipt Date & Time:	3/20/19 0950			
Number of Containers & Container Type:	1-11- Cusi			
Approx. Total Volume Received (L):	NIL		-	
Check-in Temperature (°C)	2.5			
Temperature OK? 1	⟨Ŷ⟩ N	ΥN	Y N	ΥN
remperature OK:		1 14	1 14	
DO (mg/L)	8.6	1 11		1 1
		1 14		1 11
DO (mg/L)	8.6			, , , , , , , , , , , , , , , , , , ,
DO (mg/L) pH (units)	8.6 7.47 11,110		T N	
DO (mg/L) pH (units) Conductivity (μS/cm)	8.6 7.47 11,110 7.2		T N	
DO (mg/L) pH (units) Conductivity (µS/cm) Salinity (ppt)	8.6 7.47 11,110 7.2 413		T N	
DO (mg/L) pH (units) Conductivity (µS/cm) Salinity (ppt) Alkalinity (mg/L) ²	8.6 7.47 11,110 7.2 413			

Test Performed:	Mussel Development Control/Dilution Water: 8:2 / Lab SW / Lab ART Other: Alkalinity: 106 Hardness or Salinity: 30 ppt Additional Control? (Y) N = Brive Control Alkalinity: 106 Hardness or Salinity: 30 ppt
Test Performed:	Control/Dilution Water: 8:2 / Lab SW / Lab ART Other:
	Alkalinity: Hardness or Salinity:
	Additional Control? Y N = Alkalinity: Hardness or Salinity:
Test Performed:	Control/Dilution Water: 8:2 / Lab SW / Lab ART Other:
	Alkalinity: Hardness or Salinity:
	Additional Control? Y N = Alkalinity: Hardness or Salinity:
Notes:	¹ Temperature of sample should be 0-6°C, if received more than 24 hours past collection time.
	² mg/L as CaCO3, ³ Measured for freshwater samples only, NA = Not Applicable
Additional Comments:	

Client: JACOBS
Project: Wyckoff
Test Type: Mussel Development

DI Blank: <u>0.0</u> Test Start Date: <u>3/20/2019</u> Analyst: NM EG
Analysis Date: 51719

N x 1.22

				N X 1.22			
Sample ID	Nautilus ID	Sub-Sample Date	Test Day	NH3-N (mg/L)	Ammonia (mg/L)		
Blank Spike (10 mg/L NH ₃)		NA	NA	9.0	0.11		
Wyckoff		3/20/2019	Check In	1.2	1.5		
	 						
Spike Check (10 mg/L NH ₃)		NA	NA				
				the the second s			
Sample Duplicate ^a		NA NA	NA NA	1.1	1.3		
Sample Duplicate + Spike ^a		NA	NA NA	10.5	12.8		
Spike Check (10 mg/L NH ₃)		NA	NA	9.0	11.0		

 $\frac{\text{Relative Percent Difference (RPD) = [sample] (mg/L) - [sample duplicate] (mg/L)}}{[\text{average ammonia] (mg/L)}} \times 100$

Acceptable Range: 0-20%

 $\frac{Percent \; Recovery = [spiked \; sample] \; (mg/L) - [sample] \; (mg/L)}{nominal \; [spike] \; (mg/L)} \quad x \; 100$

Nautilus Environmental. 4340 Vandever Avenue. San Diego, CA 92120.

Acceptable Range: 80-120%b

QC Sample ID	[NH ₃]	[Sample Dup]	Measured [Spike]	Nominal [Spike]	RPD	% Recovery
Blank	0	NA	11.0	10	NA	110
Wyckoff	1.5	1.3	12.8	10	14.3	113

Comments:
Notes: ^a Unless otherwise noted, the last sample listed on the datasheet is used for duplicate and duplicate + spike QC check.
^b Acceptable range for % recovery applies only to the blank spike. Spike recoveries in samples may vary based on sample matrix and are for information only.
^c Calculation not performed due to one or both values below the method detection limit.
Method Detection Limit = 0.5 mg/L
QC Check: EG 5/10/19 Final Review: 5/W/19

Appendix C Chain-of-Custody Form

Enthalpy Analytical (REGION COPY)

DateShipped: 3/19/2019

AirbillNo: 774740017282

CarrierName: FedEx

Special Instructions:

Analysis Key: CHRTOX=Chronic Toxicity

CHAIN OF CUSTODY RECORD

Wyckoff Eagle Harbor GWTP 2019/WA Project Code: WEH-025Z Cooler #: 1 of 1 No: 10-031919-095235-0352

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

2019T10P000DD210W2LA00 Contact Name: Keith Allers Contact Phone: 206-780-1711

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
031919		Ground Water/ K.Allers	Composite	CHRTOX(8 Weeks)	(< 6 C) (1)	SP-11	03/19/2019 09:33	Field Sample

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Kind Ollow JACKES	3-19-2019	Taxula TAYLOR NASU (EA)	०१६० वैथीन	RECEIPT TENP

Appendix D
Reference Toxicant Test Results

Bivalve Larval Development Test

Copper Sulfate

CETIS Summary Report

Report Date:

09 Apr-19 09:31 (p 1 of 3)

Test Code:

190320msdvSO | 02-0163-9394

	····						rest Code:	190320msdvSO 02-0163-939
Bivalve Larval	Survival and Developn	nent Test						Nautilus Environmental (CA)
Batch ID: Start Date: Ending Date: Duration:	20 Mar-19 15:25 F 22 Mar-19 15:00 S	Test Type: Protocol: Species: Source:	Development- EPA/600/R-95 Mytilus gallopr Taylor Shellfis	/136 (1995) ovincialis	oy			viluted Natural Seawater lot Applicable
Sample ID: Sample Date: Receive Date: Sample Age:	20 Mar-19 N	Code: //aterial: Source: Station:	190320msdvS Copper sulfate Reference Tox Copper Sulfate	kicant			Client: Ir Project:	nternal
Comparison S	ummary							
Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method	1
13-2821-2322 11-9614-8486 14-4724-2580	Combined Development Development Rate Survival Rate	t Ra 5 5 20	10 10 40	7.071 7.071 28.28	4.47% 1.92% 5.2%	-	Dunnet	t Multiple Comparison Test t Multiple Comparison Test lany-One Rank Sum Test
Point Estimate	Summarv							
Analysis ID	Endpoint	Level	μg/L	95% LCL	95% UCL	TU	Method	i
10-2896-8877	Combined Development	t Ra EC25 EC50	8.057 11.63	7.412 10.5	8.772 12.62		Linear I	nterpolation (ICPIN)
06-2977-8138	Development Rate	EC25 EC50	8.199 11.9	7.748 11.17	8.766 12.65		Linear I	nterpolation (ICPIN)
15-3118-7055	Survival Rate	EC25 EC50	24.09 29.39	22.74 28.5	24.96 29.97		Linear I	nterpolation (ICPIN)
Test Acceptab	ility							
Analysis ID	Endpoint	Attrib	ute	Test Stat	TAC Limi	ts	Overla	Decision
06-2977-8138 11-9614-8486 14-4724-2580 15-3118-7055 13-2821-2322	Development Rate Development Rate Survival Rate Survival Rate Combined Development	Contro Contro Contro	ol Resp ol Resp ol Resp ol Resp	0.9745 0.9745 0.9802 0.9802 0.04475	0.9 - NL 0.9 - NL 0.5 - NL 0.5 - NL NL - 0.25		Yes Yes Yes Yes No	Passes Acceptability Criteria

043 5/3/A Q18

Report Date:

09 Apr-19 09:31 (p 2 of 3)

Test Code:

190320msdvSO | 02-0163-9394

Bivalve Lar	Bivalve Larval Survival and Development Test							Nautilus Environmental (CA)			
Combined [Development Rate	e Summary									
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9553	0.9147	0.9959	0.9176	0.9891	0.01462	0.0327	3.42%	0.0%
2.5		5	0.932	0.878	0.986	0.8846	0.9701	0.01944	0.04348	4.67%	2.44%
5		5	0.9607	0.9393	0.9821	0.94	0.9785	0.007717	0.01726	1.8%	-0.57%
10		5	0.5714	0.4953	0.6476	0.5055	0.6593	0.02742	0.06131	10.73%	40.18%
20		5	0	0	0	0	0	0	0		100.0%
40		5	0	0	0	0	0	0	0		100.0%
Developme	nt Rate Summary	•									
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9745	0.9611	0.9878	0.9598	0.9891	0.0048	0.01073	1.1%	0.0%
2.5		5	0.9673	0.9587	0.9759	0.9583	0.9758	0.003091	0.006911	0.71%	0.73%
5		5	0.9607	0.9393	0.9821	0.94	0.9785	0.007717	0.01726	1.8%	1.41%
10		5	0.6009	0.5424	0.6595	0.5444	0.6742	0.02109	0.04716	7.85%	38.33%
20		5	0	0	0	0	0	0	0		100.0%
40		5	0	0	0	0	0	0	0		100.0%
Survival Rat	te Summary										
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9802	0.9462	1	0.9451	1	0.01224	0.02736	2.79%	0.0%
2.5		5	0.9637	0.902	1	0.9066	1	0.02222	0.04969	5.16%	1.68%
5		5	1	1	1	1	1	0	0	0.0%	-2.02%
10		5	0.9495	0.9036	0.9953	0.8956	0.9835	0.01652	0.03694	3.89%	3.14%
20		5	0.9253	0.8549	0.9956	0.8571	1	0.02533	0.05665	6.12%	5.61%
40		5	0	0	0	0	0	0	0		100.0%
Combined D	Development Rate	e Detail									
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	0.9891	0.97	0.9766	0.9176	0.9231					
2.5		0.8846	0.9701	0.9624	0.8846	0.9583					
5		0.9447	0.9785	0.9676	0.94	0.9727					
10		0.6593	0.522	0.5934	0.5055	0.5769					
20		0	0	0	0	0					
40		0	0	0	0	0					
Developmen	nt Rate Detail			***************************************					***************************************		
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	0.9891	0.97	0.9766	0.9598	0.9767					
2.5		0.9699	0.9701	0.9624	0.9758	0.9583					
5		0.9447	0.9785	0.9676	0.94	0.9727					
10		0.6742	0.5828	0.6034	0.5444	0.6					
20		0	0.3020	0.0034	0.5444	0.0					
40		0	0	0	0	0					
Survival Rat	e Detail								400 to 100 to		
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	1	1	1	0.956	0.9451		***************************************			······································
2.5		0.9121	1	1	0.9066						
5		1	1	1		1					
10		0.978	-	-	1	1					
20			0.8956	0.9835	0.9286	0.9615					
40		0.9176	0.8901	0.9615	0.8571	1					
-	***************************************	0	0	0	0	0					

Report Date:

09 Apr-19 09:31 (p 3 of 3)

Test Code:

190320msdvSO | 02-0163-9394

							rest Code:	190320msaVSO 02-0163-9392
Bivalve La	ırval Survival and l	Developme	nt Test					Nautilus Environmental (CA)
Combined	Development Rat	e Binomials	3					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	182/184	194/200	209/214	167/182	168/182		
2.5		161/182	195/201	179/186	161/182	184/192		
5		188/199	182/186	179/185	188/200	178/183		
10		120/182	95/182	108/182	92/182	105/182		
20		0/182	0/182	0/182	0/182	0/194		
40		0/182	0/182	0/182	0/182	0/182		
Developm	ent Rate Binomials	3						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	182/184	194/200	209/214	167/174	168/172		
2.5		161/166	195/201	179/186	161/165	184/192		
5		188/199	182/186	179/185	188/200	178/183		
10		120/178	95/163	108/179	92/169	105/175		
20		0/167	0/162	0/175	0/156	0/194		
40		0/1	0/1	0/1	0/1	0/1		
Survival R	ate Binomials			W		TATE OF THE STATE		
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	182/182	182/182	182/182	174/182	172/182		
2.5		166/182	182/182	182/182	165/182	182/182		
5		182/182	182/182	182/182	182/182	182/182		
10		178/182	163/182	179/182	169/182	175/182		
20		167/182	162/182	175/182	156/182	182/182		
40		0/182	0/182	0/182	0/182	0/182		

Report Date:

Test Code:

09 Apr-19 09:31 (p 1 of 4) 190320msdvSO | 02-0163-9394

							Test	Code:	190320m	nsdvSO 0	2-0163-939
Bivalve Larv	al Survival and	Developme	ent Test						Nautilus	s Environr	nental (CA)
Analysis ID: Analyzed:	13-2821-2322 09 Apr-19 9:2		•		relopment Rantrol vs Trea			IS Version:	CETISv1 Yes	.8.7	
Data Transfo	orm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	rected)	NA	C > T	NA	NA		4.47%	5	10	7.071	
Dunnett Mult	tiple Compariso	n Test									
Control	vs C-μg/L		Test Stat	Critical	MSD DF	P-Value	P-Type	Decision(α:5%)		
Lab Control	2.5	***************************************	1.18	2.227	0.099 8	0.2655	CDF		icant Effect		
	5		-0.1124	2.227	0.099 8	0.7885	CDF		icant Effect		
	10*		11.48	2.227	0.099 8	<0.0001	CDF	Significant	Effect		
ANOVA Table	e										
Source	Sum Squ	uares	Mean Squ	uare	DF	F Stat	P-Value	Decision(α:5%)		
Between	0.934646	9	0.311549		3	62.57	<0.0001	Significant	Effect		
Error	0.079666	67	0.0049791	167	16						
Total	1.014314				19						
Distributiona	al Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Bartlett I	Equality of \	/ariance	1.77	11.34	0.6216	Equal Var	iances			
Distribution	Shapiro-	Wilk W Nor	rmality	0.913	0.866	0.0727	Normal D	istribution			
Combined D	evelopment Rat	e Summary	1								
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	5	0.9553	0.9147	0.9959	0.97	0.9176	0.9891	0.01462	3.42%	0.0%
2.5		5	0.932	0.878	0.986	0.9583	0.8846	0.9701	0.01944	4.67%	2.44%
5		5	0.9607	0.9393	0.9821	0.9676	0.94	0.9785	0.007717	1.8%	-0.57%
10		5	0.5714	0.4953	0.6476	0.5769	0.5055	0.6593	0.02742	10.73%	40.18%
20		5	0	0	0	0	0	0	0		100.0%
40		5	0	0	0	0	0	0	0		100.0%
Angular (Cor	rected) Transfo	rmed Sumr	mary								
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	5	1.37	1.268	1.472	1.397	1.28	1.466	0.03664	5.98%	0.0%
2.5		5	1.317	1.211	1.424	1.365	1.224	1.397	0.03834	6.51%	3.85%
5		5	1.375	1.32	1.43	1.39	1.323	1.424	0.01982	3.22%	-0.37%
10 20		5	0.8576	0.7801	0.935	0.8626	0.7909	0.9476	0.0279	7.27%	37.4%
40		5 5	0.03684 0.03707	0.03619 0.03706	0.03748 0.03708	0.03707	0.03591	0.03707	0.000233	1.42%	97.31%
			0.03707	0.03700	0.03706	0.03707	0.03707	0.03707	0	0.0%	97.29%
Graphics											
1.0						0.100	F	1			
0.9 🚅	9			Reject Null	nus.	0.075					
3.0 men	8 -			•		0.075			4		
0.7	7				_	0.050 و	-		990		
l Deve	ļ.				i	Corr. Angle 0.025 0.000	E				
B 82 0.0	‡		-								
Combined Development 8 Rate 9.0 8.0 8.0	5 =				,	0.000		000000	60	7/1	
E 0.4	4 =					-0.025	<u>.</u> 	/			
	3 =					0.025	-				•

0.3

0.2

0.1 0.0

0 LC

-0.100 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5

Rankits

40

10

C-µg/L

20

-0.050

-0.075

Report Date:

09 Apr-19 09:31 (p 2 of 4)

Test Code:

190320msdvSO | 02-0163-9394

						THE RESERVE THE PERSON NAMED IN COLUMN 1		. 00uc.	10002011	134100 0	2-0100-303
Bivalve Larva	al Survival and I	Develop	ment Test						Nautilus	Environ	mental (CA
Analysis ID: Analyzed:	11-9614-8486 09 Apr-19 9:28		•	evelopment R arametric-Cor		itments		IS Version:		.8.7	
Data Transfo	rm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	ected)	NA	C > T	NA	NA		1.92%	5	10	7.071	
Dunnett Mult	iple Compariso	n Test									
Control	vs C-μg/L		Test Sta	t Critical	MSD DF	P-Value	P-Type	Decision	(a:5%)		
Lab Control	2.5	-	0.967	2.227	0.054 8	0.3447	CDF	·····	ificant Effect		***************************************
	5		1.572	2.227	0.054 8	0.1524	CDF	_	ificant Effect		
	10*		21.51	2.227	0.054 8	<0.0001	CDF	Significar	t Effect		
ANOVA Table	}										
Source	Sum Squ	ares	Mean So	luare	DF	F Stat	P-Value	Decision	(α:5%)		
Between	0.961029	6	0.320343	32	3	214.4	<0.0001	Significan		***************************************	
Error	0.023903		0.001493	3979	16	erone.					
Total	0.984933	3			19						
Distributiona	l Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances			of Variance	2.907	11.34	0.4061	Equal Vai				***************************************
Distribution	Shapiro-	Wilk W I	Normality	0.9727	0.866	0.8098	Normal D	istribution		-	
Development	Rate Summary										
C-µg/L	Control Type	Coun	t Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	5	0.9745	0.9611	0.9878	0.9766	0.9598	0.9891	0.0048	1.1%	0.0%
2.5		5	0.9673	0.9587	0.9759	0.9699	0.9583	0.9758	0.003091	0.71%	0.73%
5		5	0.9607	0.9393	0.9821	0.9676	0.94	0.9785	0.007717	1.8%	1.41%
10		5	0.6009	0.5424	0.6595	0.6	0.5444	0.6742	0.02109	7.85%	38.33%
20		5	0	0	0	0	0	0	0		100.0%
40 		5	0	0	0	0	0	0	0		100.0%
Angular (Corr	rected) Transfor	med Su	ımmary								
C-µg/L	Control Type	Coun		95% LCL	95% UCL		Min	Max	Std Err	CV%	%Effect
0	Lab Control	5	1.413	1.369	1.458	1.417	1.369	1.466	0.01597	2.53%	0.0%
2.5		5	1.39	1.366	1.414	1.396	1.365	1.414	0.008694	1.4%	1.67%
5		5	1.375	1.32	1.43	1.39	1.323	1.424	0.01982	3.22%	2.72%
10		5	0.8875	0.8272	0.9478	0.8861	0.8298	0.9633	0.02172	5.47%	37.21%
20		5	0.03835	0.03637	0.04033	0.0387	0.03591	0.04004	0.000712	4.15%	97.29%
40		5	0.5236	0.5234	0.5238	0.5236	0.5236	0.5236	0	0.0%	62.95%
Graphics											
1.0 F						0.08 г	-				
0.9				Reject Null	-	0.07	-			•	/
ļ.						0.06	-				,
Rate 8.0						0.05	-			• /	
0.7					3	0.04					
0.6			-		Control	0.03	-				
do 0.5					Ę	Corr. Angle 0.03 0.02 0.01	•				
ě						ا 0.01 0.00			/ssee		
0.4						-0.01					
0.3				•		-0.02		886			

-0.06 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5

Rankits

0.2

0.1

0 LC

20

C-µg/L

40

-0.03 -0.04

-0.05

Report Date:

09 Apr-19 09:31 (p 3 of 4)

Test Code:

190320msdvSO | 02-0163-9394

								Test Code: 190320msdvS			savSO 02	vSO 02-0163-9394		
Bivalve Larv	al Survival and	Developm	ent Test							Nautilus	Environn	nental (CA		
Analysis ID:	14-4724-2580	Eı	n dpoint: Sur	rvival Rate				CET	S Version:	CETISv1.	8.7	***************************************		
Analyzed:	09 Apr-19 9:28	8 A r	nalysis: No	nparametric-	-Control vs	: Tre	atments	Offic	ial Results	: Yes				
Data Transfo	orm	Zeta	Alt Hyp	Trials	Seed			PMSD	NOEL	LOEL	TOEL	TU		
Angular (Corr	ected)	NA	C > T	NA	NA			5.2%	20	40	28.28			
Steel Many-C	One Rank Sum T	est												
Control	vs C-μg/L		Test Stat	Critical	Ties D)F F	P-Value	P-Type	Decision	(α:5%)				
Lab Control	2.5		25.5	17	1 8	0	0.6377	Asymp	Non-Signi	ficant Effect		 ,		
	5		32.5	17	1 8	0	0.9812	Asymp	Non-Signi	ficant Effect				
	10		21	17	0 8	٥ د).2314	Asymp	Non-Signi	ficant Effect				
	20		20.5	17	1 8	0	.1966	Asymp	Non-Signi	ficant Effect				
ANOVA Table	е						N							
Source	Sum Sqւ	ıares	Mean Squ	ıare	DF	F	Stat	P-Value	Decision((a:5%)				
Between	0.142418	4	0.0356046	31	4	3	3.048	0.0410	Significan	t Effect				
Error	0.233600	15	0.0116800)3	20									
Total	0.376018	19			24									
Distributiona	I Tests													
Attribute	Test			Test Stat	Critical	P	P-Value	Decision(α:1%)					
Variances	Bartlett F	Equality of	Variance	110.5	13.28	<	:0.0001	Unequal V	ariances					
Distribution	Shapiro-	Wilk W No	rmality	0.956	0.8877	0	.3398	Normal Di	stribution					
Survival Rate	Summary													
C-µg/L	0													
C-μg/L	Control Type	Count	Mean	95% LCL	95% UCI	L N	/ledian	Min	Max	Std Err	CV%	%Effect		
0	Lab Control	5	Mean 0.9802	95% LCL 0.9462	95% UCI	L N		Min 0.9451	Max 1	Std Err 0.01224	CV% 2.79%	%Effect 0.0%		
0		·												
0 2.5 5		5	0.9802	0.9462	1	1		0.9451	1	0.01224	2.79%	0.0%		
0 2.5		5 5	0.9802 0.9637	0.9462 0.902	1	1 1 1		0.9451 0.9066	1	0.01224 0.02222	2.79% 5.16%	0.0% 1.68%		
0 2.5 5		5 5 5	0.9802 0.9637 1	0.9462 0.902 1	1 1 1	1 1 1 0		0.9451 0.9066 1	1 1 1	0.01224 0.02222 0	2.79% 5.16% 0.0%	0.0% 1.68% -2.02%		
0 2.5 5 10		5 5 5 5	0.9802 0.9637 1 0.9495	0.9462 0.902 1 0.9036	1 1 1 0.9953	1 1 1 0).9615).9176	0.9451 0.9066 1 0.8956	1 1 1 0.9835	0.01224 0.02222 0 0.01652	2.79% 5.16% 0.0% 3.89%	0.0% 1.68% -2.02% 3.14%		
0 2.5 5 10 20 40		5 5 5 5 5 5	0.9802 0.9637 1 0.9495 0.9253 0	0.9462 0.902 1 0.9036 0.8549	1 1 1 0.9953 0.9956	1 1 1 0).9615).9176	0.9451 0.9066 1 0.8956 0.8571	1 1 1 0.9835	0.01224 0.02222 0 0.01652 0.02533	2.79% 5.16% 0.0% 3.89%	0.0% 1.68% -2.02% 3.14% 5.61%		
0 2.5 5 10 20 40	Lab Control	5 5 5 5 5 5	0.9802 0.9637 1 0.9495 0.9253 0	0.9462 0.902 1 0.9036 0.8549	1 1 1 0.9953 0.9956	1 1 0 0).9615).9176	0.9451 0.9066 1 0.8956 0.8571	1 1 1 0.9835	0.01224 0.02222 0 0.01652 0.02533	2.79% 5.16% 0.0% 3.89%	0.0% 1.68% -2.02% 3.14% 5.61%		
0 2.5 5 10 20 40 Angular (Cor	Lab Control	5 5 5 5 5 5 5	0.9802 0.9637 1 0.9495 0.9253 0	0.9462 0.902 1 0.9036 0.8549	1 1 0.9953 0.9956	1 1 0 0 0).9615).9176	0.9451 0.9066 1 0.8956 0.8571 0	1 1 1 0.9835 1	0.01224 0.02222 0 0.01652 0.02533 0	2.79% 5.16% 0.0% 3.89% 6.12%	0.0% 1.68% -2.02% 3.14% 5.61% 100.0%		
0 2.5 5 10 20 40 Angular (Cor C- µg/L	Lab Control rected) Transfor Control Type	5 5 5 5 5 5 rmed Sum	0.9802 0.9637 1 0.9495 0.9253 0 mary	0.9462 0.902 1 0.9036 0.8549 0	1 1 0.9953 0.9956 0	1 1 0 0 0	0.9615 0.9176 0.9176	0.9451 0.9066 1 0.8956 0.8571 0	1 1 1 0.9835 1 0	0.01224 0.02222 0 0.01652 0.02533 0	2.79% 5.16% 0.0% 3.89% 6.12%	0.0% 1.68% -2.02% 3.14% 5.61% 100.0%		
0 2.5 5 10 20 40 Angular (Cor C- µg/L	Lab Control rected) Transfor Control Type	5 5 5 5 5 5 rmed Sum Count	0.9802 0.9637 1 0.9495 0.9253 0 mary Mean 1.459	0.9462 0.902 1 0.9036 0.8549 0 95% LCL	1 1 0.9953 0.9956 0 95% UCI	1 1 0 0 0 1	0.9615 0.9176 0.9176 0.9176 0.9176	0.9451 0.9066 1 0.8956 0.8571 0 Min 1.334	1 1 0.9835 1 0 Max 1.534	0.01224 0.02222 0 0.01652 0.02533 0 Std Err 0.04594	2.79% 5.16% 0.0% 3.89% 6.12% CV% 7.04%	0.0% 1.68% -2.02% 3.14% 5.61% 100.0% %Effect 0.0%		
0 2.5 5 10 20 40 Angular (Cor C-μg/L 0 2.5	Lab Control rected) Transfor Control Type	5 5 5 5 5 5 rmed Sum Count 5	0.9802 0.9637 1 0.9495 0.9253 0 mary Mean 1.459 1.426	0.9462 0.902 1 0.9036 0.8549 0 95% LCL 1.331 1.243	1 1 0.9953 0.9956 0 95% UCI 1.587 1.609	1 1 0 0 0 1 1 1	0.9615 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176 0.9176	0.9451 0.9066 1 0.8956 0.8571 0 Min 1.334 1.26	1 1 0.9835 1 0 Max 1.534 1.534	0.01224 0.02222 0 0.01652 0.02533 0 Std Err 0.04594 0.06584	2.79% 5.16% 0.0% 3.89% 6.12% CV% 7.04% 10.32%	0.0% 1.68% -2.02% 3.14% 5.61% 100.0% %Effect 0.0% 2.25%		
0 2.5 5 10 20 40 Angular (Cor C-μg/L 0 2.5 5	Lab Control rected) Transfor Control Type	5 5 5 5 5 5 rmed Sum Count 5 5	0.9802 0.9637 1 0.9495 0.9253 0 mary Mean 1.459 1.426 1.534	0.9462 0.902 1 0.9036 0.8549 0 95% LCL 1.331 1.243 1.534	1 1 0.9953 0.9956 0 95% UCI 1.587 1.609 1.534	1 1 1 0 0 0 0	.9615 .9176 	0.9451 0.9066 1 0.8956 0.8571 0 Min 1.334 1.26 1.534	1 1 1 0.9835 1 0 Max 1.534 1.534 1.534	0.01224 0.02222 0 0.01652 0.02533 0 Std Err 0.04594 0.06584 0	2.79% 5.16% 0.0% 3.89% 6.12% CV% 7.04% 10.32% 0.0%	0.0% 1.68% -2.02% 3.14% 5.61% 100.0% %Effect 0.0% 2.25% -5.12%		

Report Date: Test Code: 09 Apr-19 09:31 (p 4 of 4) 190320msdvSO | 02-0163-9394

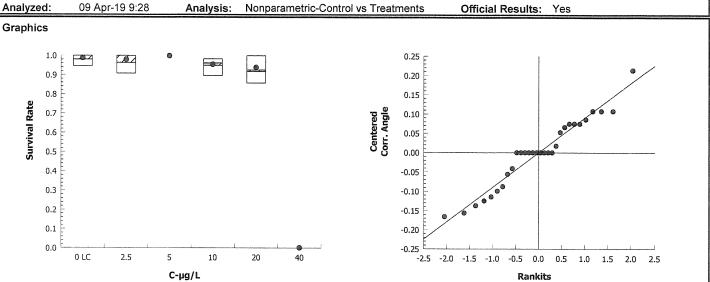
Bivalve Larval Survival and Development Test

Analysis ID: 14-4724-2580 Endpoint: Survival Rate

Analyzed: 09 Apr-19 9:28 Analysis: Nonparametric-Control vs Treatments

CETIS Version: CETISv1.8.7

Official Results: Yes



Report Date:

09 Apr-19 09:31 (p 1 of 3)

Test Code:

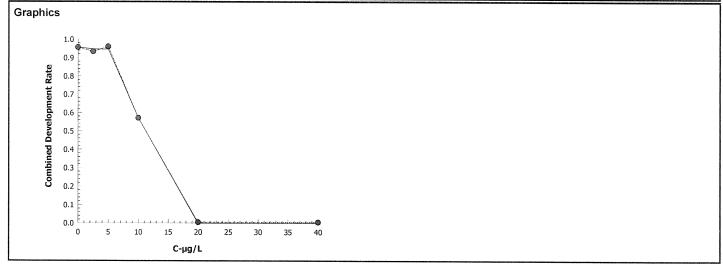
190320msdvSO | 02-0163-9394

Bivalve Larva	I Survival and Deve	elopment Test			Nautilus Environmental (CA)
Analysis ID:	10-2896-8877	Endpoint:	Combined Development Rate	CETIS Version:	CETISv1.8.7
Analyzed:	09 Apr-19 9:28	Analysis:	Linear Interpolation (ICPIN)	Official Results:	Yes

Linear Interpol	ation Options					
X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method	
Linear	Linear	1786700	1000	Yes	Two-Point Interpolation	<u>, , , , , , , , , , , , , , , , , , , </u>
Point Estimate	s					
Level ua/L	95% LCL 95	% UCL				

	Level	μg/L	95% LCL	95% UCL	
	EC25	8.057	7.412	8.772	
	EC50	11.63	10.5	12.62	
i		-	The Control of the Co		A CONTRACTOR OF THE PARTY OF TH

Combine	Combined Development Rate Summary			Calculated Variate(A/B)							
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Lab Control	5	0.9553	0.9176	0.9891	0.01462	0.0327	3.42%	0.0%	920	962
2.5		5	0.932	0.8846	0.9701	0.01944	0.04348	4.67%	2.44%	880	943
5		5	0.9607	0.94	0.9785	0.007717	0.01725	1.8%	-0.57%	915	953
10		5	0.5714	0.5055	0.6593	0.02742	0.06131	10.73%	40.18%	520	910
20		5	0	0	0	0	0		100.0%	0	922
40		5	0	0	0	0	0		100.0%	0	910



Report Date:

09 Apr-19 09:31 (p 2 of 3)

Test Code:

190320msdvSO | 02-0163-9394

Bivalve Larval Survival and Development Test

Analysis ID: 06-2977-8138

Endpoint: Development Rate

CETIS Version: CETISv1.8.7

Analyzed: 09 Apr-19 9:28 Analysis: Linear Interpolation (ICPIN) Official Results: Yes

Linear Interpolation OptionsX TransformY TransformSeedResamplesExp 95% CLMethodLinearLinear20120041000YesTwo-Point Interpolation

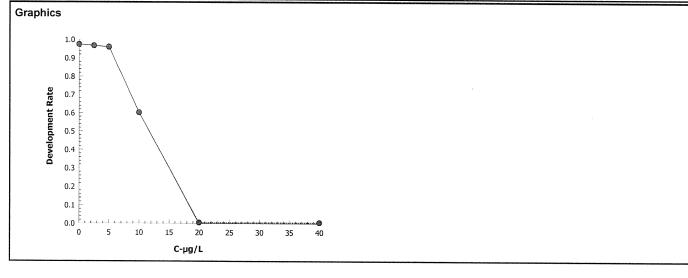
Point Estimates

 Level
 μg/L
 95% LCL
 95% UCL

 EC25
 8.199
 7.748
 8.766

 EC50
 11.9
 11.17
 12.65

Developm	Development Rate Summary			Calculated Variate(A/B)							
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Lab Control	5	0.9745	0.9598	0.9891	0.0048	0.01073	1.1%	0.0%	920	944
2.5		5	0.9673	0.9583	0.9758	0.003091	0.006911	0.71%	0.73%	880	910
5		5	0.9607	0.94	0.9785	0.007717	0.01725	1.8%	1.41%	915	953
10		5	0.6009	0.5444	0.6742	0.02109	0.04716	7.85%	38.33%	520	864
20		5	0	0	0	0	0		100.0%	0	854
40		5	0	0	0	0	0		100.0%	0	5



Report Date:

09 Apr-19 09:31 (p 3 of 3)

Test Code:

190320msdvSO | 02-0163-9394

Bivalve Larval Survival and Development Test

Analysis ID: 15-3118-7055

Endpoint: Survival Rate

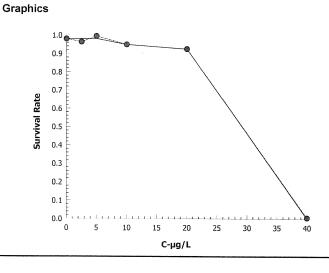
CETIS Version: CETISv1.8.7

Analyzed: 09 Apr-19 9:28 Analysis: Linear Interpolation (ICPIN) Official Results: Yes

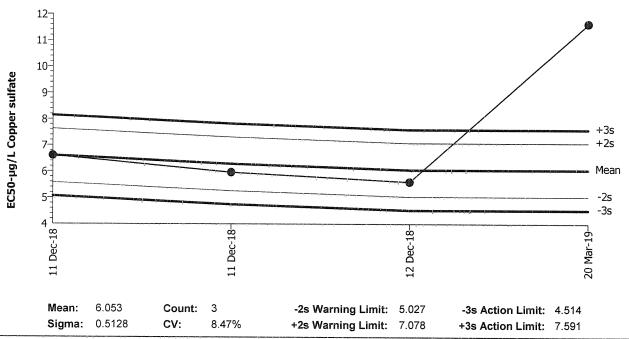
X Transform Y Transform Seed Resamples Exp 95% CL Method Linear Linear 1642468 1000 Yes Two-Point Interpolation	Linear Interpol	ation Options				,
Linear Linear 1642468 1000 Yes Two-Point Interpolation	X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
	Linear	Linear	1642468	1000	Yes	Two-Point Interpolation

Point Estimates

Survival Rate Summary			Calculated Variate(A/B)								
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Lab Control	5	0.9802	0.9451	1	0.01224	0.02736	2.79%	0.0%	892	910
2.5		5	0.9637	0.9066	1	0.02222	0.04969	5.16%	1.68%	877	910
5		5	1	1	1	0	0	0.0%	-2.02%	910	910
10		5	0.9495	0.8956	0.9835	0.01652	0.03694	3.89%	3.14%	864	910
20		5	0.9253	0.8571	1	0.02533	0.05665	6.12%	5.61%	842	910
40		5	0	0	0	0	0		100.0%	0	910



Bivalve Larvival and Development Test Test Type: Development-Survival Protocol: EPA/600/R-95/136 (1995) Organism: Mytilus galloprovincialis (Bay Mussel Protocol) Endpoint: Combined Development Rate Nautilus Environmental (CA) Material: Copper sulfate Source: Reference Toxicant-REF



Quality	Control Data
---------	--------------

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2018	Dec	11	11:55	6.606	0.5529	1.078			09-7408-5780	08-1757-8045
2			11	12:30	5.959	-0.09393	-0.1832			01-7940-4185	15-9822-3312
3			12	13:55	5.593	-0.4598	-0.8966			11-6161-8836	02-1891-3936
4	2019	Mar	20	15:25	11.63	5.579	10.88	(+)	(+)	02-0163-9394	10-2896-8877

Copper sulfate

Material:

09 Apr-19 09:36 (1 of 1)

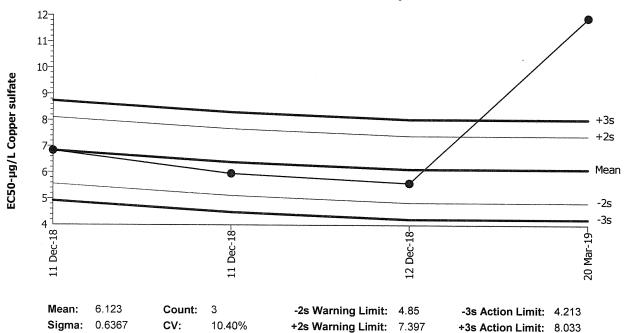
Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Test Type: Development-Survival **Protocol:** EPA/600/R-95/136 (1995)

Organism: Mytilus galloprovincialis (Bay Mussel

Endpoint: Development Rate Source: Reference Toxicant-REF



Qualit	Control Data
--------	--------------

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
. 1	2018	Dec	11	11:55	6.828	0.7049	1.107			09-7408-5780	03-3077-4520
2			11	12:30	5.952	-0.1707	-0.2681			01-7940-4185	03-0677-9138
3			12	13:55	5.589	-0.5336	-0.8381			11-6161-8836	13-7938-6780
4	2019	Mar	20	15:25	11.9	5.781	9.079	(+)	(+)	02-0163-9394	06-2977-8138

09 Apr-19 09:36 (1 of 1)

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

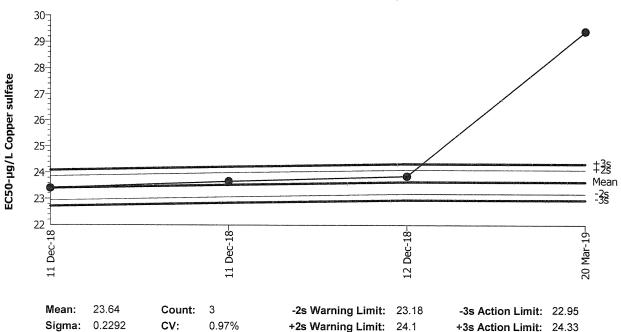
Test Type: Development-Survival
Protocol: EPA/600/R-95/136 (1995)

Organism: Mytilus galloprovincialis (Bay Mussel

Endpoint: Survival Rate

Material: Source:

Copper sulfate
Reference Toxicant-REF



	-											
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	
1	2018	Dec	11	11:55	23.4	-0.2395	-1.045			09-7408-5780	12-1829-1326	
2			11	12:30	23.66	0.02379	0.1038			01-7940-4185	12-4826-8052	
3			12	13:55	23.86	0.2171	0.9474			11-6161-8836	20-5520-1077	
4	2019	Mar	20	15:25	29.39	5.754	25.11	(+)	(+)	02-0163-9394	15-3118-7055	

02 May-19 15:27 (1 of 1)

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

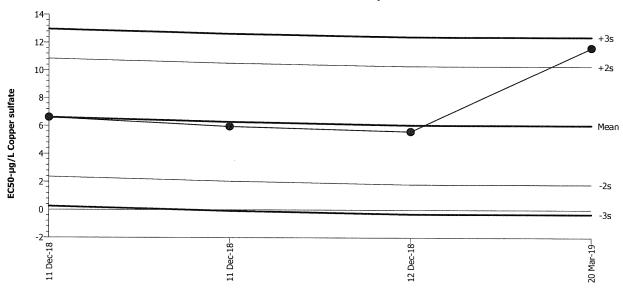
Test Type: Development-Survival Protocol: EPA/600/R-95/136 (1995) Organism: Mytilus galloprovincialis (Bay Mussel

Endpoint: Combined Development Rate

Material: Copper sulfate Source:

Reference Toxicant-REF

Bivalve Larval Survival and Development Test



(*	Si

Mean: 6.053 2.119 gma:

Count: 3 CV: 35.00%

-2s Warning Limit: 1.816 +2s Warning Limit: 10.29

-3s Action Limit: -0.3029 +3s Action Limit: 12.41

Quality Control Data

	•										
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2018	Dec	11	11:55	6.606	0.5529	0.261		-	09-7408-5780	08-1757-8045
2			11	12:30	5.959	-0.09393	-0.04434			01-7940-4185	15-9822-3312
3			12	13:55	5.593	-0.4598	-0.217			11-6161-8836	02-1891-3936
4	2019	Mar	20	15:25	11.63	5.579	2.633	(+)		02-0163-9394	10-2896-8877

Reference toxicant warning and control chart limits recalculated pased on 75th percentile inter laboratory Ocofficient of variation, as defined in EPA-833-P-60-003, for comparison purposes only.

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Test Type: Development-Survival **Protocol:** EPA/600/R-95/136 (1995)

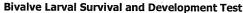
Organism: Mytilus galloprovincialis (Bay Mussel

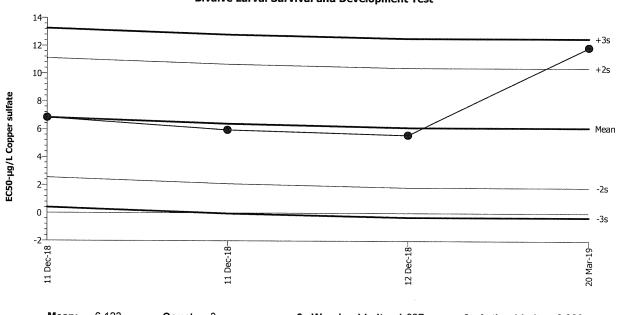
Endpoint: Development Rate

Material: Copper sulfate

Source:

Reference Toxicant-REF





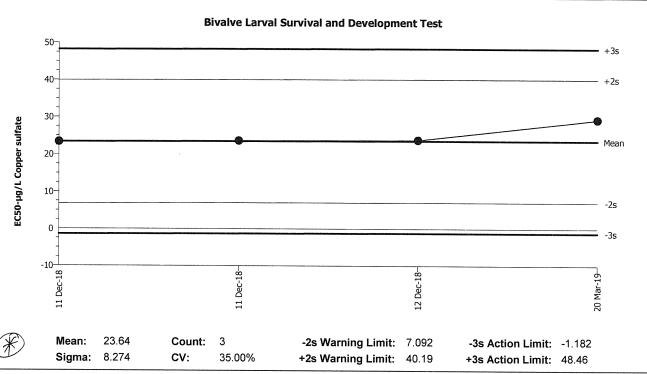
(II)	Mean:	6.123	Count:	3	-2s Warning Limit:	1.837	-3s Action Limit:	-0.306
\mathscr{F}	Sigma:	2.143	CV:	35.00%	+2s Warning Limit:	10.41	+3s Action Limit:	12.55

Quality	Control	Data
---------	---------	------

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2018	Dec	11	11:55	6.828	0.7049	0.3289			09-7408-5780	03-3077-4520
2			11	12:30	5.952	-0.1707	-0.07966			01-7940-4185	03-0677-9138
3			12	13:55	5.589	-0.5336	-0.249			11-6161-8836	13-7938-6780
4	2019	Mar	20	15:25	11.9	5.781	2.697	(+)	*	02-0163-9394	06-2977-8138

Reference toxicant warning and control chart limits recalculated based on 75th percentile interCaboratory coefficient of variation, as defined in EPA-833- R-00-003, for comparison purposes only.

Bivalve Larval Survival and Development Test Test Type: Development-Survival Protocol: EPA/600/R-95/136 (1995) Organism: Mytilus galloprovincialis (Bay Mussel Source: Reference Toxicant-REF)



Qualit												
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	
1	2018	Dec	11	11:55	23.4	-0.2395	-0.02894			09-7408-5780	12-1829-1326	
2			11	12:30	23.66	0.02379	0.002875			01-7940-4185	12-4826-8052	
3			12	13:55	23.86	0.2171	0.02624			11-6161-8836	20-5520-1077	
4	2019	Mar	20	15:25	29.39	5.754	0.6955			02-0163-9394	15-3118-7055	

Reference toxicant worning and control chart limits recalculated based on 75th percentile interlaboratory coefficient of variation, as defined in EPA-833-R-00-003, for comparison purposes only.

CETIS Test Data Worksheet

Report Date:

26 Mar-19 14:35 (p 1 of 1)

Test Code:

02-0163-9394/190320msdvSO

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Start Date: 20 Mar-19 Species: Mytilus galloprovincialis Sample Code: 190320msdvSO End Date: 22 Mar-19 Protocol: EPA/600/R-95/136 (1995) Sample Source: Reference Toxicant Sample Date: 20 Mar-19 Material: Copper sulfate Sample Station: Copper Sulfate

C-µg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
				9178	9131		913/12	
~~			32	X10	101	184	182	0 NM 4/4/19
			33			200	194	
			34			175	0	
			35			201	19,5	
			36			166	161	
			37			0	0	Cell lysed
			38			163	95	411 1932
			39			199	188	
			40			186	179	
			41	· · · · · · · · · · · · · · · · · · ·		9 Ø 156	01560	
			42			0	0	Cells lysed
			43			194	167	
			44			185	179	
			45			186	182	
			46			179	108	
			47			214	209	
			48			162	0	
			49			165	161	
			50			175	105	,
			51					Cells lysed
			52			192	184	
***************************************			53			172	168	
			54			167	0	
			55			183	0 178 17792	
· · · · · · · · · · · · · · · · · · ·			56			184169	1779	26 4/5/19
			57			200	188	
			58			0	0	Cells 14se & Cells 14se &
***************************************			59			0	0	Cells 14 sed
			60			194	0	,

20 Mar-19 10:55 (p 1 of 1)

Test Code: 02-0163-9394/190320msdvSO

Start Date: 20 Mar End Date: 22 Mar Sample Date: 20 Mar		1ar-19	19 Protocol : EPA/600/R-95/136 (1995)				Sample Code: 190320msdvSO Sample Source: Reference Toxicant		
C-µg/L		Code Rep		Material: C			# NI	Sample Station: Copper Sulfate	
0-µg/L	LC	1	32	illitial Delisity	Final Density	# Counted	# Normal	Notes	
0	LC	2	33						
0	LC	3	47			208	200	RT 3/23/19	
0	LC	4	43		}	200	200	F1 3/23/17	
0	LC	5	53		no responsable de la companya del companya de la companya del companya de la companya del la companya de la com				
2.5		1	36						
2.5		2	35						
2.5		3	40			185	176	RT 3/23/19	
2.5		4	49						
2.5	†	5	52						
5		1	39						
5		2	45						
5		3	44			182	175	RT 3/23/19	
5		4	57						
5		5	55						
10		1	31						
10		2	38						
10		3	46						
10		4	56			165	69	RT 3/23/19	
10		5	50						
20		1	54						
20		2	48						
20	-	3	34						
20	-	4	41			156	0	RT 3/23/19	
20	-	5	60						
40	-	1	51						
40	-	2	58					7	
40	-	3	42			0	Õ	RT 3/23/19	
40	-	4 5	37 59						

ac.Bo

Marine Chronic Bioassay

Water Quality Measurements

 Client:
 Internal
 Test Species:
 M. galloprovincialis

 Sample ID:
 CuSO₄
 Start Date/Time:
 3/20/2019 | 525

 Test No.:
 190320msdvSO
 End Date/Time:
 3/22/2019 | 500

Concentration		Salinity	processor on a passage of each of the house of the section of the	To	emperatu	re	Diss	olved Ox	ygen		рН	
(μg/L)		(ppt)			(°C)			(mg/L)			(pH units)
	0	24	48	0	24	48	0	24	48	0	24	48
Lab Control	31.6	31.4	31.3	15.5	15.4	15.1	8.2	7.9	8.3	7.96	8.01	7.96
2.5	31.9	31.9	31.9	15.4	15.1	14.8	8.1	8,0	8.3	7.98	8,01	795
5	31.9	32.0	32.1	15.1	15.1	14.8	8.1	7.9	8.3	7.98	8.02	7.98
10	31.9	31.9	31.9	15.4	15.2	14.8	7.9	7.9	8.3	7.99	8,02	7.98
20	31.9	31.8	31.9	15.7	15.2	14.8	8.0	7.9	8.3	8.00	8.04	7.99
40	31.8	31.7	31.8	15.7	15.3	14.9	8.0	7.9	8.2	8.01	8,04	7.99
									-			

		0	24	48	High conc. made (μg/L):[40	
Technician Initials:	WQ Readings:	BO	585	B0	Vol. Cu stock added (mL):	2.5	
	Dilutions made by:	BO			Final Volume (mL):	500	
					Cu stock concentration (μg/L):	8,000	
Comments:	0 hrs:						
	24 hrs:						
	48 hrs:						
QC Check:	EG 4/11/19				Final Review:	13 5/3/A	

Client:	Internal - Copper Sulfate
Test No.:	190320 msdu 50
Test Species:	M.galloprovincialis
Animal Source:	Mission Bay
Date Received:	3/5/19 0
Test Chambers:	30 mil shell vial
Sample Volume:	Iron. L

Start Date/Time:	3/20/2019	1525	
End Date/Time:	3/22/2019	1500	
Technician Initials:	BO/KS/FG		

Spawn Information

First Gamete Release Time:

THE PERSON	- Cartestante	3

Sex	Number Spawning
Male	4
Female	4

Gamete Selection

Sex	Beaker Number(s)	Condition (sperm motility, egg density, color, shape, etc.)
Male	1,3,4	apadmetility and density
Female 1	COLUMN TO THE PERSON TO THE PE	pale yellow color, good dersity, some round
Female 2	2	white color, good density mostly rous
Female 3	3	Ovange color gooddersity, mostly and
		3 10

Egg Fertilization Time: 1253

Embryo Stock Selection

Stock Number	% of embryos at 2-cell division stage
Female 1	N/A
Female 2	N/A
Female 3	100%

Stock(s) chosen for testing:

Embryo Inoculum Preparation

Target count on Sedgwick-Rafter slide for desired density is 6 embryos

Number Counted:

15	15
18	19
19	18
17	19
19	19

Mean: 17.8

Mean
$$17.8$$
 x 50 = 890 embryos/ml

Initial Density: Desired Final Density:

300

2.96 (dilution facto

(to inoculate with 0.5 ml)

Prepare the embryo inoculum according to the calculated dilution factor. For example, if the dilution factor is 2.25, use 100 ml of existing stock (1 part) and 125 ml of dilution water (1.25 parts).

Time Zero Control Counts

, , , , , , , , ,	Time Zero Control Counts								
Rand. No.	No. Dividing	Total	% Dividing	Mean % Dividing					
1	186	187	99						
2	168	169	99						
3	189	191	99	99.1.					
4	192	194	99	'''					
_5	166	168	99						
6	192	193	99	1 !					

48-h QC: 169 174= 97.1 %

Comments:

QC Check:

Final Review: $\sqrt{5/3}/9$

Nautilus Environmental. 4340 Vandever Avenue. San Diego, CA 92120.

Bivalve Larval Development Test Copper Chloride

CETIS Summary Report

Report Date: 28 Mar-19 09:13 (p 1 of 3)
Test Code: 190320msdv | 00-9922-7600

							Test Code:	190320msdv 00-9922-760
Bivalve Larva	I Survival and Developn	nent Test						Nautilus Environmental (CA)
Batch ID: Start Date: Ending Date: Duration:	20 Mar-19 15:25 F 22 Mar-19 15:00 S	Protocol: Species:	Development-S EPA/600/R-95 Mytilus gallopr Taylor Shellfis	/136 (1995) ovincialis	ow Bay	_		luted Natural Seawater ot Applicable
Sample ID: Sample Date: Receive Date: Sample Age:	20 Mar-19 N 20 Mar-19 S	Code: //aterial: Source: Station:	190320msdv Copper chlorid Reference Tox Copper Chloric	icant			Client: Int Project:	ternal
Comparison S	Summary							
Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method	
17-4071-9030	Combined Development	Ra 5	10	7.071	7.61%		Dunnett	Multiple Comparison Test
08-3081-0323	Development Rate	2.5	5	3.536	4.82%			any-One Rank Sum Test
00-7449-8257	Survival Rate	20	40	28.28	7.02%			Multiple Comparison Test
Point Estimate	e Summary							
Analysis ID	Endpoint	Level	μg/L	95% LCL	95% UCL	TU	Method	
12-2384-4421	Combined Development	: Ra EC25 EC50	6.512 8.284	6.049 7.795	6.913 8.754		Linear Ir	terpolation (ICPIN)
07-3949-1564	Development Rate	EC25	6.616	6.429	6.8		Linear Ir	iterpolation (ICPIN)
		EC50	8.334	7.978	8.7			, ,
05-5691-6970	Survival Rate	EC25	23.75	21.71	25.4		Linear In	iterpolation (ICPIN)
		EC50	29.16	27.81	30.26			•
Test Acceptab	ility							
Analysis ID	Endpoint	Attrib	ute	Test Stat	TAC Limi	ts	Overlap	Decision
07-3949-1564	Development Rate	Contro	l Resp	0.9728	0.9 - NL		Yes	Passes Acceptability Criteria
08-3081-0323	Development Rate	Contro	l Resp	0.9728	0.9 - NL		Yes	Passes Acceptability Criteria
	Survival Rate	Contro	l Resp	0.9681	0.5 - NL		Yes	Passes Acceptability Criteria
00-7449-8257	Survivar Rate	Contro	oop					
00-7449-8257 05-5691-6970	Survival Rate		l Resp	0.9681	0.5 - NL		Yes	Passes Acceptability Criteria



Analyst: JU QA: 4794219

28 Mar-19 09:13 (p 2 of 3)

Test Code:

190320msdv | 00-9922-7600

							1621	Code:	19032	zumsav į ut	0-9922-760
Bivalve Lar	val Survival and l	Developme	nt Test						Nautilus	Environm	nental (CA)
Combined	Development Rat	e Summary	,								
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9418	0.8561	1	0.8187	0.9788	0.03085	0.06899	7.33%	0.0%
2.5		5	0.8995	0.8488	0.9502	0.8571	0.9424	0.01827	0.04085	4.54%	4.49%
5		5	0.9163	0.8603	0.9722	0.8571	0.9728	0.02016	0.04508	4.92%	2.71%
10		5	0.2408	0.1476	0.3341	0.1319	0.3194	0.03359	0.0751	31.18%	74.43%
20		5	0.02521	0	0.08426	0	0.1099	0.02127	0.04755	188.6%	97.32%
40		5	0	0	0	0	0	0	0		100.0%
Developme	nt Rate Summary									.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9728	0.9665	0.9791	0.9648	0.9788	0.002256	0.005044	0.52%	0.0%
2.5		5	0.9621	0.9432	0.9811	0.9424	0.9827	0.00681	0.01523	1.58%	1.1%
5		5	0.9583	0.9423	0.9743	0.9436	0.9728	0.00577	0.0129	1.35%	1.49%
10		5	0.2462	0.1607	0.3317	0.1463	0.3194	0.03079	0.06886	27.96%	74.69%
20		5	0.02913	0	0.09818	0	0.1282	0.02487	0.05561	190.9%	97.01%
40		5	0	0	0	0	0	0	0		100.0%
Survival Ra	ite Summary						T		·····		
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9681	0.8797	1	0.8407	1	0.03187	0.07126	7.36%	0.0%
2.5		5	0.9352	0.8754	0.9949	0.8846	1	0.02152	0.04812	5.15%	3.41%
5		5	0.956	0.9023	1	0.9011	1	0.01935	0.04326	4.53%	1.25%
10		5	0.9692	0.9135	1	0.9011	1	0.02008	0.04491	4.63%	-0.11%
20		5	0.8934	0.8113	0.9755	0.8242	1	0.02957	0.06612	7.4%	7.72%
40		5	0	0	0	0	0	0	0	7.170	100.0%
Combined I	Development Rate	e Detail									
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	0.9735	0.9648	0.8187	0.9788	0.973					
2.5		0.8571	0.9066	0.8571	0.9341	0.9424					
5		0.9176	0.9436	0.8901	0.9728	0.8571					
10		0.3170	0.3430								
				0.2143	0.2363	0.3024					
20		0	0.005181	0.1099	0	0.01099					
40		0	0	0	0	0			TOTAL PROPERTY.		
Developme	nt Rate Detail										
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	0.9735	0.9648	0.9739	0.9788	0.973					
2.5		0.963	0.9538	0.9689	0.9827	0.9424					
5		0.9709	0.9436	0.9529	0.9728	0.9512					
10		0.1463	0.3194	0.2267	0.2363	0.3024					
20		0	0.005181	0.1282	0	0.01227					
40		0	0	0	0	0					
Survival Ra	te Detail										The second secon
C-μg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	1	1	0.8407	1	1					
2.5		0.8901	0.9505	0.8846	0.9505	1					
5		0.9451	1	0.9341	1	0.9011					
10		0.9011	1	0.9451	1	1					
20		0.8901	1	0.8571	0.8242	0.8956					
40											
70		0	0	0	0	0					

Analyst: JU QA: KTPH2/19

Report Date: Test Code: 28 Mar-19 09:13 (p 3 of 3)

190320msdv	00-9922-7600
------------	--------------

							Test Code:	190320msdv 00-9922-7600
Bivalve La	rval Survival and I	Developme	nt Test					Nautilus Environmental (CA)
Combined	Development Rate	Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	184/189	192/199	149/182	185/189	180/185		
2.5		156/182	165/182	156/182	170/182	180/191		
5		167/182	184/195	162/182	179/184	156/182		
10		24/182	61/191	39/182	43/182	62/205		
20		0/182	1/193	20/182	0/182	2/182		
40		0/182	0/182	0/182	0/182	0/182		
Developme	ent Rate Binomials	•		***************************************		***************************************	The state of the s	W
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	184/189	192/199	149/153	185/189	180/185		
2.5		156/162	165/173	156/161	170/173	180/191		
5		167/172	184/195	162/170	179/184	156/164		
10		24/164	61/191	39/172	43/182	62/205		
20		0/162	1/193	20/156	0/150	2/163		
40		0/1	0/1	0/1	0/1	0/1		
Survival Ra	ate Binomials	· · · · · · · · · · · · · · · · · · ·						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
0	Lab Control	182/182	182/182	153/182	182/182	182/182		
2.5		162/182	173/182	161/182	173/182	182/182		
5		172/182	182/182	170/182	182/182	164/182		
10		164/182	182/182	172/182	182/182	182/182		
20		162/182	182/182	156/182	150/182	163/182		
40		0/182	0/182	0/182	0/182	0/182		

Analyst: Ja QA: 19742/19

Report Date:

28 Mar-19 09:13 (p 1 of 6)

Test Code:

190320msdv | 00-9922-7600

							lest	Code:	19002	:0msdv 00	J-9922-10
Bivalve Larv	al Survival and I	Developme	nt Test						Nautilus	Environn	nental (C
Analysis ID:	17-4071-9030	En	dpoint: Cor	mbined Deve	elopment R	ate	CFT	IS Version:	CETISv1.	8.7	
Analyzed:	28 Mar-19 9:1		-	ametric-Cor	•			ial Results			
Data Transfo	orm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	ected)	NA	C > T	NA	NA		7.61%	5	10	7.071	
Dunnett Mult	tiple Compariso	n Test									
Control	vs C-µg/L		Test Stat	Critical	MSD D	P-Value	P-Type	Decision	(α:5%)		
Lab Control	2.5		1.508	2.305	0.148 8	0.1968	CDF	Non-Sign	ificant Effect		***************************************
	5		0.9924	2.305	0.148 8	0.3840	CDF	•	ificant Effect		
	10*		13.09	2.305	0.148 8	<0.0001	CDF	Significar	t Effect		
	20*		19.17	2.305	0.148 8	<0.0001	CDF	Significar			
ANOVA Table	е										
Source	Sum Squ	ares	Mean Squ	ıare	DF	F Stat	P-Value	Decision	(α:5%)		
Between	6.208095		1.552024		4	150.2	<0.0001	Significan	t Effect		
Error	0.206667	2	0.0103333	6	20			Ū			
Total	6.414762				24						
Distributiona	l Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Bartlett E	Equality of V	ariance	1.843	13.28	0.7645	Equal Var	iances			-
	~										
Distribution	Shapiro-	Wilk W Nor	mality	0.9807	0.8877	0.8990	Normal Di	istribution	\		
	Shapiro- evelopment Rate			0.9807	0.8877	0.8990	Normal Di	Istribution	\		
Combined Do				0.9807 95% LCL	0.8877 95% UCL		Min	Max	Std Err	CV%	%Effec
Combined Do	evelopment Rate	Summary Count							Std Err 0.03085	CV% 7.33%	%Effec
Combined Do C-µg/L 0 2.5	evelopment Rate	Summary Count	Mean	95% LCL	95% UCL	Median	Min	Max			
Combined Do C-µg/L 0 2.5	evelopment Rate	Summary Count 5 5 5	Mean 0.9418	95% LCL 0.8561	95% UCL	Median 0.973	Min 0.8187	Max 0.9788	0.03085	7.33%	0.0%
Combined Do C-µg/L 0 2.5 5	evelopment Rate	Count 5	Mean 0.9418 0.8995	95% LCL 0.8561 0.8488	95% UCL 1 0.9502	Median 0.973 0.9066	Min 0.8187 0.8571	Max 0.9788 0.9424	0.03085 0.01827	7.33% 4.54%	0.0% 4.49%
Combined Do C-μg/L 0 2.5 5 10 20	evelopment Rate	Summary Count 5 5 5	Mean 0.9418 0.8995 0.9163	95% LCL 0.8561 0.8488 0.8603	95% UCL 1 0.9502 0.9722	Median 0.973 0.9066 0.9176	Min 0.8187 0.8571 0.8571	Max 0.9788 0.9424 0.9728	0.03085 0.01827 0.02016	7.33% 4.54% 4.92%	0.0% 4.49% 2.71% 74.43%
Combined Do C-μg/L 0 2.5 5 10 20	evelopment Rate	Count 5 5 5 5	Mean 0.9418 0.8995 0.9163 0.2408	95% LCL 0.8561 0.8488 0.8603 0.1476	95% UCL 1 0.9502 0.9722 0.3341	Median 0.973 0.9066 0.9176 0.2363	Min 0.8187 0.8571 0.8571 0.1319	Max 0.9788 0.9424 0.9728 0.3194	0.03085 0.01827 0.02016 0.03359	7.33% 4.54% 4.92% 31.18%	0.0% 4.49% 2.71% 74.43% 97.32%
Combined Do C-µg/L 0 2.5 5 10 20 40	evelopment Rate	Count 5 5 5 5 5 5	Mean 0.9418 0.8995 0.9163 0.2408 0.02521 0	95% LCL 0.8561 0.8488 0.8603 0.1476 0	95% UCL 1 0.9502 0.9722 0.3341 0.08426	Median 0.973 0.9066 0.9176 0.2363 0.005181	Min 0.8187 0.8571 0.8571 0.1319 0	Max 0.9788 0.9424 0.9728 0.3194 0.1099	0.03085 0.01827 0.02016 0.03359 0.02127	7.33% 4.54% 4.92% 31.18%	0.0% 4.49% 2.71%
Combined Do C-µg/L 0 2.5 5 10 20 40 Angular (Cor	evelopment Rate Control Type Lab Control rected) Transfor Control Type	Count 5 5 5 5 5 5 cmed Summ	Mean 0.9418 0.8995 0.9163 0.2408 0.02521 0 mary Mean	95% LCL 0.8561 0.8488 0.8603 0.1476 0	95% UCL 1 0.9502 0.9722 0.3341 0.08426 0	Median 0.973 0.9066 0.9176 0.2363 0.005181 0	Min 0.8187 0.8571 0.8571 0.1319 0	Max 0.9788 0.9424 0.9728 0.3194 0.1099	0.03085 0.01827 0.02016 0.03359 0.02127	7.33% 4.54% 4.92% 31.18%	0.0% 4.49% 2.71% 74.43% 97.32%
Combined Do C-µg/L 0 2.5 5 10 20 40 Angular (Cor C-µg/L 0	evelopment Rate Control Type Lab Control	Count 5 5 5 5 5 5 5 med Summ	Mean 0.9418 0.8995 0.9163 0.2408 0.02521 0	95% LCL 0.8561 0.8488 0.8603 0.1476 0	95% UCL 1 0.9502 0.9722 0.3341 0.08426 0	Median 0.973 0.9066 0.9176 0.2363 0.005181 0	Min 0.8187 0.8571 0.8571 0.1319 0	Max 0.9788 0.9424 0.9728 0.3194 0.1099 0	0.03085 0.01827 0.02016 0.03359 0.02127	7.33% 4.54% 4.92% 31.18% 188.6%	0.0% 4.49% 2.71% 74.43% 97.32% 100.0%
Combined Do C-µg/L 0 2.5 5 10 20 40 Angular (Cor C-µg/L 0 2.5	evelopment Rate Control Type Lab Control rected) Transfor Control Type	Count 5 5 5 5 5 5 cmed Summ	Mean 0.9418 0.8995 0.9163 0.2408 0.02521 0 mary Mean	95% LCL 0.8561 0.8488 0.8603 0.1476 0 0	95% UCL 1 0.9502 0.9722 0.3341 0.08426 0	Median 0.973 0.9066 0.9176 0.2363 0.005181 0 Median	Min 0.8187 0.8571 0.8571 0.1319 0	Max 0.9788 0.9424 0.9728 0.3194 0.1099 0	0.03085 0.01827 0.02016 0.03359 0.02127 0	7.33% 4.54% 4.92% 31.18% 188.6%	0.0% 4.49% 2.71% 74.43% 97.32% 100.0%
Combined Do C-µg/L 0 2.5 5 10 20 40 Angular (Cor C-µg/L 0 2.5 5	evelopment Rate Control Type Lab Control rected) Transfor Control Type	Count 5 5 5 5 5 5 cmed Summ	Mean 0.9418 0.8995 0.9163 0.2408 0.02521 0 mary Mean 1.35	95% LCL 0.8561 0.8488 0.8603 0.1476 0 0 95% LCL 1.197	95% UCL 1 0.9502 0.9722 0.3341 0.08426 0 95% UCL 1.504	Median 0.973 0.9066 0.9176 0.2363 0.005181 0 Median 1.406	Min 0.8187 0.8571 0.8571 0.1319 0 0	Max 0.9788 0.9424 0.9728 0.3194 0.1099 0	0.03085 0.01827 0.02016 0.03359 0.02127 0 Std Err 0.05523	7.33% 4.54% 4.92% 31.18% 188.6% CV% 9.15%	0.0% 4.49% 2.71% 74.43% 97.32% 100.0%
Combined Do C-µg/L 0 2.5 5 10 20 40 Angular (Cor C-µg/L 0 2.5	evelopment Rate Control Type Lab Control rected) Transfor Control Type	Count 5 5 5 5 5 cmed Summ Count 5 5 5 5 5 5 5 5 5 5 6 6 6 6 7 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8	Mean 0.9418 0.8995 0.9163 0.2408 0.02521 0 mary Mean 1.35 1.253	95% LCL 0.8561 0.8488 0.8603 0.1476 0 0 95% LCL 1.197 1.168	95% UCL 1 0.9502 0.9722 0.3341 0.08426 0 95% UCL 1.504 1.339	Median 0.973 0.9066 0.9176 0.2363 0.005181 0 Median 1.406 1.26	Min 0.8187 0.8571 0.8571 0.1319 0 0 Min 1.131 1.183	Max 0.9788 0.9424 0.9728 0.3194 0.1099 0 Max 1.425 1.328	0.03085 0.01827 0.02016 0.03359 0.02127 0 Std Err 0.05523 0.03071	7.33% 4.54% 4.92% 31.18% 188.6% CV% 9.15% 5.48%	0.0% 4.49% 2.71% 74.43% 97.32% 100.0% %Effect 0.0% 7.18% 4.73%
Combined Do C-µg/L 0 2.5 5 10 20 40 Angular (Cor C-µg/L 0 2.5 5	evelopment Rate Control Type Lab Control rected) Transfor Control Type	Count 5 5 5 5 5 cmed Summ Count 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Mean 0.9418 0.8995 0.9163 0.2408 0.02521 0 nary Mean 1.35 1.253 1.286	95% LCL 0.8561 0.8488 0.8603 0.1476 0 0 95% LCL 1.197 1.168 1.179	95% UCL 1 0.9502 0.9722 0.3341 0.08426 0 95% UCL 1.504 1.339 1.393	Median 0.973 0.9066 0.9176 0.2363 0.005181 0 Median 1.406 1.26 1.28	Min 0.8187 0.8571 0.8571 0.1319 0 0 Min 1.131 1.183 1.183	Max 0.9788 0.9424 0.9728 0.3194 0.1099 0 Max 1.425 1.328 1.405	0.03085 0.01827 0.02016 0.03359 0.02127 0 Std Err 0.05523 0.03071 0.03851	7.33% 4.54% 4.92% 31.18% 188.6% CV% 9.15% 5.48% 6.69%	0.0% 4.49% 2.71% 74.43% 97.32% 100.0% %Effect 0.0% 7.18%

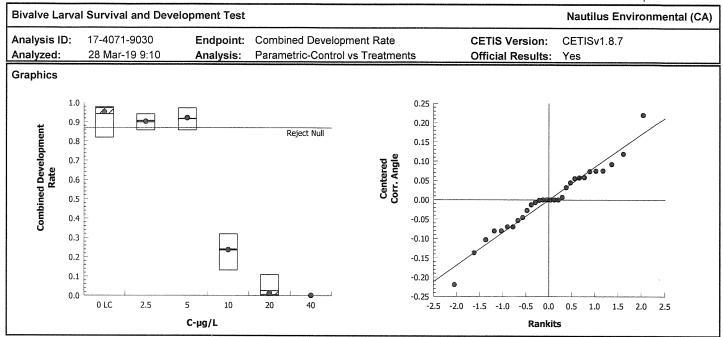
Analyst: Ja QA: 1774/2/19

Report Date:

28 Mar-19 09:13 (p 2 of 6)

Test Code:

190320msdv | 00-9922-7600

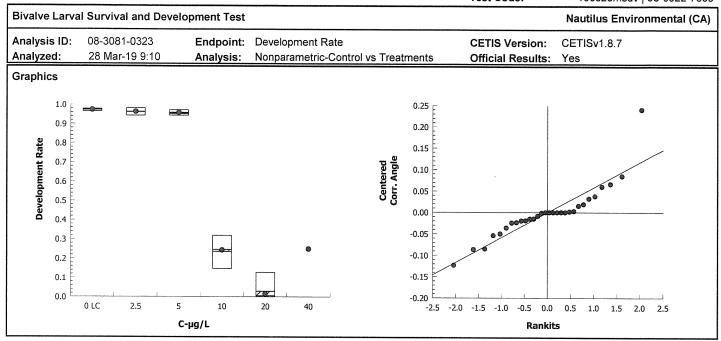


0 Lab Control 5 0.9728 0.9665 0.9791 0.9735 0.9648 0.9788 0.002256 0.52% 0.0% 2.5 5 0.9621 0.9432 0.9811 0.963 0.9424 0.9827 0.00681 1.58% 1.1% 5 0.9583 0.9423 0.9743 0.9529 0.9436 0.9728 0.00577 1.35% 1.49% 10 5 0.2462 0.1607 0.3317 0.2363 0.1463 0.3194 0.03079 27.96% 74.69 20 5 0.02913 0 0.09818 0.005181 0 0.1282 0.02487 190.9% 97.01 40 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CETIS An	alytical Rep	ort					•	ort Date: Code:			13 (p 3 of 6) 0-9922-7600
Part Part	Bivalve Larv	al Survival and I	Developme	nt Test						Nautilus	Environn	nental (CA)
Angular (Corrected) NA	•			•	•		Treatments				8.7	
Control vs C-μg/L Test Stat Critical Ties DF P-Value P-Type Decision(α:5%)	Data Transfo	orm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Control vs C-μg/L Test Stat Critical Ties DF P-Value P-Type Decision(α:5%)	Angular (Corr	ected)	NA	C > T	NA	NA		4.82%	2.5	5	3.536	
Lab Control 2.5	Steel Many-C	One Rank Sum T	est									
5°	Control	vs C-μg/L		Test Stat	Critical	Ties Di	P-Value	P-Type	Decision(α:5%)		
10°	Lab Control	2.5		21	17	0 8	0.2314	Asymp	Non-Signi	ficant Effect		
Note		5*		17	17	0 8	0.0463	Asymp	Significan	t Effect		
Source Sum Squ		10*		15	17	0 8	0.0158	Asymp	Significan	t Effect		
Source Sum Squ = Mean Squ = DF F Stat P-Value Decision(α:5%)		20*		15	17	0 8	0.0158	Asymp	Significan	t Effect		
Between 7.16249 1.790622 4 311.1 <0.0001 Significant Effect	ANOVA Table	е										
Fire	Source	Sum Sqւ	ıares	Mean Squ	are	DF	F Stat	P-Value	Decision(α:5%)		
Total 7.277615 24 24 24 24 24 24 24 2	Between	7.16249		1.790622		4	311.1	<0.0001	Significan	t Effect		
Test Test Test Test Test Stat Test Test	Error	0.115125		0.0057562	49	20						
Attribute Test Test State Critical P-Value Decision(α:1%) Variances Distribution Bartlett Equality of Variance Shapiro-Wilk W Normality 17.11 13.28 0.0018 Unequal Variances Non-normal Distribution Distribution Shapiro-Wilk W Normality 0.8743 0.8877 0.0053 Non-normal Distribution Development Rate Summary C-µg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effe 0 Lab Control 5 0.9728 0.9665 0.9791 0.9735 0.9648 0.9788 0.002256 0.52% 0.0% 2.5 5 0.9621 0.9432 0.9811 0.963 0.9424 0.9827 0.00681 1.58% 1.1% 5 0.9583 0.9423 0.9743 0.9529 0.9436 0.9728 0.00577 1.35% 1.499 10 5 0.2462 0.1607 0.3317 0.2363 0.1463 0.3194	Total	7.277615				24						
Variances Bartlett Equality of Variance 17.11 13.28 0.0018 Unequal Variances Distribution Shapiro-Wilk W Normality 0.8743 0.8877 0.0053 Non-normal Distribution Non-normal Distribution	Distributiona	al Tests										
Distribution Shapiro-Wilk W Normality 0.8743 0.8877 0.0053 Non-normal Distribution	Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			*
Development Rate Summary C-µg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effe C	Variances	Bartlett E	Equality of V	'ariance	17.11	13.28	0.0018	Unequal \	/ariances			
C-μg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effe 0 Lab Control 5 0.9728 0.9665 0.9791 0.9735 0.9648 0.9788 0.002256 0.52% 0.0% 2.5 5 0.9621 0.9432 0.9811 0.963 0.9424 0.9827 0.00681 1.58% 1.1% 5 0.9583 0.9423 0.9743 0.9529 0.9436 0.9728 0.00577 1.35% 1.49% 10 5 0.2462 0.1607 0.3317 0.2363 0.1463 0.3194 0.03079 27.96% 74.69 20 5 0.02913 0 0.09818 0.005181 0 0.1282 0.02487 190.9% 97.01 40 Transformed Summary C-μg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effe	Distribution	Shapiro-	Wilk W Nor	mality	0.8743	0.8877	0.0053	Non-norm	al Distributio	on		
0 Lab Control 5 0.9728 0.9665 0.9791 0.9735 0.9648 0.9788 0.002256 0.52% 0.0% 2.5 5 0.9621 0.9432 0.9811 0.963 0.9424 0.9827 0.00681 1.58% 1.1% 5 0.9583 0.9423 0.9743 0.9529 0.9436 0.9728 0.00577 1.35% 1.49% 10 5 0.2462 0.1607 0.3317 0.2363 0.1463 0.3194 0.03079 27.96% 74.69 20 5 0.02913 0 0.09818 0.005181 0 0.1282 0.02487 190.9% 97.01 40 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Developmen	t Rate Summary										
2.5	C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
5 0.9583 0.9423 0.9743 0.9529 0.9436 0.9728 0.00577 1.35% 1.499 10 5 0.2462 0.1607 0.3317 0.2363 0.1463 0.3194 0.03079 27.96% 74.69 20 5 0.02913 0 0.09818 0.005181 0 0.1282 0.02487 190.9% 97.01 40 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	Lab Control	5	0.9728	0.9665	0.9791	0.9735	0.9648	0.9788	0.002256	0.52%	0.0%
10 5 0.2462 0.1607 0.3317 0.2363 0.1463 0.3194 0.03079 27.96% 74.69 20 5 0.02913 0 0.09818 0.005181 0 0.1282 0.02487 190.9% 97.01 40 5 0 0 0 0 0 0 0 0 0 0 0 Angular (Corrected) Transformed Summary C-μg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effe 0 Lab Control 5 1.406 1.387 1.425 1.407 1.382 1.425 0.006821 1.09% 0.0% 2.5 5 1.378 1.327 1.43 1.377 1.328 1.439 0.01866 3.03% 1.94% 5 1.367 1.326 1.408 1.352 1.331 1.405 0.01481 2.42% 2.74% 10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	2.5		5	0.9621	0.9432	0.9811	0.963	0.9424	0.9827	0.00681	1.58%	1.1%
20	5		5	0.9583	0.9423	0.9743	0.9529	0.9436	0.9728	0.00577	1.35%	1.49%
40 5 0 0 0 0 0 0 0 0 0 0 100.0 Angular (Corrected) Transformed Summary C-μg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err Cv% %Effer 0 Lab Control 5 1.406 1.387 1.425 1.407 1.382 1.425 0.006821 1.09% 0.0% 2.5 5 1.378 1.327 1.43 1.377 1.328 1.439 0.01866 3.03% 1.94% 5 5 1.367 1.326 1.408 1.352 1.331 1.405 0.01481 2.42% 2.74% 10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	10				0.1607	0.3317	0.2363	0.1463	0.3194	0.03079	27.96%	74.69%
Angular (Corrected) Transformed Summary C-μg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effet 0 Lab Control 5 1.406 1.387 1.425 1.407 1.382 1.425 0.006821 1.09% 0.0% 2.5 5 1.378 1.327 1.43 1.377 1.328 1.439 0.01866 3.03% 1.94% 5 1.367 1.326 1.408 1.352 1.331 1.405 0.01481 2.42% 2.74% 10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	20				0	0.09818	0.005181	0	0.1282	0.02487	190.9%	97.01%
C-μg/L Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effet 0 Lab Control 5 1.406 1.387 1.425 1.407 1.382 1.425 0.006821 1.09% 0.0% 2.5 5 1.378 1.327 1.43 1.377 1.328 1.439 0.01866 3.03% 1.94% 5 1.367 1.326 1.408 1.352 1.331 1.405 0.01481 2.42% 2.74% 10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	40		5 	0	0	0	0	0	0	0		100.0%
0 Lab Control 5 1.406 1.387 1.425 1.407 1.382 1.425 0.006821 1.09% 0.0% 2.5 5 1.378 1.327 1.43 1.377 1.328 1.439 0.01866 3.03% 1.94% 5 1.367 1.326 1.408 1.352 1.331 1.405 0.01481 2.42% 2.74% 10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	Angular (Cor	rected) Transfor	rmed Sumn	nary								
2.5 5 1.378 1.327 1.43 1.377 1.328 1.439 0.01866 3.03% 1.94% 5 1.367 1.326 1.408 1.352 1.331 1.405 0.01481 2.42% 2.74% 10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	C-μg/L	Control Type		Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
5 1.367 1.326 1.408 1.352 1.331 1.405 0.01481 2.42% 2.74% 10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	0	Lab Control		1.406	1.387	1.425	1.407	1.382	1.425	0.006821	1.09%	0.0%
10 5 0.5159 0.4134 0.6183 0.5076 0.3926 0.6006 0.03691 16.0% 63.3% 20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05	2.5			1.378	1.327	1.43	1.377	1.328	1.439	0.01866	3.03%	1.94%
20 5 0.1259 -0.04483 0.2966 0.07204 0.03929 0.3662 0.06148 109.2% 91.05			-	1.367	1.326	1.408	1.352	1.331	1.405	0.01481	2.42%	2.74%
0.0002 0.0002 0.00140 100.270 01.00									0.6006	0.03691	16.0%	63.3%
40 5 0.5236 0.5234 0.5238 0.5236 0.5236 0.5236 0 0.0% 62.75										0.06148	109.2%	91.05%
	40		5	0.5236	0.5234	0.5238	0.5236	0.5236	0.5236	0	0.0%	62.75%

Report Date: Test Code:

28 Mar-19 09:13 (p 4 of 6)

190320msdv | 00-9922-7600



Report Date:

28 Mar-19 09:13 (p 5 of 6)

Test Code:

190320msdv | 00-9922-7600

							Test			20msdv 00	
Bivalve Larv	al Survival and	Developme	nt Test						Nautilus	Environn	nental (C
Analysis ID:	00-7449-8257	En	dpoint: Su	rvival Rate			CET	IS Version:	CETISv1	8 7	
Analyzed:	28 Mar-19 9:1		•	rametric-Cor	ntrol vs Trea	itments		ial Results			
Data Transfo	orm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	ected)	NA	C > T	NA	NA	V	7.02%	20	40	28.28	
Dunnett Mult	tiple Compariso	n Test									
Control	vs C-μg/L		Test Stat	Critical	MSD DI	P-Value	P-Type	Decision	(α:5%)		
Lab Control	2.5		1.343	2.305	0.21 8	0.2487	CDF	Non-Sign	ificant Effect		
	5		0.7286	2.305	0.21 8	0.5006	CDF	Non-Sign	ificant Effect		
	10		0.2392	2.305	0.21 8	0.7136	CDF	Non-Sign	ificant Effect		
	20		2.122	2.305	0.21 8	0.0705	CDF	Non-Sign	ificant Effect		
ANOVA Table	е										
Source	Sum Squ	uares	Mean Sq	uare	DF	F Stat	P-Value	Decision	(a:5%)		
Between	0.122725	51	0.0306812	28	4	1.483	0.2449	Non-Sign	ificant Effect		
Error	0.413883	39	0.020694	19	20			-			
Total	0.536609)			24						
Distributiona	al Tests						:				
Attribute	Test			Test Stat	Critical	P-Value	Decision(α:1%)			
Variances	Bartlett I	Equality of \	ariance	0.432	13.28	0.9798	Equal Var	iances			
Distribution	Shapiro-	-Wilk W Nor	mality	0.979	0.8877	0.8646	Normal Di	stribution			
Survival Rate	e Summary							-			
	e Summary Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effec
C-μg/L 0	_	Count 5	Mean 0.9681	95% LCL 0.8797	95% UCL	M edian	Min 0.8407	M ax	Std Err 0.03187	CV% 7.36%	%Effec 0.0%
C-μg/L 0 2.5	Control Type	5 5									
C-μg/L 0 2.5 5	Control Type	5	0.9681	0.8797	1	1	0.8407	1	0.03187	7.36%	0.0%
C-μg/L 0 2.5	Control Type	5 5	0.9681 0.9352	0.8797 0.8754	1 0.9949	1 0.9505	0.8407 0.8846	1 1	0.03187 0.02152	7.36% 5.15%	0.0% 3.41%
C-μg/L 0 2.5 5	Control Type	5 5 5	0.9681 0.9352 0.956	0.8797 0.8754 0.9023	1 0.9949 1	1 0.9505 0.9451	0.8407 0.8846 0.9011	1 1 1	0.03187 0.02152 0.01935	7.36% 5.15% 4.53%	0.0% 3.41% 1.25%
C-µg/L 0 2.5 5 10 20	Control Type	5 5 5 5	0.9681 0.9352 0.956 0.9692	0.8797 0.8754 0.9023 0.9135	1 0.9949 1	1 0.9505 0.9451 1	0.8407 0.8846 0.9011 0.9011	1 1 1 1	0.03187 0.02152 0.01935 0.02008	7.36% 5.15% 4.53% 4.63%	0.0% 3.41% 1.25% -0.11%
С-µg/L 0 2.5 5 10 20 40	Control Type	5 5 5 5 5 5	0.9681 0.9352 0.956 0.9692 0.8934 0	0.8797 0.8754 0.9023 0.9135 0.8113	1 0.9949 1 1 0.9755	1 0.9505 0.9451 1 0.8901	0.8407 0.8846 0.9011 0.9011 0.8242	1 1 1 1	0.03187 0.02152 0.01935 0.02008 0.02957	7.36% 5.15% 4.53% 4.63%	0.0% 3.41% 1.25% -0.11% 7.72%
C-µg/L 0 2.5 5 10 20 40 Angular (Cor	Control Type Lab Control	5 5 5 5 5 5 rmed Sumr	0.9681 0.9352 0.956 0.9692 0.8934 0	0.8797 0.8754 0.9023 0.9135 0.8113	1 0.9949 1 1 0.9755	1 0.9505 0.9451 1 0.8901	0.8407 0.8846 0.9011 0.9011 0.8242	1 1 1 1	0.03187 0.02152 0.01935 0.02008 0.02957	7.36% 5.15% 4.53% 4.63%	0.0% 3.41% 1.25% -0.11% 7.72%
C-µg/L 0 2.5 5 10 20 40 Angular (Cor C-µg/L 0	Control Type Lab Control rected) Transfo	5 5 5 5 5 5 5	0.9681 0.9352 0.956 0.9692 0.8934 0	0.8797 0.8754 0.9023 0.9135 0.8113	1 0.9949 1 1 0.9755 0	1 0.9505 0.9451 1 0.8901 0	0.8407 0.8846 0.9011 0.9011 0.8242 0	1 1 1 1 1 0	0.03187 0.02152 0.01935 0.02008 0.02957 0	7.36% 5.15% 4.53% 4.63% 7.4%	0.0% 3.41% 1.25% -0.11% 7.72% 100.0%
C-µg/L 0 2.5 5 10 20 40 Angular (Cor C-µg/L 0 2.5	Control Type Lab Control rected) Transfo Control Type	5 5 5 5 5 5 rmed Sumr	0.9681 0.9352 0.956 0.9692 0.8934 0	0.8797 0.8754 0.9023 0.9135 0.8113 0	1 0.9949 1 1 0.9755 0	1 0.9505 0.9451 1 0.8901 0	0.8407 0.8846 0.9011 0.9011 0.8242 0	1 1 1 1 1 0	0.03187 0.02152 0.01935 0.02008 0.02957 0	7.36% 5.15% 4.53% 4.63% 7.4%	0.0% 3.41% 1.25% -0.11% 7.72% 100.0%
C-μg/L 0 2.5 5 10 20 40 Angular (Cor C-μg/L 0 2.5	Control Type Lab Control rected) Transfo Control Type	5 5 5 5 5 5 rmed Sumr Count	0.9681 0.9352 0.956 0.9692 0.8934 0 mary Mean 1.459	0.8797 0.8754 0.9023 0.9135 0.8113 0 95% LCL	1 0.9949 1 1 0.9755 0 95% UCL 1.666	1 0.9505 0.9451 1 0.8901 0 Median 1.534	0.8407 0.8846 0.9011 0.9011 0.8242 0 Min	1 1 1 1 1 0 Max 1.534	0.03187 0.02152 0.01935 0.02008 0.02957 0 Std Err 0.07471	7.36% 5.15% 4.53% 4.63% 7.4% CV%	0.0% 3.41% 1.25% -0.11% 7.72% 100.0% %Effect 0.0%
С-µg/L 0 2.5 5 10 20 40	Control Type Lab Control rected) Transfo Control Type	5 5 5 5 5 5 rmed Sumr Count 5 5	0.9681 0.9352 0.956 0.9692 0.8934 0 mary Mean 1.459 1.337	0.8797 0.8754 0.9023 0.9135 0.8113 0 95% LCL 1.252 1.182	1 0.9949 1 1 0.9755 0 95% UCL 1.666 1.492	1 0.9505 0.9451 1 0.8901 0 Median 1.534 1.347	0.8407 0.8846 0.9011 0.9011 0.8242 0 Min 1.16 1.224	1 1 1 1 1 0 Max 1.534 1.534	0.03187 0.02152 0.01935 0.02008 0.02957 0 Std Err 0.07471 0.05587	7.36% 5.15% 4.53% 4.63% 7.4% CV% 11.45% 9.35%	0.0% 3.41% 1.25% -0.11% 7.72% 100.0% %Effec 0.0% 8.38%
C-μg/L 0 2.5 5 10 20 40 Angular (Cor C-μg/L 0 2.5 5	Control Type Lab Control rected) Transfo Control Type	5 5 5 5 5 5 rmed Sumr Count 5 5	0.9681 0.9352 0.956 0.9692 0.8934 0 mary Mean 1.459 1.337 1.393	0.8797 0.8754 0.9023 0.9135 0.8113 0 95% LCL 1.252 1.182 1.229	1 0.9949 1 1 0.9755 0 95% UCL 1.666 1.492 1.557	1 0.9505 0.9451 1 0.8901 0 Median 1.534 1.347 1.334	0.8407 0.8846 0.9011 0.9011 0.8242 0 Min 1.16 1.224 1.251	1 1 1 1 1 0 Max 1.534 1.534	0.03187 0.02152 0.01935 0.02008 0.02957 0 Std Err 0.07471 0.05587 0.05915	7.36% 5.15% 4.53% 4.63% 7.4% CV% 11.45% 9.35% 9.5%	0.0% 3.41% 1.25% -0.11% 7.72% 100.0% *Effect 0.0% 8.38% 4.54%

0 LC

2.5

10

C-µg/L

20

40

Report Date:

-2.5 -2.0 -1.5 -1.0 -0.5

0.0 0.5 1.0

Rankits

28 Mar-19 09:13 (p 6 of 6)

190320msdv | 00-9922-7600

1.5 2.0 2.5

Test Code: **Bivalve Larval Survival and Development Test** Nautilus Environmental (CA) Analysis ID: 00-7449-8257 Endpoint: Survival Rate **CETIS Version:** CETISv1.8.7 Analyzed: 28 Mar-19 9:10 Analysis: Parametric-Control vs Treatments Official Results: Yes Graphics 1.0 0.35 0.30 0.9 Reject Null 0.25 8.0 0.20 Survival Rate 0.15 0.7 0.10 0.6 0.05 0.5 0.00 -0.05 0.4 -0.10 0.3 -0.15 -0.20 0.2 -0.25 0.1 -0.30 0.0 -0.35

Analyst: JU QA: 4504219

Report Date:

28 Mar-19 09:13 (p 1 of 3)

Test Code:

190320msdv | 00-9922-7600

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Analysis ID: 12-2384-4421 Analyzed: 28 Mar-19 9:11

Analysis:

Endpoint: Combined Development Rate Linear Interpolation (ICPIN)

CETIS Version: Official Results: Yes

CETISv1.8.7

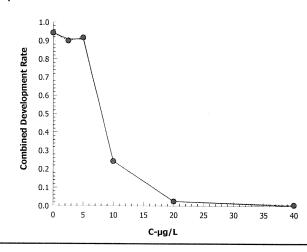
X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	234830	1000	Yes	Two-Point Interpolation

Point Estimates

Level	μg/L	95% LCL	95% UCL
EC25	6.512	6.049	6.913
EC50	8.284	7.795	8.754

Combined	d Development Rat	e Summary	Calculated Variate(A/B)								
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Lab Control	5	0.9418	0.8187	0.9788	0.03085	0.06899	7.33%	0.0%	890	944
2.5		5	0.8995	0.8571	0.9424	0.01827	0.04085	4.54%	4.49%	827	919
5		5	0.9163	0.8571	0.9728	0.02016	0.04508	4.92%	2.71%	848	925
10		5	0.2408	0.1319	0.3194	0.03359	0.0751	31.18%	74.43%	229	942
20		5	0.02521	0	0.1099	0.02127	0.04755	188.6%	97.32%	23	921
40		5	0	0	0	0	0		100.0%	0	910

Graphics



Analyst: JU QA: KFP 42/19

000-089-187-3

Report Date:

28 Mar-19 09:13 (p 2 of 3)

Test Code:

190320msdv | 00-9922-7600

Bivalve Larval Survival and Development Test

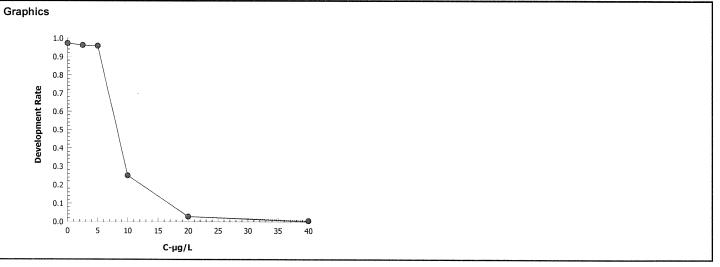
Nautilus Environmental (CA)

Analysis ID:07-3949-1564Endpoint:Development RateCETIS Version:CETISv1.8.7Analyzed:28 Mar-19 9:11Analysis:Linear Interpolation (ICPIN)Official Results:Yes

Linear Interpola	tion Options				
X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	895165	1000	Yes	Two-Point Interpolation

Point E	stimates		
Level	μg/L	95% LCL	95% UCL
EC25	6.616	6.429	6.8
EC50	8.334	7.978	8.7

Developm	ent Rate Summary	•	Calculated Variate(A/B)								
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Lab Control	5	0.9728	0.9648	0.9788	0.002256	0.005043	0.52%	0.0%	890	915
2.5		5	0.9621	0.9424	0.9827	0.00681	0.01523	1.58%	1.1%	827	860
5		5	0.9583	0.9436	0.9728	0.00577	0.0129	1.35%	1.49%	848	885
10		5	0.2462	0.1463	0.3194	0.03079	0.06886	27.96%	74.69%	229	914
20		5	0.02913	0	0.1282	0.02487	0.05561	190.9%	97.01%	23	824
40		5	0	0	0	0	0		100.0%	0	5



Analyst: Ja QA: 15842/19

Report Date:

28 Mar-19 09:13 (p 3 of 3)

Test Code:

190320msdv | 00-9922-7600

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Analysis ID: 05-5691-6970 Endpoint: Survival Rate CETIS Version: CETISv1.8.7

Analyzed: 28 Mar-19 9:10 Analysis: Linear Interpolation (ICPIN) Official Results: Yes

Linear Interpolation Options

X Transform Y Transform Seed Resamples Exp 95% CL Method

Linear Linear 866266 1000 Yes Two-Point Interpolation

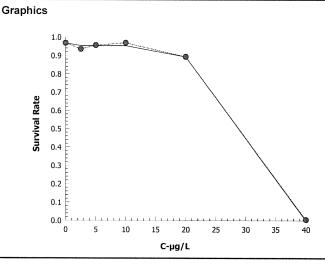
Point Estimates

 Level
 µg/L
 95% LCL
 95% UCL

 EC25
 23.75
 21.71
 25.4

 EC50
 29.16
 27.81
 30.26

Survival I	Rate Summary		Calculated Variate(A/B)								
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Lab Control	5	0.9681	0.8407	1	0.03187	0.07126	7.36%	0.0%	881	910
2.5		5	0.9352	0.8846	1	0.02152	0.04812	5.15%	3.41%	851	910
5		5	0.956	0.9011	1	0.01935	0.04326	4.53%	1.25%	870	910
10		5	0.9692	0.9011	1	0.02008	0.04491	4.63%	-0.11%	882	910
20		5	0.8934	0.8242	1	0.02957	0.06612	7.4%	7.72%	813	910
40		5	0	0	0	0	0		100.0%	0	910



Analyst: Ja QA: 4794219

000-089-187-3

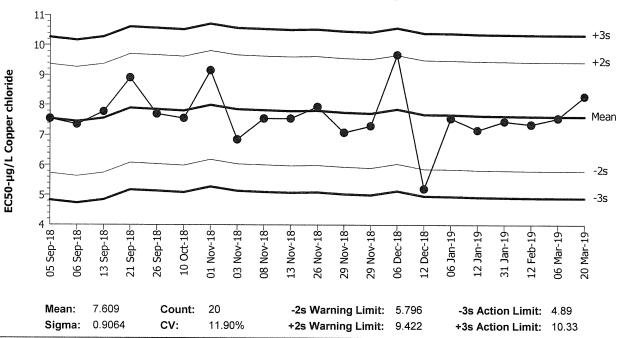
CETIS QC PlotReport Date: 28 Mar-19 09:14 (1 of 1)

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Test Type:Development-SurvivalOrganism:Mytilus galloprovincialis (Bay MusselMaterial:Copper chlorideProtocol:EPA/600/R-95/136 (1995)Endpoint:Combined Development RateSource:Reference Toxicant-REF

Bivalve Larval Survival and Development Test



Quali	ty Con	trol Data	а								
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2018	Sep	5	13:20	7.546	-0.06347	-0.07003			19-1012-9409	17-6300-0161
2			6	14:20	7.352	-0.2569	-0.2834			07-3859-0678	17-1869-4075
3			13	13:45	7.772	0.163	0.1798			05-2434-4016	18-1252-3060
4			21	14:30	8.908	1.299	1.433			02-0289-2516	20-3309-6290
5			26	14:30	7.698	0.08942	0.09866			14-5297-9976	05-2024-1647
6		Oct	10	15:15	7.554	-0.05459	-0.06023			01-3786-4049	16-8922-8681
7		Nov	1	14:30	9.15	1.541	1.701			18-8008-0024	06-2080-3928
8			3	13:30	6.851	-0.7585	-0.8368			13-3014-0314	15-4510-7321
9			8	15:30	7.548	-0.06146	-0.0678			18-8284-7572	06-5807-1390
10			13	13:45	7.548	-0.06146	-0.0678			19-8628-7209	13-8978-9468
11			26	14:50	7.933	0.3245	0.358			05-6256-7096	05-0142-7867
12			29	16:30	7.082	-0.5275	-0.5819			00-5944-3746	07-6331-4646
13			29	20:25	7.3	-0.3093	-0.3412			02-0971-0800	10-0317-7113
14		Dec	6	19:10	9.677	2.068	2.282	(+)		16-3949-4890	04-8210-0425
15			12	13:55	5.202	-2.407	-2.656	(-)		05-3477-8648	14-5219-2764
16	2019	Jan	6	18:10	7.549	-0.05959	-0.06574			00-4814-4263	10-6652-1953
17			12	16:40	7.158	-0.4506	-0.4972			02-7901-0365	04-0206-8014
18			31	20:05	7.448	-0.161	-0.1777			11-0188-3209	19-4158-0070
19		Feb	12	14:30	7.347	-0.2617	-0.2888			05-4773-4064	14-0529-6566
20		Mar	6	14:40	7.555	-0.05373	-0.05928			11-4050-7104	03-7884-0450
21			20	15:25	8.284	0.675	0.7448			00-9922-7600	12-2384-4421

Analyst: Ja QA: KFP4419

000-089-187-3

28 Mar-19 09:14 (1 of 1)

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Test Type: Development-Survival **Protocol:** EPA/600/R-95/136 (1995)

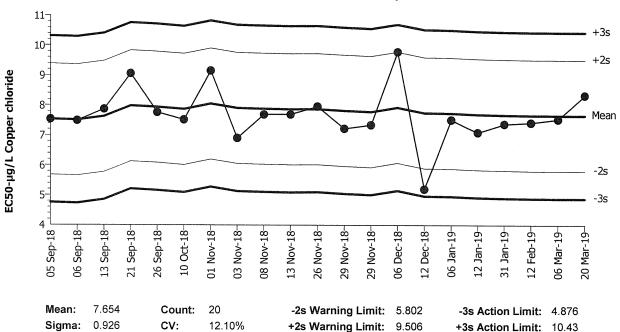
Organism: Mytilus galloprovincialis (Bay Mussel

Endpoint: Development Rate

Material: Copper chloride

Source:

Reference Toxicant-REF



Quali	Quality Control Data											
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	
1	2018	Sep	5	13:20	7.533	-0.1212	-0.1308			19-1012-9409	19-7681-8197	
2			6	14:20	7.486	-0.1677	-0.1811			07-3859-0678	06-9273-0813	
3			13	13:45	7.865	0.2113	0.2282			05-2434-4016	10-4201-7804	
4			21	14:30	9.055	1.401	1.513			02-0289-2516	06-7733-9627	
5			26	14:30	7.763	0.1088	0.1175			14-5297-9976	09-2075-5640	
6		Oct	10	15:15	7.517	-0.1374	-0.1483			01-3786-4049	18-2433-5674	
7		Nov	1	14:30	9.149	1.495	1.615			18-8008-0024	14-9885-9137	
8			3	13:30	6.905	-0.7491	-0.809			13-3014-0314	14-1522-9033	
9			8	15:30	7.691	0.03688	0.03983			18-8284-7572	13-3039-9929	
10			13	13:45	7.691	0.03688	0.03983			19-8628-7209	00-1366-0167	
11			26	14:50	7.958	0.3038	0.3281			05-6256-7096	05-6433-7919	
12			29	16:30	7.221	-0.4331	-0.4677			00-5944-3746	12-1835-1530	
13			29	20:25	7.342	-0.312	-0.337			02-0971-0800	14-6758-9802	
14		Dec	6	19:10	9.781	2.127	2.297	(+)		16-3949-4890	03-2778-3085	
15			12	13:55	5.198	-2.456	-2.652	(-)		05-3477-8648	07-1234-5247	
16	2019	Jan	6	18:10	7.509	-0.1447	-0.1563			00-4814-4263	13-5934-9717	
17			12	16:40	7.094	-0.5605	-0.6053			02-7901-0365	06-1305-7196	
18			31	20:05	7.377	-0.2775	-0.2997			11-0188-3209	01-6713-0404	
19		Feb	12	14:30	7.421	-0.2333	-0.252			05-4773-4064	11-5918-1928	
20		Mar	6	14:40	7.531	-0.1225	-0.1323			11-4050-7104	19-8242-5220	
21			20	15:25	8.334	0.68	0.7343			00-9922-7600	07-3949-1564	

28 Mar-19 09:14 (1 of 1)

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

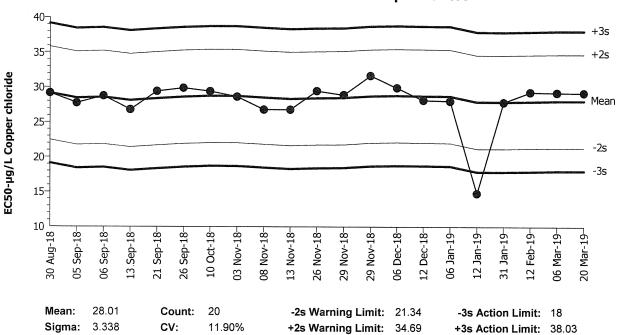
Test Type: Development-Survival **Protocol:** EPA/600/R-95/136 (1995)

Organism: Mytilus galloprovincialis (Bay Mussel

Endpoint: Survival Rate

Material: Copper chloride

Source: Reference Toxicant-REF



Qual	Quality Control Data										
Point	t Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2018	Aug	30	12:40	29.15	1.144	0.3427			04-5323-0718	17-0214-3213
2		Sep	5	13:20	27.72	-0.2859	-0.08564			19-1012-9409	12-4890-7502
3			6	14:20	28.73	0.7187	0.2153			07-3859-0678	08-3450-9811
4			13	13:45	26.78	-1.226	-0.3672			05-2434-4016	13-8372-0203
5			21	14:30	29.39	1.38	0.4135			02-0289-2516	02-1350-9917
6			26	14:30	29.86	1.85	0.5542			14-5297-9976	08-9946-4918
7		Oct	10	15:15	29.38	1.368	0.4099			01-3786-4049	16-7437-4645
8		Nov	3	13:30	28.6	0.5853	0.1753			13-3014-0314	19-1258-0474
9			8	15:30	26.77	-1.24	-0.3715			18-8284-7572	02-4676-6589
10			13	13:45	26.77	-1.24	-0.3715			19-8628-7209	03-9393-7697
11			26	14:50	29.44	1.425	0.4269			05-6256-7096	11-5015-6962
12			29	16:30	28.87	0.8593	0.2574			00-5944-3746	20-1962-0376
13			29	20:25	31.65	3.635	1.089			02-0971-0800	21-2341-9901
14		Dec	6	19:10	29.9	1.887	0.5654			16-3949-4890	19-4410-1396
15			12	13:55	28.13	0.1222	0.03662			05-3477-8648	20-2904-3770
16	2019	Jan	6	18:10	28.01	-0.00389	-0.00117			00-4814-4263	00-6198-2529
17			12	16:40	14.78	-13.23	-3.964	(-)	(-)	02-7901-0365	08-0441-2945
18			31	20:05	27.83	-0.1842	-0.05519			11-0188-3209	12-1004-4079
19		Feb	12	14:30	29.28	1.271	0.3808			05-4773-4064	07-6241-6865
20		Mar	6	14:40	29.2	1.189	0.3562			11-4050-7104	15-7196-8133
21			20	15:25	29.16	1.154	0.3456			00-9922-7600	05-5691-6970

Report Date: Test Code: 15 Mar-19 15:26 (p 1 of 1) 00-9922-7600/190320msdv

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Start Date:	20 Mar-19	Species:	Mytilus galloprovincialis	Sample Code:	190320msdv
End Date:	22 Mar-19	Protocol:	EPA/600/R-95/136 (1995)	Sample Source:	Reference Toxicant
Sample Date:	20 Mar-19	Material:	Copper chloride	Sample Station:	Copper Chloride

ample Date				matorian.	Copper Chloride			Sample Station: Copper Chloride
C-µg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
			1			156	2	
			2			191	180	
			3			0	0	Cells lysed
			4			163	180 0 2 170	
			5			173	170	
			6			173	165	
			7			191	61	
			8			170	162	
			9			153	149	
			10			185	180	
			11			162	0	
			12			0	0	Cells lysed
			13			172	167	
			14			0	0	Cells lysed
			15			172	39	1
			16			195	184	
#0000000000000000000000000000000000000			17			164	24	
			18			0	24	Cells lysed
			19			182	43	,
			20			162	43 156	
			21			193	1	
			22			189	185	
-			23			150	0	
			24			184	179	
			25			189	184	
P1-9-19-04-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0			26			199	192	
			27			64	156	
			28			0	0	Cells lysed
	-		29			161	156	/
			30			205	62	

CETIS Test Data Worksheet

Report Date: Test Code: 15 Mar-19 15:26 (p 1 of 1)

00-9922-7600/190320msdv

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Start Date:	20 Mar-19	Species:	Mytilus galloprovincialis	Sample Code:	190320msdv
End Date:	22 Mar-19	Protocol:	EPA/600/R-95/136 (1995)	Sample Source:	Reference Toxicant
Sample Date:	20 Mar-19	Material:	Copper chloride	Sample Station:	Copper Chloride

C-µg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	LC	1	25					
0	LC	2	26					
0	LC	3	9			163	159	RT 3/23/19
0	LC	4	22					
0	LC	5	10					
2.5		1	20					
2.5		2	6					
2.5		3	29			152	148	RT 3/23/19
2.5		4	5				1 1 1	
2.5		5	2					
5		1	13					
5		2	16					
5		3	8			172	164	RT 3/23/19
5		4	24					
5		5	27					
10		1	17					
10		2	7					
10		3	15			157	39	RT 3/23/19
10		4	19					
10		5	30					
20		1	11					
20		2	21					
20		3	1	V-000000000000000000000000000000000000		172	0	RT 3/23/19
20		4	23	-		1 1		121 0/0 // 1
20		5	4	e e e e e e e e e e e e e e e e e e e				
40		1	28					
40		2	14					
40		3	3			0	0	RT 3/23/19
40		4	12					1-1 0/0/11
40		5	18					



Marine Chronic Bioassay

Water Quality Measurements

Client: Internal		Test Species:	M. galloprovincialis
Sample ID: CuCl ₂		Start Date/Time:	3/20/2019 1525
Test No.: 190320r	nsdv	End Date/Time:	3/22/2019 500

Concentration		Salinity	**************************************	T	emperatu	re	Diss	olved Ox	ygen		рН	
(μg/L)	(μg/L) (ppt)		(°C)		(mg/L)		(pH units)					
	0	24	48	0	24	48	0	24	48	0	24	48
Lab Control	31.8	34.631.	31.3	15.5	15.3	15.1	8.1	7.9	8.3	8.00	8.03	7.89
2.5	32.0	31.9	32.0	15.5	15.2	14.6	8.1	7.9	8.3	8.01	8.03	7.94
5	32.0	.31.9	32.1	15.5	15.1	14.6	8.1	7.9	8.3	8.01	8.03	7.98
10	32.0	31.9	32.1	15.5	15.3	14.8	8.0	7.9	8.4	8.0Z	8,04	7.99
20	31.9	31.8	32.0	15.5	15.1	14.8	8.0	80	8.4	8.02	8,05	7.99
40	31.7	31.7	31.8	15.5	15.2	14.7	8.0	8.0	8.4	8.03	8.06	8.00

	0 24 48	High conc. made (μg/L):	40
Technician Initials:	WQ Readings: BO 565 BO	Vol. Cu stock added (mL):	2.2
	Dilutions made by: Bo	Final Volume (mL):	500
	<u> </u>	Cu stock concentration (μg/L):	9,000
Comments:	Ohrs: A Temperature measured from	simogate vial on tray.	
	24 hrs:		
	48 hrs: @ Q18 B0 3/22/19		
QC Check:	VFP 4/2/19	Final Review:	Ea4/3/19

Client:	Internal Cullz
Test No.:	190320 msdv
Test Species:	M.gallomovincialis
Animal Source:	Mission Bay
Date Received:	315/19 0
Test Chambers:	30 mil shell vial
Sample Volume:	10mL

Start Date/Time:	3/20/2019	1525	
End Date/Time:	3/22/2019	1500	
Technician Initials:	BOKSIFG		

Spawn Information

First Gamete Release Time:

1113

Sex	Number Spawning
Male	4
Female	4

Gamete Selection

Garriete Gelection		
Sex	Beaker Number(s)	Condition (sperm motility, egg density, color, shape, etc.)
Male	1,3,4	apad metility and density
Female 1	ì	pale yellow color, good dersity, some round
Female 2	2	white color, good density mostly rous
Female 3	3	Ovange color gooddersity, mostlymed

Egg Fertilization Time: 1253

Embryo Stock Selection

Stock Number	% of embryos at 2-cell division stage
Female 1	NIA
Female 2	NIA
Female 3	100%

Stock(s) chosen for testing:

Embryo Inoculum Preparation

Target count on Sedgwick-Rafter slide for desired density is 6 embryos

Number Counted:

15	15
18	19
19	18
17	19
19	19

Mean
$$17.8$$
 \times 50 = 890 embryos/ml

Initial Density: 890

Desired Final Density: (to inoculate with 0.5 ml)

Prepare the embryo inoculum according to the calculated dilution factor. For example, if the dilution factor is 2.25, use 100 ml of existing stock (1 part) and 125 ml of dilution water (1.25 parts).

Time Zero Control Counts

· · · · · · · · · · · · · · · · · · ·			
No. Dividing	Total	% Dividing	Mean % Dividing
186	187	99	
168	169	99	
189	191	99	99%
192	194	99	11,
166	168	99	
192	193	99	7
	No. Dividing 186 168 189 192 166 192	No. Dividing Total 186 187 168 169 189 191 192 194 166 168 197 193	186 187 99 168 169 99 189 191 99 192 194 99 166 168 99

Comments:

QC Check:

Final Review: EG 4319

Appendix E
List of Qualifier Codes



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 ≤ 110%
- Q15 Did not meet minimum test acceptability criteria. Refer to QA section of report.
- Q16 Percent minimum significant difference (PMSD) was <u>below</u> 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 <u>above</u> 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 <u>temperature</u> 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 <u>salinity</u> 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.

Updated: 6/30/15